Former Haulbowline Factory, Haulbowline Island, Cork

Detailed Quantitative Risk Assessment (Including Generic Assessment)

A092989

Cork County Council
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Prepared on behalf of WYG Environment and Planning (NI) Limited.

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Executive Summary

Instruction and outline	WYG Environment, Transport and Planning (WYG EPT) were appointed by Cork County Council (CCC) on 5th May 2015, to provide multi-disciplinary environmental consultancy services for the Detailed Quantitative Risk Assessment (DQRA) and Specification of Outline Remedial Options for the Factory Site (Former Steelworks Site) at Haulbowline Island, Ringaskiddy, County Cork.
Aims	The overall aim of the work completed at the Former Factory Site and this report is to provide an assessment of the significance of the risks to human and environmental receptors, in order to assist in identifying risks which may require mitigation. As specified by tender documentation issued by Cork County Council, this includes a Generic and Detailed Quantitative Risk Assessment (GQRA & DQRA) which integrates relevant data obtained from recent monitoring in 2014 and 2015 with existing (previous) site investigation data.
Hydrogeology and Hydrology Environment	Haulbowline Island is set in the centre of the main estuarine channel of Cork Harbour. The central part of the island is a large artificial harbour and dock area. The Factory Site, located on the centre of the Island accounts for around one third of the land area of Haulbowline Island. Monitoring of groundwater within the made ground and natural soils/bedrock has identified that underlying groundwater is connected to the Cork Harbour waters. Hydraulic connectively reduces with distance inland from the shoreline. This is supported by in situ groundwater data level monitoring which has shown tidal signals for groundwater within the made ground, underlying alluvium and limestone. This clear twice daily tidal signal is however absent in BH208 in the centre of the site. Permeability testing has shown that the made ground is permeable and heterogeneous. Lower permeabilities were observed for the underlying alluvium which is consequently inhibiting downward contaminant migration.
Initial Conceptual Site Model	Arup in collaboration with Cork County Council (CCC) undertook a review of all previous works undertaken on the site in order to develop an initial CSM (Arup, 2014). Through completion of a preliminary quantitative risk assessment a number of soil contamination hotspots were identified as requiring further consideration for a residential with gardens end use as follows: • Hydrocarbons in soils in the Former East Camber and South Tip, particularly near BH216, BH218, BH219 (associated with former hydrocarbon storage tanks and historic white spirit spill). • Hotspots of PCB contamination in soils. • Heavy metals in soils, in particular arsenic, cadmium, copper, mercury, lead and zinc. • VOCs detected in BH215, BH217, BH214 and TP216 in the south of the Site associated with former hydrocarbon storage tanks.

Initial Conceptual Site Model Cont'd	The Arup report also considered a potential future commercial end use and identified heavy metal hotspots of arsenic, lead and PCBs. Regarding controlled waters, the 2014 assessment (Arup 2014), identified soil leachability test results in excess of environmental standards for total chromium, copper, mercury, zinc, hexavalent chromium, potassium, sodium, chloride, sulphate, anthracene, fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and total PAH. Groundwater analysis results for the 2005 to 2010 investigations were compared to environmental quality standards and identified elevated heavy metals, particularly zinc, manganese, arsenic and chromium, hydrocarbons (TPHs and PAHs) and ammoniacal nitrogen. Free product was also noted in BH216 and BH218 in the former East Camber.
Generic Quantitative Risk Assessment	The laboratory analysis results were assessed against relevant GACs. In regard to human health, these were compared to commercial land use GACs to consider the current and future uses of the site and also to park land use GACs to consider a future recreational land use. Whilst, arsenic, lead, dibenzo(a,h)anthracene and PCBs had measured concentrations which exceeded the GACs for either one or both uses, statistical analysis of the data found that only lead and PCB contamination are present at levels across the site, and with hotspots of arsenic and lead contamination are considered to pose a potential significant risk to human health for future site users. Groundwater samples collected from wells screened in the various horizons of made ground, alluvium and limestone, were found to have measured concentrations of some of the contaminants of concern in excess of their relevant WQSs. In particular, measured cadmium, chromium, chromium VI, copper, zinc, lead and mercury concentrations exceeded relevant WQSs and are consequently considered to be contaminants of concern with the potential to impact Cork Harbour waters through migration through saturated made ground, natural soils and water. Measured speciated PAHs including anthracene, benzo(a)pyrene, benzo(b)-fluoranthene, benzo(k)-fluoranthene, benzo(g,h,i)perylene, fluoranthene, Indeno(1,2,3-cd)pyrene and naphthalene and total and speciated TPH concentrations also exceeded relevant WQS in groundwater samples, particularly at BH216. Also 1,2,4 trichlorobenzene, hexachlorobutadiene and trichloroethene at this location exceeded relevant WQSs. However due to their low concentrations and isolated occurrences to one location only, they are not considered to be capable of causing a WQS to be exceeded in the actual Cork Harbour water receptor. It is also worth noting that groundwater in the bedrock is largely not impacted, with contaminant concentrations typically being less than applicable WQSs. Consequently, significant downward migration of contaminants into the Bedrock aquifer has not occurred. Sampling and analysis of Cork Harbour marine waters and with the exception of lead also did not measure concentrations in excess of WQSs showing that they are not currently being impacted. Elevated dissolved lead concentrations were identified in water samples collected and analysed from two drainage outlets and a nearby surface water sample. Consequently, contaminated sediment in drainage is considered to have the potential to be leaching and discharging to the Cork Harbour waters.

Generic Quantitative Risk Assessment Cont'd	Gas concentrations considered in conjunction with gas flows have resulted in most monitored locations being classified as characteristic situation 1 according to CIRIA guidance as they have gas screening values (GSVs) of less than 0.07l/hr. BH109, BH213 and BH215 have been classified as characteristic situation 2, due to elevated carbon dioxide with elevated gas flows. BH218, where LNAPL hydrocarbon is present on groundwater has been classified as characteristic situation 3 with a maximum GSV of 2.98l/hr (CIRIA, 2007). Both characteristic 2 and 3 would require gas protection measures to be installed into any buildings to be constructed on site.
Water DQRA Tier 4	A bespoke Detailed Quantitative Risk Assessment model has been completed to establish a conservative estimate of the mass of dissolved phase contaminant flux potentially leaving the site as part of the local tidal regime and its impact on Cork Harbour marine waters taking into account the potential for dilution. This also included Tier 3 fate and transport modelling for organic hydrocarbon contaminants to take into account attenuation mechanisms, particularly degradation. The modelling showed no theoretical impacts to the waters of Cork Harbour from the majority of the potential constituents of concern identified through the generic assessment process. However, the model predicted that hydrocarbon concentrations in the Harbour waters to a distance of 20m from the southern shoreline could be impacted, however they are not considered to be of significant concern as the predicted concentrations are less than that which can be analytically measured. It should be noted that with the exception of lead sampling and the laboratory analysis of Cork Harbour waters for the above contaminants has not identified an actual impact.
Human Health DQRA	A human health DQRA was completed to consider inhalation pathways associated with volatile contaminants in groundwater. RBCA (Risk Based Corrective Action) Model v2.6 was used to model maximum measured concentrations of volatile TPHs, PAHs and trichloroethene. Two specific end uses were considered a recreational end use and a commercial end use. The commercial end use was also considered to be a residential end use to assess potential risks for resident Navy Officers (adjacent land users to the west). Maximum measured concentrations of trichloroethene, speciated TPHs and speciated PAHs did not exceed the derived SSTLs for groundwater sampled from the made ground and natural soils. As a result potential significant risks to the end commercial and recreational site users on and off site are not present.

Recommendation and Conclusions	Remediation is considered necessary to protect the health of the end users of the site for arsenic, lead, PCBs and asbestos through direct contact, ingestion and dust inhalation pathways and ground gas inhalation with respect to human health. Remediation of hydrocarbon concentrations, specifically free product in respect to the Cork Harbour waters is also necessary. A possible remedial approach is through the provision of a capping layer to any proposed soft landscaping areas which will break the pathway associated with risks to human health Where hard standing or buildings are proposed these will also provide an effective capping removing the pathway with respect to these contaminants. Gas protection measures are also necessary for any buildings on site. In respect of groundwater, a free product treatment system should be designed and implemented to effectively recovery or remove a free phase product source noted at BH218 and BH208 as LNAPL on groundwater. This can also treat any dissolved TPH concentrations in groundwater in made ground and alluvium located in this area.

1.0 Introduction

1.1 Instruction

WYG Environment, Transport and Planning (WYG EPT) were appointed by Cork County Council (CCC) on 5th May 2015, to provide multi-disciplinary environmental consultancy services for the Detailed Quantitative Risk Assessment (DQRA) and Specification of Outline Remedial Options for the Factory Site (Former Steelworks Site) at Haulbowline Island, Ringaskiddy, County Cork, (Figure 1 and Figure 2).

1.2 Legal Context and Assessment Framework

The Environmental Risk Assessment for the Former Factory Site, includes an assessment of groundwater, surface water and ground gas monitoring results, completion of DQRA and design of an appropriate outline remediation plan. The work, as presented in this report, has been completed in accordance with best practice guidance documents including "Framework Approach for the Management of Contaminated Land and Groundwater at EPA Licensed Facilities" (EPA, 2012); the "Code of Practice: Environmental Risk Assessment for Unregulated Disposal Sites" (EPA, 2007) and the "Model Procedures for the Management of Land Contamination – Contaminated Land Report" (EA, 2004). This latter piece of guidance is specifically relevant to land contamination in the United Kingdom (UK), however it is relevant, as the EPA's framework has been broadly based on it.

The framework approach identifies three stages as outlined below:

Stage 1 – Site Investigation and Assessment including

- Preliminary Site Assessment
- Detailed Site Investigation
- Quantitative Risk Assessment

Stage 2 – Corrective Action Feasibility and Design

- Outline Corrective Action Strategy (Objectives)
- Feasibility study and outline design
- Detailed design
- Final Strategy and implementation plan

Stage 3 – Corrective Action Implementation and Aftercare

- Enabling works
- Corrective Action Implementation and Verification
- Aftercare

This assessment presented in this report presents the results of a detailed site investigation and quantitative risk assessment in accordance with Stage 1 above.

The risk assessment process is underpinned by the establishment and continual refinement of a Conceptual Site Model (CSM). A CSM describes the potential sources of contamination at a site, the contaminant migration pathways it may follow and the receptors that could be or are being impacted. When all three are present i.e. source, pathway and receptor, then a potential pollutant linkage is considered to be present, requiring characterisation and assessment in order to determine whether remedial works are needed to adequately address any potentially unacceptable risks.

1.3 Limitations of the Report

Attention is drawn to the report conditions, included in Appendix A.

1.4 Aims and Objectives

The overall aim of the work completed at the Former Factory Site and this report is to provide an assessment of the significance of the risks to human and environmental receptors, in order to assist in identifying risks which may require mitigation. As specified by tender documentation issued by Cork County Council, this includes a Generic and Detailed Quantitative Risk Assessment (GQRA & DQRA) which integrates relevant data obtained from recent monitoring in 2014 and 2015 with existing (previous) site investigation data.

The scope of work included:

- Development of an integrated profile of the chemical and physical nature of made ground, alluvial materials and bedrock to include site referencing and summary of site context in line with the objectives of risk assessment methodology. Hydrogeological and hydrological setting shall also be addressed;
- Detailed interpretation of testing in respect to sources, pathways and receptors, which also takes into account potential off-site contamination sources. This included a summary of previous report data as required, Generic Assessment (human health and waters) and

assessment of pollutant linkages using GACs, identification of unacceptable risk/contaminants of concern for DQRA assessment, DQRA and Conceptual Site Model (CSM) presentation;

- Water DQRA (tiered approach), including rationale and methodology, technical basis for assessment, CSM, flux modelling, dilution model and conclusions;
- Human Health DQRA (on site and off site receptors), including rationale and methodology, results and CSM;
- Identification of key issues, relationships and trends; and
- Identification of an outline of the remedial solution.

It should be noted that the term "made ground" utilised within this report refers to non-natural materials which have been deposited on site above alluvium, natural sediments or bedrock. This includes waste materials from the site's use as a steelwork. Any use of the term "soil" within this report refers to natural materials, soils or sediments, including alluvium, sands, silts, clays and gravel.

1.5 Report Content

This report sets forth the findings of this study in the following chapters:

Chapter 2	Previous Site Investigations Summary 2005, 2010 and Sampling / Monitoring 2014-2015
Chapter 3	Generic Quantitative Risk Assessment (GQRA) for human health and waters
Chapter 4	Updated Conceptual Model (Post GQRA)
Chapter 5	Hydrogeological and Hydrology Setting
Chapter 6	Waters (DQRA Tier 4)
Chapter 7	Human Health DQRA
Chapter 8	Recommendations for Remediation Arising from Risk Assessment
Chapter 9	Conclusions

1.6 Previous Reports

A number of investigations have been undertaken on the Site in the past. The factual and interpretive environmental reports completed between 2002 and 2010 are listed in Table 1 and have been reviewed to inform a desk study completed by Arup's in 2014.

A DQRA has also been undertaken for the East Tip which is located to the East of the Site. Considering the proximity of this site, it is also included in Table 1.

Table 1 – Previous Reports (Arup, 2014)

Report Title	Year	Author
Haulbowline Steelworks Site Assessment, Desk Study, REP/1/Draft 3	2014	ARUP
East Tip, Haulbowline Island, Cork. Detailed Quantitative Risk Assessment (Including Generic Assessment)	2013	WYG
Geo-Environmental Report, Main Site, Haulbowline	2010	WYG
Ground investigation (Appendix B of Geo-Environmental Report, Main Site, Haulbowline)	2010	Glover Site Investigations
Groundwater and Gas Monitoring Assessment	2008	WYG
On-going Water Quality Monitoring, Former Steelworks, Haulbowline Island, County Cork	2007	Glover Site Investigations
On-going Water Quality Monitoring, Former Steelworks, Haulbowline Island, County Cork	2007	Glover Site Investigations
On-going Water Quality Monitoring, Former Steelworks, Haulbowline Island, County Cork	2006	Glover Site Investigations
Haulbowline Island, Parallel Review of Investigation	2006	Hyder Consulting
Factual Geo-Environmental Report Contamination and Geotechnical Assessment	2005	WYG
Interpretative Geo-Environmental Report Contamination and Geotechnical Assessment	2005	WYG
Examination of 29 slag samples from the former steelworks at Haulbowline Island, Cork, Ireland for Glover Site Investigations Ltd (Appendix K of Factual Geo-Environmental Report Contamination and Geotechnical Assessment 2005)	2005	TRS
Static Cone Penetration Tests Factual Report (Appendix M of Factual Geo- Environmental Report Contamination and Geotechnical Assessment 2005)	2005	Lankelma CPT Ltd
Environmental Assessment of Irish Ispat Ltd, Haulbowline, Co. Cork	2002	OCM
IPC Application	1999	Irisk Ispat
Phase One Investigation and Assessment at Haulbowline Island, Cork Harbour, Cork	2002	Enviros Aspinwall

1.7 Initial Conceptual Site Model

Arup in collaboration with Cork County Council (CCC) undertook a review of all previous works undertaken on the site in order to develop an initial CSM (Arup, 2014). The initial CSM developed from this review is presented in Appendix B.

This initial conceptual site model was further modified by Arup through completion of a preliminary quantitative risk assessment which identified a number of soil contamination hotspots following consideration of previous site investigation soil analysis results for a residential with gardens end use as follows:

- Hydrocarbons in the Former East Camber and South Tip near BH216, BH218, BH219 (associated with former hydrocarbon storage tanks and historic white spirit spill). Hydrocarbons were also identified by Arup in localised hotspots around TP109, TP214, BH208, TP104, TP102 and TP204.
- Hotspots of PCB contamination were considered by Arup to be widespread across the Site with a greater density of hotspots in the former South Tip, East Camber, east of the former East Camber and in the northern part of the Site.
- Heavy metals were considered to be widespread across the Site. Hotspots of heavy metal contamination were considered to be:
  - Arsenic hotspots at TP134 and TP214, BH201.
  - Cadmium hotspots at TP102, TP134, TP204, TP206, BH201 and BH208.
  - Copper hotspots at TP116, TP134, TP210, TP218, BH109, BH201.
  - Mercury hotspots at TP113, TP134, BH109, BH217 and BH219.
  - Lead hotspots at TP116, TP133, TP134, TP204, BH109, BH216 and BH219.
  - Zinc hotspots at TP133, TP134, TP204, TP109, BH111 and BH216.
- VOCs were detected in BH215, BH217, BH214 and TP216 in the south of the Site associated with former hydrocarbon storage tanks.

A site investigation plan is presented as Figure 3a on the current site layout and Figure 3b on the current proposed Master Plan.

The Arup report also considered a potential future commercial end use and identified the following hotspot sources of contamination:

- Heavy metal hotspots of arsenic (TP134, BH201), mercury (TP113, TP134, BH109, BH212, BH217, BH219) and lead (TP116, TP134, BH216).

- Localised hotspots of PCBs in the former East Camber (BH109), in the eastern part of the Site (BH106, BH211, TP209 and TP117) and the northern part of the Site (TP102 and TP104).

In regard to controlled waters, the 2014 assessment (Arup 2014), identified soil leachability test results in excess of environmental standards for total chromium, copper, mercury, zinc, hexavalent chromium, potassium, sodium, chloride, sulphate, anthracene, fluoranthene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and total PAH.

Groundwater analysis results for the 2005 to 2010 investigations were compared to relevant environmental quality standards and identified elevated heavy metals, particularly zinc, manganese, arsenic and chromium, hydrocarbons (TPHs and PAHs) and ammoniacal nitrogen. Free product was also noted in BH216 and BH218 in the former East Camber.

In developing the initial conceptual model Arups determined that the underlying limestone aquifer should not be considered as a sensitive receptor. It is brackish or saline, is therefore considered to be of a poor water quality and would not be used for public or private drinking water supplies. As a result, it has not been included as a sensitive receptor for risk assessment purposes.

2.0 Site Details and Previous Site Investigations Summary 2005, 2010 and Sampling / Monitoring 2014-2015

2.1 Site Details, Location and Settings

Haulbowline Island is situated in an industrial and urbanised harbour setting in the lower part of Cork Harbour with many industries, some commercial fishing activity, commercial shipping and leisure amenities occurring around it. The Island is over looked by residential towns such as Cobh to the north and Ringaskiddy to the south. A site location map presented as Figure 1.

The occupation of Haulbowline Island is shared between the former Irish Steel site and the Irish Naval Service. There are currently no permanent residents living on the island. East of the naval property is the East Tip which is an area of land reclaimed from a natural area of shallow water know as the Spit Bank by infilling of processing waste from the steelworks processes. A site layout map of Haulbowline Island is presented in Figure 2.

The majority of buildings associated with the steel production have been demolished and cleared from the site since 2005, although a number of listed buildings were retained. The former steelworks site operations comprised of an Electrical Arc Furnace and rolling mill, along with various ancillary buildings such as an oxygen plant, scrap yard, water clarifiers, machine shops, electrical sub-stations, joinery shop, shipbuilding and warehousing, as presented in Figure 2.

The area of Haulbowline Island was 23.5ha when steel processing started in 1938 and 34.9ha when production ceased in 2001, an increase of 11.4ha or almost 50% due mainly to waste deposition on the East Tip area of the Island. The main steelworks site is 11.3ha and currently the East Tip covers 9ha. Therefore, the former Irish Steel site has a total area occupation on Haulbowline Island of slightly more than 20ha.

The western portion of the Island, occupied by the naval base, consists of limestone rock outcrop, which dips downward to the east and to the south. It is reported that the majority of the land east of the outcropping bedrock, including the area occupied by the former main steelworks site, naval docks and the East Tip have been formed by historic infilling, with quarry materials and on-site production wastes.

The Island was originally used as a naval supply and dock yard, which was located in the western area of the existing Island, by the Royal Navy in the 18th and 19th Centuries. There was extensive land reclamation during the development of the naval docks. The island was comprised of two islands linked by a bridge until 1902 when the two islands were linked by infilling activity. Areas of the site have been backfilled with material from periods before operation of the steelworks (East Camber) to throughout the operation of the steelworks (East Camber, South Tip and East Tip). Various materials may have been historically backfilled in these areas. The locations of the filled areas are presented in Figure 3a.

The groundwater beneath the site is influenced by the surrounding estuarine water of Cork Harbour with salinity and tidal variations impacting the groundwater making it unsuitable for use as a drinking water supply. There are no existing groundwater wells used for potable water supply on Haulbowline Island.

2.1.1 Steel Production

Steel processing began in 1942 with backing from the Irish Government with the installation of two open hearth furnaces producing steel from scrap. A pickling, galvanizing and corrugation plant was opened in 1954. Initially a coal gasification plant was used to fire the open hearth furnaces of the steelworks which was converted to fire on heavy fuel oil in 1956. The coal gasification plant was subsequently demolished. In 1962 a single 70 tonne oil fired open hearth furnace replaced both of the older furnaces and the Island was connected by a bridge to the mainland in 1966.

Modernisation of the plant began in 1972, when a 35 tonne electric arc furnace replaced the oil fired open hearth furnace and the electrical substation and transformers were installed to power the furnace. In 1980 the plant was connected to the natural gas supply system operated by Bord Gáis and natural gas was used, principally in the reheat furnace. Gas was distributed throughout the site from an above ground installation. The galvanizing plant ceased operations in 1981. In the same year a 90 tonne Arc Furnace was installed and the plant reconfigured to combine fast melting in the Arc Furnace with continuous casting and a continuous universal mill. A Ladle Furnace was installed in 1992.

2.1.2 Steel Production Wastes

A detailed account of the waste steams associated with the steelworks site is outlined in the 2010 WYG site investigation report (WYG, 2010). Wastes that were largely placed on the East Tip area of the Island consisted of;

- Non hazardous[1] Slag (molten flux formed in the steelmaking process), Refractories (consisting mostly of bricks that were used for lining the steel vessels), Scrap Metal, (There is waste scrap metal that that was dumped across the site within the slag material), Refuse Waste, Construction and Demolition Waste and Topsoil,
- Potentially Hazardous Millscale (formed during oxidisation of steel in process),
- Hazardous Sludge (Oil, greases and hydraulic fluids from the steel making machinery was collected with the mill scale in tanks known as clarifiers), hazardous Furnace Flue Dust (Most flue dust was pelletised due to the high lead content and exported to the UK for recycling).
- Radioactive Waste. Radioactivity was present on the steelworks site in various forms while the plant was in production and, for a time, after it closed. None of the radiation items remain at Haulbowline which is confirmed by the RPII. WYG screened all waste/soil samples taken on-site with a MiniRad 1000 series gamma survey monitor to detect for the presence of radioactive material of which none was detected (WYG, 2010).

2.2 Previous Investigations

Previous land contamination assessment reports as presented in Table 1, present the findings of two main phases of site investigation works which were completed and reported in 2005 and 2010 (WYG, 2005 & WYG, 2010). It is not the intention to reproduce this data within this report. Consequently, the above reports should be read in conjunction with this report and copies are included on a CD at the end of the appendices.

In summary, the site investigations and monitoring works included:

- 30 No. boreholes to various depths including into the underlying Limestone Bedrock;
- 45 No. trial pits;

[1] The terms hazardous or non-hazardous applied to the different wastes is in reference to specific regulatory meanings and should not be taken as referring to specific risks that the waste components pose to human health, the environment or ecological receptors.

- Chemical, UK National Rivers Authority (NRA) leachability testing[2] and geotechnical testing of solid samples;
- Chemical and geochemical testing of water samples;
- Ground gas monitoring;
- Groundwater monitoring;
- Surface water sampling; and
- In-situ permeability testing.

Site investigation locations are shown on Figure 3a including from two previous investigations in 2005 (WYG, 2005) and 2010 (WYG, 20010) which have been utilised within the risk assessment contained in this report.

2.3 Potential Contaminants of Concern (PCOC) – Industry Profile

The UK's department of the Environment Industry Profile for steelworks (DOE, 1995) provides information on the processes, material and wastes associated with steelworks. It identifies that steel is an alloy of iron produced by refining iron to remove excess carbon and other elements and that some aluminium, nickel and chromium may be deliberately added. Solid material produced in the process includes slag, arising, scrap, dust and slurries and refractory material. Steel making slags are normally poured into contained areas and allowed to solidify.

The profile identified the following contaminants of concern (COCs) in relation to steelworks sites:

- Metals and metalloids - Iron, arsenic, chromium, lead, manganese, molybdenum, nickel and zinc. Additionally, aluminium, tin and vanadium associated with rolling and finishing processes;
- Inorganic compounds - fluoride, sulphates and phosphates;
- Acid/alkalis associated with rolling and finishing;
- Asbestos; and
- Organic compounds – fuels, oils and PCBs.

[2] NRA Leachability test is a laboratory test completed on solid material during which leachate is generated and analysed for contaminants of concern. It is used to assess the potential for contaminants to leach from solid to liquid phase to impact groundwater and surface water.

As a result of the above, the following extensive list of contaminants were tested for as part of the site investigation, sampling and monitoring works completed:

Solid waste and natural sediments;

- Metals including aluminium, arsenic, cadmium, calcium, chromium (total), hexavalent chromium (or chromium VI), lead, mercury, selenium, boron (water-soluble), copper, nickel, zinc, antimony, barium, beryllium, magnesium, manganese and vanadium;
- Organic Compounds including phenols total and speciated, mineral oil, speciated total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX) and methyl tertiary butyl ether (MTBE), total polyaromatic hydrocarbons (PAHs) and suite of volatile organic compounds (VOCs);
- Inorganics including cyanide total, cyanide complex, cyanide free, thiocyanate, sulphide, sulphate - total, acid, soluble, sulphate - water soluble, 2:1 extract, sulphur free, pH value and asbestos.; and
- Polychlorinated biphenyls (PCBs).

Groundwater, surface water and leachate from leachability tests;

- Metals including aluminium, arsenic, cadmium, calcium, chromium (total), hexavalent chromium (or chromium VI), lead, mercury, selenium, boron (water-soluble), copper, nickel, zinc, antimony, barium, beryllium, magnesium, manganese, vanadium, iron, sodium, potassium
- Organic Compounds including phenols total and speciated, speciated total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX) and methyl tertiary butyl ether (MTBE), total polyaromatic hydrocarbons (PAHs), suite of volatile organic compounds (VOCs) and suite of semi- volatile organic compounds (SVOCs);
- Nitrogen compounds including ammoniacal nitrogen, nitrate and nitrite.
- Inorganics including cyanide total, cyanide complex, cyanide free, thiocyanate, sulphide, sulphate - total, acid, soluble, sulphate - water soluble, 2:1 extract, sulphur free, pH value,
- Dioxins and Furans;
- Polychlorinated biphenyls (PCBs); and
- Water quality indicators chemical oxygen demand (COD), biochemical oxygen demand (BOD) and electrical conductivity.

2.4 Methodology Assessment Criteria

For a risk of harm to human health or the environment to occur as a result of ground contamination, all of the following elements must be present:

- A source, i.e. a substance that is capable of causing pollution or harm;
- A receptor (or target), i.e. something which could be adversely affected by the contaminant; and
- A pathway, i.e. a route by which the contaminant can reach the receptor.

If one of these elements is missing there can be no risk. If all are present then the magnitude of the risk is a function of the magnitude and mobility of the source, the sensitivity of the receptor and the nature of the migration pathway.

In order to assess the human health and environmental risks posed by potential contaminants within made ground, underlying natural soils and underlying groundwater an initial screen of the laboratory results was undertaken using Generic Assessment Criteria (GACs). GACs are generic screening values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information. Where contaminant concentrations fall below relevant GACs, they are not considered to be capable of causing a risk to the receptor being considered and as a result do not warrant further consideration.

2.4.1 Human Health – Chemical Analysis of Solid Samples

In order to assess the solid laboratory analyses results, both for made ground material and natural sediments, WYG have utilised GACs which comply with current Irish Framework Guidance (EPA, 2012) to assess potential risks to human health receptors. Following discussion with CCC, WYG have used appropriate commercially available GACs for the generic human health risk assessment which are regularly used in Ireland and the UK. GACs are contaminant specific and have been derived for various land use types including commercial / industrial, low density and high density housing and park / open spaces and allotments. Those that are relevant to assessing contamination within the Former Factory Site include:

- Suitable 4 Use Levels (S4ULs) Park land use GACs are commercially available GACs and are considered appropriate for screening soils based upon the possible future recreational use of the Former Factory Site. They have been recently derived in the UK by the Chartered Institute of Environmental Health and the Land Quality Management Team at the University of Nottingham. These were developed through collaboration of a number of UK

contaminated land specialist practitioners and published jointly by CLAIRE and CIEH, (CIEH, 2015). These screening criteria can be considered to be appropriate for use in Planning for assessing risks to the health of future park or recreational site users of the site. The CSM for this land use and derivation of GACs assumes that the site in question has large grassed areas that are used for a range of recreational activities including picnicking, sunbathing and casual sports uses e.g. a football 'kick around'. There is also often a small children's play area, which may have tarmac or other hard cover. Parks are also assumed to have areas such as flower beds and paddling pools or duck ponds. However, pathways relating to contact with surface water are not assessed in development of the GACs. These GACs are considered to be more appropriate in the context of the potential future site end use than other commercially available GACs such as those that have been calculated by the CIEH and LQM (CIEH, 2009) which only provide GACs relevant to residential, allotments and commercial land uses. It is considered the use of residential GACs would provide an overly conservative assessment and they assume that a child is the critical receptor who would be exposed 365 days per year.

- S4UL Commercial and industrial land use GACs, assume that buildings are present, normally for office use on site and that indoor pathways are therefore applicable. Outdoor contact pathways are restricted to lunchtimes or break times. It should be noted that these GACs are typically more than the above park land use GACs and therefore generally the use of park land use GACs provides for a more conservative assessment.

A full list of the GACs is provided in Appendix C. Solid sampling laboratory analysis results compared to relevant GACs are presented in Appendix D for all solid samples analysed, made ground and natural sediments.

Statistical Methodology

In May 2008, "Guidance on comparing soil contamination data with a critical concentration" was jointly published by the Chartered Institute of Environmental Health (CIEH) and Contaminated Land Applications in the Real Environment (CL:AIRE) (CIEH, CLAIRE, 2008). This document provides guidance on statistical techniques and methods for data assessment purposes, specifically comparing a critical concentration with an unbiased sample data set of soil contaminant results.

2.4.2 Methods for Water Assessment

The analytical data from solid leachability tests, groundwater and surface water samples has been assessed by direct comparison with Water Quality Standards (WQS) as presented in Table 2. Where a specific Irish Surface Water Standard is not available, then other standards such as drinking water standards (Irish standards if available) were utilised or Environmental Quality Standards (EQS) from the UK. These are mainly national statutory standards sourced from, in order of preference, European Union Enivronmental Objectives (Surface Waters) (amendment) Regulations 2015, European Communities Environmental Objectives (Surface Waters) Regulations 2009 (Annual Average) for surface waters other than inland waters e.g. coastal and transitional waters; European Communities Environmental Objectives (Surface Waters) Regulations 2009 (Annual Average) for inland surface waters; and other international water quality standards namely UK Environmental Quality Standards (EQS) and UK Drinking Water Standards (DWS). These are used as screening standards in the first instance to determine which of the potential contaminants of concern (PCOC) should be further assessed for significance of the risk posed.

In order to assess PCOCs, compliance point standards are required which should be appropriate for the receptor being considered. For the Factory site, the Cork Harbour waters are considered to be the primary receptor. As a result the preferred quality standards adopted are those as in Table 2 and are EQS values for "other surface waters".

2.4.3 UK NRA Leachability Tests on the Solid Matrix

The results of the UK National Rivers Authority (NRA) leachability tests on made ground and natural sediment samples were screened against water quality standards (WQSs) to assess their potential risk (Table 2).

UK NRA leachability test results and water analysis summary screening sheets are presented in Appendix E and Appendix F respectively. These sheets summarise the laboratory analysis results and compare them to a contaminant specific GAC (appropriate water quality standard), with concentrations in excess of GACs highlighted.

Table 2 – Water Quality Standards from European Communities Environmental Objectives (Surface Waters) Regulations and 2009 (Annual Average) (DoEHLG, 2009) and as amended by European Union Environmental Objectives (Surface Waters) (amendment) Regulations 2015 (DoEHLG, 2015)

Contaminant	Water Quality Standard (WQS) (µg/l)
Arsenic	20
Chromium III	4.7 (inland water – no other surface water)
Chromium VI	0.6
Copper	5
Zinc	40
Lead	1.3
Nickel	8.6
Phenol	8
Mercury	0.07*
Cadmium	0.2
Total Ammonia (mg/l N/l)(good status)	65
Ammoniacal Nitrogen	40 (mg/l) (inland water standard)
Benzene	8
Xylene	10
Toluene	10
Anthracene	0.1
Benzo(a)pyrene	0.00017
Benzo(b & k)fluoranthene (sum)	0.03 (2009 standard)
Benzo(g,h,i)perylene & indeno (1,23-cd)pyrene (sum)	0.002 (2009 standard)
Fluoranthene	0.00632
Naphthalene	2
1.2.4 Trichlorobenzene	0.4
Hexachlorobutadiene	0.6 (MAC)
Trichloroethylene	10

Other standards / Notes:

Aluminium – Drinking Water Standard – 0.2mg/l Water Soluble Boron – UK Marine Water EQS - 7mg/l Manganese – UK freshwater EQS – 0.03mg/l

It should be noted that Surface Water standards are for "other surface waters" which includes coastal transitional Water Quality Standards.

*MAC other surface waters 2015 standard

2.4.4 Ground Gas

Ground gas monitoring results from Arups in 2014 and Cork County Council in 2015 have been assessed using methodologies from CIRIA Document, C665 (CIRIA, 2007). This provides guidance on the collection of relevant and valid data to allow the gassing regime to be adequately characterised and assessed. Appendix G contains a more detailed assessment methodology and the results of the assessment are in Appendix H.

2.5 Chemical Analysis Results – Solid Soil Quality

In undertaking this assessment, to consider made ground and natural soil quality, data for samples collected from investigations in 2005 and 2010 were compared to the GACs as included in Appendix C and those contaminants with concentrations exceeding the GACS is presented in Table 3.

Table 3 – Summary Analysis Results from Solid Samples where Concentrations of Contaminants of Concern exceed GACs

Contaminant	No. of Samples	Maximum Conc. (mg/kg)	No. of Samples below Detection Limit	Park Land Use Human Health GAC			Commercial Land Use GAC		
				GAC (mg/kg)	No. of Samples Exceeding GAC	Location and Depth (mbgl)	GAC (mg/kg)	No. of Samples Exceeding GAC	Location and Depth (mbgl)
Arsenic	139	704	5	170	2	TP134 (3.6), BH201 (0.25-0.5)	640	2	TP134 (3.6), BH201 (0.25-0.5)
Lead	139	18850	0	477	29	TP102 (0-1.3), TP102 (1.3-1.9), TP113 (3.5), TP114 (0.8), TP115 (3-3.3), TP116 (1), TP117 (0-1.0), TP118 (2-2.5), TP122 (3-3.8), TP133 (3.5), TP134 (3.6), *TP204 (1.3),* TP206 (1-1.8), TP214 (2.4), BH108 (4.5), BH109 (1.2-1.65), BH109 (2.7), BH109 (3.2-3.65), BH109 (4.2-4.65), BH110 (0-1), BH110 (3.5), BH111 (1), BH111 (2.5-3.7), BH216 (2.8-3.3), BH216 (3.9-4.1), BH217 (0.35-0.6), BH217 (3-4), BH219 (5)	4,640	4	TP116 (1), TP134 (3.6), TP204 (1.3), BH216 (2.8-3.3)
Dibenzo(ah) anthracene	138	1.25	94	1.1	1	TP134 (3.6)	3.5	0	None
Total PCBs	139	3.99	71	0.008	31	TP101 (1.8-3.2), TP102 (0-1.3 & 1.3-1.9), TP103 (0-1.4), TP104 (0.30-1 & 1-2), TP106 (1-2), TP114 (0.8), TP115 (0-1), TP116 (1 & 2), TP117 (0-1.1), TP118 (1.1 & 2-2.5), TP119 (1.7), TP133 (0-0.7 & 3.5), TP202 (1.05), TP204 (1.3), TP206 (1-1.8), TP209 (1.4), TP211 (1.6-2.4), TP213 (0.1-1), BH101 (1.5 & 2,5), BH108 (8.5), BH110 (0-1), BH110 (4.5), BH113 (0-1 & 1), BH211 (0.9-1.3),	0.24	6	TP102 (0-1.3 & 1.3-1.9), TP104 (0.30-1), TP117 (0-1.1), TP209 (1.4), BH211 (0.9-1.3)

ITALICS = LOCATIONS IN COMMERCIAL (NAVY AREA) Refer to Figures 6, 7 and 8

Heavy Metals

Chemical laboratory analysis of samples obtained from made ground and natural soils from the 2005 and 2010 investigations (WYG, 2005 & WYG, 2010), measured arsenic and lead concentrations in excess of respective GAC for both a park land use and the respective commercial GAC (Appendix D).

Samples analysed for arsenic exceeded the park land use GAC in 2 No. out of 139 No. samples, with a maximum concentration of 842mg/kg measured at TP134 at 3.6mbgl. Samples analysed for arsenic exceeded the commercial land use GAC in 2 No. out of 139 No. samples, with a maximum concentration of 842mg/kg measured at TP134 at 3.6mbgl. (Figure 6 and Figure 8).

Measured lead concentrations exceeded the park land use GAC in 29 No. out of 139 No. samples analysed, BH216 at 2.8-3.3mbgl had a maximum concentration of 18,850mg/kg. Samples analysed for lead exceeded the commercial land use GAC in 4 No. out of 139 No. samples , with a maximum concentration of 18,850mg/kg measured at BH216 at 2.8-3.3mbgl (Figure 6).

Organic Compounds

The soil samples were analysed for a number of organic compounds which included total phenols, speciated total petroleum hydrocarbons, VOCs, dioxins, furans and PCBs. The generic assessment identified only one out of 138 No. samples slightly exceeded the Park Land use GAC for a single parameter, dibenzo(ah)anthracene. The measured concentration of dibenzo(ah)anthracene was 1.25mg/kg from a sample collected at a depth of 3.6mbgl from TP134 (Figure 7).

Park land use GACs are not available for PCB, consequently the analysis result was compared to a residential land use GAC which identified that 31 No. out of 139 No. samples measured total PCB concentrations in excess of the conservative GAC. 6 no. samples exceeded the commercial land use GAC with a maximum of 4mg/kg.

2.6 Chemical Analysis Results – Solid Leachability – Analysis Results

Leachability testing as presented in the 2005 and 2010 reports (WYG, 2005 & WYG, 2010) was undertaken using UK NRA leachability tests in order to determine the potential for contaminants to leach from made ground and natural soils to groundwater in the unsaturated zone and pose a risk to ground and surface waters. It should be noted that the use of UK NRA leachability tests provides a conservative assessment due to its procedure of grinding the sample to <1mm size fraction thereby creating more surface area from which to leach contaminants.

The UK NRA contaminant leachability data were compared to respective Water Quality Standards (WQS) for each of the potential contaminants of concern and the results for those COCs which exceed applicable WQS are presented in Table 4. The leachability test results for all samples tested as compared to relevant WQSs are presented in Appendix E.

Table 4 – Summary Leachability Test Analysis Results

Contaminant	Water Quality Standard (WQS) (µg/l)	Total No. of Samples	Range (µg/l)	No. Samples Exceeding WQS	WQS Excedence Locations and Depth (mbgl)
Cadmium	0.2	69	<0.4-0.6	1*	TP116 (2.5)
Chromium	4.7	69	<1-104	22	TP102 (1.3-1.9), TP103 (0.0-1.4), TP104 (0.3-1.0), TP105 (0.3-1.1), TP106 (1.0-2.0), TP109 (0.60), TP112 (0.3-1.0), TP114 (0.8), TP114 (3.0), TP115 (0.0-1.0), TP116 (1.00), TP117 (0.0-1.0), TP118 (0.0-0.9), TP118 (1.10), TP118 (2.0-2.5), TP119 (0.4-0.7), BH101 (1.50), BH101 (2.50), BH106 (1.00), BH108 (1.50), BH110 (0.0-1.0), BH113 (1.00)
Copper	5	69	<1-123	27	TP101 (0.4-1.8), TP102 (0.0-1.3), TP102 (1.3-1.9), TP103, (0.0-1.4),TP105 (0.3-1.1), TP106 (1.0-2.0), TP111(2.0-2.5), TP112 (0.3-1.0), TP113 (0.0-1.0), TP114 (0.8), TP114 (3.0), TP115 (3.0-3.3), TP116 (1.00),TP118 (0.0-0.9), TP118 (1.1), TP119 (0.4-0.7), TP119 (1.7), BH101 (1.50), BH101 (2.50), BH102 (1.00), BH103 (4.7-5.2), BH108 (4.5), BH109 (2.7), BH110 (0-1), BH110 (2.5), BH113 (0-1), BH113 (6.5)
Lead	1.3	69	<1-31	24	TP101 (0.4-0.8), TP102 (0.0-1.3), TP102, (1.3-1.9), TP103, (0.0-1.4), TP104 (0.-1), TP104 (1-2), TP107 (2.7), TP108 (2.5-2.7), TP112 (1.4-1.6), TP113 (0.0-1.0), TP114 (3.0), TP115 (3.0-3.3), TP116 (1.00),TP118 (0.0-0.9), TP119 (0.4-0.7), TP119 (1.7), BH102 (2-3), BH106 (1), BH106 (3-4), BH108 (8.5), BH109 (2.7), BH110 (0-1), BH110 (2.5), BH110 (3.5)

Mercury	0.08	69	<0.05-0.11	5	TP114 (0.8), TP119 (1.70), BH103 (3.8-4.2), BH108 (6.5), BH110 (0.0-1.0)
Zinc	40	69	13-209	5	TP113 (0.00-1.00), BH108 (4.5), BH109 (2.70), BH109 (4.3-4.65)
Chromium, Hexavalent	0.6	69	<30-110	2*	TP103 (0.0-1.4), TP104 (0.3-1.0)
Phenol	8	69	<10-30	3*	P115 (0.0-1.0), BH101 (2.50), BH104 (3.35)
Anthracene	0.1	69	<0.01-1.65	11	TP107 (2.7), TP108 (0.8-1.5), TP108 (2.5-2.7), TP112 (0.3-1.0), TP112 (1.4-1.6), TP113 (3.5), TP114 (3.0), BH102 (3.0-4.0), BH109 (10.5-10.95), BH110 (3.5), BH110 (4.5)
Benzo(a) pyrene	0.00017	69	<0.01-0.08	3*	TP105 (0.3-1.1), TP104 (0.3-1), TP113 (0.0-1.0), TP113 (3.5)
Benzo(b) fluoranthene	0.03	69	<0.01-0.11	3	TP105 (0.3-1.1), TP113 (0.0-1.0), TP113 (3.5)
Benzo(k) fluoranthene	0.03	69	<0.01-0.06	3	TP105 (0.3-1.1), TP113 (0.0-1.0), TP113 (3.5)
Benzo(g,h,i) perylene	0.002	69	<0.01-0.06	1*	TP105 (0.3-1.1)
Fluoranthene	0.0063	69	<0.01 – 0.86	42*	TP101 (0.4-1.8), TP101 (1.8-3.2), TP102 (0-1.3), TP102 (1.3-1.9), TP103 (0-1.4), TP104 (0.3-1), TP105 (0.3-1.1), TP107 (0.8), TP107 (2.7), TP108 (0.8-1.5), TP108 (2.5-2.7), TP109 (0.6). TP109 (1.5), TP110 (1.2), TP111 (1-1.5), TP112 (0.3-1), TP112 (1.4-1.6), TP113 (3.5), TP114 (0.8), TP114 (3), TP117 (0-1.1), TP118 (0-0.9), TP118 (1.1), TP118 (2-2.5), TP119 (0.4-0.7), BH102 (2), BH102 (2-3), BH102 (3-4), BH102 (5-6), BH103 (1.2-1.65), BH104 (3.35), BH106 (1), BH106 (5-6), BH108 (4.5), BH109 (3.2-3.65), BH109 (4.2-4.65), BH107 (10.5-10.95), BH110 (0-1), BH110 (2.5), BH110 (3.5), BH110 (4.5), BH113 (6.5)
Indeno(1,2,3c,d)pyrene	0.002	1	<0.01-0.03	1*	TP105 (0.3-1.1)
Naphthalene	2	1	<0.01-3.06	1	BH102 (1)

* does not count samples with concentrations less than LOD

The leachability of metals as dissolved cations is a pH and redox controlled process. This is important in considering leaching of metals as shown in Figure 13. Chromium, lead and zinc are amphoteric metals, which means that these metals may be mobilised in both acidic and alkali waters. For chromium, mobility is least at a pH of approximately 7.5 becoming increasingly mobile as the pH increases above 8. Lead and zinc are more stable at pH of approximately 10 but are readily mobilised at pHs above and below this value.

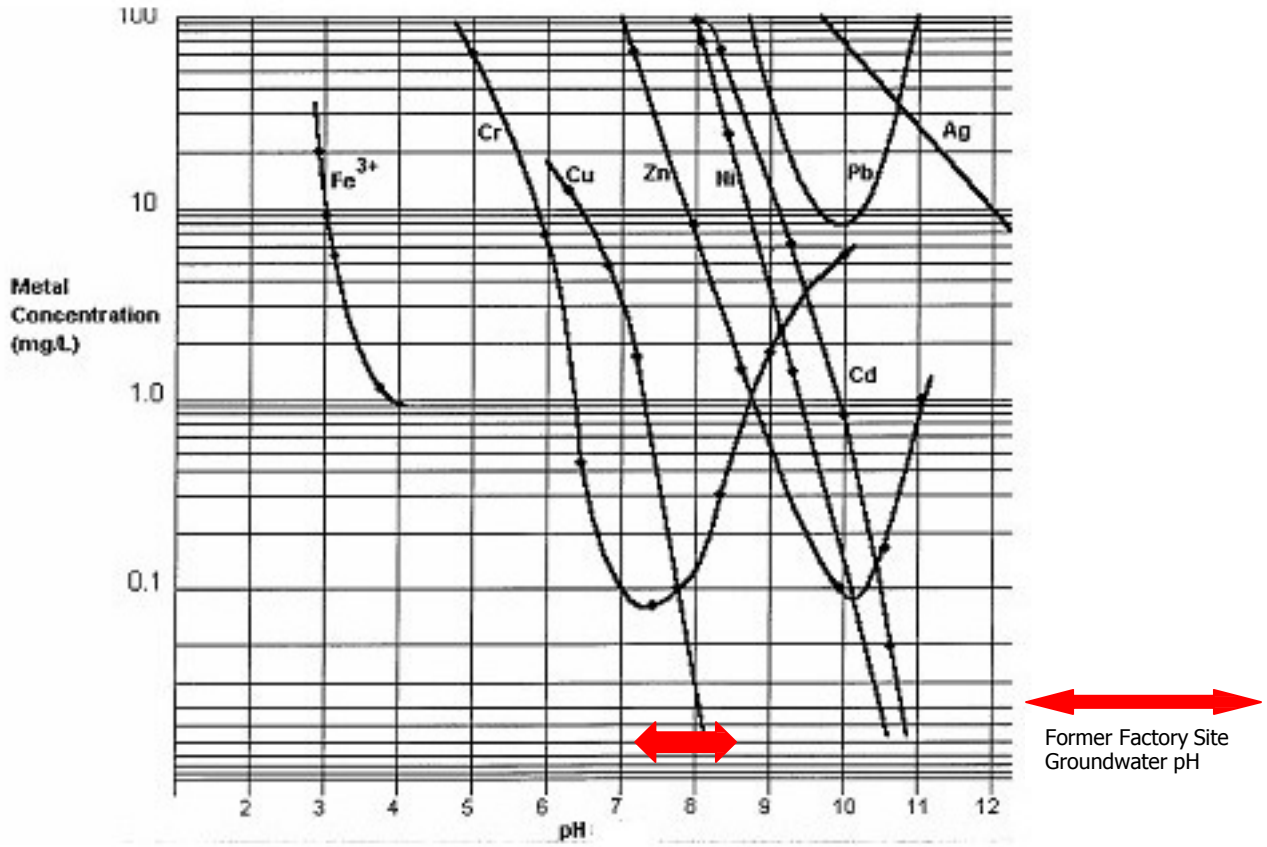

Figure 13 Metal Solubility as a function of pH (adopted from Stumm and Morgan, 1981).

Leachable concentrations of, cadmium, chromium, copper, lead, mercury, zinc, chromium hexavalent, phenol, anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, fluoranthene, indeno(1,2,3-cd)pyrene and naphthalene exceeded the relevant WQSs.

One leachable cadmium concentration was measured above the WQS with a concentration of 0.6 µg/l. All other sample concentrations were less than the LOD of 0.4µg/l, however it should be noted that the LOD is above the applicable WQS.

Leachable concentrations of chromium (saline) ranged from <1µg/l to 104µg/l. Leachable concentrations of chromium were measured above the applicable WQS of 4.7µg/l in 22 No. samples out of 69 No. tested, with exceeding concentrations ranging from 5µg/l to 104µg/l.

Leachable copper concentrations exceeded the applicable WQS of 5µg/l in 27 No. samples out of 69 No. samples analysed, with exceeding concentrations ranging from 6µg/l to 123µg/l.

Lead exceeded the WQS of 1.3µg/l in 24 No. of the 69 No. samples tested. The exceedences of these ranged from 2µg/l to 31µg/l.

Leachable concentrations of mercury ranged from <0.05µg/ to 0.11µg/l compared to the applicable WQS of 0.07µg/l. 5 No. samples of 69 No. tested exceeded this value. Exceeding concentrations ranged from 0.09µg/l to 0.11µg/l.

Zinc exceeded the WQS in 5 No. of the 69 No. samples leached, with concentrations ranging from 13µg/l to 209µg/l and concentrations that exceeded the WQS ranging from 78µg/l to-209µg/l.

Leachable concentrations of chromium hexavalent ranged from <30µg/l to 110µg/l. Leachable concentrations of chromium hexavalent were measured above the applicable of WQS of 0.6µg/l in 2 No. samples of 69 No. tested, with exceeding concentrations ranging from 30µg/l to 110µg/l. It should however be noted that the laboratory detection limit is greater than the WQS.

Leachable phenol concentrations exceeded the applicable WQS of 8µg/l in 3 No. samples out of 69 No. samples analysed, with exceeding concentrations ranging from 10µg/l to 30µg/l. it should also be noted that the laboratory detection limit exceeds the WQS.

Leachable concentrations of PAH compounds in excess of applicable WQSs were also measured for anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, fluoranthene, indeno(1,2,3-cd)pyrene and naphthalene.

Samples analysed for leachable anthracene concentrations exceeded the WQS in 11 No. out of 69 No. samples, with a maximum concentration of 1.65µg/l measured at TP108 at 2.5-2.7mbgl.

Measured leachable concentrations of benzo(a)pyrene exceeded the WQS in 3 No. out of No. 69 samples, with a maximum concentration of 0.08µg/l measured at TP105 0.3-1.1mbgl.

Benzo(b)fluoranthene exceeded the WQS in 3 No. of No. 69 samples leached, with concentrations ranging from <0.01µg/l to 0.11µg/l.

Leachable benzo(k)fluoranthene concentrations were found to exceed the applicable WQS of 0.03µg/l in 3 No. of 69 No. samples analysed, with exceeding concentrations ranging from 0.04µg/l to 0.06µg/l.

Leachable concentrations of benzo(g,h,i)perylene ranged from <0.01µg/l to 0.06µg/l compared to the applicable WQS of 0.002µg/l. 1 No. of the 69 No. samples tested exceeded this value at TP105 0.3-1.1mbgl.

Measured leachable concentrations of fluoranthene exceeded the WQS in 42 No. out of 69 No. samples with a maximum concentration of 0.86µg/l measured at BH102 (2.0-3.0).

Samples analysed for leachable indeno(1,2,3-cd)pyrene concentrations, exceeded the WQS in 1 No. out of 69 No. samples, with a maximum concentration of 0.03µg/l, measured at TP105 at 0.3-1.1mbgl.

Naphthalene exceeded the WQS in 1 No. of 69 No. samples leached, with concentrations ranging from <0.01µg/l to 3.06µg/l.

2.7 Chemical Analysis Results – Water Quality

In January 2015 groundwater samples were obtained by Arups from a total of 25 No. monitoring boreholes (Figure 4) including:

- 2 No. monitoring wells screened solely within the made ground horizon, BH105A and BH113;
- 19 No. monitoring wells from the 2005 investigation screened into the made ground and underlying alluvial sediments called "composite" boreholes, BH102, BH106, BH108, BH109, BH110A, BH111, BH112A, BH114, BH201R, BH202, BH207, BH208, BH212A, BH213, BH214, BH215, BH216, BH217 and BH219; and
- 4 No. monitoring screened into limestone, BH107A, BH204, BH206 and BH209.

Two groundwater samples were collected from each borehole, one at high tide and one at low tide, referenced with the letters "H" and "L". Table 5 summarises locations where contaminant concentrations were measured in excess of applicable WQSs. The laboratory analysis results compared to relevant WQSs are presented in Appendix F. Method Statements, field notes, field data and laboratory certificates for the 2015 sampling are included in Appendix J.

Of the parameters that exceeded the WQS from the 50 No. groundwater samples collected during January 2015, manganese had the highest number of exceedances with 34 No. samples with concentrations that exceeded the applicable WQS. The greatest number of exceedances were measured in groundwater samples obtained from 16 No. "composite" boreholes and 4 No. groundwater samples from 2 No. Limestone boreholes.

As outlined further in Section 3.2 measured concentrations of manganese ranged from less than laboratory detection limits (<1.5µg/l) to 6,278µg/l.

Measured cadmium, chromium, chromium VI, copper, zinc, lead, mercury and nickel concentrations exceeded relevant WQSs in a number of groundwater samples. This included 7 No. samples in respect of cadmium with a maximum of 3.73µg/l, 2 No. samples in respect of chromium with a maximum of 5.8µg/l, 6 No. samples for chromium VI with a maximum of 6µg/l, 4 No. samples for copper with a maximum of 19µg/l, 11 No. in respect of zinc with a maximum of 174.9µg/l, 23 No. sample in respect of lead with a concentration of 27.9µg/l, 9 No. samples for mercury with a maximum of 2.1µg/l and 1 No. sample for nickel with a concentration of 10.8 µg/l. (Figure 9)

Measured speciated PAHs including anthracene, benzo(a)pyrene, benzo(b)-fluoranthene, benzo(k)- fluoranthene, benzo(g,h,i)perylene, fluoranthene, Indeno(1,2,3-cd)pyrene and naphthalene and total TPH concentrations exceeded relevant WQS in three to thirty groundwater samples analysed with concentrations ranging from less than laboratory detection limits to respective maximum concentrations of 46.23µg/l, 92.43µg/l, 109.84µg/l, 42.72µg/l, 34.98µg/l, 255.52µg/l, 40.11µg/l, 4.32µg/l and 187,094µg/l. (Figure 10)

Table 5 – Summary Groundwater Concentrations January 2015

Contaminant	WQS (µg/l)	Total No. of Samples	Range (µg/l)	No. samples exceeding WQS	Boreholes that exceed WQS standard
Cadmium	0.2	50	<0.03-3.73	7	BH108L, BH109L&H, BH215L, BH216L, BH217L&H.
Chromium	4.6	50	<0.2-5.8	2	BH105L&H
Chromium VI*	0.6	50	<2- 6	6	BH105L&H, BH108L&H, BH110A L&H.
Copper	5	50	<3-19	4	BH106H, BH207L, BH208L, BH217H
Zinc	40	50	<1.5-174.9	11	BH105AH, BH111 L&H, BH112 L&H, BH215L, BH216L, BH217L&H, BH219L&H.
Lead	1.3	50	<0.4-27.9	23	BH102L&H, BH106L&H, BH109L&H, BH112L&H, BH114H, BH202L&H, BH207L&H, BH208L&H, BH213H, BH214H, BH216L&H, BH217L&H, BH219L&H.

Contaminant	WQS (µg/l)	Total No. of Samples	Range (µg/l)	No. samples exceeding WQS	Boreholes that exceed WQS standard
Manganese	30	50	<1.5-6278	34	BH105AL, BH102L&H, BH106L&H,BH109L&H,BH114L&H, BH201RL&H, BH202L&H, BH207L&H, BH208L&H, BH212H, BH213L&H, BH214L&H, BH215H&L, BH216L&H, BH217L&H, BH219L&H. Limestone BHs – BH206L&H, BH209RL&H
Mercury**	0.07	50	<0.05-2.1	9	BH111L, BH216H&L, BH217L&H, BH219L&H. Limestone BHs –BH209RL&H
Nickel	8.6	50	<0.2-10.8	1	BH207L
Anthracene	0.1	50	<0.01-46.23	3	BH202 L&H, BH216L
Benzo(a)pyrene	0.00017	50	<0.01-92.43	5	BH208L, BH216L, BH217L&H, BH219L
Benzo(b)-fluoranthene	0.03	50	<0.01-109.84	4	BH208L, BH216L, BH217L&H
Benzo(k)-fluoranthene	0.03	50	<0.01-42.72	4	BH208L, BH216L, BH217L&H
Benzo(g,h,i)-fluoranthene	0.002	50	<0.01-34.98	4	BH208L, BH216L, BH217L&H
Fluoranthene	0.0063	50	<0.01-255.52	30	BH105AL, BH113L, BH102L&H, BH106L,BH108H, BH109L&H, BH110AL, BH111L, BH112AL, BH114L, BH201RL, BH202L&H, BH207L, BH208L, BH212AL&H, BH213L&H, BH214L&H, BH215H&L, BH216L, BH217L&H, BH219L&H.
Indeno(1,2,3-cd)pyrene	0.002	50	<0.01-40.11	4	BH208L, BH216L, BH217L&H
Naphthalene	2	50	<0.01-4.32	2	BH102L&H
TPH (total)	10	50	<10-187,094	4	BH208L, BH216L, BH217L&H.
1.2.4-Trichlorobenzene	0.4	50	0.01-3.72	1	BH216L
Hexachloro-butadiene	0.6	50	<0.1-8.22	1	BH216L

Note 1 – table does not include results of duplicate samples Refer to Figures 9 and 10 for locations

To assess the brackish quality of groundwater, chloride analysis was completed on groundwater and surface water. The harbour water samples (HF-S samples) and therefore seawater measured chloride concentrations ranging from 15-16.7mg/l with an average of 16mg/l. In groundwater samples collected from limestone, chloride ranged from 2mg/l to 13.6mg/l, showing that the groundwater in limestone is brackish. In the overburden monitoring wells, i.e. made ground and natural soils, similar concentrations of chloride were measured and therefore indicative of brackish water in BH105A, BH113, BH108, BH110, BH111, BH210R, BH212, BH215 and BH217.

In November 2015 groundwater samples were obtained by RPS from a total of 5 No. monitoring boreholes including:

- BH105 – targeted as previous analysis results measured the maximum chromium VI concentration
- BH215 and BH216 – as having been impacted the most with hydrocarbons and so it is to ensure worst case volatile fractions have been measured;
- BH204R – installed in Limestone with potential for gas works contaminants;
- BH207 – is to the north of the hydrocarbon impacted area and is essentially a delineation borehole for this potential source area. Consequently sampling of this location was to confirm delineation of this source by determining that hydrocarbon concentrations are less than or close to LODs.

The aim of this limited sampling round was to provide further data on current contaminant groundwater concentrations and provide further confidence on the analysis results for samples collected in January 2015.

As for previous monitoring undertaken by Arups in January 2015, groundwater samples were collected during low and hide tides for each of the boreholes. Monitoring wells, BH215, BH216 and BH207 are composite boreholes i.e. are installed and screened across two different geological units. Consequently two groundwater samples were collected from these boreholes at two different depths in order to allow water to be sampled for each of the each of the screened geologic units, typically made ground indicated with an "S" to represent shallow sample and a "D" for deeper sample from the underlying alluvium. As for the previous sampling round, samples were collected from each borehole, one at high tide and one at low tide, referenced with the letters "H" and "L".

The laboratory analysis results compared to relevant WQSs are presented in Appendix F.

Resampling of BH105 confirmed the previous analysis results in regard to chromium VI concentrations which were again measured in excess of the WQS with concentrations of 8µg/l measured during both low and high tides. Other metals including total chromium, dissolved chromium and zinc also continued to be in excess of applicable water qualitystandards.

The analysis results for groundwater sampled from BH215 in November 2015 have confirmed the results of the January 2015 monitoring rounds, in that hydrocarbon concentrations including speciated TPH and speciated PAH and a suite of VOCs were below or close to laboratory detection limits as previously measured.

Monitoring well BH216 which is in the hydrocarbon impacted groundwater plume, when sampled and analysed also proved the previous analysis results of January 2015. Measured concentrations of speciated TPH and PAH appear to have decreased in groundwater collected from this location from a total TPH of 187mg/l in January to 111mg/l in November 2015. Total speciated PAH decreased from 1.9mg/l in January 2015 to 0.6mg/l measured in November 2015. Previously in the low tide sample from this location in January 2015 0.7µg/l trichloroethylene was measured. In November, this had increased to 116µg/l in the groundwater sample collected from the response zone in natural strata at high tide.

Groundwater samples collected in November 2015 were also analysed for cadmium. Unfortunately these results have not been included or assessed further in this section or in subsequent sections in this report as the result are considered to be unrepresentative of likely true dissolved concentrations due to analysis errors by the laboratory.

2.7.1 2015 Groundwater Data Comparison with 2005 and 2010 Analysis Results

Boreholes which were previously sampled and analysed as part of the investigations in 2005 and 2010 were resampled in 2015. Table 6 provides a summary of groundwater analysis results for 2005, 2010 and 2015 for groundwater samples from these boreholes that previous exceeded WQS. The aim was to consider trends with respect to contaminant concentrations over time. The table also presents summary concentrations only in respect of sample analysis results where groundwater contaminant concentrations previously exceeded relevant WQSs.

Table 6 – Groundwater Analysis Results 2005 – 2010 and 2015

Contaminant	WQS (µg/l)	2005-2010 Conc. Range (µg/l)	2015 Conc. Range (µg/l)
Cadmium	0.2	<0.03-1.81	<0.03-3.73
Chromium	4.7	<0.2-74	<0.2-8.9
Chromium VI	0.6	0.4-70	<2- 8
Copper	5	<1-30	<3-27
Zinc	40	<1-995	<1.5-986
Lead	1.3	<0.4-88	<0.4-147.9
Manganese	30	<1.5-6705	<1.5-6278
Mercury	0.07	<0.01-0.11	<0.05-2.1
Anthracene	0.1	<0.01-1.16	<0.01-46.23
Benzo(a)pyrene	0.00017	<0.01-7.94	<0.01-92.43
Benzo(b)-fluoranthene	0.03	<0.01-0.165	<0.01-109.84
Benzo(k)-fluoranthene	0.03	<0.01-0.12	<0.01-42.72
Fluoranthene	0.0063	<0.01-0.165	<0.01-255.52
Indeno(1,2,3-cd)pyrene	0.002	<0.01-5.27	<0.01-40.11
Naphthalene	2	<0.01-9.71	<0.01-36.48
TPH (total)	10	<10-68245	<10-187,094
1.2.4-Trichlorobenzene	0.4	<1	0.01-3.72
Hexachlorobutadiene	0.1	<1	0.01-8.22

Table 6, shows that there is little difference between the ranges of dissolved metal concentrations in groundwater between sampling in 2005-2010 and the most recent analysis results in 2015.

Hydrocarbons, TPH and speciated PAHs appear to have increased in 2015 when compared to previous sampling analysis results in 2005-2010. However this is probably not the case as the maximum concentrations presented for 2015 were typically from groundwater sampled from BH216. This location was not sampled in 2010 due to the presence of hydrocarbon LNAPL.

In regard to LNAPL, this has been mainly observed on groundwater at BH218. In 2010 LNAPL thickness at this location ranged from 0.16m to 0.75m. When monitored in January 2015 LNAPL was 2.6m thick at this location and in November 2015 2.3m thick. LNAPL has also been observed at BH216 with a thickness of 0.01m measured in 2010 and 0.02m in November 2015.

In summary, the results overall appear do not appear show an overall decrease or increase in contaminant concentrations.

3.0 Generic Quantitative Risk Assessment (GQRA)

3.1 Human Health GQRA

The results of the laboratory chemical analysis of the samples collected from made ground and natural soil horizons within the Factory Site were assessed against GACs for Park and Commercial Land Uses in order to determine if the Factory Site could be deemed as 'fit for use' under either of these scenarios with the site in its present form. As outlined in Section 2.1.1, in regards to human health and GACs, where contamination is present with concentrations that exceed GACs at depths greater than 1m, the probability of human exposure via the direct contact pathways is significantly reduced, leaving inhalation of volatile compounds as the dominant pathway with regard to human health risks. Typically, volatile compounds only significantly affect the indoor inhalation pathway.

The results of the comparison of the measured concentrations of the Potential Contaminants of Concern (Table 3) has identified the following metals or metalloids as Contaminants of Concern (COC) which exceed relevant Park Land Use Human Health GACs:

- Arsenic;
- Lead;
- Dibenzo(ah)anthracene; and
- Total PCBs.

Only arsenic, lead and PCB concentrations exceeded the relevant commercial end use. They will be considered as Contaminants of Concern and are assessed in this section for significance:

3.1.1 Statistical Analysis – Entire Site

The method of statistical analysis for each contaminant which exceeded GAC was completed in accordance with best practice guidance as outlined in Section 2.1. Summary statistical analysis sheets of the results are presented in Appendix I. The key questions and assumptions for this specific site analysis are bullet pointed below:

- Evaluated under the planning scenario;
- The overall aim is to answer the question: "Is there sufficient evidence that the true mean concentration of the contaminant (μ) is less than the critical concentration (Cc)?";
- Where non-detects were present in the data, half the non-detect value was used to process the statistical results;

- The site was considered as one zone in its entirety. This was considered reasonable, taking into account the presence of made ground and steelworks waste material across the site with potential associated contaminants and a current recreational use present on site; and
- The datasets analysed generally displayed a non-normal distribution and therefore significant was tested using the Chebychev statistical test, unless otherwise noted. Normality was tested using the Shapiro-Wilk normality test and outliers tested using Grubbs test.

The concentration data set distribution was assessed using the following hypothesis. Where: H0= $\mu \geq Cc$

H0 = the null hypothesis, μ=True mean concentration of contaminant and Cc=critical concentration (Cc in this case is the same as the GAC)

And:

H1= $\mu < Cc$

H1= the alternative hypothesis, μ=True mean concentration of contaminant and Cc=critical concentration (Cc in this case is the same as the TSV for commercial/industrial land use)

The tests were undertaken at the 95% confidence level (The statistical chance the decision is wrong would be less than 5%).

If H0 is rejected then there is sufficient statistical evidence, at the 95% confidence level, that the area under consideration has a true mean contaminant concentration which is lower than the critical value (relevant GAC). All contaminants statistically analysed are summarised in Table 7 which summarises the results of the completed statistical tests for contaminants which exceeds park land use GACs in the top 1m depth of made ground, including arsenicand lead.

Table 7 – Statistical Analysis Results for Solid Samples from top 1m – Park Land Use

Contaminant	Park Land Use GAC (mg/kg)	UCL 95th percentile (mg/kg)	95th percentile value exceeds GAC	Outliers	Assessment
Arsenic	170	106	No	Yes	Outlier at BH201 704mg/kg
Lead	477	1407	Yes	Yes	Site wide impact and outlier at TP115 8,124mg/kg
PCBs	0.008	0.54	Yes	No	Site wide impact

Table 8 – Statistical Analysis Results for Solid Samples from top 1m – Commercial Land Use

Contaminant	Park Land Use GAC (mg/kg)	UCL 95th percentile (mg/kg)	95th percentile value exceeds GAC	Outliers	Assessment
Arsenic	640	106	No	Yes	Outlier at BH201 704mg/kg
Lead	4,640	1407	No	Yes	Outlier at TP115 8,124mg/kg
PCBs	0.24	0.54	Yes	No	Site wide impact

Table 7 presents results of the statistical assessment that shows potential significant risks to human health with reference to a park land use. No statistical risk has been identified for arsenic concentrations as the calculated upper confidence level (UCL) 95th percentile mean value does not exceed the critical concentration (park land use GACs). There is sufficient evidence that the likely true mean concentration of the contaminant (μ) is less than the critical concentration (Cc). The outlier test was completed to identify potential hotspot areas of higher contaminant concentrations. The test identified an outlier at BH201, with a concentration in excess of the park land use GACs. A potential risk to the health of end recreational site users is therefore considered to be present at this location.

The UCL 95th percentile mean value for lead and PCBs, 1407mg/kg and 0.54mg/kg respectively, did exceed the park land use GACs of 477mg/kg and 0.008mg/kg respectively. Consequently the true means are likely to be greater than the critical concentrations (park land use GAC), site wide impacts have been identified and lead and PCB concentrations are considered to be capable of causing risks to the health of future park end users through direct contact pathways.

The Chebychev outlier test, appropriate for a non normally distributed dataset, was also completed on arsenic and lead concentrations and did identify an arsenic outlier at BH201 and lead outlier at TP115. These locations are therefore considered to be potential hotspot areas of higher contaminant concentrations.

Potential significant risks to human health with reference to a commercial land use have not been identified for arsenic and lead concentrations as the calculated UCL 95th percentile mean concentration does not exceed the critical concentration (commercial land use GACs). There is sufficient evidence that the likely true mean concentration of the contaminant (μ) is less than the critical concentration (Cc). However the outliers identified are with concentrations that also exceed commercial land use GACs and localised potential risks to commercial site users at BH201 and TP115 are considered to be present.

The UCL 95th percentile mean value for PCBs 0.54mg/kg respectively, did exceed the commercial land use GAC of 0.24mg/kg. Consequently potential risks to any end commercial site users are considered to be present.

3.2 Generic Waters Assessment

Elevated contaminant concentrations in groundwater can be the result of contaminants being released from solid material through leaching mechanisms. It can also arise as a direct result of liquid contaminant release through waste liquid disposal such as that which may have occurred during sludge disposal.

As noted in Section 2.7, groundwater samples were obtained from a total of 25 No. monitoring boreholes including boreholes screened into the overburden, made ground and alluvium, and then boreholes screened into limestone (Figure 4). During 2015, typically two groundwater samples were collected from each borehole, one at high tide and one at low tide. The accredited laboratory, Jones Environmental, was selected based on their metal analysis method and achievable detection limits for mercury for and chromium VI. The preferred analysis method for metals was inductively coupled plasma optical emission spectrometry (ICP-

OES) which suffers less from ionic interference that the previous analysis methods in 2005 and 2010 with ICP-MS. Mercury analysis was completed using the cold vapour atomic fluorescence spectroscopy (CV-AF) which does not suffer from ionic interference.

Sections 2.7 described the groundwater analysis results with respect to locations where contaminant concentrations were measured in excess of applicable WQSs. The laboratory analysis results compared to relevant WQSs are presented in Appendix F.

Measured cadmium, chromium, chromium VI, copper, zinc, lead, manganese, mercury and nickel concentrations exceeded relevant WQSs in groundwater sampled from a number of locations and are consequently considered to be contaminants of concern with the potential to impact Cork Harbour waters through migration through saturated made ground, natural soils and water. Measured speciated PAHs including anthracene, benzo(a)pyrene, benzo(b)-fluoranthene, benzo(k)-fluoranthene, benzo(g,h,i)perylene, fluoranthene, Indeno(1,2,3-cd)pyrene and naphthalene and total TPH concentrations exceeded relevant WQS in two to thirty groundwater samples, particularly at BH216. Also 1,2,4 trichlorobenzene, hexachlorobutadiene and trichloroethene at this location exceeded relevant WQSs. However due to their low concentrations and isolated occurrences to one location only, they are not considered to be capable of causing a WQS to be exceeded in the actual Cork Harbour water receptor. Nickel is also not considered to be capable of causing a WQS to be exceeded in the actual Cork Harbour water receptor because it is marginally elevated at one location only. These contaminants are not considered further as a result.

It is also worth noting that groundwater in the bedrock is largely not impacted with contaminant concentrations typically being less than applicable WQSs. Consequently, it is considered that significant downward migration of contaminants into the Bedrock aquifer has not occurred.

3.3 Surface Water

Surface water sampling was undertaken by Arups, RPS and Cork County Council as shown in Figure 5 during 2015. This included surface water samples taken from the Cork Harbour Waters next to the shore and in the Docks at the site boundaries. SW01 to SW06 were collected in January 2015 by Arups. With the exception of lead and fluoranthene, the laboratory analysis did not measure concentrations in excess of applicable water quality standards, as summarised in laboratory analysis results compared to WQSs as presented in Appendix F. Analysis for lead measured concentrations in excess of the WQS of 1.3µg/l in 6 No. out of the 22 No. samples analysed with a maximum concentration 4.8µg/l measured in an outlet pipe OT7 assumed to

be a drainage outlet, OT08 another outlet pipe in the same area also measured elevated lead with a concentration of 3.7 µg/l. Figure 11 shows locations where sample concentrations exceeded the lead WQS. A surface water sample (SW5) taken from the north of these two locations also measured elevated lead with a concentration of 2 µg/l. Elevated lead was also measured in the sample taken in January 2015 from SW6 and SW3 taken in November 2015, both with marginal concentrations of 1.4µg/l. a second sample was taken from this general area in November 2015. A surface water sample taken from the Harbour waters to the immediate south of the site during high tide, measured a marginal concentrations of 2µg/l, marginally exceeded the WQS of 1.3µg/l. These marginal concentrations are not of significant concern.

Additionally, the Cork Harbour coastal water body is at moderate status, i.e. less than good ecological status, due to nutrient conditions (dissolved inorganic nitrogen levels) and failure to achieve its protected area objectives, i.e. unfavourable conservation status of the Cork Harbour SPA. According to the latest status report from the Marine Institute (Marine Institute, 2010) Cork Harbour also failed on chemical status classification (WFD Annex X priority substances) due to concentrations above the environmental quality standards for Tributylin (TBT) and lead compounds. [Page 13-6]. Consequently it should be noted that lead is considered to be elevated in the wider Cork Harbour water environment.

Analysis of the samples collected during November 2015, measured one manganese concentration in excess of the WQS with a concentration of 91µg/l. The manganese concentration was from OT08 which was a drainage discharge from the site at the seawater pumping station.

The surface water samples collected in November 2015 were also analysed for cadmium. Unfortunately, these results have not been included or assessed further in this section or in subsequent sections in this report as the results are considered to be unrepresentative of likely true dissolved concentrations due to analysis errors by the laboratory.

Table 9 – Summary Surface Water Sample 2015

Contaminant	WQS (µg/l)	Total No. of Samples	Range (µg/l)	No. Samples exceeding WQS	Location of Exceedance of Standard
Lead	1.3	22	<0.4-4.8	6	SW02(HIGH), SW05 (LOW), SW06 (HIGH), OT07, OT08, SW03
Manganese	30	22	<1.5-91	1	OT08
Zinc	40	22	<1.5-226	1	OT08
Fluoranthen	0.00063	22	<0.01-0.01	2	SW3 (HIGH), SW5 (LOW)

3.4 Ground Gas

The ground gas risk assessment and summary table presenting the monitoring ground gas concentrations are presented in Appendix H. Gas concentrations considered in conjunction with gas flows have resulted in the most monitored locations being classified as characteristic situation 1 according to CIRIA guidance as they have gas screening values (GSVs) of less than 0.07l/hr. BH109, BH213 and BH215 have been classified as characteristic situation 2, due to elevated carbon dioxide with elevated gas flows. BH202 and BH214 have been classified as characteristic situation 2 based on methane concentrations being in excess of 1% and BH216 and BH217 in respect of carbon dioxide concentrations in excess of 5%. BH218, where LNAPL hydrocarbon is present on groundwater has been classified as characteristic situation 3 with a maximum GSV of 2.98l/hr (CIRIA, 2007). Both characteristic 2 and 3 would require gas protection measures to be installed into any buildings to be constructed on site.

4.0 Updated Conceptual Model (Post Generic)

4.1 Human Health

On the basis of comparison of solid analysis results with appropriate GACs and consideration of water analysis results, a number of pollutant linkages have been identified in regard to the Factory (former steelworks) Site, which are summarised in Table 10 and Table 11 and shown on Figure 14. It should be noted that these are presented for the site in its current condition without remediation.

4.1.1 Sources

Park Land Use

Arsenic, lead and PCBs were measured at concentrations that exceeded park land use GACs. Statistical analysis of arsenic, lead and PCB concentrations has shown that mean concentrations of lead and PCBs in the surface material (up to and including 1mbgl) exceed park land use GACs. Outliers or hotspots of arsenic and lead have also been identified at BH201 and TP115 respectively.

Only one dibenzo(ah)anthracene concentration exceeded the park land use GAC and consequently this is considered to be a hotspot of contamination at TP134 3.5mbgl.

Commercial Land Use

The statistical analysis results identified that mean arsenic and lead concentrations across the site for near surface materials (up to and including 1mbgl) are unlikely to exceed the commercial GACs and are therefore unlikely to cause significant risks to commercial site users. However mean concentrations of PCBs are likely to exceed the commercial GAC and consequently should be considered to be capable of causing risks to end commercial site users.

An arsenic and lead outlier or potential hotspot area comprising of higher arsenic and lead concentrations has been identified in the respective areas of BH201 and TP115. The concentrations exceed commercial land use GACs. They are however not capable of causing risks to human health through inhalation pathways, only through direct contact pathways of ingestion and direct contact with soils and so will only pose a potential risk where green space or amenity soft landscaping is proposed.

Groundwater

Concentrations of a number of contaminants have been measured in groundwater. Risks to human health from metals in groundwater will only occur in two circumstances, if the users of the site can come into direct contact with groundwater or where the groundwater is used for a potable supply. It is anticipated that future park land users will not be able to come into contact with groundwater at the site due to groundwater levels being below ground level. The brackish quality of groundwater also means that it is unlikely that it would be used for a potable supply. Metal concentrations in groundwater are therefore not of concern with respect to human health.

A number of volatile contaminants of concern in groundwater were present which would pose a potential risk to human health through vapour inhalation pathways. Low concentrations of organic contaminants, speciated TPH and speciated PAHs have been encountered in groundwater sampled from made ground and natural soils. Free product (LNAPL) hydrocarbons are also present at BH218. Concentrations have been observed for lighter TPH fractions less than C12 which are volatile and may volatilise in high enough concentrations to cause risks to human health through inhalation of hydrocarbon vapours. This is also the case for PAH compounds. Additionally, trichloroethylene has been measured in November 2015 at one location in groundwater BH216 and is capable of volatilising to cause risks through inhalation of vapours. Therefore, the DQRA will consider risks to human health through a groundwater and inhalation pathway.

Ground Gas

The ground gas assessment has identified that the underlying material is typically not generating significant concentrations of ground gas. This is with the exception of BH109, BH213 and BH215 which have been classified as characteristic situation 2, due to elevated carbon dioxide with elevated gas flows. BH202 and BH214 have been classified as characteristic situation 2 based on methane concentrations being in excess of 1% and BH216 and BH217 in respect of carbon dioxide concentrations in excess of 5%. BH218, where LNAPL hydrocarbon is present on groundwater has been classified as characteristic situation 3. Generally, the most likely source of elevated ground gas is considered to be the underlying natural organic alluvium. Further monitoring and assessment and or protection gas protection measures will be required for any buildings to be constructed on site.

Asbestos

The 2005 and 2010 results have not identified asbestos fibres to be present in any of the samples analysed. However, this predates the recent updates to laboratory analysis methods which are now a lot more sensitive and so more frequently identify asbestos. Consequently, this contaminant should remain as a contaminant of concern in the conceptual site model.

Table 10 – Updated Conceptual Site Model – Human Health Under Current Site Conditions

Source	Pathway	Receptor
Shallow arsenic hotspots, lead contamination and PCBs associated with solid material	Direct dermal contact Ingestion dust and soil Inhalation of dust	Future park land users Commercial land users (hotspots & PCBs)
Dibenzo(ah)anthracene	Direct dermal contact Ingestion dust and soil Inhalation of dust	Future park land users Soft landscaped areas only
Asbestos in soil	Inhalation of fibres	Future park land users Commercial land users Construction workers
Ground Gas – methane and carbon dioxide	Lateral and vertical migration and inhalation	Current and future site users in buildings
Hydrocarbons in Groundwater including LNAPL, speciated TPHs (<C12), PAHs and trichloroethylene	Lateral and vertical migration and inhalation	Current and future site users in buildings, off site human health receptors

4.2 Water and Ecology

On the basis of comparison of solid, leachability and water analysis results with appropriate GACs, a number of pollutant linkages have been identified in groundwater from the Factory Site, which are summarised in Table 11.

4.2.1 Sources

Concentrations of cadmium, chromium, chromium VI, copper, zinc, lead, manganese, mercury and nickel concentrations exceeded relevant WQSs in groundwater sampled from a number of locations and are consequently considered to be contaminants of concern with the potential to impact Cork Harbour waters through migration in saturated made ground, natural soils and water.

Concentrations of speciated PAHs including anthracene, benzo(a)pyrene, benzo(b)-fluoranthene, benzo(k)- fluoranthene, benzo(g,h,i)perylene, fluoranthene, Indeno(1,2,3-cd)pyrene and naphthalene and total and speciated TPH concentrations exceeded relevant

WQSs in two to thirty groundwater samples, particularly at BH216. Also 1,2,4 trichlorobenzene and hexachlorobutadiene at this location exceeded relevant WQSs. However due to their low concentrations and isolated occurrences to one location only, 1,2,4 trichlorobenzene and hexachlorobutadiene are not considered to be capable of causing a WQS to be exceeded in the actual Cork Harbour water receptor.

Free product, LNAPL hydrocarbons has also been identified on groundwater at BH218 (approx 2m depth) and to a lesser extent at BH208 (approx 10cm depth). LNAPL is considered to be a continuing source of groundwater hydrocarbons.

Leachable concentrations of cadmium, chromium, chromium VI, copper, zinc, lead and mercury have also been observed above applicable WQSs and as elevated concentrations of these contaminants have also been identified in groundwater sampled from the site, pollutant linkages are considered to be present with respect to leaching to groundwater.

Table 11 – Updated Conceptual Site Model – Controlled Waters and Ecology

Source	Pathway	Receptor
Leachable cadmium, chromium, chromium VI, copper, lead, mercury zinc and PAHs.	Leaching from unsaturated zone	Shallow groundwater
	Leaching within tidal zone through wetting and drying	Shallow groundwater
	Lateral and vertical groundwater migration, preferentially through waste	Cork Harbour waters
	Uptake by flora and fauna	Flora and fauna in Cork Harbour particularly on foreshore
Groundwater contamination with cadmium, chromium, chromium VI, copper, zinc, lead, manganese, mercury, nickel.	Lateral and vertical groundwater migration, preferentially through made ground and drainage	Cork Harbour Waters
TPH Hotspot (associated with former oil storage tanks) and PAH Hotspot particularly BH216, BH218 and BH208 and LNAPL particularly BH218 and BH208	Uptake by flora and fauna	Flora and fauna in cork Harbour and on foreshore

4.2.2 Pathways

Based on review of existing site investigation data and information contained in previous reports, the following pathways have been identified with respect to water receptors:

- Leaching of mobile compounds through rainwater infiltration in the unsaturated zone, i.e. leaching of materials from made ground, steelworks waste including slag, to underlying groundwater in made ground and natural soils;
- Leaching of compounds within tidally influenced made ground material and saturated materials from tidal flows i.e. leaching of materials from slag material, other steelworks waste to underlying groundwater;
- Contaminant migration in groundwater including through tidal groundwater flow into Haulbowline Docks and Cork Harbour waters;
- Preferential pathways through areas of higher permeable made ground and natural soils and drainage; and
- Vertical migration into alluvium and limestone bedrock

Attenuation mechanisms such as sorption are likely to be present and combined with lower permeable alluvium are considered to be preventing significant downward contaminant migration with lower contaminant concentrations measured in the underlying limestone when compared to groundwater sampled and analysed from the made ground and natural overburden material.

Elevated manganese concentrations were above relevant WQSs in groundwater sampled from limestone. It is considered that a proportion is likely to be naturally occurring. The Limestone aquifer is not a valuable resource in regard to its potential for abstractions as they of a poor quality due to their brackish quality. Consequently, the primary receptor is considered to be the Cork Harbour in regard to potential contaminant migration.

4.2.3 Receptors

The primary receptor in regard to water is considered to be the Cork Harbour due to the actual hydraulic connection between shallow groundwater underlying the site and marine waters in Cork Harbour. In considering this as the primary receptor it is also considered to be protective of ecology, flora and fauna in the Cork Harbour.

5.0 Hydrogeological and Hydrology Conceptual Site Model

The Arup 2014 report which included a gap analysis, identified that future risk assessments would benefit from a better understanding of the groundwater regime beneath the site, particularly with respect to the influence of the tidal cycle on the water level data. As a result, in-situ data loggers were deployed to a number monitoring wells across the site including wells screened into made ground, screened across multiple lithologies (made ground and natural soils), and screened into Limestone bedrock.

The following section draws together the available factual data from previous reports and the more recent 2014 logger data and outlines a hydro-geological Conceptual Site Model (CSM) describing the relationship between the land and the surrounding water bodies. This CSM has been used as the technical basis for further assessment of groundwater source-pathway-receptor linkages.

5.1 Site Made Ground/Geological Conditions

The ground conditions have been outlined in the previous reports, specifically section 3.5.1 of the 2014 Arup Report (Arup, 2014) which also includes a series of geological cross sections based on 2005 and 2010 site investigation data (WYG, 2005 and WYG, 2010). These have been presented in the Arup 2014 report as figures 5.3a, b and c and are presented in Appendix K for ease of reference.

Geological conditions can be simplified into the following key component parts and are summarised in Table 12.

- Made Ground: Encountered at all investigation locations to a maximum depth of 11mbgl at BH113 which is next to the dry dock wall in the southeast of the site. Made ground generally consists of varying depths of concrete up to 1.8m thick and includes the former factory building floor slabs, foundations and yards and various concrete open pits and trenches such as mill scale pits and cable dusts. There are areas of the site where concrete hardstanding is absent, for example in the area of the South Tip (BH110, TP218, TP115 and TP114), in the southeast of the site, BH111, TP217, BH212A and BH113 and in the northwest of the site BH101, TP202, TP102 and TP103.
- Made ground underlying the site varies in depth from 0.2-11mbgl and composition; with limestone quarry stone infill at various locations including along the western wall of the dry dock (BH112 and BH113) and in the north BH101, BH104; a more general fill of sandy gravelly clay with brick and concrete fragments, gravelly sand or to a brick and concrete

rubble fill with clinker and ash inclusions e.g. BH106, TP118 and TP221; and waste materials from the former Steelworks including waste slag particularly in the areas of the East Camber BH101, BH105, and South Tip BH108, BH109, BH110, BH111 up to 6m depth in BH110.

- Alluvium (Estuarine / Marine Deposits): Generally, directly underlies the made ground and is comprised of sandy estuarine silt (with shell fragments) and or a sandy gravelly clay to the top of the limestone bedrock. Occasional layers of marine gravels or marine sands were encountered in localised areas of the site, e.g. BH110 in the south. The base of these deposits varied from 1.3mbgl to 10.4mbgl (WYG, 2010).
- Glacial Till deposits: Comprised of gravelly, sandy clay, gravelly sand or sandy gravel, all with cobbles throughout (Arup, 2014). This varied in thickness from 0.8-5.5m (WYG, 2010).
- Limestone Bedrock: the top of which was encountered at depths of between 1.8mbgl (BH204) in the northwest to 16.85mbgl in BH109 in the south.

Table 12 – Summary of Ground Conditions Encountered During 2005 and 2010 Site Investigations (Arup, 2014)

Lithology	Strata Description	Thickness Range (m)
Made Ground	Concrete: Reinforced	0.2-1.8
Made Ground	Varying from gravelly sandy clay, to waste slag, to brick, concrete, rubble, timber, ash and clinker and limestone quarry fill	0.2-11
Superficial deposits marine / estuarine alluvium underlain with glacial till	Alluvium, predominant silts, with clay and localized sand and gravel lenses. Glacial till is predominantly gravelly sandy clay with cobbles and localized lenses of sands and gravels.	0.6-12.9
Bedrock Limestone	Limestone and weathered limestone, top of encountered at 1.8-16.85mbgl	Base not proven

5.2 Hydrology

Haulbowline Island is set in the main estuarine channel servicing a large natural harbour to the southeast of the City of Cork. The central part of the island is a large artificial harbour and dock area. The Factory Site, located on the centre of the Island accounts for around one third of the land area of Haulbowline Island.

5.2.1 Tidal Regime

The correlation of topographic levels, typically reported in metres above ordnance datum (mAOD), to sea level, typically referenced against local Chart Datums, require a correction to enable direct comparison of land and sea. Understanding this relationship is a fundamental aspect of the hydro-geological conceptual site model.

Topographic (land) levels in this region of Ireland are based on the 'Malin Head Datum' which is the standard Ordnance Datum and all topographic surveying (and borehole height referencing) is benchmarked against this datum and quoted as mAOD. It is important to note that 0.00mAOD does not equate to local Mean Sea Level, for reasons which will be discussed below.

The local Chart Datum is based on the 'Admiralty Tide Charts' which are in-turn based on the lowest astronomical tide (i.e. Spring Low Water), also known as the 'Poolbeg Datum'. The Poolbeg Datum is 2.7m below the Malin Head Datum (i.e.-2.7mOD). In addition, there is a further local correction factor for the Cobh area which must be applied to the Chart (Poolbeg) Datum of +0.13m to correlate between land and sea.

In summary, a correction factor of -2.57m needs to be applied to sea level data referenced against local Chart Datum to allow direct reconciliation against land levels referenced against Ordnance Datum as in Table 13. For example, the mean high water spring level of 4.1m equates to 1.53mAOD.

Table 13 presents the key data statistics of the tidal regime and calculated mean high and low water levels.

Table 13 – Tidal Regime

Tidal Stage	Admiralty Chart Datum (Cobh)	Metres above Ordnance Datum (mAOD)
Mean High Water Spring (MHWS)	4.2	1.53
Mean High Water Neap (MHWN)	3.2	0.63
Mean Low Water Neap (MLWN)	1.3	-1.27
Mean Low Water Spring (MHWS)	0.4	-2.17
Calculated average High Water Level	-	1.08
Calculated average mid tide	-	-0.32
Calculated average Low Water Level	-	-1.72
Calculated average Tidal range	-	2.8

* -2.57m correction factor applied from Chart Datum to Ordnance Datum

5.3 Relationship of Factory Site and Tidal Regime

Mean local sea level is approximately -0.32mAOD. Mean High Water Mark is 1.08mAOD with a Mean High Water Spring Tide Level of 1.53mAOD. Given that made ground are known to be present to depths up to - 8.0mOD, at some locations it will be below mean sea level and therefore potentially in direct hydraulic continuity with the tidal cycle. The amount of tidal influence of borehole water levels will be dependent on the distance from the Harbour waters, made ground and superficial permeabilities and also permeabilities of any manmade structures, dock walls, South Tip rock embankment, former building foundations and underground structures. The degree of tidal influence will also be controlled in part by the storativity of the affected strata. A cross section showing the above is presented in Appendix L.

The relationship of land to sea level will be discussed in more detail in the following section within the context of groundwater monitoring data recently acquired for the site.

5.4 Groundwater Level Data

In situ groundwater data level loggers were strategically deployed by Minerex in monitoring installations across the site in 2014 to determine the variability in groundwater levels over time. Full factual records are presented in the "Report on Groundwater Level Monitoring at Haulbowline Former Steelworks Site, 2015" (Minerex, 2015) included in Appendix M for ease of reference. Key data statistics are summarised in Table 14.

The graphed logger data (hydrograph) is presented in full in Appendix M, in summary in Appendix N and summarised in Table 14 which was collected during the monitoring period (14th November to 9th December 2014). At most monitored borehole locations, a consistent twice-daily 'tidal' pressure signal was recorded. It should be noted that most borehole locations have been screened into varying strata types e.g. made ground and underlying natural materials. These will be referred to as composite boreholes. Two boreholes, BH105A and BH113, were screened exclusively into made ground (including saturated made ground), one borehole BH208 screened exclusively into natural silts and gravel at base and a number of boreholes BH107A, BH204, BH206 and BH209, were screened into the bedrock limestone. More pronounced tidal signals are present in those borehole located closest to the shoreline or docks.

Rainfall data for the monitoring period is also provided in the Minerex report, overlaid on the in-situ data logger plots to determine effects of precipitation on hydraulic head levels. Generally effects were not noticeable due to low rainfall levels during the monitoring period. There was one occurrence of 29.1mm rainfall on the 21st November. It is difficult to determine whether this had an effect on water levels as it also corresponds to an incoming spring tide. Generally, this amount of rainfall did not appear to impact groundwater levels except for BH202 which had a water level increase of 0.5m. At the other locations evidence of rainfall effects appear to be absent, negligible or indeterminable by comparison to the tidally driven fluctuations (Figure 15).

Figure 15 shows the high rainfall occurrence on 21 November and the spring tide.

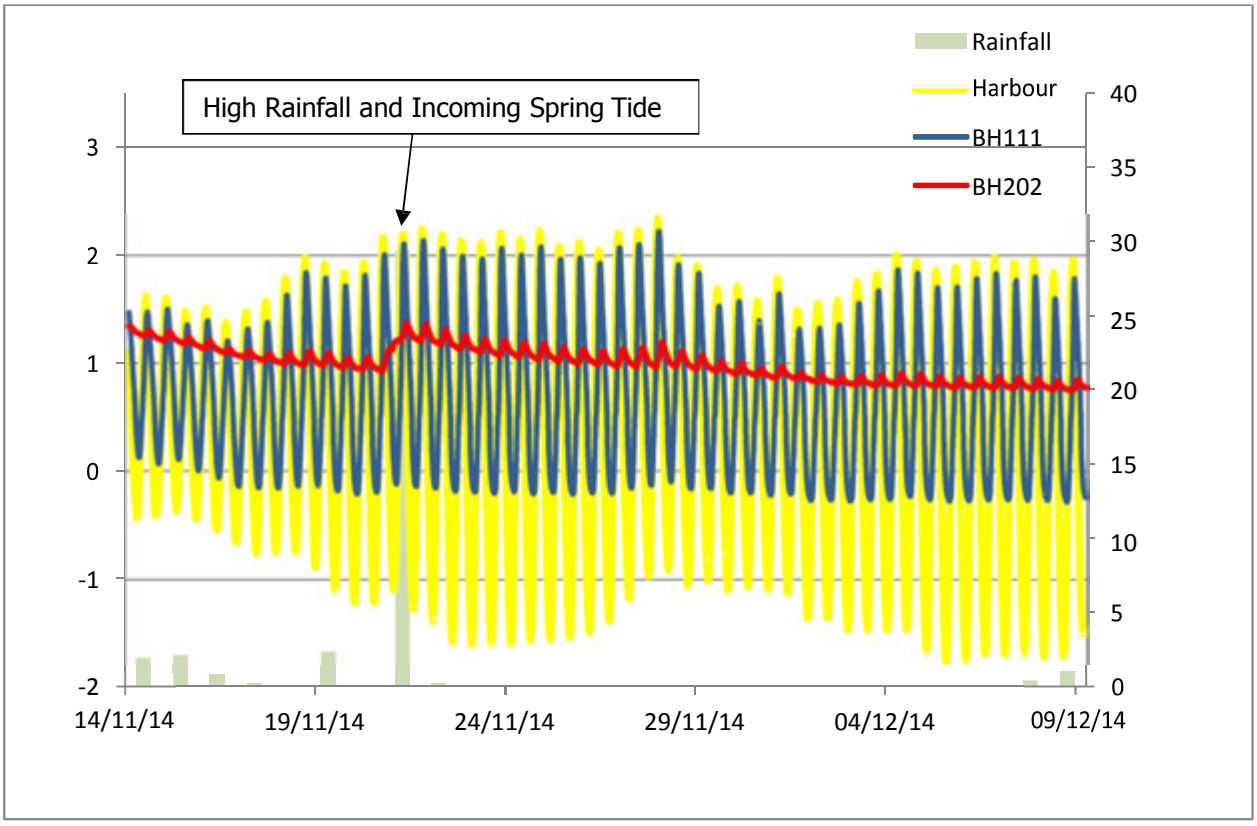

Figure 15 – Groundwater Levels in BH202 and BH111

Table 14 – Groundwater Level Data Summary from 2014 Logger Data (Minerex, 2014)

Strata	Borehole	Max (mAOD)	Min (mAOD)	Ave (mAOD)
Made Ground	BH113	2.64	-0.61	0.68
	BH105A	1.69	0.89	1.19
Alluvium, Estuarine/ Marine Deposits (Silt)	BH218	-0.28	-0.7	-0.53
	BH208	2.08	1.57	1.74
Composite Boreholes (made ground, alluvium and glacial till) (Fluvio-glacial deposits)	BH102	1.02	-0.001	0.52
	BH106	1.88	0.14	1.03
	BH108	1.25	0.51	0.85
	BH110A	1.28	0.25	0.70
	BH111	2.22	-0.29	0.65
	BH112A	2.50	-0.34	1.12
	BH114	1.72	-0.64	0.56
	BH202	1.37	0.74	1.00
	BH214	1.97	-0.13	0.97
	BH217	1.61	1.11	1.32
	BH219	1.28	0.70	0.98
	BH107A	1.56	0.82	1.11
	BH204R	1.92	0.18	0.83
	BH206	1.85	0.18	1.03
	BH209R	1.56	0.63	1.04

Strata	Borehole	Max (mAOD)	Min (mAOD)	Ave (mAOD)
	Harbour water	2.35	-1.75	0.3

Note 1: Levels referenced against topographic benchmark (mAOD) corrected by Minerex (Minerex, 2014)

The hydrographs presented in Appendix N and in the Minerex report (Minerex, 2014) identify only one borehole with groundwater levels that did not exhibit clear twice daily tidal signals, BH208. However, the overall water level does appear to rise and fall with the overall tides (e.g. neap and sprint tides) suggesting low level connectivity with the Cork Harbour Waters. A lower level of connectivity is also evident with BH218 where slight tidal signals were observed (10cm range). Both of these boreholes are located in the centre of the site and are screened exclusively into natural silts. The lower connectivity is therefore considered to be a function of lower permeability silts, the storativity of the deposits and the borehole's distance from Cork Harbour.

Boreholes located closest to Cork Harbour and Docks exhibit the greatest tidal signals including BH112A and BH113 with tidal signals ranging up to approximately 3m. The tidal signals decrease in magnitude with distances inland, e.g. BH110 in the South Tip closest to the Rock Embankment with a tidal signal range of approximately 0.5m this decreases to approximately 0.1-0.2m in BH108 further inland.

This data demonstrates that there is a saturated mass of made ground material which is in a perpetual state hydraulic interaction with the surrounding tidal waters of the estuary (i.e. direct hydraulic continuity with the sea). On this basis, any apparent hydraulic gradient, particularly in the peripheral areas next to Cork Harbour is considered to be a short-lived function of the tidal regime and will be reversed within a normal 6-12 hour tidal cycle. However this reversal is most notable at the site's periphery next to the Dock waters. In the centre of the site, i.e. at BH208 a complete reversal with the tide is not present, meaning there is an overall positive gradient towards the Cork Harbour waters from the centre of the site. i.e. there is a shallower gradient at high tide compared to low tide.

It is important to note that a tidal signal, as evidenced by twice-daily variations in hydraulic head level in monitoring wells, is clear evidence of hydraulic connection to the sea.

Again, the hydraulic head fluctuations observed in saturated natural strata below the normal tidal range are considered to be a pressure signal related to tidal loading rather than as direct evidence of the flow of water either vertically or laterally within these units. This is represented in the hydrographs for BH107A, BH204R, BH206 and BH209R. A cross section with tidal graphs presented in Appendix P.

Additional to the above, Figures 16 to 18 below provide hydrographs for groundwater in the made ground, for composite boreholes (made ground and alluvium) and Limestone boreholes. In particular, Figure 16 provides hydrographs for two boreholes in the South Tip in which steelwork waste was deposited, i.e. slag. Low level tidal signals were observed in both these boreholes and are less pronounced with a lag during falling tide, when compared to tidal signals of the Cork Harbour waters. This is possibly a reflexion of a made ground with a lower bulk hydraulic conductivity. It is considered possible that the reduced conductivity of the made ground at other monitored locations particularly with underlying natural silts, is preventing groundwater being influenced by the full tidal range such that the full influence of the high tide is not reached in this horizon before the tide falls again. Similarly, the water level in the made ground and underlying alluvium does not drain to the minimum low tidal level as it is essentially contained within a confining low permeable alluvium.

This is compared to Figure 17 which is for two boreholes, BH112A and BH113 located adjacent to the former dry dock and shows clear connectivity with the Cork Harbour waters.

Figure 16 – BH110A and BH108 Hydrographs (South Tip)

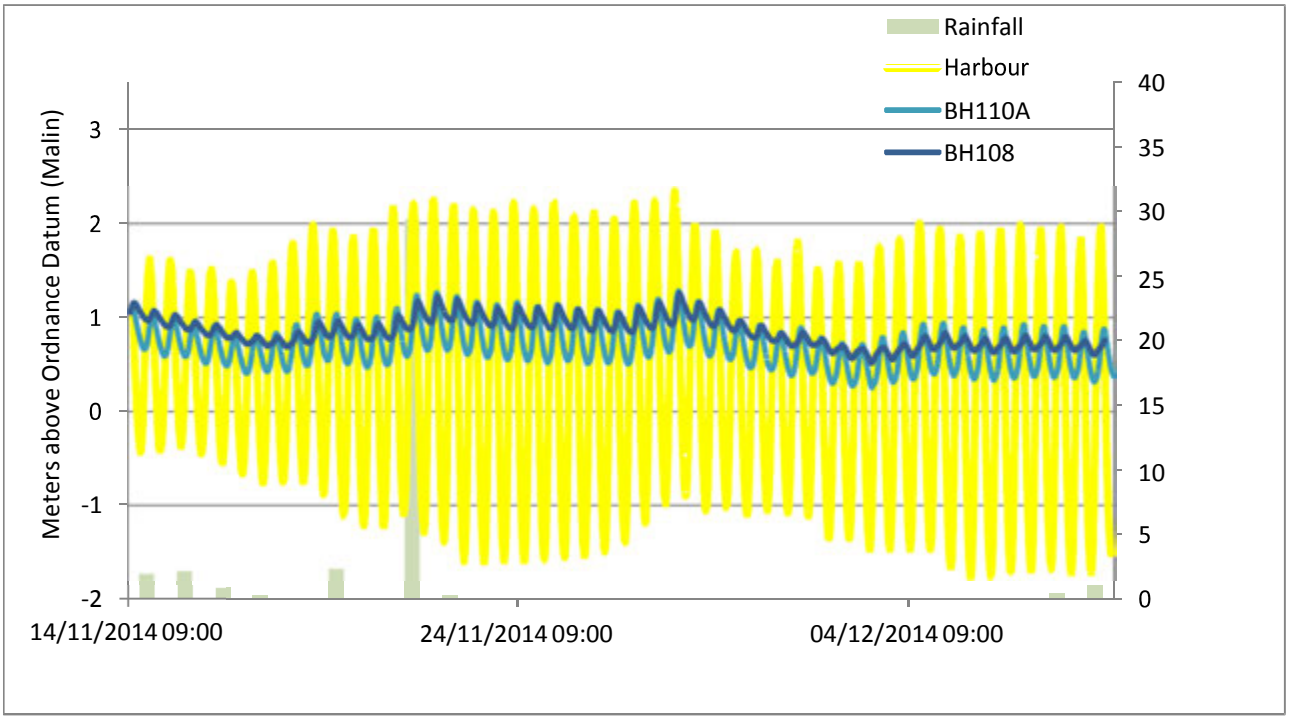

Figure 17 – BH112A and BH113 Hydrographs (Adjacent to Dry Dock)

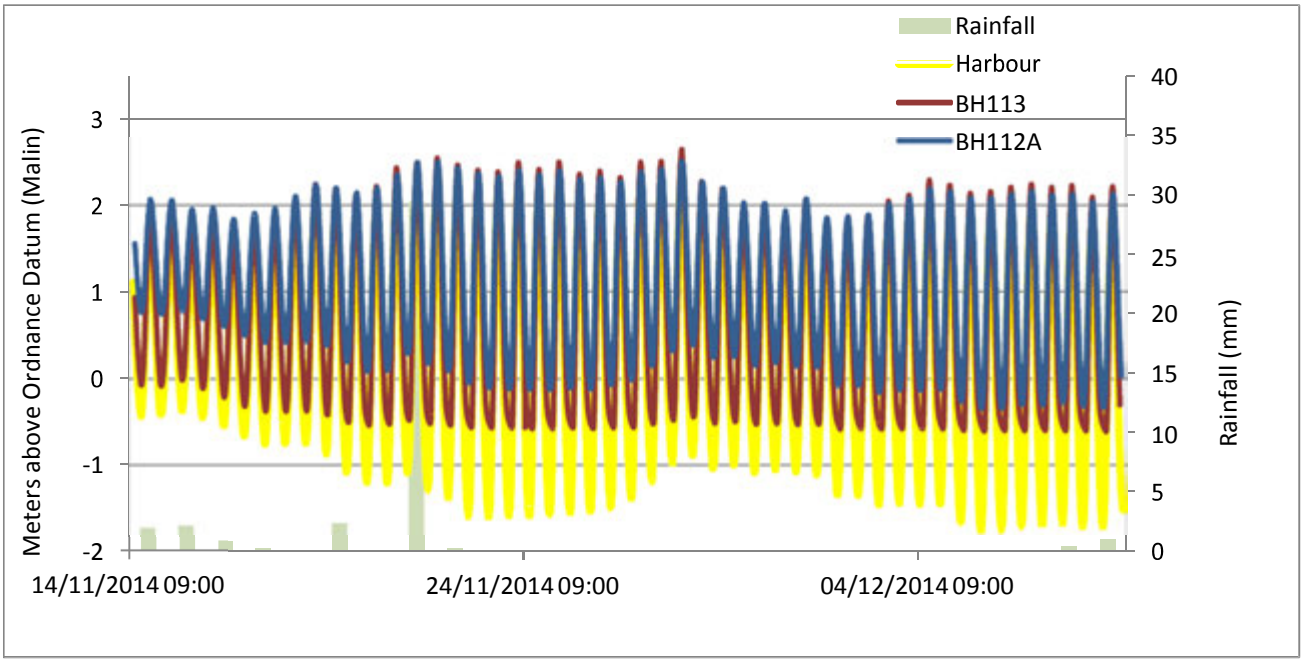

Figure 18 – Hydrographs for Water levels in Boreholes screened into Limestone

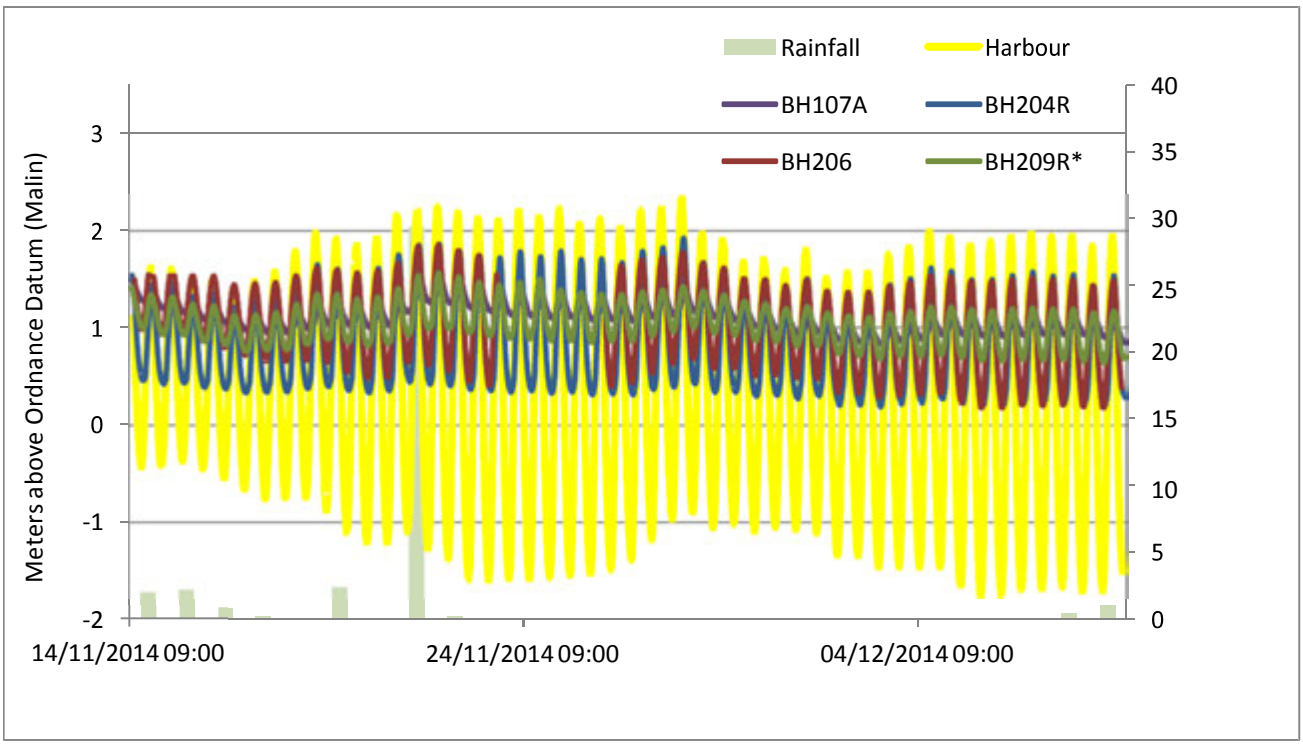

Figure 18 presents hydrographs for data loggers installed into borehole screened into bedrock Limestone. Full tidal signals are not observed for groundwater in the Limestone and the hydrographs appear to show a lag between the high tide water levels and low tide water levels.

5.5 Hydraulic Conductivity (Made Ground, Alluvium and Limestone)

Hydraulic conductivity is a key parameter in undertaking a DQRA, while published values for different geology types are available, site specific data is always preferred. Consequently, in situ hydraulic conductivity tests were completed in boreholes on the Factory site by Minerex and are presented in their report in Appendix M. This included in-situ rising and falling head tests using slugs.

It is important to note that; because the main strata types, particularly on the periphery of the site next to the Cork Harbour are in direct hydraulic continuity with the tidal cycle (as discussed above), the results of empirical in-situ testing (i.e. rising and falling head test) can be significantly influenced (both positively and negatively) by the local tidal regime. Consequently, the results of such testing should be considered as indicative.

5.5.1 Made Ground and Composite Boreholes

Table 15 presents a summary of the results of Permeability Test estimates for the Factory site by the various methods outlined above and presents the minimum, maximum and average based on all results.

Table 15 – Summary Hydraulic Conductivity Estimates – Composite Boreholes

Testing Method	Borehole	Lithology	Permeability (m/sec)	Permeability (m/day)
Rising Head	BH105A	Made ground - slag	too high to calculate*	86.4*
	BH113	Made ground - quarry fill	too high to calculate*	86.4*
	BH108	Made ground, silt and gravel	7.79E-05	6.73E+00
	BH111	Made ground slag and gravel	3.90E-05	3.37E+00
	BH114	Made ground, silt and gravel	5.61E-06	4.85E-01
	BH216	Made ground and sand	9.59E-06	8.29E-01
Falling Head	BH105A	Made ground - slag	too high to calculate	86.4*
	BH113	Made ground - quarry fill	too high to calculate	86.4*
	BH108	Made ground, silt and gravel	1.83E-04	1.58E+01
	BH111	Made ground slag and gravel	3.99E-05	3.45E+00
	BH114	Made ground, silt and gravel	2.25E-05	1.95E+00
	BH216	Made ground and sand	2.91E-05	2.52E+00
	Maximum		1.E-03*	86.4*
	Average		3.67E-04	31.7
	Average not including literature values		5.08E-05	4.39E+00
	Minimum		5.61E-06	0.4845

* a literature value of $1x10^{-3}$m/sec (Fetter, 2001)

As can be seen from the above, the calculated average hydraulic conductivity of 3.67E-04m/sec is considered to be representative of a generally granular material with some fines, i.e. within the literature range for well sorted sands or glacial outwash to silty sands to fine sands $1x10^{-7}$ to $1x10^{-3}$m/sec (Fetter, 2001) and also very slightly less permeable for literatures values for steel slag of $4.5x10^{-4}$m/sec (Ziemkiewicz and Skousen, 1998).

However, to account for made ground with higher permeability, i.e. BH105A and BH113, it is considered appropriate to include permeability estimates from literature sources for these two locations. Fetter 2001 provides permeability for well sorted gravel of $1x10^{-4}$m/sec to $1x10^{-2}$m/sec which would be considered to be representative of granular material.

The broad range of hydraulic conductivity's exhibited by the made ground is in-keeping with the heterogeneity of the material recorded from site observations, from engineering borehole logs and also the fact that boreholes are screened across made ground of varying lithology and the underlying natural silts (alluvium).

5.5.2 Alluvium (Clay/Slit)

Table 16 presents a summary of the results of hydraulic conductivity estimates for alluvium and presents the minimum, maximum and average based on all results. These permeability test results were specifically for alluvium material underlying the East Tip site, Haulbowline Island to the immediate east of this Factory Site, however as identified by Arup's (Arup, 2014) they are also considered appropriate for alluvium underlying the Factory Site. Average permeabilities of alluvium are significantly less, by three orders of magnitude, than that observed for the overlying waste material. They are considered to be appropriate when compared to a literature value range for silt, sandy silts, clayey sands and till with a range of 10^{-8}-10^{-6} m/sec and silty sands, fine sands with a range of 10^{-7} – 10^{-5} (Fetter 2001).

Table 16 – Summary Hydraulic Conductivity Estimates – Alluvium (Arup, 2014)

Testing Method	Borehole	Hydraulic Conductivity	Hydraulic conductivity
Rising Head	BH301A[4]	8.9E-7	8E-2
	BH302	2.3E-7	4E-2
	BH304	2.4E-7	2E-2
	BH306D	2.8E-8	3E-3
	BH310B	2.1E-6	0.19
	BH316	1.5E-6	0.13
Falling Head	BH301silt	6.8E-6	0.59
	BH303 silt	7.8E-7	0.07
	BH304[4]	3.7E-6	0.32
	BH305 silt	2.5E-6	0.22
	BH307 Silt	1.4E-7	0.01
	BH310B	2.1E-6	0.18
	Maximum	6.87E-6	0.59
	Average	1.8E-6	0.16
	Minimum	2.8E-8	0.003

5.5.3 Bedrock (Limestone)

Table 17 presents a summary of the results of hydraulic conductivity estimates for the limestone bedrock in the East Tip by the various methods outlined above and presents the minimum, maximum and average based on all results. Literature value for Waulsortian Limestone found a range of 0.1-20m/day (Tedd et all, 2011), consequently the measured permeabilities below are considered to be within that range and are therefore appropriate.

Table 17 – Summary Hydraulic Conductivity Estimates - Bedrock

Testing Method	Borehole	Hydraulic Conductivity (m/sec)	Hydraulic Conductivity (m/day)
Rising Head	BH107A	7.95E-05	6.87E+00
	BH204R	1.04E-05	9.02E-01
	BH206	6.38E-06	5.51E-01
Falling Head	BH107A	9.11E-05	7.87E+00
	BH204R	1.07E-05	9.26E-01
	BH206	1.35E-05	1.17E+00
	Maximum	9.11E-05	8
	Average	3.53E-05	3
	Minimum	6.38E-06	0.5508

5.6 Drainage Survey

A survey of accessible manholes and drains was completed in December 2015 by Lehane Environmental and Industrial Services Ltd. The outputs from this survey are included in Appendix O. Additional drainage plans are also included in previous reports (Arup, 2014). The survey generally has identified that the drains on the site, comprising of both storm drains and former process drains are in a state of disrepair with a number of collapsed sections. Consequently, it was not possible for the contractor to complete a full drainage survey of the site.

One point of interest from the survey included evidence of contamination "Oily Smell" in one drainage run which originated in the centre of the site, travelling south, from MH19, to MHA to MHE and also MH24. MHE is to the west of BH218 which has depths of LNAPL present and consequently it is considered that the drains in this area could be acting as a preferential pathway in regard to a known LNAPL contamination source.

5.7 Updated Hydrogeological Conceptual Model

On the basis of comparison of solid, leachability and water analysis results with appropriate GACs, a number of pollutant linkages have been identified in regard to the Factory Site (former steel works), summarised in Table 11, Section 4.

The made ground material is considered to be highly heterogeneous as is shown by the engineering logs and the range of hydraulic conductivity estimates, from a maximum of 2.98E-02m/sec to a minimum of 2.10E-07m/sec (see Section 5.5). The made ground and underlying natural soils have been shown to be indirect connectivity with the Cork Harbour waters as presented in Section 5.3 and particularly at location next to the Cork Harbour water and docks is in a perpetual state hydraulic interaction with the surrounding tidal waters of the estuary (i.e. direct hydraulic continuity with the sea).

However, there is an important distinction between fluctuations in head measurements at the periphery of the site (which are in the order of 2-2.5m) and those head measurements within the interior of the site (which are in the order of 0.5m). In simple terms, there is insufficient time between high and low tide (approximately 6 hours) for most of the water within the saturated tidal zone particularly in the centre of the site, to flow to the periphery (conservatively assuming an average hydraulic conductivity of 3.67E-04m/sec or 32m/day) before the transient and tidally created hydraulic gradient in one direction is reversed with the incoming tide (i.e. opposite hydraulic gradients in both directions over each tidal cycle). The

more pronounced tidally influenced fluctuations in hydraulic head near the periphery of the site (i.e. circa 2-2.5m – see Tidal Conceptual Site Model in Appendix P) which is reduced significantly in the centre of the site suggest that a component of flow may be occurring from the centre of the site, which is partially reversed or a few hours either side of each high tide and limited with decreasing distance from the shoreline.

6.0 Water DQRA

6.1 Rational and Methodology for Assessment

For the avoidance of doubt, the assessment presented herein is considered to be an appropriate response to the particular situation presented by this site and has been undertaken for clear technical reasons as detailed in the sections below. The assessment is intended to present a conservative and yet realistic baseline of theoretical environmental impact, specifically from dissolved phase contaminants within the saturated parts of the site into the surrounding waters of Cork Harbour. In turn the outputs of this modelling are intended to allow informed decisions about the appropriate course of remedial action to be made and outline remedial design solutions to be tested and validated.

6.2 Technical Basis for Groundwater Assessment

As discussed in previous sections of this report, there are various technical reasons which necessitate the adoption of a bespoke Groundwater DQRA on this site, and these are summarised below within the context of the tiered assessment process.

For this purposes of the DQRA the site has been divided into two. Groundwater contaminant migration is determined on the basis of groundwater flow direction towards the Cork Harbour waters which surround the site to the north, east and south. The highest water levels are considered to be present in the centre of the site, specifically at BH208. Groundwater and a hydraulic gradient moves radially outwards from this location. This is maintained to a certain extent during a high tide where it appears the gradient indicates that flows would still occur from the centre of the site, radially north, west and south to the nearest boreholes. However along the periphery of the site next to the dry docks e.g. BH112 the hydraulic gradient is reversed with the high tide with a flow inwards.

Consequently, the site has been split into two as shown in Figure 19. Groundwater in the north eventually discharges into the Cork Harbour waters in the Dock and to the north of the site. In the south the water moves through the South Tip to discharge to the south of the South Tip. Each zone is modelled separately as a result.

6.2.1 Generic Quantitative Risk Assessment (Leachate and Groundwater Screening)

This process compares site chemical data against the relevant water quality standards which are intended to be conservatively protective of sensitive aquatic ecosystems and/or human health. This process precedes the DQRA and is intended to identify the COCs in both solid phase derived leachate and in local groundwater beneath the site (solid samples are considered separately in this document with respect to human health risk assessment). Given the immediate proximity of the receptor (i.e. estuarine waters of Cork Harbour), the identification of various COCs prompted the requirement for further and more refined assessment to the wider environment (i.e. Groundwater DQRA).

6.2.2 Tier 1 DQRA (Soil to Leachate)

This process utilises the UK's Environment Agency's (EA) Remedial Targets Methodology (RTM) software or other equivalent software to model the leaching potential of soils using established Soil: Water partition co-efficient's (kd) for the various COCs identified through screening and initial assessment. The need to model this step using computer software (RTM) is to a greater or lesser extent made redundant by empirical (actual and measured) results of leachability testing, but the outputs can be used to calibrate the laboratory test results if necessary. The results of this step, together with the results of various laboratory testing, confirmed that certain COCs were potentially leachable from the waste material on the East Tip at concentrations above the relevant WQS.

6.2.3 Tier 2 DQRA (Soil Derived Leachate to Groundwater)

This stage of assessment again utilises the EA's RTM model or other equivalent software to create a 2-dimensional analytical model describing the relationship between soil derived leachate and its potential impact on the underlying groundwater. The model requires a number of key site specific input parameters which include hydraulic gradient and also a background concentration of contaminant in pore water (i.e. groundwater). Critically, the hydrological Conceptual Site Model, together with analysis of data-logger results has shown that there is no definitive persistent or static hydraulic gradient in the groundwater beneath the site, only the twice daily ebb and flow of the tide. This is with the exception of boreholes in the centre of the site, with lower connectivity with Cork Harbour waters and consequently a hydraulic gradient towards the Cork Harbour Waters is maintained for a longer time during a rising to high tide. This means that for modelling purposes theoretical gradients must be adopted to drive flow or more conservatively a flow estimate can be made by adopting a change in water

level. For this purpose an average of an appropriate hydraulic gradient during low tide will be averaged with a lower high tide hydraulic gradient.

Additionally, in a number of instances the concentration of certain COC's in the groundwater are already in excess of WQSs. In these circumstances, should such concentrations be included as background concentrations within the model, the software model (RTM) would not be able to run the algorithms within the model to dilute leachate into groundwater because the logic breaks down. In other words, the Tier 2 RTM model seeks to dilute the leaching concentrations into the available groundwater to achieve the WQSs, which it cannot do if that groundwater already contains a greater concentration.

6.2.4 Tier 3 Groundwater Assessment (Groundwater to Groundwater)

This type of assessment again uses the RTM software or other equivalent software to model the fate and transport (attenuation, degradation and sorption characteristics) of the identified concentrations of COCs in groundwater during passage along a flow path toward the receptor (or an identified compliance point). In this report, RTM groundwater tier 3 modelling has been completed to take into account attenuation / degradation mechanisms that would impacted dissolved organic groundwater contaminants migrating along the pathway on site towards the Cork Harbour waters. As established previously, the CSM shows that groundwater beneath the site is in direct hydraulic continuity with the tidal waters of the Harbour and hence is already technically within the receptor. However, this pathway will be modelled using tier 3 groundwater RTM for hydro organic contaminants of concern namely PAHs and speciated PAHs, specifically to take into account degradation and attenuation mechanisms that would occur to these contaminants dissolved in groundwater migrating through saturated soils towards the Cork Harbour waters.

6.2.5 Tier 4 - Contaminant Flux and Dilution (Mass Transport) Model

Cognisant of the fact that a substantial proportion of the made ground and natural soil material beneath the site is in direct hydraulic continuity with the estuarine waters of Cork Harbour, the remaining questions are:

- How much contaminant is being generated and discharged into Cork Harbour? and
- Is the contribution of contaminants 'significant' and how far does this impact extend?

This approach requires a bespoke analytical model which seeks to improve the understanding of the likely scale of theoretical impact represented by the site by considering the effects of dilution of contaminants in the Haulbowline Dock and estuarine waters of Cork Harbour. A Tier

4 CSM is presented in Appendix Q. The model will be discussed in greater detail below and within the calculation sheets presented in AppendixR.

6.3 Tier 3 Groundwater Assessment (Groundwater to Groundwater)

The aim of this Tier 3 DQRA is to provide a more site specific assessment of risks to controlled waters from the identified potential pollutant linkages and contaminants of concern, specifically to include degradation of organic contaminants into the assessment. In this section we specifically consider the potential transport of dissolved phase hydrocarbons from an area associated with the LNAPL 'source area' to the South Tip.

It should be noted that there is an exception of one pollutant linkage, associated with observed free product (LNAPL) on groundwater in the centre of the site at BH216. This will not be specifically modelled as part of this DQRA, instead due to the potential risks associated with LNAPL, this pollutant linkage will require source removal / remediation as outlined in Section 8.

Potential pollutant linkages have been identified as potentially significant with regard to controlled waters and these include the contaminants of concern speciated TPH and speciated PAHs which will be included in this Tier 3 Groundwater DQRA.

6.3.1 Methodology

This section presents the results of the tiered water risk assessment in particular Tier 3 which considers natural attenuation (including dispersion, retardation and degradation) of organic contaminants, speciated TPH and speciated PAHs as they moves through the saturated zones toward the receptor, Cork Harbour waters.

Remedial Target Methodology (RTM)

The risk to groundwater was assessed using the Uk's Environmental Agency RTM worksheets which is a quantitative decision tool for risk-based groundwater assessment. The UK software is designed for Tiered Risk Assessment using the four tier Remedial Targets Methodology (RTM) presented by the UK's Environment Agency 2006 Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination and Accompanying Remedial Targets Worksheet V3.2.

This methodology uses a one-dimensional groundwater flow solution combined with a 3-dimensional treatment of dispersion, adsorption and decay. The RTM methodology calculates concentrations in groundwater at receptor or compliance point location. The concentration

adopted is called compliance point standard (CPS). It does not include any assessment of the toxicity of each contaminant and does not evaluate risk directly. The risk evaluation process is normally completed by comparing the predicted concentrations to the applicable CPS.

In this risk assessment, the RTM models will be used to calculate predicted groundwater concentrations in groundwater at the point before it would discharge into the Cork Harbour waters.

The source, pathways and receptor points are characterised in the sections below with a detailed sensitivity analysis to assess the relative importance of the different parameters.

6.3.2 Source Zone Characterisation

The contaminants of concern have been identified from the GQRA presented in Section 4 and includes the organic contaminants, speciated PAHs and TPHs, based on existing groundwater analysis results for groundwater in made ground and underlying natural soils. The groundwater hydrocarbon plumes are primarily located within the southern site area and consequently the plume area which is within the southern site area as shown on Figure 19 has been modelled. Table 18 provides the plume dimensions.

TPH impacts are characterised using the 13 equivalent carbon fractions defined by the TPHCWG (Total Petroleum Hydrocarbon Criteria Working Group). The compounds of concern requiring modelling are summarised in Table 19. For the purposes of modelling, the impacts are characterised by the average concentration of each of the identified potential constituents of concern.

Table 18 – Source Area Dimensions (Soil and Groundwater)

Source	Parameter	Units	Value	Justification
TPHs and PAHs	Width	m	150	Site data - perpendicular to anticipated groundwater flow direction to the south – Hydrocarbon Impacts at BH240 and BH242 delineated by clean adjacent BH267, S271, BH215, BH205, D273 (shallow), BH209, BH217, BH223, BH218, D275 and BH110
	Length	m	120	
	Plume thickness	m	4	Estimated conservatively based on site data, depth of installation at BH216 with made ground to 4mbgl underlain by alluvial sands and gravel

Table 19 – Average Concentrations of Constituents of Concern – TPHs and PAHs Shallow Perched Groundwater in Made Ground/top of Glacial Till

Contaminant of Concern	Average Groundwater Concentration (µg/l)
Aliphatic >C8-C10	7.46
Aliphatic >C10-C12	381
Aliphatic >C12-C16	1473
Aliphatic >C16-21	2000
Aliphatic >C21-35	818.33
Aromatic >C8-C10	5.21
Aromatic >C10-C12	94.54
Aromatic >C12-C16	833.75
Aromatic >C16-C21	1680.83
Aromatic >C21-35	856.25
PAHs	
Anthracene	1.94
Benzo(a)pyrene	3.88
Benzo(b)fluoranthene	4.61
Benzo(k)fluoranthene	1.8
Benzo(g,h,i)perylene	1.48
Fluoranthene	10.8
Indeno(123cd)pyrene	1.7

6.3.3 Pathway Characterisation

Parameters defining the saturated zones have to be specified in order to quantify likely contaminant partitioning into soils, dilution within underlying groundwater and then movement within groundwater. The impacts identified at this site are already within the groundwater, in the made ground and underlying natural soils. Thus, the primary contaminant movement is considered to be primarily through the made ground and also underlying natural soils which have been characterised as the saturated zone to model contaminant movement through groundwater to receptor compliance points.

Parameters defining the saturated zone have to be specified in order to quantify likely contaminant movement within the groundwater. The RTM model has been used conservatively to model contaminant movement through one stratum at a time thus, each of the identified geological units have been characterised separately using site specific data where possible. In the absence of site specific data, published literature values have been utilised to characterise 'typical' saturated zones (Table 20).

Table 20 – Saturated Zone Input Parameters

Parameter	Units	Value	Justification
Hydraulic Conductivity	m/s	5.08E-5	Site data –permeability tests
Hydraulic Gradient	-	0.006	Site derived data based on groundwater levels between BH208 and BH111 including an average of hydraulic gradient at high tide and at low tide.
Effective Porosity	-	0.34	Medium value for a granular material gravel and sand
Saturated aquifer thickness	M	6	Estimated site data - depth of made ground soils in area of plume with conservative inclusion of underlying natural due to hydrogeological connections.

Degradation Potential

Field geochemical data obtained during groundwater monitoring is included in Appendix S and summarised in Table 21. This data can be used to assess whether conditions are suitable for biodegradation of contaminants. Hydrocarbons, in particular the more soluble and lighter molecular weight PAH and TPH compounds can be subject to degradation by both biotic and abiotic means. Where these compounds are subject to degradation by an indigenous microbial population, many have been shown to be degraded through metabolism and co-metabolism and under aerobic and anaerobic conditions, although research has shown that biodegradation tends to proceed more rapidly under aerobic conditions. Data was obtained from all boreholes where groundwater samples were collected using low flow techniques.

This data can be used to assess whether conditions are suitable for biodegradation of contaminants. It has been summarised in the table below and is presented in full in Appendix J.

Table 21 – Summarised Geochemical Data

Geological Unit	Temp (°C)	EC (µS)	pH	Eh (mV)	DO (mg/l)
Made Ground Top of alluvial soils	13.25-17.1	747-34264	6.58-8.57	-140.3-69.8	0.09-6.49

Redox potential was recorded in the range between -140-70mV. Environment Agency report P95 indicated that below -50mV is indicative of reductive processes and anaerobic degradation. EA R&D P95 indicates that aerobic degradation generally occurs under a redox potential above 150mV. Mildly reducing conditions are considered to be 50mV to -150mV. This suggests that conditions are generally mildly reducing. Which provides evidence that degradation of hydrocarbons is likely to be occurring although high end degradation rates are unlikely to be achieved.

Degradation processes are pH sensitive. Environment Agency R&D P95 indicates the "optimal pH range for microbial degradation lies between approximately 6 and 8.5". Site data shows that the pH is in the range of 6.6 to 8.6 and is considered to be within the quoted optimal range for degradation.

EA R&D report P305 indicates that temperature "affects the solubility of chemicals involved in the oxidation-reduction processes. Biological and biochemical processes are accelerated at

temperatures in excess of 20°C and may be inhibited at temperatures below 5°C. Site data recorded groundwater temperatures between 13°C and 17°C.

Dissolved Oxygen

Dissolved oxygen concentrations obtained during groundwater sampling and monitoring November 2015 round were measured in the approximate range of 0.09mg/l to 6.5mg/l however typically they were greater than 1mg/l. The Environment Agency R & D Report P305 states that a dissolved oxygen content of more than 1mg/l indicates degradation may occur under aerobic conditions. Therefore, the data for dissolved oxygen indicates that aerobic conditions are likely to be present within groundwater.

Summary

In summary, the pH, temperature, dissolved oxygen and redox recorded for the groundwater particularly in the underlying made ground and alluvium suggest that there is potential for microbial degradation of hydrocarbons. It is therefore considered appropriate to include an appropriate estimate of degradation within the modelling. No site specific data is available regarding degradation rates of TPHs and PAHs on site, however it is considered reasonable to use literature values where available. This includes those from Howard P.H. et al (1991)

Published half lives for the contaminants of concern are presented in Appendix S. The values that have been utilised in the model are medium values calculated as an average of the lowest and maximum degradation rate published by Howard for groundwater.

6.3.4 Compliance Point

The environmental compliance point for the RTM model has been selected as a land point downgradient of the plume immediately before groundwater would enter the Cork Harbour waters. The distance has been measured as 85m which is from the plume edge as shown on Figure 10 to BH111.

Compliance Criteria

Compliance criteria for all contaminants identified as part of this assessment have been derived from the applicable water framework directive water quality standards as included in Table 2.

6.3.5 Sensitivity Analysis, Assumptions and Limitations

Sensitivity analysis has been undertaken to assess the relative importance of the model input parameters. The relative importance of the various parameters differs dependant on the inclusion of environmental degradation and also on the nature of the base model used (e.g. steady state or time dependant).

Environmental degradation has been taken into account as conditions observed at the site during the monitoring visits are indicative of conditions that are appropriate for such processes to act, particularly at the periphery of the plume.

Tier 3 – Dilution and Attenuation

The hydraulic conductivity value was obtained from site specific testing in the made ground and underlying natural soils, and from available pump test results. An average of the values for each geological unit has been utilised in the RTM modelling. Decreasing hydraulic conductivity values by an order of magnitude tends to increase the predicted PAH concentrations by four orders of magnitude. Hydraulic conductivity values are considered to be highly sensitive parameters in the DQRA assessment

The hydraulic gradient has been calculated from site specific topographical data and measured groundwater levels. Increasing the hydraulic gradient by an order of magnitude resulted in increases to the predicted groundwater concentrations by similar orders of magnitude.

6.3.6 Model Output

The RTM model inputs and output results are presented in Appendix S, detailing model inputs and the derived predicted average concentrations for each contaminant. The base model used in the derivation of the SSTLs is considered conservative and reflects the uncertainties in the data available at this stage. Predicted average concentrations are presented in Table 22.

Table 22 – Predicted Concentrations at Compliance Point

Contaminant of Concern	WQS (µg/l)	Predicted Average Concentrations (µg/l)
Aliphatic >C8-C10	10	0.2
Aliphatic >C10-C12	10	1.8
Aliphatic >C12-C16	10	4.1
Aliphatic >C16-21	10	**750**
Aliphatic >C21-35	10	**307**
Aromatic >C8-C10	10	0.1
Aromatic >C10-C12	10	0.4
Aromatic >C12-C16	10	2.3
Aromatic >C16-C21	10	**630**
Aromatic >C21-35	10	**321**
PAHs		
Anthracene	0.1	**0.27**
Benzo(a)pyrene	0.00017	**0.6**
Benzo(b)fluoranthene	0.03	**2**
Benzo(k)fluoranthene	0.03	**0.8**
Benzo(g,h,i)perylene	0.002	**0.5**
Fluoranthene	0.0063	**1.73**
Indeno(123cd)pyrene	0.02	**0.5**

Bold indicates SSTL exceeded by maximum concentration

After completing a Tier 3 groundwater RTM DQRA modelling, a number of contaminants of concern including TPH aliphatic and aromatic C16-21 and C21-35 and all the PAH compounds

are predicted to exceed the relevant WQS at the compliance point set as a point within the South Tip.

6.4 Introduction to Tier 4 Assessment

The assessment of risks to surface water presented previously within this report are conservative and have indicated that the site poses a theoretical risk to the wider environment in terms of dissolved phase contaminants discharging into the Cork Harbour at concentrations above relevant Water Quality Standards.

The Tier 4 modelling exercise presented within the following sections of this report seeks to establish a conservative estimate of the mass of dissolved phase contaminant flux potentially leaving the site, and to understand this mass within the context of the daily flux of water passing the site as part of the local tidal regime.

6.5 Methodology Overview

There are two key component parts to the Tier 4 Mass Transport model. The first is a flux model which quantifies the volume of water flux from the site. The second is a dilution model based on the calculation and application of dilution factors which may be applied to representative concentrations of identified contaminants in the groundwater being discharged into the receptor, in this instance, the tidal waters of Cork Harbour.

Whilst based on as much site specific data and input parameters as possible, the model relies on a number of reasonable assumptions and is necessarily a conservative simplification of a very complex and dynamic environment. In order to maintain the integrity of the model and to ensure its technical defensibility, a balance needs to be maintained between realism and conservatism. The key input parameters are tested through sensitivity analysis to ensure that those selected as the basis of the model are appropriately conservative, yet realistic.

6.6 CSM and Basis for Modelling

An idealised 'schematic' representation of the Conceptual Site Model is presented in Appendix Q and shows an overview of the main theoretical inputs and outputs of the site system.

It is acknowledged that there is a deeper section of saturated made ground and natural strata positioned below mean low tide level, wherein an element of mixing of water may occur but

the actual flow of groundwater within this zone, either laterally or vertically, will be negligible by comparison to that which occurs within the overlying tidally affected zone.

On this basis, and for the purposes of this modelling, only the flow associated with the saturated zone (made ground and natural soils) within the tidal range are directly assessed. The contribution from precipitation/infiltration is also considered as part of this system and will be discussed further below.

The following sections describe the methodology underpinning the Flux model and in-turn the Dilution model.

6.7 Flux Modelling

The flux model (presented in R) has two component parts. The first is an estimate of the discharge through site from each tidal cycle and is based primarily on Darcy's Law which is considered to adequately describe discharge (herein flow) given the inter-granular flow associated with the waste deposits. The second component is a calculation of total flux from the site on a daily basis, assuming two tidal cycles each day as well as the average daily contribution from precipitation/infiltration. Each will be discussed in turn below.

6.7.1 Flow

The key components of 'flow' described by Darcy's Law are as by the following equation:

- Q= KIA

Where 'Q' is Flow (m^3/day)'K' is Hydraulic conductivity (m/day); 'I' is hydraulic gradient, expressed by hydraulic head over distance of travel (h/l); 'A' is the cross sectional area through which flow occurs.

The key input parameters used for this calculation are presented within the model spreadsheet in Appendix R and discussed in further detail below.

6.7.2 Conservatism within the Flow Model

Hydraulic Conductivity (K)

The risk assessment process is undertaken using site specific data and minimising the use of any literature values with respect to the physical properties of the made ground and underlying geology. Because of the heterogeneities within both the made ground and the underlying geology, multiple measurements or tests were undertaken to obtain the physical properties.

For some properties, such as hydraulic conductivity within the made ground, there is a large range in property value.

The hydraulic conductivity of made ground material is the most important and sensitive parameter concerning estimates of flow on this site. As shown in Table 15 in Section 5.5.1, the range of estimated hydraulic conductivity's exhibited by this material through various analytical and/or empirical testing methods is large with the highest estimates at 1E-03m/sec (literature value) and the lowest at 5.61E-06m/sec.

From this data and field observations, it is clear the material is highly heterogeneous and anisotropic and therefore groundwater flow through this medium is likely to be complex and impractical to model in any detail. On this basis, it is considered appropriate to adopt a conservative estimate of hydraulic conductivity for modelling purposes which is broadly representative of the permeable made ground material as a whole.

It is accepted that underlying natural soils, typically silts are within this tidal zone, however the made ground hydraulic conductivity values would be considered highly conservative in considering flux from this material.

For the north of the site an 'average' value for K has been adopted as 3.67E-04m/sec which is considered appropriately conservative given the variability of made ground in this part of the site.

For the south of the site an 'average' value for K has been adopted as 5.08E-05m/sec which is considered appropriately conservative. The logger data hydrographs for wells in the south of the site as shown in Appendix M appear to show a lower permeable material when compared with hydrographs of the made ground boreholes in the north of the site e.g. BH113. Consequently, a lower average which does not include the literature values which have been substituted for BH105A and BH113 have not been included in this average.

Further justification for adoption of these values is provided within the sensitivity analysis in Section 6.7.4.

Contaminant Concentrations

Consideration was given to whether it was more appropriate to use a median value as opposed to a mean value which is then applied across the entire unit and a representative value for assessment purposes. In some instances, a mean value can be skewed by the presence of a very high or low value when compared to the rest of the data, in this case the use of a median value is often considered to be more representative. For example, in regard to lead

concentrations in groundwater, the average value which has been utilised in this assessment is 120.4µg/l and the median value is 12µg/l. Most concentrations measured in groundwater in were low or near to laboratory detection limits and less than WQSs and as a result the average concentration is considered to have been skewed by a few larger concentrations of close to 1000µg/l. However, averages have been used in preference to median values as it offers a further level of conservatism to the assessment.

Discharge

It should be noted that the model assumes instantaneous contaminant discharge to the harbour which thus considers maximum impact and minimum attenuation. Given the hydrographs presented in Figures 16, 17 and 18 this represents the worst case scenario and is thus considered to be highly conservative.

The layout of the site, location of Cork Harbour Water and potential groundwater flows as discussed in section below have determined two differing discharge areas, one to the south, including South Tip and then secondly to the east and north. Consequently, it is considered appropriate to spilt the site into two for flux modelling and dilution modelling purposes.

Hydraulic gradient (I)

It is important to note that; based on the available data, there is no evidence to suggest that a steady and persistent hydraulic gradient exists beneath the entire site. There is a clear tidal hydraulic head observed in all saturated strata beneath the site (including made ground), with the exception of two locations in the centre of the site, BH218 installed into underlying lower permeable silts and BH208 which is installed into both made ground and underlying natural silts. For most monitored boreholes on site clear tidal signals were observed with the peaks created by high tides balanced by the troughs of low tide. Hydraulic gradients from the centre of the site e.g. at BH208 are greatest during a low tide creating a clear hydraulic gradient radially outwards from this location. During a high tide, this gradient is significantly lower but is still present in the centre of the site, however closer to the Cork Harbour the gradient is reversed and also reversed completely in the direction of the dry dock, e.g. from BH112A. In the direction of the South Tip from BH208 towards BH110A a positive hydraulic gradient appears to be maintained in boreholes in this direction. Consequently, hydraulic gradients vary significantly across the site and according to tides.

Darcy's Law cannot function without a component of hydraulic gradient (I) to drive flow and therefore an arbitrary or artificial value for 'I' must be adopted and this introduces an inherent element of conservatism into the model. In this instance, consideration has been given to a 'h'

(hydraulic head) value. The highest water levels are considered to be present in the centre of the site, specifically at BH208. During a low tide the hydraulic gradient is radially outwards from this location. This is maintained to a certain extent during a high tide where it appears the gradient indicates that flows would still occur from the centre of the site radially north, west and south to the nearest boreholes. However, along the periphery of the site next to the dry docks e.g. BH112 the hydraulic gradient is reversed with the high tide with a flow inwards.

Consequently, the site has been split into two as shown in Figure 19. Groundwater in the north eventually discharges into the Cork Harbour waters in Dock and to the north of the site. In the south the water moves through the South Tip to discharge to the south of the South Tip. Each zone is modelled separately as a result. The calculated hydraulic gradients are an average of the high hydraulic gradient at low tide and a lower hydraulic gradient present in the centre of the site at high tide for each zone (north and south).

Notwithstanding the tidal changes in hydraulic gradients, the observations of relatively large changes in head (circa 2-2.5m) in monitoring wells closer to the periphery of the site (see Tidal CSM – Appendix P), coupled with the relatively high hydraulic conductivity of the made ground, it is reasonable to conclude that an element of flow does indeed occur around the edges of the site as a result of the tidal cycle. On this basis, the conservative estimates of 'I' are considered to be valid and yet suitably conservative.

Cross sectional area (A)

The cross-sectional area is based on the shoreline perimeter of each zone. The northern zone cross sectional area includes the shoreline on the northern infilled East Camber, northern shoreline then turning to travel south along the western dock wall and western dry dock wall a total length of 915m. The southern zone shoreline and cross sectional area includes the length of the southern site shoreline 393m. This is multiplied by the full tidal range (i.e. 2.8m) to provide the cross sectional area. For modelling purposes, this is considered to be fixed and reasonable also given the westerly land mass occupied by the navy to the west of the site will represent an effective low flow barrier in this direction. On this basis, flow is assumed to occur in an outward, broadly radial direction from the centre points of BH208 and BH105A, through the shoreline perimeter of each zone and will provide a more conservative assessment.

6.7.3 Flux

Taking the outputs of the flow calculations above for each zone, North and South (Section 6.6.1), and the RTM fate and transport modelling completed for the southern site area, together with a highly conservative estimate of contribution from precipitation and subsequent

infiltration (assumed to be 50% due to run off from concrete and also interception by drainage). It is also considered to be still be relatively high to account for areas which do not have concrete cover, i.e. the South Tip and an area in the north and to also account for the likelihood of a drainage system in disrepair and therefore leaking significantly. The total daily flux for the North Zone was 2,299m^3/day and for the South Zone was 78m^3/day. Full details of the calculation outputs are presented within the flux model in Appendix R. In essence this assumes an instantaneous discharge from the site, and aside from the calculated and averaged hydraulic gradients over low and high tide, does not take into account the twice daily rising tide which retards the flux. It is thus considered suitably conservative.

6.7.4 Flux Model Sensitivity Analysis

Sensitivity analysis on the key parameters is presented in Appendix R and discussed in outline below. The outputs of this exercise have also been used to validate the input parameters selected for the model.

Context

A comparison of estimated tidally driven flow compared to specific yield of the saturated soil mass (i.e. groundwater volume within the made ground and natural) within normal tidal range was undertaken to provide some context to the estimates of flow using Darcy's Law. This assessment provided an upper limit to what could be expected to theoretically drain from the site assuming the maximum hydraulic conductivity (k) and an arbitrary hydraulic gradient. The outputs of this calculation equated to approximately 9% of the total specific yield for the North Zone and 1.8% for the South Zone.

Darcy's Law Calculations

A sensitivity analysis was undertaken on hydraulic gradient (i) in Darcy's Law flow calculations assuming full 2.8m normal tidal range rather than adopted value of 1.1m (equating to an average of high tide and low tide calculated hydraulic gradients). It should be noted that the adopted value is already conservative but the results are presented for transparency. The outputs of this calculation show an increase in the flux from 2299m^3/day to 3249m^3/day (average flow) in the north of the site and an order magnitude increases in the south from 78m^3/day to 887m^3/day.

Sensitivity analysis was also undertaken by varying the value for Hydraulic conductivity (k) in Darcy's Law calculations. The analysis was performed assuming the following values for k in Table 23.

Table 23 – Hydraulic Conductivity Values used in Sensitivity Analysis

	North Zone	South Zone	Unit	
K(0)	1.00E-03	1.00E-03	m/second	Highest
	8.64E+01	8.64E+01	m/day	
K(1)	3.67E-04	5.08E-05	m/second	Adopted
	3.17E+01	4.39E+00	m/day	
K(2)	3.67E-05	5.08E-06	m/second	
	3.17E+00	4.39E-01	m/day	
K(3)	3.67E-06	5.08E-07	m/second	
	3.20E-01	4.39E-02	m/day	
K(4)	3.67E-08	5.08E-07	m/second	
	3.17E-03	4.39E-03	m/day	
K(5)	5.61E-06	5.61E-06	m/second	Lowest site specific measured value
	0.48	0.48	m/day	

*literature value from Fetter (2001) for well sorted gravels.

The outputs of this analysis (Appendix R) suggest that at hydraulic conductivity's below 3.67 E-04m/s (North Zone) and 5.08 E-05m/s (South Zone), the contribution of flux from rainfall becomes significant at almost 100% of total flux in south of site and 30% for north of site. In other words, the movement of water is too slow for any significant flow to occur during low tide.

6.8 Dilution Model

The dilution model describes a process whereby the daily mixing of a given volume of water (defined by the flux model) containing a given concentration of a particular contaminant (based on representative groundwater chemistry results) is diluted by varying volumes of water in the receptor representing increasing distances away from the site within the wider harbour. The model is inherently conservative as it assumes that the water body into which dilution occurs is a static entity, whereas the reality of the situation is that the local system is in a perpetual state of tidally induced flux.

This model is also conservative as it does not allow for a dilution factor which is offered by the land mass to the west and ultimate Cork Harbour Waters to the west. Only dilution to the north and east is allowed for in the North Zone model, and south for the South Zone model is included.

The dilution models are presented in Appendix R together with associated sensitivity analysis on key input parameters. The following sections outline the key component parts of the model.

6.8.1 Groundwater Chemistry (COCs)

Table 24 presents a summary of the key COCs and associated data statistics identified within groundwater within the saturated material.

Table 24 – Contaminants of Concern (COCs)

		North Zone				
Determinant	WQS (µg/l)	Total No. of Samples	Average (µg/l)	Minimum (µg/l)	Maximum (µg/l)	No. samples exceeding WQS
Cadmium	0.2	28	0.05	<0.03	0.11	0
Chromium VI	0.6	28	5.5	<2	8	2
Chromium Total	4.7	28	1.12	<2	8.9	2
Copper	5	28	3.82	<3	13	3
Zinc	40	28	16.1	1.9	123.2	3
Lead	1.3	28	2.26	<0.4	1	14
Manganese	30	28	682	<1.5	1173	19
Anthracene	0.1	28	0.02	<0.01	0.18	2
Benzo(a)pyrene	0.00017	28	0.01	<0.01	0.11	1
Benzo(b)fluoranthene	0.03	28	0.02	<0.01	0.21	1
Benzo(k)fluoranthene	0.03	28	0.01	<0.01	0.08	1
benzo(ghi)perylene	0.002	28	0.01	<0.01	0.05	1
Fluoranthene	0.0063	28	0.03	<0.01	0.4	17
Indeno(123cd)pyrene	0.002	28	0.01	<0.01	0.06	1
Naphthalene	2	28	0.3	<0.01	3.3	2
Total TPH	10	28	187.46	<0.01	5114	1
Aliphatics >C12-C16	10	28	17	<10	190	1
Aliphatics >C16-C21	10	28	24	<10	400	1
Aliphatics >C21-C35	10	28	67	<10	1540	1
Aromatics >EC10-EC12	10	28	5.7	<10	24	1
Aromatics >EC12-EC16	10	28	18	<10	230	1
Aromatics >EC16-EC21	10	28	29	<10	520	1
Aromatics >EC21-EC35	10	28	91	<10	2210	1
		South Zone				
Cadmium	0.2	26	0.36	<0.02	3.73	7
Chromium VI	0.6	26	2.08	<2	4	4
Copper	4.7	26	4.08	<3	19	2
Zinc	5	26	45.24	<1.5	174.9	8
Lead	40	26	3.37	<0.4	27.9	12
Manganese	1.3	26	933	<1.5	6278	17
Mercury	0.07	26	0.21	<0.01	1.31	7

		North Zone				
Determinant	WQS (µg/l)	Total No. of Samples	Average (µg/l)	Minimum (µg/l)	Maximum (µg/l)	No. samples exceeding WQS
Anthracene	0.1	26	3.76	<0.01	46.23	4
Benzo(a)pyrene	0.05	26	7.42	<0.01	92.43	6
Benzo(b)fluoranthene	0.03	26	8.63	<0.01	109.84	7
Benzo(k)fluoranthene	0.03	26	3.46	<0.01	42.72	6
benzo(ghi)perylene	0.02	26	3	<0.01	34.98	6
Fluoranthene	0.1	26	19.48	<0.01	255.52	7
Indeno(123cd)pyrene	0.02	26	3.6	<0.01	40.11	6
Aliphatics >C8-C10	10	26	0.08	<5	64	1
Aliphatics >C10-C12	10	26	0.6	<5	9035	1
Aliphatics >C12-C16	10	26	1.2	<10	34640	4
Aliphatics >C16-C21	10	26	718	<10	47040	4
Aliphatics >C21-C35	10	26	293	<10	17880	2
Aromatics >EC8-EC10	10	26	0.04	<5	10	0
Aromatics >EC10-EC12	10	26	0.1	<5	2135	2
Aromatics >EC12-EC16	10	26	0.7	<10	19450	4
Aromatics >EC16-EC21	10	26	603	<10	39000	4
Aromatics >EC21-EC35	10	26	307	<10	17840	4

Note the LOD values have been used in the calculation of averages where concentrations were measured as less than the LOD.

As can be seen from the above, the groundwater contains various constituents which are marginally and/or locally in excess of the relevant Water Quality Standard. For example, the average concentrations of chromium total in groundwater in the north zone are below the WQS but a small number of samples are only marginally above. For other constituents, including manganese and chromium (VI) the average concentration in groundwater is elevated by comparison to the corresponding WQS. On this basis, the 'average' concentration of these COCs in groundwater has been conservatively assumed to be representative of the whole for modelling purposes.

The 'maximum' values have been included within the above table for completeness and transparency but also for sensitivity analysis purposes.

6.8.2 Modelling of the Receptor

Cork harbour is a very large natural harbour with a correspondingly large coastline and complex tidally influenced flow regime. It is of course impractical and inappropriate to seek to use the entire water volume within Cork Harbour to model the effects of dilution. Consequently, for modelling purposes, a series of arbitrary radial 'zones' have been adopted with increasing distance / radii from the site. These are summarised as follows:

Zone	Distance from Shore	Volume of water for Dilution – North Zone (litres/day)	Volume of water for Dilution – South Zone (litres/day)
Zone 1	0-10m	3.61E+08	9.69E+06
Zone 2	0-20m	3.76E+08	6.09E+07
Zone 3	0-50m	4.29E+08	2.16E+08
Zone 4	0-100m	5.96E+08	4.53E+08
Zone 5	0-150m	8.40E+08	6.34E+08

The site area has been determined for each Zone, North and South as shown in Figure 19. Based on Bathymetry surveys of the near shore waters in the North Zone an average depth water ranges from 6.92m to 8.35m and in the south zone and 1m to 4.07m in the South Zone, has been conservatively assumed between the shoreline perimeter and 150m. On this basis, the volume of water present in each of the zones (1-5) can be calculated, and converted into litres to enable direct comparison with the chemical testing results which are referenced in ug/l.

6.8.3 Dilution Calculations

The estimated daily flux (outputs from the flux model) divided by the total volume in zones 1-5 (doubled to account for two tidal cycles per day) provides a 'dilution factor' which is in-turn applied to the representative concentrations of each of the COCs identified in groundwater beneath the site. Table 25 and Table 26 summarises the outputs for North Zone and South Zone.

Table 25 – Dilution Calculation Outputs – North Zone

	WQS (µg/l)	Predicted Concentrations (µg/l)				
		Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		6.E-03	6.E-03	5.E-03	4.E-03	3.E-03
Cadmium	0.2	0.000	0.000	0.000	0.000	0.000
Chromium VI	0.6	0.035	0.034	0.029	0.021	0.015
Chromium Total	4.7	0.007	0.007	0.006	0.004	0.003
Copper	5	0.024	0.023	0.020	0.015	0.010
Zinc	40	0.103	0.099	0.086	0.062	0.044
Lead	1.3	0.014	0.014	0.012	0.009	0.006
Manganese	30	4.348	4.174	3.656	2.630	1.866
Anthracene	0.1	0.000	0.000	0.000	0.000	0.000
Benzo(a)pyrene	0.0001	0.00006	0.00006	0.00005	0.00004	0.00003
Benzo(b)fluoranthene	0.03	0.00013	0.00012	0.00011	0.00008	0.00005
Benzo(k)fluoranthene	0.03	0.00006	0.00006	0.00005	0.00004	0.00003
benzo(ghi)perylene	0.002	0.00006	0.00006	0.00005	0.00004	0.00003
Fluoranthene	0.0063	0.00019	0.00018	0.00016	0.00012	0.00008
Indeno(123cd)pyrene	0.002	0.00006	0.00006	0.00005	0.00004	0.00003
Total TPH	10	0.002	0.002	0.002	0.001	0.001
Aliphatics >C12-C16	10	1.195	1.147	1.005	0.723	0.513
Aliphatics >C16-C21	10	0.108	0.104	0.091	0.066	0.047
Aliphatics >C21-C35	10	0.153	0.147	0.129	0.093	0.066
Aromatics >EC10-EC12	10	0.427	0.410	0.359	0.258	0.183
Aromatics >EC12-EC16	10	0.036	0.035	0.031	0.022	0.016
Aromatics >EC16-EC21	10	0.115	0.110	0.096	0.069	0.049
Aromatics >EC21-EC35	10	0.185	0.177	0.155	0.112	0.079

* Values highlighted in red show where concentration exceeds WQS

Table 26 – Dilution Calculation Outputs – South Zone

	WQS (µg/l)	Predicted Concentrations (µg/l)				
		Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		8.E-03	1.E-03	4.E-04	2.E-04	1.E-04
Cadmium	0.2	0.00	0.00	0.00	0.00	0.00
Chromium VI	0.6	0.02	0.00	0.00	0.00	0.00
Copper	5	0.03	0.01	0.00	0.00	0.00
Zinc	40	0.36	0.06	0.02	0.01	0.01
Lead	1.3	0.03	0.00	0.00	0.00	0.00
Manganese	30	7.46	1.19	0.33	0.16	0.11
Mercury	0.07	0.00	0.00	0.00	0.00	0.00
Anthracene	0.1	0.00	0.00	0.00	0.00	0.00
Benzo(a)pyrene	0.00017	0.0048	0.0008	0.0002	0.0001	0.0001
Benzo(b)fluoranthene	0.03	0.0160	0.0025	0.0007	0.0003	0.0002
Benzo(k)fluoranthene	0.03	0.0064	0.0010	0.0003	0.0001	0.0001
benzo(ghi)perylene	0.002	0.0040	0.0006	0.0002	0.0001	0.0001
Fluoranthene	0.0063	0.0138	0.0022	0.0006	0.0003	0.0002
Indeno(123cd)pyrene	0.002	0.0040	0.0006	0.0002	0.0001	0.0001
Aliphatics >C8-C10	10	0.00	0.000	0.00	0.00	0.00
Aliphatics >C10-C12	10	0.01	0.002	0.00	0.00	0.00
Aliphatics >C12-C16	10	0.03	0.005	0.00	0.00	0.00
Aliphatics >C16-C21	10	6.00	0.955	0.27	0.13	0.09
Aliphatics >C21-C35	10	2.46	0.391	0.11	0.05	0.04
Aromatics >EC8-EC10	10	0.00	0.000	0.00	0.00	0.00
Aromatics >EC10-EC12	10	0.00	0.001	0.00	0.00	0.00
Aromatics >EC12-EC16	10	0.02	0.003	0.00	0.00	0.00
Aromatics >EC16-EC21	10	5.04	0.802	0.23	0.11	0.08
Aromatics >EC21-EC35	10	2.57	0.409	0.12	0.05	0.04

* Values highlighted in red show where concentration exceeds WQS

6.8.4 Sensitivity Analysis

Sensitivity analysis on the key parameters of the dilution model is presented in Appendix R and discussed in outline below. The outputs of this exercise have also been used to validate the input parameters selected for the model.

North Zone

Sensitivity analysis was undertaken assuming the 'maximum' (rather than average) recorded concentration of COCs in groundwater is distributed equally through entire saturated mass (within normal tidal range). The results of this analysis suggested that the predicted impact of key COCs, notably total benzo(a)pyrene, would be detectable at concentrations above the relevant WQS at greater distances away from the site (i.e. potentially beyond 150m).

Sensitivity analysis was undertaken on the dilution model assuming a 'High Level' flux by increasing the estimate flux by 50% from that adopted in the model. The results indicated that all COCs in groundwater still would not impact on the harbour water and would be theoretically present at concentrations below their respective WQS values.

A number of sensitivity analyses were undertaken assuming variable flux as a result of changes in hydraulic conductivity (K 1-5) within the flow model and show that this parameter (k) has the most significant influence on the outputs of this assessment.

The key output of this sensitivity analysis shows that using the maximum hydraulic conductivity of the tidally saturated material does not result in theoretical concentrations of any COCs being in excess of respective WQSs.

South Zone

Sensitivity analysis was undertaken assuming the 'maximum' (rather than average) recorded concentration of COCs in groundwater is distributed equally through entire saturated mass (within normal tidal range). The results of this analysis suggested that the predicted impact of key COCs, notably total TPHs, PAHs and manganese would be detectable at concentrations above the relevant WQS at greater distances of between 10m and beyond 150m away from the site.

Sensitivity analysis was undertaken on the dilution model assuming a 'High Level' flux by increasing the estimate flux by 50% from that adopted in the model. The results indicated similar impacts to the original models.

A number of sensitivity analyses were undertaken assuming variable flux as a result of changes in hydraulic conductivity (K 1-5) within the flow model and show that this parameter (k) has the most significant influence on the outputs of this assessment.

6.9 Conclusions

The outputs of the Tier 4 flux and dilution modelling process indicate that there are no theoretical impacts to the waters of Cork Harbour from the majority of the constituents of concern identified by previous tiers of assessment.

For the north of the site there are no theoretical impacts to the waters immediately surrounding the shoreline or in the Dock of the site, in that COC predicted concentrations are less than applicable WQS. This is considered to be largely due to the significant depths of waters in the Dock (i.e. approximately 7m).

For the Cork Harbour Waters to the south of the site, theoretical impacts were identified for the dock waters, with predicted total benzo(a)pyrene, benzo(ghj)perylene, fluoranthene and indeno(123cd)oyrene up to 20m from the shoreline and fluoranthene with predicted concentrations up to and beyond 150m. However, it should be noted that the WQSs and the predicted concentrations are too small to be measured by currently accredited laboratory methods. Since the predicted concentrations are less than current laboratory detection limits.

As presented in Section 3.4, actual concentrations of these contaminants have not been measured in excess of applicable WQSs for samples collected from the Cork Harbour waters close to the site (<10m) and therefore actual impacts have not been identified and that the assessment presented is deliberately conservative having utilised a number of conservative inputs including hydraulic conductivity values, hydraulic gradients and use of mean contaminant concentrations used to calculate flux.

7.0 Human Health DQRA

The aim of this human health DQRA is to provide a more site specific assessment of risks to potential future site users on site and off site navy residents. The GQRA was undertaken in consideration of a recreational park end use and commercial end use, as the most applicable end use scenarios in order to provide a worst case assessment of the site and to inform the potential redevelopment proposals, Master Plan.

The risks associated with contamination in made ground and natural soils have been assessed through comparison with generic assessment criteria. They do not consider inhalation risks associated with vapours from volatile contaminants in groundwater. Additionally, this DQRA assessment will consider the inhalation pathway viable for volatile contaminants, to determine whether specific remediation for this pathway is required. Consequently, the DQRA outlined in this section aims to assess these potential risks.

The pollutant linkages identified as requiring further detailed assessment in relation to human health are summarised in Table 27.

It should also be noted that the presence of free phase hydrocarbon product (LNAPL) on groundwater will not be specifically considered as part of this DQRA. It is assumed to have the potential to cause risks to the health of the end site users and Cork Harbour Waters and so will be remediated as outlined in Section 8.

Table 27 – Summary of Potential Risk to Human Health

Hazard/Pollutant	Pathway	Receptor
Volatile TPHs (<C12 fraction) and PAHs in shallow groundwater BH218 and BH216	Inhalation of vapours	Future site users, off site third party human health receptors
VOCs in groundwater namely trichloroethylene in BH216	Inhalation of vapours	Future site users, off site third party human health receptors

7.1 Methodology DQRA Modelling

Volatile impacts in soils and groundwater have been identified as requiring DQRA modelling to assess potential risks to predominantly residential future site users.

To assess risk via the vapour inhalation pathway from dissolved phase contaminants in groundwater, the RBCA (Risk Based Corrective Action) Model v2.6 was used. Where applicable, the model has been made compliant with the updated CLEA Model and in the absence of site specific input parameters, CLEA default values have been used to define the critical receptors, land use, and where applicable building type etc.

Default contaminant properties within the RBCA v2.6 have been modified in accordance with the new CLEA model and where applicable, contaminant data provided in "The LQM/CIEH S4ULs for Human Health Risk Assessment" (LQM, 2015).

A number of contaminant specific and site-specific input parameters are required to define the environmental conditions at the site, and thus quantify the site conceptual model. These are discussed in the sections below. The model input sheets are presented in Appendix T.

7.2 Source Characteristics

The source impacts considered further are:

- Dissolved hydrocarbons in groundwater, particularly at BH216 and BH218 and specifically, TPH C5- C12 fractions and speciated PAHs.
- VOC, trichloroethylene in groundwater at BH216 only.

7.3 Pathway Characteristics

Parameters defining the pathway for volatile contaminants to migrate through the unsaturated zone have to be specified in order to estimate the concentration of the constituents to which a receptor may be exposed at the surface.

Exposure can occur from indoor and outdoor vapour, however, considerable experience of such assessments has indicated that risks associated with indoor air exposure are typically orders of magnitude greater than the outdoor exposure risks, thus only indoor air exposure has been considered.

Two specific end uses are being considered a recreational end use and a commercial end use. Whilst the recreational or park end use would normally only include outdoor inhalation

exposure pathways, however to allow for visitor centres and educational end use where potentially a recreational user (park end user) could be indoors for the entirety of their visit, only the indoor inhalation pathway has been conservatively modelled.

For the indoor exposure pathway, building parameters must be defined to estimate build up of vapours within the structure and thus a concentration within the building to which the receptor may be exposed.

Unsaturated Zone Physical Properties

A fate and transport model is required to assess volatilisation and vapour migration to the indoor air spaces. The model chosen is the Johnson-Ettinger model which has been adopted in the UK as the vapour model for CLEA.

The unsaturated (vadose) zone has been identified primarily as comprising of Made Ground. The composition of Made Ground varies across the site however in the unsaturated zone in the area of the hydrocarbon impacts it appears to be a mainly sandy gravelly clay, with construction/demolition type material with inclusions of quarry fill (aggregate fill). Consequently, the purposes of this assessment, the vadose zone has been classified as a typical sandy loam soil. Parameters, for which no site specific data is available, are defined using appropriate literature sources.

Table 28 details the unsaturated zone input parameters used and justification for each.

Table 28 – Unsaturated Zone Input Parameters Groundwater

Parameter	Value used in Model	Units	Reference
Depth to groundwater source – Made ground/top of glacial till	1.0	m	Water table variable. 1m selected as reasonable conservative estimate. Minimum water level measured was 1.2m bgl. Also limitations of modelling software require minimum of 1m between source and receptor.
Total porosity	0.53	-	CLEA default for sandy loam soil (EA,2009)
Water Content	0.33	-	CLEA default for sandy loam soil (EA,2009)
Fraction organic carbon	0.005	-	Average value site data for made ground (0.8%
Soil Bulk Density	1.21	g/cm3	CLEA default for sandy loam soil (EA,2009)
Vapour permeability of vadose zone	3.05 x 10-8	cm2	CLEA default for sandy loam soil (EA,2009)

7.4 Building Parameters

For both the recreational and commercial end use proposed, building parameters are required to assess potential vapour intrusion and accumulation within structures. These have been defined in line with 'typical' commercial standards as defined in the CLEA guidance (EA,2009) which reflects an office type building considered to be the most conservative commercial building type. Table 24 details the input parameters used and justification for each.

Table 29 – Building Parameters

Parameter	Units	Values Used in Model	Reference
Cross sectional area of basement	m2	424	CLEA Science Report: SC050021/SR3
Building Volume/area ratio	m	9.6	CLEA Science Report: SC050021/SR3
No. of air exchanges per day	1/day	24	CLEA Science Report: SC050021/SR3
Thickness of basement or foundation walls	m	0.15	CLEA Science Report: SC050021/SR3 (EA,2009)
Fraction of the foundation that are cracks	-	0.002	CLEA Science Report: SC050021/SR3 (EA,2009)
Porosity in the foundation cracks	-	0.25	RISC default value
Water content in the foundation			
Length of foundation perimeter	m	82.4	CLEA Science Report: SC050021/SR3
Foundation depth below ground			CLEA Science Report: SC050021/SR3
Pressure difference	Pa	4.4	CLEA Science Report: SC050021/SR3

7.5 Receptor Exposure Factors – Recreational and Commercial End Uses

The recreational end use assumes that the critical receptor will be young children visiting the site. In this instance, the critical receptor is assumed to be a young female child (aged zero to six years old) with an exposure duration of six years.

Critical receptor exposure characteristics are presented in Table 30, with justification for each. These parameters are set as default within the CLEA v1.06.

Table 30 – Exposure Factors – Child Critical Receptor – Recreational End Use

Parameter	Units	Values Used in Model	Reference
Body weight	Kg	13.3	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure frequency	Events /yr	365	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure duration	Years	6	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure frequency for indoor air	events/yr	365	CLEA Science Report SC050021/SR3 (EA,2009)
Lung retention factor	-	1	CLEA Science Report SC050021/SR3 (EA,2009)

The commercial end use assumes that a working adult aged 16 to 65 is the critical receptor. Adult critical receptor exposure characteristics are presented in Table 31, with justification for each. These parameters are set as default within the CLEA v1.06. Table 32 considers the potential for a commercial end use by the Navy and in particular a residential end use. This is considered to be protective of an offsite navy resident receptor to the west of this site.

Table 31 – Exposure Factors – Adult Critical Receptor – Commercial End Use

Parameter	Units	Values Used in Model	Reference
Body weight	Kg	70.0	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure frequency	Events /yr	230	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure duration	Years	49	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure frequency for indoor air	events/yr	230	CLEA Science Report SC050021/SR3 (EA,2009)
Inhalation rate indoors	m3/day	15.7	CLEA Science Report SC050021/SR3 (EA,2009)

Table 32 – Exposure Factors – Adult Critical Receptor – Commercial End Use – Navy Residents

Parameter	Units	Values Used in Model	Reference
Body weight	Kg	70	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure frequency	Events /yr	365	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure duration	Years	49	CLEA Science Report SC050021/SR3 (EA,2009)
Exposure frequency for indoor air	events/yr	365	CLEA Science Report SC050021/SR3 (EA,2009)
Inhalation rate indoors	m3/hr	15.7	CLEA Science Report SC050021/SR3 (EA,2009)

7.6 Estimation of Potential Risks and Derivation of Site Specific Target Levels (SSTLs) for Groundwater – Indoor Inhalation Pathway

As there are no commercially available Generic Assessment Criteria (GACs) available to assess human health risks from volatile impacts in groundwater via the vapour inhalation pathway, modelling is required to calculate SSTLs (Site Specific Target Levels) or clean-up standards that are considered to be protective of human health.

Risk to human health is quantified in terms of a Hazard Quotient for each contaminant via each pathway. The Hazard Quotient for each specific pathway is defined as the ratio between the modelled chronic daily intake (in units of mg/kg bw/day) of a contaminant (via that pathway) and the toxicological benchmark for that contaminant (via that pathway).

HQ = Calculated Daily Intake / Toxicological Benchmark

If the calculated intake is less than the toxicological benchmark (i.e. a HQ of <1), then no adverse health effects are expected as a result of exposure. If the calculated intake is greater than the toxicological benchmark (i.e. HQ>1), then adverse health effects are considered possible.

In this instance the RBCA software has be run to calculate Site Specific Threshold Levels (SSTLs) or clean–up levels. Essentially it calculates that contaminant concentration when the hazard quotient equals 1 (HQ=1). Both models were run to calculate SSTLs for the site (hazard quotient equals 1), which are contaminant concentrations that are considered to be protective of human health.

The model output detailing the SSTLs for soils to be protective of human health are provided in Appendix U and are summarised in Tables 33, 34 and 35. Full results of the RBCA modelling (inputs and outputs sheets) are presented in Appendix T and U respectively.

Table 33 – SSTLs for Volatile Contaminants in Groundwater – Indoor Air Volatilisation – Recreational

Determinant	SSTL (µg/l)	Max Groundwater concentration (µg/l)	Assessment
Trichloroethylene	8.8E-1	1.2E-1	No impact
TPH Aliphatic C5-6	>3.6E+1	0.0E+0	No impact
TPH Aliphatic C6-8	>5.4E+0	1.0E-2	No impact
TPH Aliphatic C8-10	>4.3E-1	6.4E-1	No impact
TPH Aliphatic C10-12	>3.4E-2	9.0E+0	No impact
TPH Aliphatic C12-16	>7.6E-4	3.7E+1	No impact

Determinant	SSTL (µg/l)	Max Groundwater concentration (µg/l)	Assessment
TPH Aromatic C5-7	>1.8E+3	0.0E+0	No impact
TPH Aromatic C7-8	>5.9E+2	0.0E+0	No impact
TPH Aromatic C8-10	5.9E+1	3.2E-2	No impact
TPH Aromatic C10-12	>2.5E+1	2.1E+0	No impact
TPH Aromatic C12-16	>5.8E+0	1.9E+1	No impact
o xylene	>1.7E+2	9.7E-4	No impact
m/p xylene	1.7E+2	4.6E-3	No impact
Acenaphthene	>4.1E+0	6.0E-2	No impact
Acenaphthylene	>7.9E+0	6.4E-2	No impact
Anthracene	>5.6E-2	4.6E-2	No impact
Benz(a)anthracene	>3.8E-3	1.2E-1	No impact
Benzo(a)pyrene	>3.8E-3	9.2E-2	No impact
Benzo(b)fluoranthene	>2.0E-3	1.1E-1	No impact
Benzo(ghi)perylene	>2.6E-4	3.5E-2	No impact
Benzo(k)fluoranthene	>8.0E-4	4.3E-2	No impact
Chrysene	>2.0E-3	1.0E-1	No impact
Dibenz(ah)anthracene (S4UL) *	>6.0E-4	4.4E-3	No impact
Fluoranthene	>2.3E-1	2.6E-1	No impact
Fluorene	>1.9E+0	2.0E-1	No impact
Indeno(123-cd)pyrene	>2.0E-4	4.0E-2	No impact
Naphthalene	>1.9E+1	3.3E-3	No impact
Phenanthracene	>1.1E+0	4.5E-1	No impact

>= SSTL exceeds solubility limits, therefore contaminant unlikely to present a risk unless free product is present.

Table 34 – SSTLs for Volatile Contaminants in Ground Water – Inoor Air Volatilisation – Commercial End Use

Determinant	SSTL (µg/l)	Max Groundwater concentration (µg/l)	Assessment
Trichloroethylene	6.5E-1	1.2E-1	No impact
TPH Aliphatic C5-6	>3.6E+1	0.0E+0	No impact
TPH Aliphatic C6-8	>5.4E+0	1.0E-2	No impact
TPH Aliphatic C8-10	>4.3E-1	6.4E-1	No impact
TPH Aliphatic C10-12	>3.4E-2	9.0E+0	No impact
TPH Aliphatic C12-16	>7.6E-4	3.7E+1	No impact
TPH Aromatic C5-7	>1.8E+3	0.0E+0	No impact
TPH Aromatic C7-8	>5.9E+2	0.0E+0	No impact

Determinant	SSTL (µg/l)	Max Groundwater concentration (µg/l)	Assessment
TPH Aromatic C8-10	4.4E+1	3.2E-2	No impact
TPH Aromatic C10-12	>2.5E+1	2.1E+0	No impact
TPH Aromatic C12-16	>5.8E+0	1.9E+1	No impact
o xylene	1.5E+2	9.7E-4	No impact
m/p xylene	1.2E+2	4.6E-3	No impact
Acenaphthene	>4.1E+0	6.0E-2	No impact
Acenaphthylene	>7.9E+0	6.4E-2	No impact
Anthracene	>5.6E-2	4.6E-2	No impact
Benz(a)anthracene	>3.8E-3	1.2E-1	No impact
Benzo(a)pyrene	>3.8E-3	9.2E-2	No impact
Benzo(b)fluoranthene	>2.0E-3	1.1E-1	No impact
Benzo(ghi)perylene	>2.6E-4	3.5E-2	No impact
Benzo(k)fluoranthene	>8.0E-4	4.3E-2	No impact
Chrysene	>2.0E-3	1.0E-1	No impact
Dibenz(ah)anthracene	>6.0E-4	4.4E-3	No impact
Fluoranthene	>2.3E-1	2.6E-1	No impact
Fluorene	>1.9E+0	2.0E-1	No impact
Indeno(123-cd)pyrene	>2.0E-4	4.0E-2	No impact
Naphthalene	>1.9E+1	3.3E-3	No impact
Phenanthracene	>1.1E+0	4.5E-1	No impact

>= SSTL exceeds solubility limits, therefore contaminant unlikely to present a risk unless free product is present.

Table 35 – SSTLs for Volatile Contaminants in Groundwater – Commercial – Navy Residential End Use

Determinant	SSTL (µg/l)	Max Groundwater concentration (µg/l)	Assessment
Trichloroethylene	4.1E-1	1.2E-1	No impact
TPH Aliphatic C5-6	2.7E+1	0.0E+0	No impact
TPH Aliphatic C6-8	>5.4E+0	1.0E-2	No impact
TPH Aliphatic C8-10	>4.3E-1	6.4E-1	No impact
TPH Aliphatic C10-12	>3.4E-2	9.0E+0	No impact
TPH Aliphatic C12-16	>7.6E-4	3.7E+1	No impact
TPH Aromatic C5-7	1.3E+3	0.0E+0	No impact
TPH Aromatic C7-8	>5.9E+2	0.0E+0	No impact
TPH Aromatic C8-10	2.8E+1	3.2E-2	No impact
TPH Aromatic C10-12	>2.5E+1	2.1E+0	No impact
TPH Aromatic C12-16	>5.8E+0	1.9E+1	No impact

Determinant	SSTL (µg/l)	Max Groundwater concentration (µg/l)	Assessment
o xylene	9.6E+1	9.7E-4	No impact
m/p xylene	7.8E+1	4.6E-3	No impact
Acenaphthene	>4.1E+0	6.0E-2	No impact
Acenaphthylene	>7.9E+0	6.4E-2	No impact
Anthracene	>5.6E-2	4.6E-2	No impact
Benz(a)anthracene	>3.8E-3	1.2E-1	No impact
Benzo(a)pyrene	>3.8E-3	9.2E-2	No impact
Benzo(b)fluoranthene	>2.0E-3	1.1E-1	No impact
Benzo(ghi)perylene	>2.6E-4	3.5E-2	No impact
Benzo(k)fluoranthene	>8.0E-4	4.3E-2	No impact
Chrysene	>2.0E-3	1.0E-1	No impact
Dibenz(ah)anthracene	>6.0E-4	4.4E-3	No impact
Fluoranthene	>2.3E-1	2.6E-1	No impact
Fluorene	>1.9E+0	2.0E-1	No impact
Indeno(123-cd)pyrene	>2.0E-4	4.0E-2	No impact
Naphthalene	1.9E+1	3.3E-3	No impact
Phenanthracene	>1.1E+0	4.5E-1	No impact

>= SSTL exceeds solubility limits, therefore contaminant unlikely to present a risk unless free product is present.

Maximum measured concentrations of trichloroethene, speciated TPHs and speciated PAHs do not exceed the derived SSTLs for groundwater sampled from the made ground and natural soils.

As a result potential significant risks to the end commercial and recreational site uses are not present due to the potential for inhalation of vapours of trichloroethene, TPHs and PAHs from groundwater.

SSTLs derived as 'residual' for risks from groundwater normally arise when the concentration at which a contaminant would have to exist in dissolved phase in groundwater to cause an inhalation risk exceeds the solubility limit of that contaminant. In other words, the contaminant cannot dissolve in groundwater in large enough quantities to then volatilize in sufficient quantities that would pose a significant risk. Consequently, potential significant risks to the end site users have not been identified as maximum measured concentrations do not exceed the calculated SSTLs.

8.0 Conclusions

The following conclusions have been determined from the preceding sections:

- Results of investigations, monitoring and sampling, deemed to be appropriate for a site of this nature, have been presented for the Haulbowline Factory Site. This included sampling and analysis of the made ground material and underlying natural sediments, including solid and leachability analysis results for a large suite of COCs. Sampling and analysis of groundwater from made ground, underlying natural alluvium and limestone at depth and sampling of adjacent Cork Harbour surface waters has also been undertaken.
- Extensive hydrogeological monitoring was completed to further understand the hydrogeological regime at the Factory Site including providing further information on the connectivity's between groundwater in underlying strata, made ground, alluvium and limestone and also with the Cork Harbour waters. This was completed by deploying data level loggers into boreholes to monitor groundwater levels over time. The data indicated that that the majority of monitored locations are hydraulically connected with the surrounding waters of the Cork Harbour. It is worth noting that the limestone bedrock is largely not impacted, with contaminant concentrations typically measured at less that applicable WQSs.
- The solid sample analytical results were compared to relevant GACs to consider risks to human health and identified elevated concentrations of arsenic, lead and PCBs in shallow soils with the potential to cause risks to any users of a potential future park and also commercial site users. There is also considered to be a potential for asbestos fibres to be present to cause risks to future end users and construction workers.
- Analysis results of water samples collected from on site boreholes were compared to relevant WQSs to consider risks to the Cork Harbour including ecology and have identified elevated heavy metals and hydrocarbons. During the generic assessment, groundwater contaminant concentrations associated with the made ground material and natural soils including cadmium, chromium, chromium VI, copper, zinc, lead, manganese, TPH and PAHs were found to be present at levels greater than respective conservative screening levels and as a result were further assessed through completion of a bespoke DQRA to evaluate the potential impact upon Cork Harbour waters.

- Monitoring of groundwater has identified significant depths of LNAPL hydrocarbons on groundwater at BH218 and lower LNAPL amounts, 0.02m at BH216. A drainage survey completed at the site has identified evidence of the hydrocarbon contamination in the drains running to the south between these two location. Consequently, drains on the Former Factory site are potentially acting as preferential contamination migration pathways and should be appropriately decommissioned.
- However, it should be noted that with the exception of lead, sampling and analysis the Cork Harbour waters during high and low tides have typically not identified contaminant concentrations in excess of relevant WQSs. Dissolved lead in groundwater has been identified in two drainage outlets which discharge into the Cork Harbour waters. An adjacent groundwater sampling location when samples and analysed also measured elevated lead concentrations and consequently there is the potential for drainage to be contributing to elevated lead concentrations in the Cork Harbour water. Aside from lead there is no evidence to suggest that contaminants on the Haulbowline Factory Site are causing actual pollution of Cork Harbour waters and WQSs are being exceeded.
- A bespoke and conservative DQRA flux and dilution modelling process has been completed for contaminants that exceeded WQSs during the GQRA assessment and identified that there are no theoretical impacts to the waters of Cork Harbour from the majority of the constituents of concern identified. However, a theoretical impact to the waters immediately surrounding the southern shoreline of the site (i.e. within 20m) were identified for PAHs (to 10m) but these impacts are not considered to be significant as they are less than those that can be accurately measured by accredited laboratory detection methods. It should also be noted that remediation will include treatment and removal of an LNAPL hydrocarbon source. This will also result in the lowering of dissolved hydrocarbon concentrations in groundwater.

In order to address potential risks to human health and water receptors, Section 9, provides recommendations for remediation including the use of a capping system, provision of buildings and hardstanding capping, treatment of hydrocarbons (LNAPL treatment) and provision of gas protection measures. The capping system will break the pathway associated with risks to human health by preventing direct contact with the identified lead, arsenic, asbestos and PCBs for future site users, and secondly it will also reduce infiltration of rainwater and therefore contaminant leaching to groundwater and migration to the Cork Harbour.

9.0 Recommendations for Remediation Arising from Risk Assessment

Haulbowline Island has been determined to have the following Contaminants of Concern for which remediation may be necessary:

- Human Health Receptors: Arsenic, Lead, PCBs and Asbestos through direct contact, ingestion and dust inhalation pathways and ground gas through ingress into buildings and inhalation;
- Water Resources Receptor: hydrocarbons in groundwater discharging to Cork Harbour.

The primary aim of any remediation will be to mitigate risks to human health and reduce the contaminant flux to the Cork Harbour water.

Human Health Remediation – Recreational and Commercial Site Users: Arsenic, Lead, PCBs and Potentially Asbestos Contamination in Shallow Soils – Capping Layer

A site-wide impact from soils containing lead and PCBs, a lead hotspot, arsenic hotspot and potentially asbestos was identified. It is recommended that remedial works are undertaken to eliminate this identified risk. It is considered that the emplacement of a clean cover system in proposed soft amenity areas for the end commercial and recreational site uses will remove the risks. Where hardstanding and buildings are proposed or constructed these will also effectively provide a capping layer, preventing exposure to end users through direct contact pathways.

The aim of the cover system is to create an engineered horizontal layer of "uncontaminated" material on site to sever the source-pathway pollutant linkage and thus prevent direct contact between human (health) receptors, and the contaminated soil. It is considered sufficient to provide a minimum of 800mm of clean material, comprising of capillary break layer and overlain by 'clean' topsoil and subsoil.

All material imported onto the site will require validation testing to determine its suitability and acceptability for use in the agreed cover system.

In regard to asbestos, further investigations, risk assessments and as appropriate mitigation measures may be necessary to ensure any risks to construction workers redeveloping the site, and any risks from inhalation of asbestos fibres are adequately mitigated.

Human Health Remediation – Recreational and Commercial Site Users – Elevated Ground Gas and Ground Gas Protection Measures

The human health GQRA has identified that potential risks are present associated with ground gases and the end commercial and recreational site users. A number of monitored locations have been classified as characteristic situation 2 (CIRIA, 2007) which required gas protection measures to be installed into any buildings on site to prevent any potential upward migration of ground gases, breaking the pollutant linkage.

The recommended gas protection measures should be designed in accordance with CIRIA guidance and should include:

- A reinforced gas proprietary membrane installed, validated and certified;
- All sub-surface service entrance points, joints and penetrations should be adequately sealed;
- A ventilated sub-floor void should be provided with a height minimum of 150 mm and a proven capability of providing a complete volume change every 24 hours.

One location, BH218 has also been classified as Characteristic Situation 3 in accordance with CIRIA guidance. However, it is considered that this is due to free product hydrocarbons (LNAPL) being present on groundwater at this location. Free product is proposed for remediation as outlined below and consequently, following remediation, validation gas monitoring should be undertaken and the ground gas risk assessment updated to confirm requirements for ground gas protection measures in this area.

Additionally, a validation protocol should be implemented to confirm that the gas protection measures have been installed in accordance with the above proposals. This will be achieved by means of a detailed site inspection carried out during installation of the gas protection measures, to ensure an auditable checklist of the critical features is covered. Photographs of the protection measures' installation should be taken throughout any installation works and should be included in a validation report as appropriate.

Risk to Cork Harbour Remediation and Human Health Remediation – Free Product Remediation

Objective - To address risks posed to future site users and controlled water receptors from any free phase contamination in groundwater located at BH218, BH216 and BH208.

It is proposed that a NAPL recovery system, involving skimmers and recovery, followed by monitored natural attenuation (MNA) is designed and implemented in order to effectively treat the free phase hydrocarbon product source noted at BH218 and BH216 as LNAPL on groundwater. Recent monitoring (November 2015) has identified a LNAPL thickness of approximately 2.6m on groundwater at BH218 and 0.02m at BH216. Recent gas monitoring at BH208 has also suggested that NAPL might be present at this location. It is expected that treatment of NAPL, will also treat dissolved TPH concentrations in groundwater in made ground and alluvium located in this area. Following NAPL recovery, a strategy of MNA should be implemented. The remedial objective and remedial criteria for MNA, will be to demonstrate that contaminants of concern will naturally degrade such that the relevant WQSs can be achieved in the Cork Harbour waters within a 30 year timeframe.

It is recommended that a specialist contractor with proven experience of NAPL recovery and treatment of hydrocarbon contaminated groundwater is engaged for this purpose. This would include designing and installing a skimming and NAPL recovery system, with drilling and installation of extraction wells from which NAPL will be recovered.

It is also recommended that the specialist remedial contractor be required to complete intrusive investigations, through drilling and installation of additional monitoring wells to more accurately delineate and characterise the extent of NAPL and allow for a more effective remediation design.

It is likely that the optimum remedial design undertaken by a remediation contractor will be a central area of where recovery is completed i.e. where maximum LNAPL depths were measured, and then potentially subsequent treatment or insitu treatment through injection of compounds to break down residual hydrocarbons, for example in the groundwater smearing zone. Specific contaminant remedial criteria or targets should be agreed with relevant regulators prior to commencement.

Risk to Cork Harbour – Lead.

With the exception of lead, significant impacts to the Cork Harbour waters from metals have not been identified. None the less, the future redevelopment of the site as shown on a current master plan will include large areas of hardstanding and buildings. Where present these will effectively prevent rainwater infiltration, contaminant leaching and therefore reduce contaminant flux into the Cork Harbour waters.

The drainage and former steelworks process drainage network, considered to be still present on the site, although in a state of disrepair, should also be appropriately decommissioned to

prevent it acting as a preferential pathway to contaminant flux, particularly in respect of lead which has been shown to be elevated in water sampled from two drainage outlets OT07 and OT08.

Abbreviations

BH	Borehole
BS	British Standard
CCC.	Cork County Council
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research and Information Association
CLEA	Contaminated Land Exposure Assessment
COC	Contaminants of Concern
Conc.	Concentration
CV-AF	Cold Vapour Atomic Fluorescence
DoEHLG	Department of the Environment, Heritage and Local Government
DQRA	Detailed Quantitative Risk Assessment
EA	Environment Agency
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
FOC	Fractional Organic Content
GAC	Generic Assessment Criteria
GSV	Gas Screening Value
HQ	Hazard Quotient
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ICP-OES	Inductively Coupled Plasma Optical Emission Spectrometry
IGVs	Interim Guideline Values
Kd	Partician Co-efficent
LOD	Laboratory Detection Limit
LNAPL	Light Non-Aqueous Phase Liquid

mAOD	Metres Above Ordnance Datum
mbgl	Metres Below Ground Level
NRA	National Rivers Authority
OD	Ordnance Datum
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PCOC	Preliminary Contaminants of Concern
ppm	Parts per Million
PSD	Particle size distribution
QRA	Quantitative Risk Assessment
RBCA	Risk Based Cleanup Assessment
RTM	Remedial Targets Methodology (developed by the UK's Environment Agency)
SGV	Soil Guideline Values
SI	Site Investigation
SSTL	Site Specific Target Level
SVOC	Semi-Volatile Organic Compounds
TOC	Total Organic Carbon
TP	Trial Pit
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
UK	United Kingdom
UK EA EQS	United Kingdom (UK) Environment Agency (EA) Environmental Quality Standard (EQS).
US EPA	United States Environmental Protection Agency
VOCs	Volatile organic compounds
WQS	Water Quality Standard
WFD	Waste Framework Directive

GLOSSARY

Aquifer A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water.

Carboniferous The Carboniferous is a geologic period and system that extends from the end of the Devonian period, about 359.2 ± 2.5 Ma (million years ago), to the beginning of the Permian period, about 299.0 ± 0.8 Ma.

Conceptual Site Model A conceptual model represents the characteristics of a site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

Contaminant a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of the surrounding environment.

Contaminants of concern refer to contaminants which should be considered within future investigations and risk assessments due to the expectation that they are likely to be present in elevated concentrations. and therefore this determination indicates that further consideration should be given with respect to future investigations and risk assessments. It has not yet been determined that they are capable of causing risks to receptors that would require remedial action.

Cyanide Cyanide is any chemical compound that contains the cyano group (C≡N), which consists of a carbon atom triple-bonded to a nitrogen atom.

Dataloggers Instruments placed in boreholes that can record frequent measurements of water levels/

Dioxins and Furans 'Dioxins' is a collective term for the category of 75 polychlorinated dibenzo-para-dioxin compounds (PCDDs) and 135 polychlorinated dibenzofuran compounds (PCDFs). Seventeen PCDD and PCDF compounds are likely to be of toxicological significance. The most toxic of these is 2,3,7,8-tetrachlorodibenzo- pdioxin (2,3,7,8-TCDD). The toxicity of each compound depends on the number and position of the chlorine atoms within the molecules.

EPA Environmental Protection Agency. The agency protects the environment through its licensing, enforcement and monitoring activities in Ireland.

EPA EQS AA Environmental Protection Agency Environmental Quality Standard Annual Average. This means that for each representative monitoring point within the water body, the arithmetic mean of the concentrations measured over a 12 month monitoring period does not exceed the standard.

EPA EQS MAC Environmental Protection Agency Environmental Quality Standard Maximum Allowable Concentration. This means for each representative monitoring point within the water body no measured concentration exceeds the standard.

Foreshore Also known as the intertidal zone, the foreshore is the area that is exposed to the air at low tide and submerged at high tide.

Generic Assessment Criteria (GACs) Contaminant concentrations values used for comparison purposes to assess risk associated with contaminant concentrations found on site and are derived using non-site-specific information.

Groundwater Groundwater is water located beneath the ground surface in soil pore spaces and in the fractures of lithologic formations.

Groundwater abstraction is the process of taking water from a ground source, either temporarily or permanently.

Hazard Quotient The Hazard Quotient for each specific pathway is defined as the ratio between the modelled chronic daily intake (in units of mg/kg bw/day) of a contaminant (via that pathway) and the toxicological benchmark for that contaminant (via that pathway).

HQ = Calculated Daily Intake / Toxicological Benchmark

Hexavalent Chromium Chromium a transition metal exists in the environment in a number of oxidation states ranging from -2 to +6. The Cr (III) or trivalent state is the most stable form. Cr(VI) hexavalent chromium is the form primarily used in the manufacture of steel. Both forms are present as cations in solution as well as forming several different oxyanions and oxide or hydroxyl compounds. In natural groundwaters, trivalent Cr is the prevalent form as hexavalent Cr is readily reduced to the trivalent form. Hexavalent chromium is considered toxic to human health through the inhalation pathway.

ICP Inductively Coupled Plasma spectrometry is a technique for elemental analysis which is applicable to most elements over a wide range of concentrations.

Leachate A solution resulting from leaching, as of soluble constituents from soil, landfill, etc., by downward percolating ground water.

Millscale Mill scale is a milling waste generated while rolling the metal in metal extrusion industries.

NRA Leachability Tests A laboratory test derived from the UK's Environment Agency Recommended Test (R&D note 301). The leaching fluid used in this method is intended to represent materials coming into contact with acid rain. Leaching is carried out by adding to the required sample weight, a volume of water left overnight to attain carbonate equilibrium (pH ~ 5.6) to give a 10:1 ratio of water to soil. The bottle is tumbled at a rate of ~0.5 revolutions per minute at room temperature for 24 hours. The resultant leachant can then be analysed for any parameters desired.

PAHs Polycyclic aromatic hydrocarbons are chemical compounds that consist of fused aromatic rings and do not contain heteroatoms or carry substituents. They are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco

Partician Coefficent (Kd) The Kd parameter is a factor related to the partitioning of a contaminant between the solid and aqueous phases.

Pathway a route or means by which a receptor can be exposed to, or affected by, a contaminant.

PCBs Polychlorinated Biphenyls are a class of organic compounds with 1 to 10 chlorine atoms attached to biphenyl which is a molecule composed of two benzene rings each containing six carbon atoms. The chemical formula for all PCBs is $C_{12}H_{10-x}Cl_x$.

Phenol Phenol is both a manufactured chemical and a natural substance. It is a toxic, colourless crystalline solid with a sweet tarry odour.

Pollutant linkage The relationship between a contaminant, pathway and receptor.

Receptor is something that could be adversely affected by a contaminant, such as people, an ecological system, property or a water body.

Refractory A refractory is a material that retains its strength at high temperatures.

Seepages where groundwater exits the waste during low tide onto the foreshore.

SGV Soil Guideline Values are a series of measurements and values used by the United Kingdom's Department for Environment, Food and Rural Affairs (DEFRA) to measure contamination of the soil.

Slag Slag is the by-product of smelting ore to purify metals.

Source A substance that is capable of causing harm

TPH Total Petroleum Hydrocarbons is a term used to describe a large family of several hundred chemical compounds that originally come from crude oil.

VOCs Volatile Organic Compound(s) are organic chemical compounds that have high enough vapour pressures under normal conditions to significantly vaporize and enter the atmosphere.

Waulsortian Limestone Formation Waulsortian Limestone consists of poorly bedded, dense, pale grey mudstone-wackestone and fine-grained packstonegrainstone.

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FIGURES

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

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CORK COUNTY COUNCIL

Project: HAULBOWLINE FACTORY SITE

Drawing Title: SITE LOCATION PLAN

REV	DESCRIPTION	BY	CHK	APP	DATE

Scale @	Drawn	Date	Checked	Date	Approved	Date
NTS	RJ	JAN 16	YB	JAN 16	YB	JAN 16

Project No.	Office	Type	Drawing No.	Revision
A092989	1504	E	FIGURE 1	A

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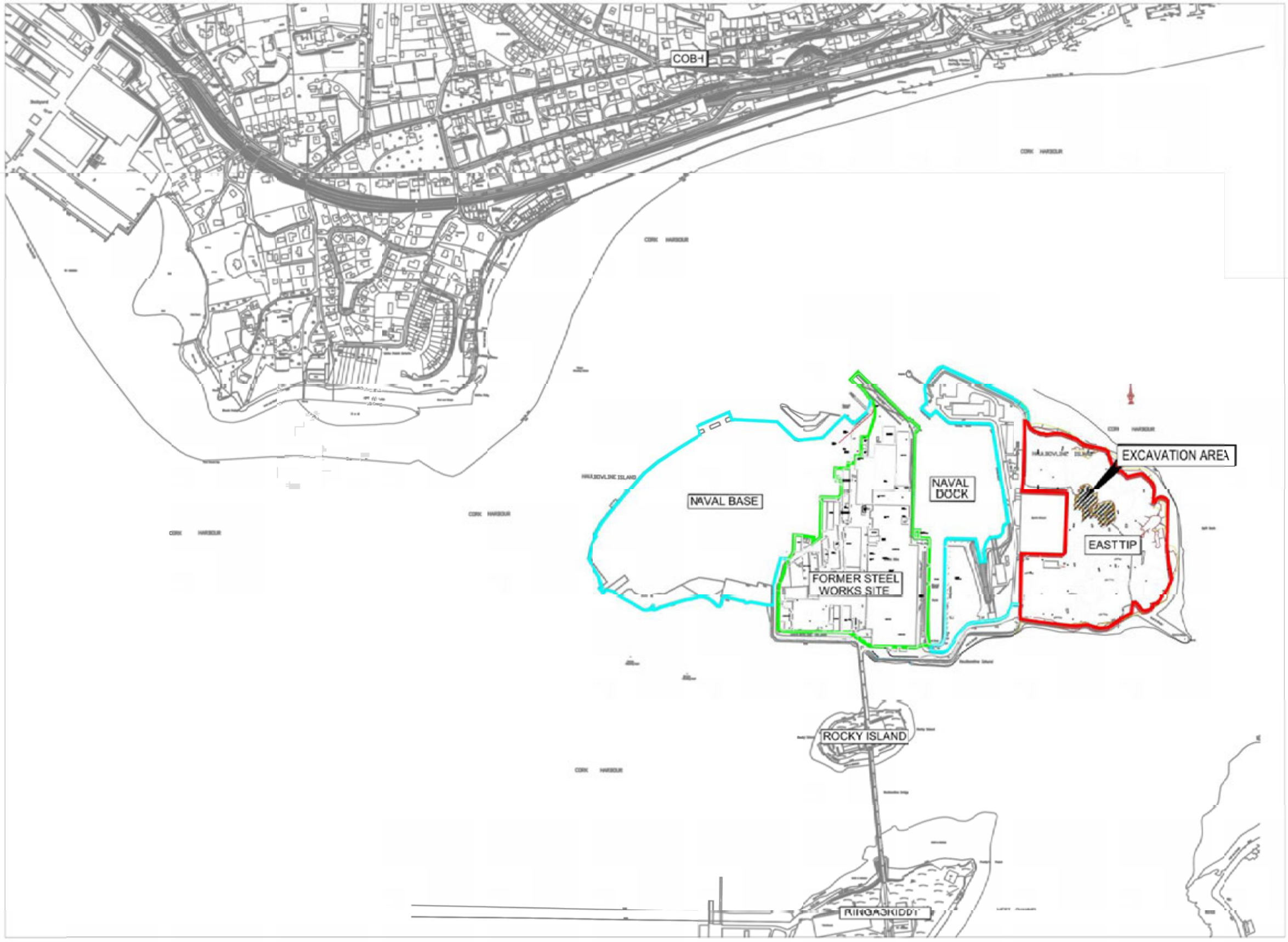
Figure 2 Site Layout Plan

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS



N

LEGEND:

- EAST TIP SITE BOUNDARY
- NAVAL BASE SITE BOUNDARY
- FORMER STEEL WORKS SITE

FILENAME : C:\USERS\DANIEL.SWIFT\DESKTOP\A092989-FIGURE2 (1).DWG | PLOTTED BY : DANIEL.SWIFT | PLOTTED DATE : 06 January 2016 16:35:52

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CORK COUNTY COUNCIL

Project:
HAULBOWLINE FACTORY SITE

Drawing Title:
SITE LAYOUT MAP OF HAULBOWLINE ISLAND

REV	DESCRIPTION	BY	CHK	APP	DATE

Scale @	Drawn	Date	Checked	Date	Approved	Date
NTS	RJ	JAN 16	YB	JAN 16	YB	JAN 16

Project No.	Office	Type	Drawing No.	Revision
A092989	1504	E	FIGURE 2	A

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Figure 3a Site Investigation Locations – Current Site Layout

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- Former Steelwork Buildings
- Existing Buildings
- Former South Tip Boundary
- Former East Camber Boundary

SPENCER JETTY
TP101
BH101
TP202
BH201R
BH102
TP201
BH201
BAG HOUSE
BH201R
TP104
TP102
SCRAP BIN
FORMER HEAVY OIL PIPLINE
FORMER LIMESTONE QUARRY
TP203
NAVAL STORES
TP103
SCRAP BIN
STONE BUILDING
SCRAP YARD
TRANSFORMER ROOM
SW205
BH103
TP223
BH202
BH204R
TP105
STONE BUILDING
TP205
SW206
TP204
LADEL FURNACE
BH104
PUMP HOUSE
SUB STATION
TP107
TP206
BH205
TP106
BILLET STORAGE YARD
TP108
SW209
SW207
MAIN OFFICES
BH105A
CASTER SCALE WELL
FORMER GASWORKS
STORES
STONE BUILDINGS
BH105
REVERSING MILL
REHEAT FURNACE
BH207
BH206
BH106
TP109
SW205
TP207
BH107
TP214
SUBSTATION
SW203
SW202
TP208
SEA WATER PUMPING STATION
SCALE WELL
SW204
GARAGE
FIRST AID
WORKSHOPS
BH208
BH209
TP112
TP110
BH213
SW210
CONTINOUS MILL
TP111
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
SW201
TP219
TP215
PICKLING UNIT
TP213
TP212
BH211
110kv STATION
TP222
BH112
BH114
BH215
BH217
TP116
STEEL MILL BUILDING
TP209
TP220
OIL STORAGE TANKS
LPG STORAGE
TP134
BH216
TP113
DRY DOCK
FINISHING PRODUCT LOADING DOCK
BH218
TP133
TP216
WORKSHOPS
TP221
TP210
TP117
TP122
WHARFSIDE CRANES
BH108
BH214
TP114
BH109
TP115
TP115A
BH219
TP218
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
COOLING BED
TP217
BH212
BH110
BH110A
TP118
BH111B
BH111
BH111A
TP211
STORAGE RACKS
BH113
TP119

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

SITE INVESTIGATIONS LOCATIONS

Scale 1:750 @A1 1:1500 @A3	Drawn CS	Date 21/12/15	Checked DH	Date 21/12/15	Approved DH	Date 21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 3A	–

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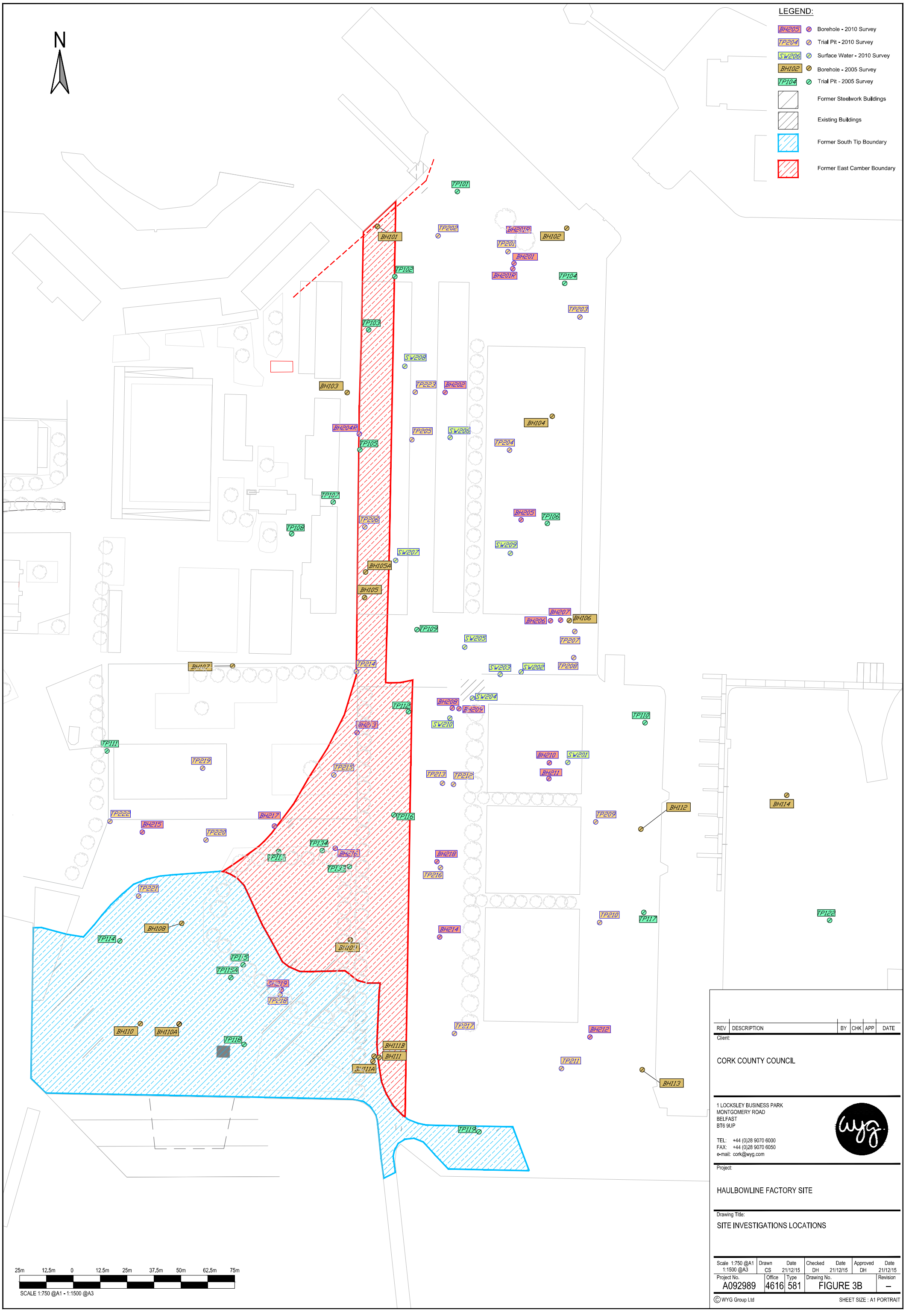
Figure 3b Site Investigation Locations – Proposed Site Layout / Master Plan



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Drawing Title:

SITE INVESTIGATIONS LOCATIONS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 3B	–

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FILENAME : WYG COMP LIBRARY PROJECTS ENGINEERING BELFAST A092 A092989 F-03 EXECUTION 11 EPX4 FIGURES FIGURES FIGURES NOTTINGHAM FIGURE5A092989-FIGURE5B.DWG | PLOTTED BY : ROWAN.JOSLING | PLOTTED DATE : 05 January 2016 13:7:53

Figure 4 Monitoring Well Locations

N

LEGEND:

- BH205 — Bore Hole - 2010 Survey
- BH102 — Bore Hole - 2005 Survey
- BH102 — Bore Hole - No Longer Accessible
- Former Steelwork Buildings
- Existing Buildings

SPENCER JETTY
BH101
BH201R
BH102
BAG HOUSE
BH201
BH201R
SCRAP BIN
SCRAP BIN
NAVAL STORES
STONE BUILDING
TRANSFORMER ROOM
SCRAP YARD
BH103
BH202
BH204R
BH104
STONE BUILDING
LADEL FURNACE
PUMP HOUSE
SUB STATION
BH205
BILLET STORAGE YARD
MAIN OFFICES
BH105A
CASTER SCALE WELL
FORMER GASWORKS
STORES
STONE BUILDINGS
BH105
REVERSING MILL
REHEAT FURNACE
BH207
BH206
BH106
BH107
SUBSTATION
SEA WATER PUMPING STATION
SCALE WELL
GARAGE
FIRST AID
WORKSHOPS
BH208
BH209
BH213
CONTINOUS MILL
SCHOOL
FORMER HOSPITAL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
PICKLING UNIT
BH211
110kv STATION
BH112
BH114
BH217
BH215
STEEL MILL BUILDING
LPG STORAGE
OIL STORAGE TANKS
BH216
BH218
DRY DOCK
FINISHING PRODUCT LOADING DOCK
WORKSHOPS
BH214
WHARFSIDE CRANES
BH108
BH109
BH219
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
COOLING BED
BH212
BH110
BH110A
BH111B
BH111
PCABIN
BH111A
STORAGE RACKS
BH113

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

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Drawing Title:

MONITORING WELL LOCATIONS

Scale	Drawn	Date	Checked	Date	Approved	Date
A1 1:750	CS	18/10/10	DH	18/10/10	DH	18/10/10

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 4	–

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Figure 5 Surface Water and Drainage Outlet Sampling Locations

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- SW1 — Surface Water Sampling Locations January 2015
- SW01 — Surface Water Sampling Locations - November 2015
- HF-S — Surface Water Sampling Locations - November 2015
- OT — Surface Water Sampling Locations - November 2015

SPENCER JETTY
SW03
SW6
HF-S-1 (shallow from near surface - top 300mm)
HF-S-2 (deep i,e from base)
TP101
BH101
TP202
BH201R
BH102
TP201
BH201
BAG HOUSE
TP102
SCRAP BIN
TP104
NAVAL STORES
TP103
SCRAP BIN
TP203
STONE BUILDING
TRANSFORMER ROOM
SW205
SCRAP YARD
BH103
TP223
BH202
BH204R
TP205
SW206
TP204
LADEL FURNACE
BH104
SW5
TP105
PUMP HOUSE
SUB STATION
TP107
BH205
TP106
QT07
TP206
BILLET STORAGE YARD
TP108
SW209
SW207
FORMER GASWORKS
MAIN OFFICES
BH105A
CASTER SCALE WELL
STORES
STONE BUILDINGS
BH105
REVERSING MILL
REHEAT FURNACE
BH207
BH206
BH106
HF-S-3
TP109
TP207
SW205
QT08
BH107
TP214
SUBSTATION
SW203
SW202
TP208
SEA WATER PUMPING STATION
SCALE WELL
SW204
GARAGE
FIRST AID
WORKSHOPS
BH208
BH209
TP112
TP110
BH213
SW210
CONTINOUS MILL
TP111
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
SW4
TP219
TP215
ELECTRICAL CONTROL ROOM
BH210
SW201
PICKLING UNIT
TP213
TP212
BH211
110kv STATION
TP222
BH112
BH215
BH217
TP116
STEEL MILL BUILDING
TP209
BH114
TP220
OIL STORAGE TANKS
LPG STORAGE
HF-S-4
TP134
BH216
BH218
TP113
TP133
TP216
DRY DOCK
FINISHING PRODUCT LOADING DOCK
WORKSHOPS
TP221
TP210
TP117
TP122
BH108
BH214
WHARFSIDE CRANES
TP114
BH109
TP115
TP115A
BH219
TP218
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
CABIN
COOLING BED
TP217
BH212
BH110
BH110A
TP118
BH111B
BH111
BH111A
TP211
SW3
STORAGE RACKS
BH113
HF-S-6
SW1
HF-S-5
TP119
SW11
SW2

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

SURFACE WATER & DRAINAGE OUTLET SAMPLING

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1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 5	–

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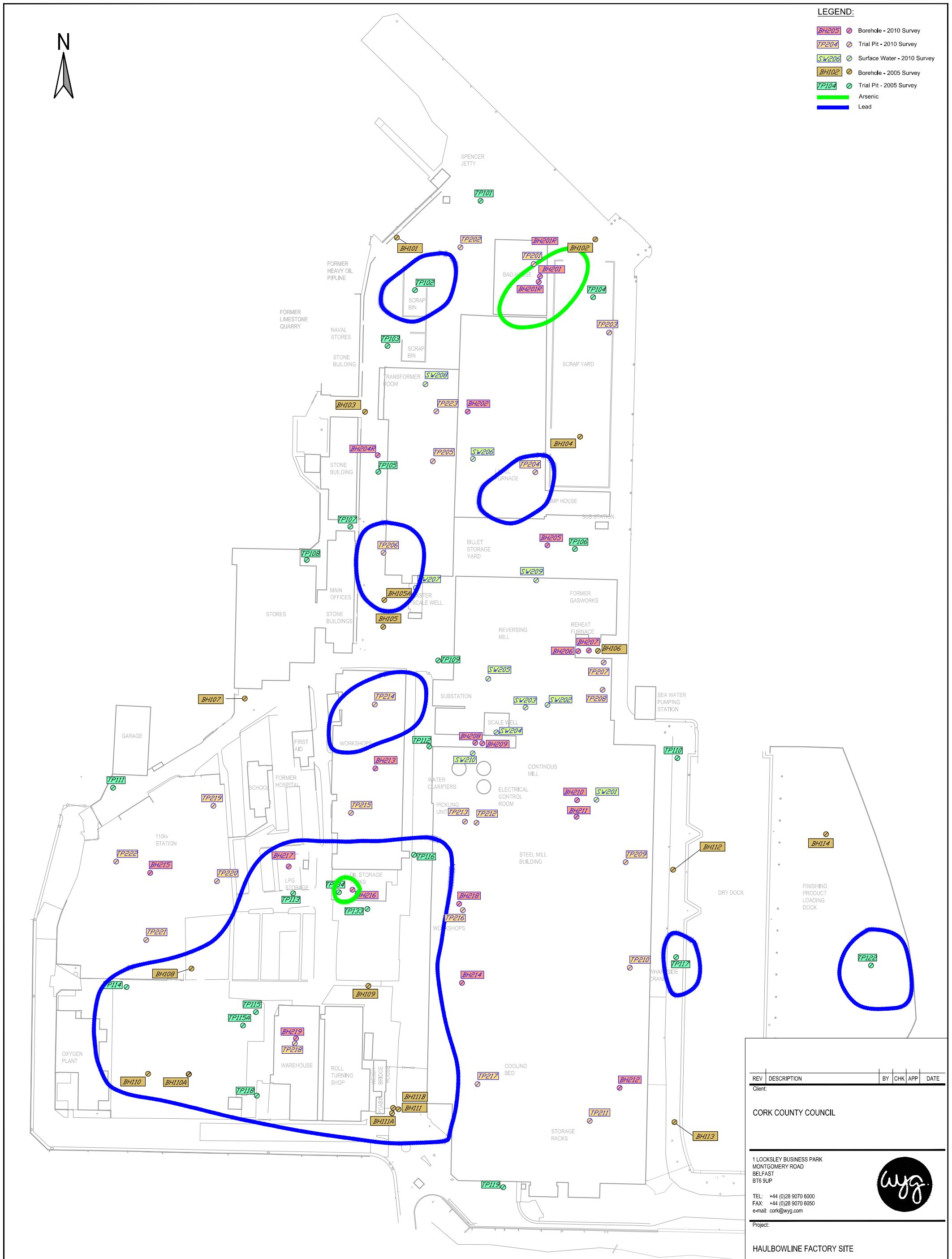
Figure 6 Solid Analysis – Locations with metal concentrations in Excess of Park GACs



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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

SOLID ANALYSIS - LOCATIONS WITH METAL CONCENTRATIONS IN EXCESS OF PARK GACS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 6	–

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FILENAME: \\WYG.COM\PUBBRANCH PROJECTS\ENGINEERING\BELFAST\A092989\P-03 EXECUTION\11 EPC\4 FIG\RESS FIG\JRESS\NOTTINGHAM FIGURES\A092989-FIGJRES2.DWG | PLOTTED BY - DANIEL.SWIFT | PLOTTED DATE - 06 January 2016 15:31:56

Figure 7 Solid Analysis – Locations with organic concentrations in Excess of Park GACs

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- Dibenzo (ah) Anthracene

SPENCER JETTY
FORMER HEAVY OIL PIPLINE
FORMER LIMESTONE QUARRY
NAVAL STORES
STONE BUILDING
SCRAP BIN
BAG HOUSE
SCRAP YARD
TRANSFORMER ROOM
LADEL FURNACE
PUMP HOUSE
SUB STATION
BILLET STORAGE YARD
MAIN OFFICES
STORES
STONE BUILDINGS
CASTER SCALE WELL
FORMER GASWORKS
REVERSING MILL
REHEAT FURNACE
SUBSTATION
SEA WATER PUMPING STATION
SCALE WELL
GARAGE
FIRST AID
WORKSHOPS
SCHOOL
FORMER HOSPITAL
WATER CLARIFIERS
CONTINOUS MILL
ELECTRICAL CONTROL ROOM
PICKLING UNIT
110kv STATION
LPG STORAGE
OIL STORAGE TANKS
STEEL MILL BUILDING
DRY DOCK
FINISHING PRODUCT LOADING DOCK
WHARFSIDE CRANES
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE
CABIN
HOUSE
COOLING BED
STORAGE RACKS

TP101, BH101, TP202, BH201R, BH102, TP201, BH201, TP102, BH201R, TP104, TP203, TP103, BH104, BH204R, TP105, TP205, SW206, TP204, TP107, TP206, BH205, TP106, TP108, SW209, SW207, BH105A, BH105, BH206, BH207, BH106, TP109, SW205, TP207, BH107, TP214, SW203, SW202, TP208, SW204, BH208, BH209, TP112, TP110, SW210, BH213, TP111, TP219, TP215, TP213, TP212, BH210, SW201, BH211, BH112, BH114, TP222, BH215, BH217, TP116, TP209, TP220, TP134, BH216, TP113, TP133, BH218, TP216, TP221, TP210, TP117, TP122, BH108, TP114, BH214, BH109, TP115, TP115A, BH219, TP218, BH110, BH110A, TP118, BH111B, BH111, BH111A, TP217, BH212, TP211, BH113, TP119

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

Client:

CORK COUNTY COUNCIL

1 LOCKSLEY BUSINESS PARK
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BELFAST
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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

SOLID ANALYSIS - LOCATIONS WITH ORGANIC CONCENTRATIONS IN EXCESS OF PARK GACS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

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A092989	4616	581	FIGURE 7	–

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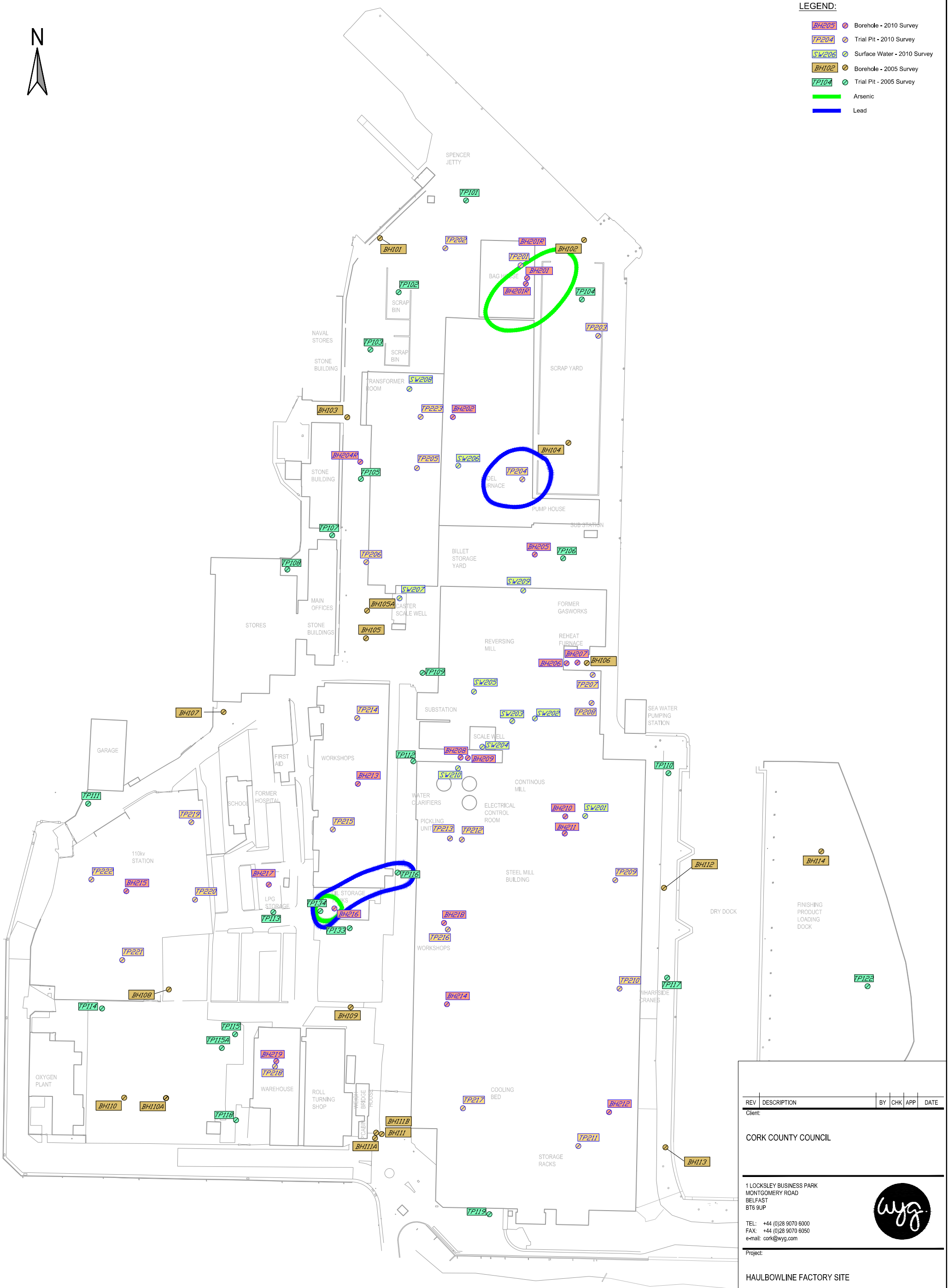
Figure 8 Solid Analysis – Locations with metal concentrations in Excess of Commercial GACs



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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

SOLID ANALYSIS - LOCATIONS WITH METAL CONCENTRATIONS IN EXCESS OF COMERCIAL GACS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 8	–

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Figure 9 Water Analysis – Locations with metal concentrations in excess of WQS

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- Copper
- Chromium
- Chromium VI
- Cadium
- Zinc
- Mercury
- Lead

SPENCER JETTY
TP101
BH101
TP202
BH201R
BH102
TP201
BH201
BAG HOUSE
TP102
BH201R
TP104
SCRAP BIN
NAVAL STORES
TP203
TP103
SCRAP BIN
STONE BUILDING
SCRAP YARD
TRANSFORMER ROOM
SW208
BH103
TP223
BH202
BH104
BH204R
TP205
SW206
TP204
STONE BUILDING
TP105
LADEL FURNACE
PUMP HOUSE
SUB STATION
TP107
BH205
TP106
TP206
BILLET STORAGE YARD
TP108
SW209
SW207
MAIN OFFICES
BH105
CASTER SCALE WELL
FORMER GASWORKS
STORES
STONE BUILDINGS
REVERSING MILL
REHEAT FURNACE
BH206
BH106
TP109
SW205
TP207
BH107
TP214
SUBSTATION
SW203
SW202
TP208
SEA WATER PUMPING STATION
SCALE WELL
SW204
GARAGE
FIRST AID
WORKSHOPS
TP112
BH208
BH209
TP110
BH213
SW210
CONTINOUS MILL
TP111
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
SW201
TP219
TP215
PICKLING UNIT
TP213
TP212
BH211
110kv STATION
BH112
TP222
BH217
TP116
STEEL MILL BUILDING
TP209
BH114
BH215
TP220
OIL STORAGE TANKS
LPG STORAGE
TP134
BH216
BH218
TP113
TP133
DRY DOCK
FINISHING PRODUCT LOADING DOCK
TP216
WORKSHOPS
TP221
TP210
TP117
WHARFSIDE CRANES
TP122
BH108
BH214
TP114
BH109
TP115
TP115A
BH219
TP218
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
COOLING BED
TP217
BH212
BH110
BH110A
TP118
BH111B
BH111
PCABIN
BH111A
TP211
STORAGE RACKS
BH113
TP119

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

LOCATIONS WITH METAL CONCETRATIONS IN EXCESS OF WQS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 9	--

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SHEET SIZE : A1 PORTRAIT

Figure 10 Water Analysis – locations with organic concentrations in excess of WQS

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- PAH
- TPH

NOTE:

PAH SHOWN EXCLUDE FLUORANTHENE WHICH WAS TYPICALLY MEASURED ABOVE THE WQS AT ALL MONITORED LOCATIONS EXCLUDING BH107

SPENCER JETTY
TP101
BH101
TP202
BH201R
BH102
TP201
BH201
BAG HOUSE
TP102
BH201R
TP104
SCRAP BIN
NAVAL STORES
TP103
SCRAP BIN
TP203
STONE BUILDING
TRANSFORMER ROOM
SW208
SCRAP YARD
BH103
TP223
BH202
BH104
BH204R
TP205
SW206
TP204
STONE BUILDING
TP105
LADEL FURNACE
PUMP HOUSE
TP107
SUB STATION
BH205
TP106
TP206
BILLET STORAGE YARD
TP108
SW209
SW207
MAIN OFFICES
BH105A
CASTER SCALE WELL
FORMER GASWORKS
STORES
STONE BUILDINGS
BH105
REVERSING MILL
REHEAT FURNACE
BH207
BH206
BH106
TP109
SW205
TP207
BH107
TP214
SUBSTATION
SW203
SW202
TP208
SEA WATER PUMPING STATION
SCALE WELL
SW204
GARAGE
FIRST AID
WORKSHOPS
BH208
BH209
TP112
TP110
BH213
SW210
CONTINOUS MILL
TP111
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
SW201
TP219
TP215
PICKLING UNIT
TP213
TP212
BH211
110kv STATION
BH114
TP222
BH217
TP116
STEEL MILL BUILDING
TP209
BH112
BH215
TP220
LPG STORAGE
OIL STORAGE TANKS
TP134
BH216
BH218
DRY DOCK
FINISHING PRODUCT LOADING DOCK
TP113
TP133
TP216
TP221
WORKSHOPS
TP210
TP117
TP122
BH108
BH214
WHARFSIDE CRANES
TP114
BH109
TP115
TP115A
BH219
TP218
WAREHOUSE
OXYGEN PLANT
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
PCABIN
COOLING BED
TP217
BH212
BH110
BH110A
TP118
BH111B
BH111
BH111A
TP211
STORAGE RACKS
BH113
TP119

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

LOCATIONS WITH ORGANIC CONCETRATIONS IN EXCESS OF WQS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 10	--

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SHEET SIZE : A1 PORTRAIT

Figure 11 Surface Water and Outlets – Locations with lead in excess of WQS

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- SW1 — Surface Water Sampling Locations January 2015
- SW01 — Surface Water Sampling Locations - November 2015
- HF-S — Surface Water Sampling Locations - November 2015
- OT — Surface Water Sampling Locations - November 2015
- Lead - Surface Water or Outlet Excedence
- Lead - Groundwater Excedence

SPENCER JETTY
SW03
SW6
HF-S-1 (shallow from near surface - top 300mm)
HF-S-2 (deep i.e from base)
TP101
TP202
BH101
BH201R
BH102
TP201
BH201
BAG HOUSE
TP102
SCRAP BIN
TP104
NAVAL STORES
TP203
TP103
SCRAP BIN
SCRAP YARD
STONE BUILDING
TRANSFORMER ROOM
SW208
BH103
TP223
BH202
BH104
BH204R
TP205
SW206
TP204
LADEL FURNACE
STONE BUILDING
TP105
SW5
PUMP HOUSE
SUB STATION
TP107
OT07
BH205
TP106
BILLET STORAGE YARD
TP206
TP108
SW209
SW207
MAIN OFFICES
BH105A
CASTER SCALE WELL
FORMER GASWORKS
STORES
STONE BUILDINGS
BH105
REVERSING MILL
REHEAT FURNACE
BH207
BH206
BH106
HF-S-3
TP109
SW205
TP207
OT08
BH107
TP214
SUBSTATION
SW203
SW202
TP208
SEA WATER PUMPING STATION
SCALE WELL
SW204
GARAGE
FIRST AID
WORKSHOPS
BH208
BH209
TP112
TP110
BH213
SW210
CONTINOUS MILL
TP111
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
SW201
SW4
TP219
TP215
PICKLING UNIT
TP213
TP212
BH211
110kv STATION
BH114
TP222
BH217
TP116
STEEL MILL BUILDING
TP209
BH112
BH215
TP220
OIL STORAGE TANKS
LPG STORAGE
TP134
BH216
BH218
HF-S-4
DRY DOCK
TP113
TP133
TP216
FINISHING PRODUCT LOADING DOCK
WORKSHOPS
TP221
TP210
TP117
TP122
BH108
BH214
WHARFSIDE CRANES
TP114
BH109
TP115
TP115A
BH219
TP218
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
PCABIN
COOLING BED
TP217
BH212
BH110
BH110A
TP118
BH111B
BH111
BH111A
SW3
TP211
STORAGE RACKS
BH113
HF-S-6
SW1
HF-S-5
TP119
SW11
SW2

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

Client:

CORK COUNTY COUNCIL

1 LOCKSLEY BUSINESS PARK
MONTGOMERY ROAD
BELFAST
BT6 9UP

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FAX: +44 (0)28 9070 6050
e-mail: cork@wyg.com

Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

LEAD WQS EXCEDENCES IN SURFACE WATER SAMPLES AND DRAINAGE OUTLETS

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 11	--

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SHEET SIZE : A1 PORTRAIT

Figure 12 Ground Gas Characterisation

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- TP204 — Trial Pit - 2010 Survey
- SW206 — Surface Water - 2010 Survey
- BH102 — Borehole - 2005 Survey
- TP104 — Trial Pit - 2005 Survey
- Characterisation Situation Boundary
- 2 — CIRIA Characterisation Situation

SPENCER JETTY
TP101
BH101
TP202
BH201R
BH102
TP201
BH201
BAG HOUSE
TP102
BH201R
TP104
SCRAP BIN
NAVAL STORES
TP203
TP103
SCRAP BIN
STONE BUILDING
SCRAP YARD
TRANSFORMER ROOM
SW208
BH103
TP223
BH202
BH104
BH204R
TP205
SW206
TP204
STONE BUILDING
TP105
LADEL FURNACE
PUMP HOUSE
SUB STATION
TP107
BH205
TP106
BILLET STORAGE YARD
TP206
TP108
SW209
SW207
MAIN OFFICES
BH105A
CASTER SCALE WELL
FORMER GASWORKS
STORES
STONE BUILDINGS
BH105
REVERSING MILL
REHEAT FURNACE
BH207
BH206
BH106
TP109
SW205
TP207
SUBSTATION
SEA WATER PUMPING STATION
BH107
TP214
SW203
SW202
TP208
SCALE WELL
SW204
GARAGE
FIRST AID
WORKSHOPS
BH208
BH209
TP112
TP110
BH213
SW210
CONTINOUS MILL
TP111
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
SW201
TP219
TP215
PICKLING UNIT
TP213
TP212
BH211
2
110kv STATION
BH114
BH112
TP222
BH217
TP116
STEEL MILL BUILDING
TP209
BH215
TP220
OIL STORAGE TANKS
LPG STORAGE
TP134
BH216
TP113
TP133
DRY DOCK
FINISHING PRODUCT LOADING DOCK
BH218
TP216
WORKSHOPS
3
TP221
2
TP210
TP117
TP122
BH108
BH214
WHARFSIDE CRANES
TP114
BH109
TP115
TP115A
BH219
TP218
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
PCABIN
COOLING BED
TP217
BH212
BH110
BH110A
TP118
BH111B
BH111
BH111A
TP211
STORAGE RACKS
BH113
TP119

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

Client:

CORK COUNTY COUNCIL

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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

GROUND GAS CHARACTERISATION

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 12	--

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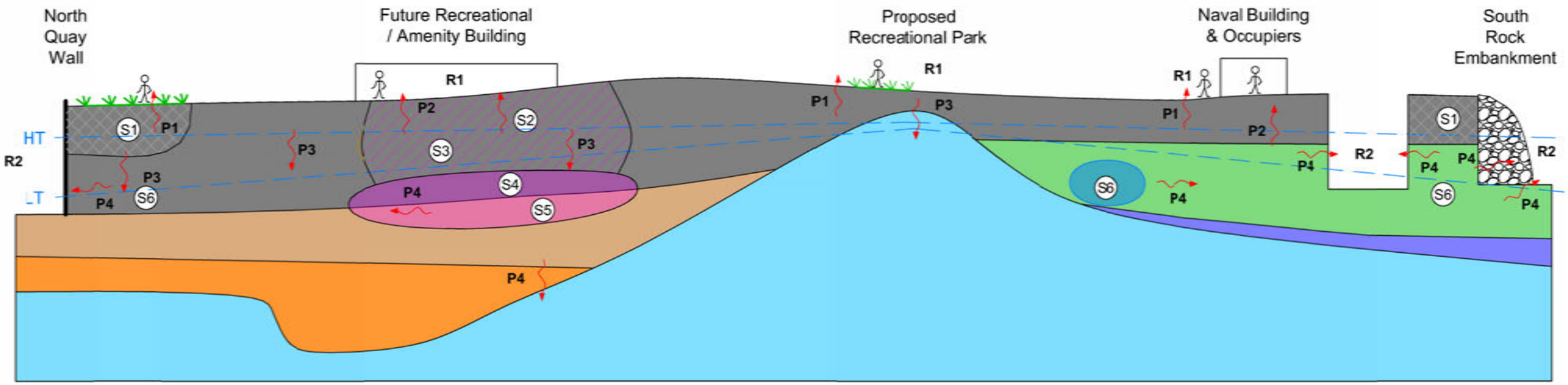
SHEET SIZE : A1 PORTRAIT

Figure 16 BH110A and BH108 Hydrographs (South Tip)

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS



Key

Boulder Clay	Waste Material - Slag, C & D Waste	S1	Metal Contamination Associated with Solid Waste Material	P1	Ingestion / Inhalation / Dermal	R1	Human Health Receptors (Recreational, Naval, Construction)
Gravel	Water Levels	S2	Hydrocarbon Hotspots in Soil	P2	Ground Gas Migration		
Gravel	Hydrocarbon Plume	S3	Organic Material Generation Ground Gas	P3	Leaching	R2	Cork Harbour Waters including Flora &Fauna
Limestone	Hydrocarbons in Soil (Unsaturated)	S4	Hydrocarbon LNAPL	P4	Water Migration		
Made Ground	Pathway	S5	Hydrocarbon Dissolved Plume				
Silt		S6	Dissolved Groundwater Metal Contamination				

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Client: Cork County Council

Project: Haulbowline Factory Site

Drawing Title: Conceptual Site Model

REV	DESCRIPTION	BY	CHK	APP	DATE

Scale @ A3	Drawn	Date	Checked	Date	Approved	Date
NTS	DM	23/11/15	YB	23/11/15	YB	23/11/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	001	02

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Figure 19 DQRA Zones (North and South)

N

LEGEND:

- BH205 — Borehole - 2010 Survey
- BH102 — Borehole - 2005 Survey
- Former Steelwork Buildings
- Existing Buildings

SPENCER JETTY
BH101
FORMER HEAVY OIL PIPLINE
FORMER LIMESTONE QUARRY
NAVAL STORES
STONE BUILDING
SCRAP BIN
SCRAP BIN
STONE BUILDING
TRANSFORMER ROOM
BH103
BH204R (LIME) 0.27
BH201R
BH102 (COMP) 0.08
BAG HOUSE
BH201
BH201R
SCRAP YARD
BH202 (COMP) 0.77
BH104
LADEL FURNACE
PUMP HOUSE
SUB STATION
BH205
BILLET STORAGE YARD
-1.7
MAIN OFFICES
STORES
STONE BUILDINGS
BH105A
CASTER SCALE WELL
BH105 (MG) 1.08
FORMER GASWORKS
REVERSING MILL
REHEAT FURNACE
BH207
BH206 (LIME) 0.19
BH106 (COMP) 0.16
NORTH ZONE
SUBSTATION
SEA WATER PUMPING STATION
BH107 (LIME) 0.92
GARAGE
FIRST AID
WORKSHOPS
SCALE WELL
BH208 1.58
BH209 (LIME) 0.16
BH213
CONTINOUS MILL
FORMER HOSPITAL
SCHOOL
WATER CLARIFIERS
ELECTRICAL CONTROL ROOM
BH210
BH211
PICKLING UNIT
110kv STATION
BH215
BH217 1.13
LPG STORAGE
OIL STORAGE TANKS
BH216
STEEL MILL BUILDING
BH112 -0.31
BH114 -0.56
DRY DOCK
FINISHING PRODUCT LOADING DOCK
BH218 (SVP) -0.68
SOUTH ZONE
WORKSHOPS
BH214 -0.04
WHARFSIDE CRANES
BH108 0.63
BH109
BH219 (COMP) 0.75
OXYGEN PLANT
WAREHOUSE
ROLL TURNING SHOP
WEIGH BRIDGE HOUSE
PCABIN
BH110
BH110A (COMP) 0.39
BH111B
BH111
BH111A
-0.2
COOLING BED
BH212
STORAGE RACKS
BH113 (MG) -0.53
-1.7

25m 12.5m 0 12.5m 25m 37.5m 50m 62.5m 75m

SCALE 1:750 @A1 - 1:1500 @A3

REV	DESCRIPTION	BY	CHK	APP	DATE

Client:

CORK COUNTY COUNCIL

1 LOCKSLEY BUSINESS PARK
MONTGOMERY ROAD
BELFAST
BT6 9UP

TEL: +44 (0)28 9070 6000
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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

DQRA ZONES (NORTH AND SOUTH)

Scale	Drawn	Date	Checked	Date	Approved	Date
1:750 @A1 1:1500 @A3	CS	21/12/15	DH	21/12/15	DH	21/12/15

Project No.	Office	Type	Drawing No.	Revision
A092989	4616	581	FIGURE 19	–

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SHEET SIZE : A1 PORTRAIT

FILENAME : W:\YG.COM\PUBR\BRANCH PROJECTS\ENGINEERING\BELFAST\A092989\P-13 EXECUTION\11 EPA\4 FIGURES\FIGURES\NOTTINGHAM FIGURES\A092989-FIGURE19.DWG | PLOTTED BY : ROWAN.JOBLING | PLOTTED DATE : 05 January 2016 14:58:42

Appendices

Appendix A WYG Report Conditions

WYG

REPORT CONDITIONS

DQRA
Haulbowline Factory (Former Steelworks) Site

This report is produced solely for the benefit of Cork County Council and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.
This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to WYGE. In time improved practices, fresh information or amended legislation may necessitate a re-assessment. Opinions and information provided in this report are on the basis of WYGE using due skill and care in the preparation of the report.
This report refers, within the limitations stated, to the environment of the site in the context of the surrounding area at the time of the inspections. Environmental conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.
This report is limited to those aspects reported on, within the scope and limits agreed with the client under our appointment. It is necessarily restricted and no liability is accepted for any other aspect. It is based on the information sources indicated in the report. Some of the opinions are based on unconfirmed data and information and are presented as the best obtained within the scope for this report.
Reliance has been placed on the documents and information supplied to WYGE by others but no independent verification of these has been made and no warranty is given on them. No liability is accepted or warranty given in relation to the performance, reliability, standing etc of any products, services, organisations or companies referred to in this report.
Whilst skill and care have been used, no investigative method can eliminate the possibility of obtaining partially imprecise, incomplete or not fully representative information. Any monitoring or survey work undertaken as part of the commission will have been subject to limitations, including for example timescale, seasonal and weather related conditions.
Although care is taken to select monitoring and survey periods that are typical of the environmental conditions being measured, within the overall reporting programme constraints, measured conditions may not be fully representative of the actual conditions. Any predictive or modelling work, undertaken as part of the commission will be subject to limitations including the representativeness of data used by the model and the assumptions inherent within the approach used. Actual environmental conditions are typically more complex and variable than the investigative, predictive and modelling approaches indicate in practice, and the output of such approaches cannot be relied upon as a comprehensive or accurate indicator of future conditions.
The potential influence of our assessment and report on other aspects of any development or future planning requires evaluation by other involved parties.
The performance of environmental protection measures and of buildings and other structures in relation to acoustics, vibration, noise mitigation and other environmental issues is influenced to a large extent by the degree to which the relevant environmental considerations are incorporated into the final design and specifications and the quality of workmanship and compliance with the specifications on site during construction. WYGE accept no liability for issues with performance arising from such factors.

Appendix B Initial Conceptual Site Model (Arup, 2014)

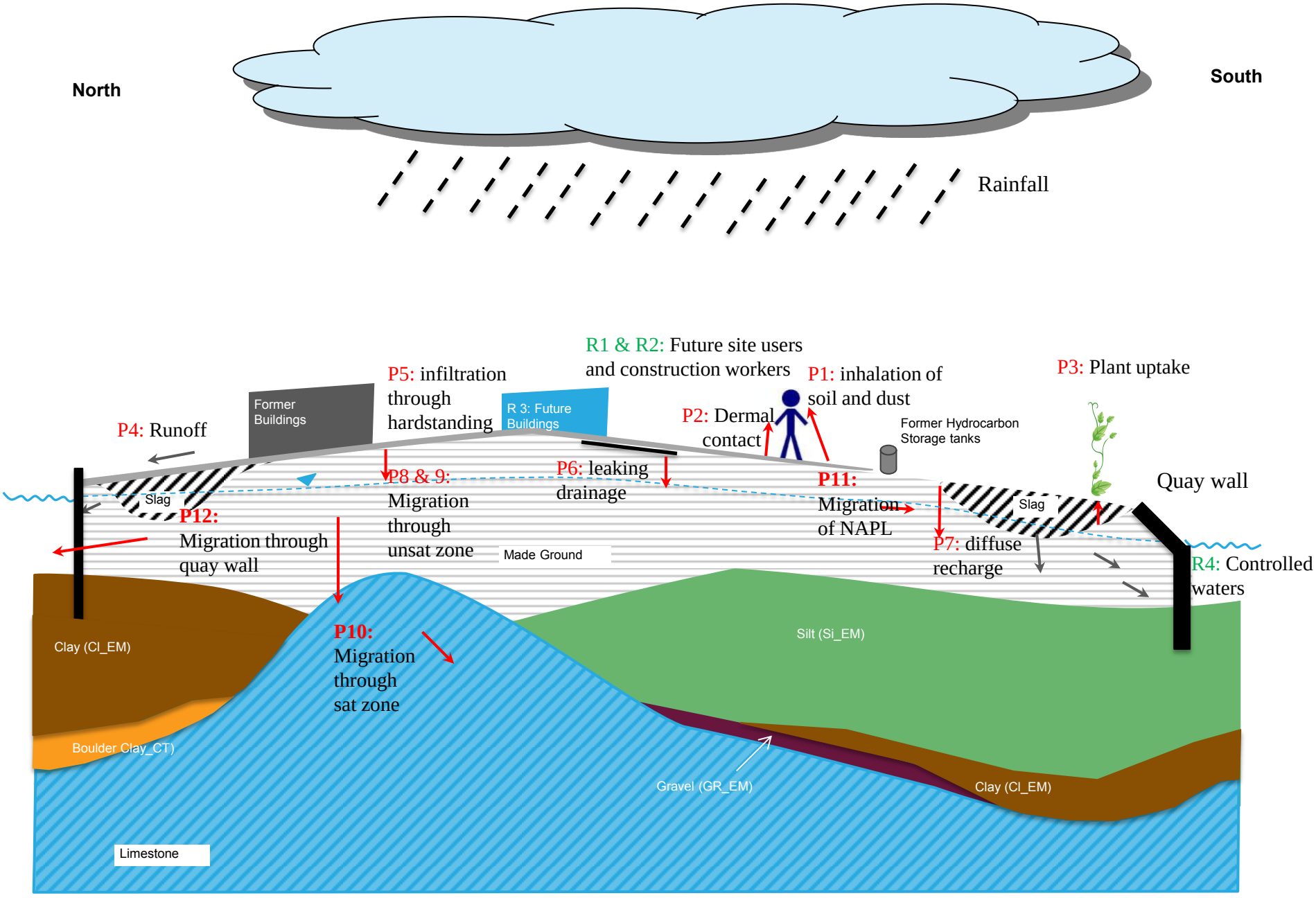

Figure 6.2: Conceptual Site Model

ARUP

Appendix C Human Health Generic Assessment Criteria (GAC)

	1% SOM	
Contaminant	**Commercial**	**Public Open Space - Park**
Heavy Metals	**mg/kg**	**mg/kg**
Inorganic Arsenic	**640**	**170**
Beryllium	**12**	**63**
Boron	**240000**	**46000**
Cadmium	**190**	**532**
Chromium III	**8600**	**33000**
Chromium VI	**33**	**220**
Copper	**68000**	**44000**
Elemental Mercury	**58**	**30**
Inorganic Mercury	**1100**	**240**
Methylmercury	**320**	**68**
Nickel	**980**	**3400**
Selenium	**12000**	**1800**
Vanadium	**9000**	**5000**
Zinc	**730000**	**170000**
Petroleum hydrocarbons		
Aliphatic EC 5-6	**3200**	**95000**
Aliphatic EC > 6-8	**7800**	**150000**
Aliphatic EC > 8-10	**2000**	**14000**
Aliphatic EC > 10-12	**9700**	**21000**
Aliphatic EC >12-16	**59000**	**25000**
Aliphatic EC >16-35	**1600000**	**450000**
Aliphatic EC >35-44	**1600000**	**450000**
Aromatic EC 5-7 (benzene)	**26000**	**76000**
Aromatic EC >7-8 (toluene)	**56000**	**87000**
Aromatic EC >8-10	**3500**	**7200**
Aromatic EC >10-12	**16000**	**9200**
Aromatic EC >12-16	**36000**	**10000**
Aromatic EC >16-21	**28000**	**7600**
Aromatic EC >21-35	**28000**	**7800**
Aromatic EC >35-44	**28000**	**7800**
Aliphatic + Aromatic EC >44-70	**28000**	**7800**
Benzene	**27**	**90**
Toluene	**56000**	**87000**
Ethylbenzene	**5700**	**17000**
o-xylene	**6600**	**17000**
m-xylene	**6200**	**170000**
p-xylene	**5900**	**170000**
Polycyclic Aromatic Hydrocarbons		
Acenaphthene	**84000**	**29000**
Acenaphthylene	**83000**	**29000**
Anthracene	**520000**	**150000**
Benz(a)anthracene	**170**	**49**
Benzo(a)pyrene	**35**	**11**
Benzo(b)fluoranthene	**44**	**13**
Benzo(ghi)perylene	**3900**	**1400**
Benzo(k)fluoranthene	**1200**	**370**
Chrysene	**350**	**93**
Dibenz(a,h)anthracene	**3.5**	**1.1**
Fluoranthene	**23000**	**6300**
Fluorene	**63000**	**20000**
Indeno(123cd)pyrene	**500**	**150**
Naphthalene	**190**	**1200**
Phenanthrene	**22000**	**6200**
Pyrene	**54000**	**15000**
Coal Tar (Bap as surrogate marker)	**15**	**4.4**
VOCs		
1, 2 Dichloroethane	**0.67**	**21**
1, 1, 1 Trichloroethane	**660**	**57000**
1, 1, 2, 2 Tetrachloroethane	**270**	**1800**
1, 1, 1, 2 Tetrachloroethane	**110**	**1500**
Tetrachloroethene	**19**	**810**
Tetrachloromethane	**2.9**	**190**
Trichloroethene	**1.2**	**70**
Vinyl Chloride	**0.059**	**4.8**
Chlorobenzene	**56**	**1300**
1, 2 Dichlorobenzene	**2000**	**24000**
1, 3 Dichlorobenzene	**30**	**390**
1, 4 Dichlorobenzene	**4400**	**36000**
1, 2, 3 Trichlobenzene	**102**	**770**
1, 2, 4 Trichlorobenzene	**220**	**1700**
1, 3, 5 Trichlorobenzene	**23**	**380**
1, 2, 3, 4 Tetrachlorobenzene	**1700**	**1500**
1, 2, 3, 5 Tetrachlorobenzene	**49**	**110**
1, 2, 4, 5 Tetachlorobenzene	**42**	**25**
Phenol	**760**	**760**
Carbon Disulphide	**11**	**1300**
Hexachlorobutadiene	**31**	**48**

Appendix D Solid Sampling Analysis Results

Haulbowline Factory Site
Solid Analysis Results

										NAVAL	NAVAL		NAVAL	NAVAL			
				J E Sample No.	**148-151 (1)**	**152-155 (1)**	**156-159 (1)**	**160-163 (1)**	**40-43 (1)**	**44-47 (1)**	**48-51 (1)**	**52-55 (1)**	**56-59 (1)**	**60-63 (1)**	**164-167 (1)**	**168-171 (1)**	**172-175 (1)**
				Sample ID	**TP101-01**	**TP101-02**	**TP102-01**	**TP102-02**	**TP103-01**	**TP104-01**	**TP104-02**	**TP105-01**	**TP106-01**	**TP106-02**	**TP107-01**	**TP107-02**	**TP108-01**
				Depth	**0.4-1.8**	**1.8-3.2**	**0.0-1.3**	**1.3-1.9**	**0.0-1.4**	**0.3-1.0**	**1.0-2.0**	**0.3-1.1**	**1.0-2.0**	**2.0-3.0**	**0.8**	**2.7**	**0.8-1.5**
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**		**MG - slag and limestone**	**silt**	**MG - scrap metal**	**MG - sand with slag and furnace brick**	**MG - slag and nat gravel from 0.8m**	**MG - gravel**	**MG - limestone boulders**	**MG- sand**	**MG - gravel**	**MG - gravel**	**MG - sand dwith brick frag**	**clay**	**MG - sand with brick frag and crockery pipe**
				Sample Date	**17/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**16/08/05**	**16/08/05**	**16/08/05**	**16/08/05**	**16/08/05**	**16/08/05**	**17/08/05**	**17/08/05**	**17/08/05**
				Sample Type	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
				Date of Receipt	**18/08/05**	**18/08/05**	**18/08/05**	**18/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**18/08/05**	**18/08/05**	**18/08/05**
				Report no	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**
				Laboratory	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**
Parameter																	
Arsenic	640	170	170		12	3	45	34	<1	15	9	2	24	6	8	8	10
Cadmium	190	532	880		<1	<1	11	6	<1	<1	1	<1	2	<1	<1	<1	<1
Chromium	8600	33000			197	27	941	973	1835	89	375	371	620	184	18	17	20
Copper	68000	44000			104	17	1519	770	184	140	531	214	913	126	10	17	14
Mercury	1100	240			<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Nickel	1800 (4)	922**			38	19	523	177	47	76	151	51	255	52	21	25	24
Lead	4640 (4)	477**	1300		354	46	***2542***	**1275**	136	376	187	49	189	45	57	132	25
Selenium	12000	1800			<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Zinc	730000	170000			429	103	3505	2755	711	456	367	286	1051	201	85	127	97
Barium		1570**															
Cobalt																	
Manganese																	
Molybdenum																	
Aluminium																	
Antimony		831**															
Calcium																	
Iron																	
Magnesium																	
Thallium																	
Tin																	
Vanadium	9000	5000			91	19	62	272	340	17	26	69	72	28	14	17	18
Water Soluble Boron	240000	46000			2	2	7	13	8	<1	1	2	1	<1	<1	1	<1
Sodium																	
Potassium																	
Hexavalent Chromium	33	220	250		0.5	<3	4.6	3.1	2.4	<3	0.6	<0.3	0.3	<0.3	0.7	<0.3	<0.3
Nitrate as NO_3																	
Sulphate - soluble 2:1 extract																	
Sulphate																	
Chloride - soluble																	
Free Cyanide*	36 (4)	34**			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cyanide*					<1	<1	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphide *																	
Water Soluble Sulphate					0.101	0.180	0.364	0.288	0.010	0.138	0.072	0.081	0.024	0.025	0.024	0.082	0.021
Acid Soluble Sulphide					<50	<50	<50	<50	58	<50	<50	<50	<50	<50	<50	<50	<50
Thiocyanate*					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Complex cyanide					<1	<1	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Sulphur																	
Total Sulphate					3309	2313	3337	5096	2209	1138	919	1489	954	741	647	668	438
Elemental Sulphur					<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Ammoniacal Nitrogen as N					12.0	16.6	8.4	11.3	4.7	2.6	0.5	4.4	2.1	1.6	11.6	11.7	13.5
Amm N2/Tot Ammonia as NH4 low																	

Haulbowline Factory Site
Solid Analysis Results

				J E Sample No.	148-151 (1)	152-155 (1)	156-159 (1)	160-163 (1)	40-43 (1)	44-47 (1)	48-51 (1)	52-55 (1)	56-59 (1)	60-63 (1)	164-167 (1)	168-171 (1)	172-175 (1)
				Sample ID	TP101-01	TP101-02	TP102-01	TP102-02	TP103-01	TP104-01	TP104-02	TP105-01	TP106-01	TP106-02	TP107-01	TP107-02	TP108-01
				Depth	0.4-1.8	1.8-3.2	0.0-1.3	1.3-1.9	0.0-1.4	0.3-1.0	1.0-2.0	0.3-1.1	1.0-2.0	2.0-3.0	0.8	2.7	0.8-1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)		MG - slag and limestone	silt	MG - scrap metal	MG - sand with slag and furnace brick	MG - slag and nat gravel from 0.8m	MG - gravel	MG - limestone boulders	MG- sand	MG - gravel	MG - gravel	MG - sand dwith brick frag	clay	MG - sand with brick frag and crockery pipe
				Sample Date	17/08/05	17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date of Receipt	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05
				Report no	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Laboratory	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																	
Asbestos screen*																	
Speciated Phenols by HPLC																	
Resorcinol																	
Catechol																	
Phenol																	
m/p-cresol		9910**															
o-cresol		9910**															
Total cresols		9910**															
Xylenols																	
1-naphthol																	
2,3,5-trimethyl phenol																	
2-isopropylphenol																	
Total Phenols	760	760															
Phenols Total Monohydric	760	760			0.02	<0.01	0.07	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Natural Moisture Content																	
pH Value					9.18	8.03	8.01	9.63	11.47	8.56	8.25	11.09	8.35	8.41	8.64	8.45	8.82
Solvent Extract					306	2311	3062	6944	34573	489	1387	266	1583	1834	3717	127	<100
Total Extractable Hydrocarbons					302	<10	2496	3313	1740	323	474	225	167	<10	58	<10	<10
TPHCWG - Aliphatics																	
Aliphatics >C5-C6	3200	95000															
Aliphatics >C6-C8	7800	150000			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	2000	14000			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	9700	21000			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C12-C16	59000	25000			<10	<10	13	18	32	<10	<10	11	<10	<10	<10	<10	<10
Aliphatics >C16-C21	1600000	450000			23	<10	144	169	213	13	25	97	15	<10	<10	<10	<10
Aliphatics >C21-C35	1600000	450000			98	<10	963	1446	711	88	181	73	104	<10	49	<10	<10
Aliphatics >C35-C40	1600000	450000			<10	<10	91	257	59	<10	<10	<10	<10	<10	<10	<10	<10
Total Aliphatics >C6-C40 (Min Oils)					122	<10	1211	1889	1014	100	206	181	118	<10	55	<10	<10
TPHCWG - Aromatics																	
Aromatics >EC5-EC7	26000	76000			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	56000	87000			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C8-C10	3500	7200			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C10-C12	16000	9200			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C12-C16	36000	10000			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C16-C21	28000	7600			15	<10	54	41	40	<10	13	<10	<10	<10	<10	<10	<10
Aromatics >C21-C40	28000	7800			43	<10	392	462	68	45	59	<10	<10	<10	<10	<10	<10
Total Aromatics >C5-C40	28000	7800			59	<10	445	503	115	53	72	<10	<10	<10	<10	<10	<10
Total TPH >C5-C40					180	<10	1656	2392	1129	154	278	181	118	<10	55	<10	<10
BTEX/MTBE GC-FID																	
MTBE		15600**															

Haulbowline Factory Site

Solid Analysis Results

				J E Sample No.	148-151 (1)	152-155 (1)	156-159 (1)	160-163 (1)	40-43 (1)	44-47 (1)	48-51 (1)	52-55 (1)	56-59 (1)	60-63 (1)	164-167 (1)	168-171 (1)	172-175 (1)
				Sample ID	TP101-01	TP101-02	TP102-01	TP102-02	TP103-01	TP104-01	TP104-02	TP105-01	TP106-01	TP106-02	TP107-01	TP107-02	TP108-01
				Depth	0.4-1.8	1.8-3.2	0.0-1.3	1.3-1.9	0.0-1.4	0.3-1.0	1.0-2.0	0.3-1.1	1.0-2.0	2.0-3.0	0.8	2.7	0.8-1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)		MG - slag and limestone	silt	MG - scrap metal	MG - sand with slag and furnace brick	MG - slag and nat gravel from 0.8m	MG - gravel	MG - limestone boulders	MG- sand	MG - gravel	MG - gravel	MG - sand dwith brick frag	clay	MG - sand with brick frag and crockery pipe
				Sample Date	17/08/05	17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date of Receipt	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05
				Report no	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Laboratory	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																	
Benzene	27	90	230														
Toluene	56000	87000															
Ethyl benzene	5700	17000															
m/p-Xylene	5900	170000															
o-Xylene	6600	17000															
Total Xylenes	312**	14500**															
PAH 17 MS																	
Naphthalene	190	1200			0.420	0.050	0.500	0.130	1.000	0.540	0.430	0.050	0.160	0.050	0.050	0.050	0.050
Acenaphthylene	83000	29000			0.13	<0.05	0.25	0.12	0.23	0.17	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	84000	29000			0.14	<0.05	1.38	0.17	0.34	0.23	0.11	0.09	0.08	<0.05	<0.05	<0.05	<0.05
Fluorene	63000	20000			<0.05	<0.05	1.77	0.06	0.06	0.14	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	22000	6200			1.03	0.20	8.99	0.88	0.69	1.85	0.81	0.12	0.11	<0.05	0.12	0.22	0.17
Anthracene	520000	150000			0.20	<0.05	4.90	0.20	0.15	0.37	0.16	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Fluoranthene	23000	6300			1.77	0.22	7.12	0.67	0.52	3.89	1.28	<0.05	<0.05	<0.05	0.11	0.24	0.19
Pyrene	54000	15000			1.46	0.15	5.27	0.60	0.48	3.63	1.00	<0.05	<0.05	<0.05	0.07	0.14	0.09
Benz(a)anthracene	170	49			0.49	<0.05	2.20	0.22	0.17	1.67	0.37	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	350	93			0.67	<0.05	2.58	0.30	0.28	1.92	0.49	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(bk)fluoranthene	44	13															
Benzo(b)fluoranthene	44	13			0.50	<0.05	1.63	<0.05	<0.05	2.45	0.56	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1200	370			0.16	<0.05	0.56	<0.05	<0.05	0.67	0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	35	11	21		0.55	<0.05	1.67	<0.05	<0.05	2.26	0.65	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(123cd)pyrene	500	150			0.46	<0.05	1.35	<0.05	<0.05	1.61	0.27	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(ah)anthracene	3.5	1.1			0.07	<0.05	0.21	<0.05	<0.05	0.39	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	3900	1400			0.46	<0.05	1.34	<0.05	<0.05	1.54	0.28	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Coronene																	
PAH Total					8.51	0.57	41.72	3.35	3.92	23.33	6.74	0.21	0.35	<0.05	0.30	0.60	0.50
PCB (7 congeners)																	
PCB 28																	
PCB 52																	
PCB 101																	
PCB 118																	
PCB 138																	
PCB 153																	
PCB 180																	
Total 7 PCBs	0.24 (5)	0.008 (5)															
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)			<0.001	0.053	3.989	1.340	0.026	0.365	0.147	<0.001	0.031	0.002	<0.001	<0.001	<0.001
Dioxins & Furans																	
Fraction of Organic Carbon					0.031	0.009	0.014						0.003			0.003	
VOCs																	
1,1,1,2-Tetrachloroethane	110	1500			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				J E Sample No.	148-151 (1)	152-155 (1)	156-159 (1)	160-163 (1)	40-43 (1)	44-47 (1)	48-51 (1)	52-55 (1)	56-59 (1)	60-63 (1)	164-167 (1)	168-171 (1)	172-175 (1)
				Sample ID	TP101-01	TP101-02	TP102-01	TP102-02	TP103-01	TP104-01	TP104-02	TP105-01	TP106-01	TP106-02	TP107-01	TP107-02	TP108-01
				Depth	0.4-1.8	1.8-3.2	0.0-1.3	1.3-1.9	0.0-1.4	0.3-1.0	1.0-2.0	0.3-1.1	1.0-2.0	2.0-3.0	0.8	2.7	0.8-1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)		MG - slag and limestone	silt	MG - scrap metal	MG - sand with slag and furnace brick	MG - slag and nat gravel from 0.8m	MG - gravel	MG - limestone boulders	MG- sand	MG - gravel	MG - gravel	MG - sand dwith brick frag	clay	MG - sand with brick frag and crockery pipe
				Sample Date	17/08/05	17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date of Receipt	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05
				Report no	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Laboratory	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																	
1,1-Dichloropropene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	27	90	230		<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromobenzene					<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000															
Hexachlorobutadiene	31	48			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	190	1200			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000			0.001	<0.001	<0.001	0.002	0.002	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site
Solid Analysis Results

				J E Sample No.	148-151 (1)	152-155 (1)	156-159 (1)	160-163 (1)	40-43 (1)	44-47 (1)	48-51 (1)	52-55 (1)	56-59 (1)	60-63 (1)	164-167 (1)	168-171 (1)	172-175 (1)
				Sample ID	TP101-01	TP101-02	TP102-01	TP102-02	TP103-01	TP104-01	TP104-02	TP105-01	TP106-01	TP106-02	TP107-01	TP107-02	TP108-01
				Depth	0.4-1.8	1.8-3.2	0.0-1.3	1.3-1.9	0.0-1.4	0.3-1.0	1.0-2.0	0.3-1.1	1.0-2.0	2.0-3.0	0.8	2.7	0.8-1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)		MG - slag and limestone	silt	MG - scrap metal	MG - sand with slag and furnace brick	MG - slag and nat gravel from 0.8m	MG - gravel	MG - limestone boulders	MG- sand	MG - gravel	MG - gravel	MG - sand dwith brick frag	clay	MG - sand with brick frag and crockery pipe
				Sample Date	17/08/05	17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Date of Receipt	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05
				Report no	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Laboratory	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																	
p/m-Xylene	5900	170000			0.009	0.003	0.001	0.003	0.003	0.006	0.009	0.001	0.001	0.001	0.001	0.002	0.001
Propylbenzene	1400 (2)	10000 (3)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000			0.006	<0.001	<0.001	0.002	<0.001	0.004	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-2-Dichloroethene	22 (4)	212**			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

				176-179 (1)	180-183 (1)	184-187 (1)	65-68 (1)	189-191 (1)	192-194 (1)	195-198 (1)	199-202 (1)	69-72 (1)	81-84 (1)	85-88 (1)	203-205 (1)	290-293 (1)	294-297 (1)	298-301 (1)
				TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113-01	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01
				2.5-2.7	0.6	1.5	1.2	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00	3.5	0.8	3.0	0.0-1.0	3.0-3.3	1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - clay with brick frag	MG - sand with brick, concrete and steel pipe	MG - sand with brick, concrete and steel pipe	MG - silt (dredged fill)	MG - clay	MG - sand with brick frag and concrete	MG - limestone boulders, sand and brick frag	organic clay	MG - slag and quarry fill	MG - clay with wire, steel and furnace slag	MG - silt with slag and furnace brick	MG - silt with slag and furnace brick	MG - slag	MG - C & D waste	MG - hardcore and sadn with brick frag
				17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	18/08/05	18/08/05	17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	18/08/05	19/08/05	19/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Arsenic	640	170	170	7	9	17	10	8	8	7	12	18	60	20	<1	23	19	46
Cadmium	190	532	880	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	1	<1	2
Chromium	8600	33000		20	21	34	26	25	24	46	168	87	17	1229	1412	405	59	35
Copper	68000	44000		9	32	19	31	1687	12	70	81	84	331	188	102	237	106	3158
Mercury	1100	240		<1	<1	<1	<1	<1	<1	<1	2	<1	8	<1	<1	<1	<1	4
Nickel	1800 (4)	922**		23	15	33	26	21	27	26	17	38	20	68	42	69	38	22
Lead	4640 (4)	477**	1300	25	148	84	133	264	41	105	118	193	**795**	**1027**	186	290	**496**	***8124***
Selenium	12000	1800		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Zinc	730000	170000		101	238	151	198	197	95	195	773	813	898	788	513	564	528	2445
Barium		1570**																
Cobalt																		
Manganese																		
Molybdenum																		
Aluminium																		
Antimony		831**																
Calcium																		
Iron																		
Magnesium																		
Thallium																		
Tin																		
Vanadium	9000	5000		15	17	26	19	16	28	30	20	39	15	339	386	124	33	24
Water Soluble Boron	240000	46000		<1	<1	1	2	<1	<1	<1	<1	1	2	7	7	4	2	2
Sodium																		
Potassium																		
Hexavalent Chromium	33	220	250	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	3.3	2.2	0.7	0.8	1.0	<0.3	0.6	<3
Nitrate as NO_3																		
Sulphate - soluble 2:1 extract																		
Sulphate																		
Chloride - soluble																		
Free Cyanide*	36 (4)	34**		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cyanide*				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphide *																		
Water Soluble Sulphate				0.027	0.075	0.044	0.050	0.029	0.011	0.056	0.096	0.082	0.317	0.076	0.011	0.164	0.153	0.178
Acid Soluble Sulphide				<50	<50	<50	<50	<50	<50	<50	<50	<50	450	<50	<50	<50	<50	85
Thiocyanate*				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Complex cyanide				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Sulphur																		
Total Sulphate				386	859	689	1460	710	484	2190	912	1331	2354	4527	2910	3198	1765	2559
Elemental Sulphur				<50	<50	<50	<50	<50	<50	<50	<50	<50	484	<50	<50	<50	<50	<50
Ammoniacal Nitrogen as N				5.2	10.3	16.0	0.5	18.6	18.7	14.6	23.3	<0.3	1.2	0.5	20.2	3.1	1.5	<0.3
Amm N2/Tot Ammonia as NH4 low																		

Haulbowline Factory Site
Solid Analysis Results

				176-179 (1)	180-183 (1)	184-187 (1)	65-68 (1)	189-191 (1)	192-194 (1)	195-198 (1)	199-202 (1)	69-72 (1)	81-84 (1)	85-88 (1)	203-205 (1)	290-293 (1)	294-297 (1)	298-301 (1)
				TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113-01	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01
				2.5-2.7	0.6	1.5	1.2	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00	3.5	0.8	3.0	0.0-1.0	3.0-3.3	1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - clay with brick frag	MG - sand with brick, concrete and steel pipe	MG - sand with brick, concrete and steel pipe	MG - silt (dredged fill)	MG - clay	MG - sand with brick frag and concrete	MG - limestone boulders, sand and brick frag	organic clay	MG - slag and quarry fill	MG - clay with wire, steel and furnace slag	MG - silt with slag and furnace brick	MG - silt with slag and furnace brick	MG - slag	MG - C & D waste	MG - hardcore and sadn with brick frag
				17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	18/08/05	18/08/05	17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	18/08/05	19/08/05	19/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Asbestos screen*																		
Speciated Phenols by HPLC																		
Resorcinol																		
Catechol																		
Phenol																		
m/p-cresol		9910**																
o-cresol		9910**																
Total cresols		9910**																
Xylenols																		
1-naphthol																		
2,3,5-trimethyl phenol																		
2-isopropylphenol																		
Total Phenols	760	760																
Phenols Total Monohydric	760	760		<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	<0.01	<0.01	<0.01
Natural Moisture Content																		
pH Value				8.21	8.83	8.36	8.30	8.26	8.24	10.28	8.31	8.28	7.57	9.76	10.56	9.21	8.24	8.02
Solvent Extract				<100	179	102	2208	374	275	1418	1094	2373	22568	20128	488	533	365	844
Total Extractable Hydrocarbons				<10	171	54	<10	120	<10	738	239	104	1266	409	195	255	176	215
TPHCWG - Aliphatics																		
Aliphatics >C5-C6	3200	95000																
Aliphatics >C6-C8	7800	150000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	2000	14000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	9700	21000		<10	<10	<10	<10	<10	<10	<10	<10	<10	25	<10	<10	<10	<10	<10
Aliphatics >C12-C16	59000	25000		<10	<10	<10	<10	<10	<10	<10	<10	<10	233	<10	<10	<10	<10	17
Aliphatics >C16-C21	1600000	450000		<10	<10	<10	<10	13	<10	<10	17	<10	511	55	18	16	<10	38
Aliphatics >C21-C35	1600000	450000		<10	29	<10	<10	41	<10	232	102	<10	97	109	58	64	29	27
Aliphatics >C35-C40	1600000	450000		<10	<10	<10	<10	<10	<10	57	<10	<10	<10	<10	<10	<10	<10	<10
Total Aliphatics >C6-C40 (Min Oils)				<10	39	<10	<10	55	<10	298	119	<10	866	164	76	80	33	82
TPHCWG - Aromatics																		
Aromatics >EC5-EC7	26000	76000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	56000	87000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C8-C10	3500	7200		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C10-C12	16000	9200		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C12-C16	36000	10000		<10	<10	<10	<10	<10	<10	<10	<10	<10	20	<10	<10	<10	<10	<10
Aromatics >C16-C21	28000	7600		<10	23	<10	<10	<10	<10	<10	<10	<10	90	11	<10	26	<10	14
Aromatics >C21-C40	28000	7800		<10	85	21	<10	<10	<10	81	54	<10	67	27	25	<10	29	37
Total Aromatics >C5-C40	28000	7800		<10	108	27	<10	<10	<10	90	62	<10	177	38	35	36	35	51
Total TPH >C5-C40				<10	147	27	<10	55	<10	388	182	<10	1043	202	111	116	68	133
BTEX/MTBE GC-FID																		
MTBE		15600**																

Haulbowline Factory Site

Solid Analysis Results

				176-179 (1)	180-183 (1)	184-187 (1)	65-68 (1)	189-191 (1)	192-194 (1)	195-198 (1)	199-202 (1)	69-72 (1)	81-84 (1)	85-88 (1)	203-205 (1)	290-293 (1)	294-297 (1)	298-301 (1)
				TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113-01	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01
				2.5-2.7	0.6	1.5	1.2	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00	3.5	0.8	3.0	0.0-1.0	3.0-3.3	1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - clay with brick frag	MG - sand with brick, concrete and steel pipe	MG - sand with brick, concrete and steel pipe	MG - silt (dredged fill)	MG - clay	MG - sand with brick frag and concrete	MG - limestone boulders, sand and brick frag	organic clay	MG - slag and quarry fill	MG - clay with wire, steel and furnace slag	MG - silt with slag and furnace brick	MG - silt with slag and furnace brick	MG - slag	MG - C & D waste	MG - hardcore and sadn with brick frag
				17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	18/08/05	18/08/05	17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	18/08/05	19/08/05	19/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Benzene	27	90	230															
Toluene	56000	87000																
Ethyl benzene	5700	17000																
m/p-Xylene	5900	170000																
o-Xylene	6600	17000																
Total Xylenes	312**	14500**																
PAH 17 MS																		
Naphthalene	190	1200		0.050	0.370	0.970	0.190	0.110	0.050	0.050	0.050	0.900	0.830	0.560	0.340	1.110	0.430	0.600
Acenaphthylene	83000	29000		<0.05	0.12	0.21	0.08	<0.05	<0.05	<0.05	<0.05	0.52	0.57	0.14	0.08	0.21	0.17	0.22
Acenaphthene	84000	29000		<0.05	0.19	0.53	0.15	0.06	<0.05	<0.05	<0.05	0.74	1.12	0.20	0.13	0.68	0.31	0.31
Fluorene	63000	20000		<0.05	0.16	0.52	<0.05	<0.05	<0.05	<0.05	<0.05	1.61	0.11	<0.05	0.07	0.45	0.14	0.43
Phenanthrene	22000	6200		<0.05	1.47	3.41	0.21	0.28	<0.05	0.19	0.11	10.85	6.58	0.83	1.75	2.79	1.80	6.82
Anthracene	520000	150000		<0.05	0.20	0.43	<0.05	0.05	<0.05	<0.05	<0.05	1.48	1.80	0.13	<0.05	0.38	0.32	1.06
Fluoranthene	23000	6300		<0.05	2.06	3.53	0.17	0.21	<0.05	0.18	0.17	12.76	10.10	0.87	1.60	3.27	2.96	8.75
Pyrene	54000	15000		<0.05	1.85	2.45	0.10	0.18	<0.05	0.18	0.14	8.56	9.73	0.67	1.31	2.96	2.61	7.21
Benz(a)anthracene	170	49		<0.05	1.28	1.11	<0.05	0.10	<0.05	0.08	<0.05	4.20	4.85	0.22	0.36	1.53	1.48	4.42
Chrysene	350	93		<0.05	1.26	1.39	<0.05	0.13	<0.05	0.09	<0.05	5.73	5.44	0.25	0.46	1.40	1.60	4.38
Benzo(bk)fluoranthene	44	13																
Benzo(b)fluoranthene	44	13		<0.05	1.11	1.18	<0.05	0.10	<0.05	<0.05	<0.05	4.03	4.08	<0.05	0.17	1.29	1.46	3.76
Benzo(k)fluoranthene	1200	370		<0.05	0.32	0.27	<0.05	<0.05	<0.05	<0.05	<0.05	1.26	1.30	<0.05	0.05	0.33	0.45	1.00
Benzo(a)pyrene	35	11	21	<0.05	1.02	1.04	<0.05	0.09	<0.05	<0.05	<0.05	3.60	4.13	<0.05	0.18	1.28	1.42	3.31
Indeno(123cd)pyrene	500	150		<0.05	0.69	0.66	<0.05	<0.05	<0.05	<0.05	<0.05	1.86	3.04	<0.05	0.11	0.78	1.07	1.94
Dibenzo(ah)anthracene	3.5	1.1		<0.05	0.13	0.18	<0.05	<0.05	<0.05	<0.05	<0.05	0.40	0.62	<0.05	<0.05	0.21	0.25	0.36
Benzo(ghi)perylene	3900	1400		<0.05	0.64	0.55	<0.05	<0.05	<0.05	<0.05	<0.05	1.81	2.86	<0.05	0.09	0.78	0.96	1.80
Coronene																		
PAH Total				<0.05	12.87	18.43	0.90	1.31	<0.05	0.72	0.42	60.31	57.16	3.87	6.70	19.45	17.43	46.37
PCB (7 congeners)																		
PCB 28																		
PCB 52																		
PCB 101																		
PCB 118																		
PCB 138																		
PCB 153																		
PCB 180																		
Total 7 PCBs	0.24 (5)	0.008 (5)																
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)		<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	0.019	<0.001	0.026	<0.001	0.033
Dioxins & Furans																		
Fraction of Organic Carbon					0.023		0.004	0.011	0.003									
VOCs																		
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				176-179 (1)	180-183 (1)	184-187 (1)	65-68 (1)	189-191 (1)	192-194 (1)	195-198 (1)	199-202 (1)	69-72 (1)	81-84 (1)	85-88 (1)	203-205 (1)	290-293 (1)	294-297 (1)	298-301 (1)
				TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113-01	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01
				2.5-2.7	0.6	1.5	1.2	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00	3.5	0.8	3.0	0.0-1.0	3.0-3.3	1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - clay with brick frag	MG - sand with brick, concrete and steel pipe	MG - sand with brick, concrete and steel pipe	MG - silt (dredged fill)	MG - clay	MG - sand with brick frag and concrete	MG - limestone boulders, sand and brick frag	organic clay	MG - slag and quarry fill	MG - clay with wire, steel and furnace slag	MG - silt with slag and furnace brick	MG - silt with slag and furnace brick	MG - slag	MG - C & D waste	MG - hardcore and sadn with brick frag
				17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	18/08/05	18/08/05	17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	18/08/05	19/08/05	19/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
1,1-Dichloropropene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	27	90	230	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromobenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000						<0.001	<0.001	0.002	<0.001	0.004	<0.001	0.002	<0.001	0.001	0.004	<0.001
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	190	1200		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000		<0.001	<0.001	<0.001		<0.001	<0.001	0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.001	0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				176-179 (1)	180-183 (1)	184-187 (1)	65-68 (1)	189-191 (1)	192-194 (1)	195-198 (1)	199-202 (1)	69-72 (1)	81-84 (1)	85-88 (1)	203-205 (1)	290-293 (1)	294-297 (1)	298-301 (1)
				TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113-01	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01
				2.5-2.7	0.6	1.5	1.2	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00	3.5	0.8	3.0	0.0-1.0	3.0-3.3	1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - clay with brick frag	MG - sand with brick, concrete and steel pipe	MG - sand with brick, concrete and steel pipe	MG - silt (dredged fill)	MG - clay	MG - sand with brick frag and concrete	MG - limestone boulders, sand and brick frag	organic clay	MG - slag and quarry fill	MG - clay with wire, steel and furnace slag	MG - silt with slag and furnace brick	MG - silt with slag and furnace brick	MG - slag	MG - C & D waste	MG - hardcore and sadn with brick frag
				17/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	18/08/05	18/08/05	17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	18/08/05	19/08/05	19/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
p/m-Xylene	5900	170000		0.001	0.001	0.001		<0.001	<0.001	0.003	<0.001	0.007	<0.001	0.003	<0.001	0.002	0.006	<0.001
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		<0.001	<0.001	<0.001				0.002		0.008		0.004	0.001	0.003	0.005	0.003
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001
Trichlorofluoromethane				<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes

1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead

** Atrisk park GAC utilised

VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

				302-305 (1)	89-92 (1)	93-96 (1)	306-309 (1)	310-313 (1)	314-317 (1)	318-321 (1)	322-325 (1)			508-511	519-522	523-525	531-534	535-538
				TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	TP119-03	TP122-01	TP122-02	TP133-01	TP133-04	TP134-01	TP134-03	TP134-04
				2.5	0.0-1.0	0.0-0.9	1.1	2.0-2.5	0.4-0.7	1.7	2.2	1.0-2.0	3.0-3.8	0.0-0.7	3.5	0.0,-1.0	3.0	3.6
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	organic silt	MG - gravel, sands	MG - slag	MG - slag with furnace brick, concrete and steel	MG - slag with furnace brick, concrete and steel	MG - sand	MG - sand limestone fill with brick & concrete frag	MG - sand limestone fill with brick & concrete frag	MG - silt	MG silt	MG - clay with brick rubble	MG - slag with steel and furnace brick - strong HC odour	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick
				17/08/05	16/08/05	15/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	17/08/05	17/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05			23/08/05	23/08/05	23/08/05	23/08/05	23/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	Fact Geo Env rep 2005 WYG Appendix I	Fact Geo Env rep 2005 WYG Appendix I	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Arsenic	640	170	170	3	48	18	34	48	36	44		6	5	12	34	27		***842***
Cadmium	190	532	880	<1	3	<1	2	3	1	<1		<1	<1	<1	3	<1		8
Chromium	8600	33000		21	108	691	758	641	250	158		50	27	35	29	180		25
Copper	68000	44000		5	755	409	293	910	326	408		13	10	70	1348	245		2161
Mercury	1100	240		<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	3	2		199
Nickel	1800 (4)	922**		16	54	78	105	111	103	135		26	20	24	33	48		52
Lead	4640 (4)	477**	1300	23	***790***	255	444	***579***	434	242		46	***482***	277	***4330***	474		***9555***
Selenium	12000	1800		<3	<3	<3	10	<3	<3	<3		<3	<3	<3	<3	<3		<3
Zinc	730000	170000		57	2934	500	1027	1273	779	460		105	110	492	6213	911		6358
Barium		1570**																
Cobalt																		
Manganese																		
Molybdenum																		
Aluminium																		
Antimony		831**																
Calcium																		
Iron																		
Magnesium																		
Thallium																		
Tin																		
Vanadium	9000	5000		19	41	211	237	142	66	25		22	22	20	27	62		35
Water Soluble Boron	240000	46000		3	2	9	10	16	2	3		<1	<1	<1	1	<1		1
Sodium																		
Potassium																		
Hexavalent Chromium	33	220	250	<0.3	<3	0.4	<0.3	<0.3	0.3	4.3		<0.3	<0.3	<0.3	0.4	1.4		<3
Nitrate as NO_3																		
Sulphate - soluble 2:1 extract																		
Sulphate																		
Chloride - soluble																		
Free Cyanide*	36 (4)	34**		<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1		<1
Total Cyanide*				<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1		<1
Sulphide *																		
Water Soluble Sulphate				0.446	0.080	0.099	0.116	0.446	0.139	0.206		0.17	0.207	0.054	1.006	0.080		0.223
Acid Soluble Sulphide				<50	<50	<50	<50	<50	<50	<50		<50	<50	<50	427	<50		<50
Thiocyanate*				<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1		<1
Complex cyanide				<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1		<1
Total Sulphur																		
Total Sulphate				2173	1546	2784	3183	3589	2874	1401		1809	2273	1251	5191	1519		4188
Elemental Sulphur				<50	<50	<50	<50	<50	<50	<50		<50	<50	<50	<50	<50		<50
Ammoniacal Nitrogen as N				4.3	<0.3	4.4	3.6	<0.3	0.9	<0.3		29.2	23.8	<5.5	<5.5	7.6		
Amm N2/Tot Ammonia as NH4 low																		

Haulbowline Factory Site

Solid Analysis Results

				302-305 (1)	89-92 (1)	93-96 (1)	306-309 (1)	310-313 (1)	314-317 (1)	318-321 (1)	322-325 (1)			508-511	519-522	523-525	531-534	535-538
				TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	TP119-03	TP122-01	TP122-02	TP133-01	TP133-04	TP134-01	TP134-03	TP134-04
				2.5	0.0-1.0	0.0-0.9	1.1	2.0-2.5	0.4-0.7	1.7	2.2	1.0-2.0	3.0-3.8	0.0-0.7	3.5	0.0,-1.0	3.0	3.6
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	organic silt	MG - gravel, sands	MG - slag	MG - slag with furnace brick, concrete and steel	MG - slag with furnace brick, concrete and steel	MG - sand	MG - sand limestone fill with brick & concrete frag	MG - sand limestone fill with brick & concrete frag	MG - silt	MG silt	MG - clay with brick rubble	MG - slag with steel and furnace brick - strong HC odour	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick
				17/08/05	16/08/05	15/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	17/08/05	17/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05			23/08/05	23/08/05	23/08/05	23/08/05	23/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	Fact Geo Env rep 2005 WYG Appendix I	Fact Geo Env rep 2005 WYG Appendix I	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Asbestos screen*												NFD	NFD					
Speciated Phenols by HPLC																		
Resorcinol																		
Catechol																		
Phenol																		
m/p-cresol		9910**																
o-cresol		9910**																
Total cresols		9910**																
Xylenols																		
1-naphthol																		
2,3,5-trimethyl phenol																		
2-isopropylphenol																		
Total Phenols	760	760																
Phenols Total Monohydric	760	760		<0.01	<0.01	0.03	<0.01	<0.01	0.01	<0.01		<0.01	<0.01	0.03	0.05	<0.01		0.03
Natural Moisture Content																		
pH Value				7.85	8.29	10.47	10.03	9.52	11.06	8.64		8.05	8.03	8.22	7.19	8.19		7.56
Solvent Extract				761	24457	13225	681	541	4251	113		170	427	2719	3398	1484		1382
Total Extractable Hydrocarbons				29	277	393	1138	529	380	212				316	9269	307		4699
TPHCWG - Aliphatics																		
Aliphatics >C5-C6	3200	95000																
Aliphatics >C6-C8	7800	150000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		<10
Aliphatics >C8-C10	2000	14000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		<10
Aliphatics >C10-C12	9700	21000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		35
Aliphatics >C12-C16	59000	25000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	645	36		582
Aliphatics >C16-C21	1600000	450000		<10	17	35	104	55	25	24		<10	<10	<17	1746	112		829
Aliphatics >C21-C35	1600000	450000		<10	81	119	471	214	111	41		<10	<10	276	721	84		398
Aliphatics >C35-C40	1600000	450000		<10	<10	<10	63	<10	<10	<10		<10	<10	14	57	12		<10
Total Aliphatics >C6-C40 (Min Oils)				<10	98	45	638	273	140	69		<10	<10	309	3168	243		1853
TPHCWG - Aromatics																		
Aromatics >EC5-EC7	26000	76000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		<10
Aromatics >C7-C8	56000	87000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		<10
Aromatics >C8-C10	3500	7200		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		<10
Aromatics >C10-C12	16000	9200		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	<10	<10		<10
Aromatics >C12-C16	36000	10000		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10	322	<10		105
Aromatics >C16-C21	28000	7600		<10	<10	<10	34	16	<10	<10		<10	<10	13	944	30		492
Aromatics >C21-C40	28000	7800		<10	41	24	146	70	53	<10		<10	<10	38	453	29		423
Total Aromatics >C5-C40	28000	7800		<10	50	31	180	86	62	<10		<10	<10	51	1726	62		1022
Total TPH >C5-C40				<10	148	75	818	359	202	69		<10	<10	359	4894	305		2875
BTEX/MTBE GC-FID																		
MTBE		15600**																

Haulbowline Factory Site

Solid Analysis Results

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				TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	TP119-03	TP122-01	TP122-02	TP133-01	TP133-04	TP134-01	TP134-03	TP134-04
				2.5	0.0-1.0	0.0-0.9	1.1	2.0-2.5	0.4-0.7	1.7	2.2	1.0-2.0	3.0-3.8	0.0-0.7	3.5	0.0,-1.0	3.0	3.6
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	organic silt	MG - gravel, sands	MG - slag	MG - slag with furnace brick, concrete and steel	MG - slag with furnace brick, concrete and steel	MG - sand	MG - sand limestone fill with brick & concrete frag	MG - sand limestone fill with brick & concrete frag	MG - silt	MG silt	MG - clay with brick rubble	MG - slag with steel and furnace brick - strong HC odour	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick
				17/08/05	16/08/05	15/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	17/08/05	17/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05			23/08/05	23/08/05	23/08/05	23/08/05	23/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	Fact Geo Env rep 2005 WYG Appendix I	Fact Geo Env rep 2005 WYG Appendix I	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Benzene	27	90	230															
Toluene	56000	87000																
Ethyl benzene	5700	17000																
m/p-Xylene	5900	170000																
o-Xylene	6600	17000																
Total Xylenes	312**	14500**																
PAH 17 MS																		
Naphthalene	190	1200		0.130	0.850	0.420	0.550	0.580	0.140	0.200		0.050	0.050	0.680	0.990	0.760		1.520
Acenaphthylene	83000	29000		0.07	0.15	0.20	0.24	0.14	0.13	0.12		<0.05	<0.05	0.07	0.28	0.06		0.58
Acenaphthene	84000	29000		0.11	0.19	0.32	0.37	0.24	0.22	0.11		<0.05	<0.05	0.14	0.32	0.16		1.19
Fluorene	63000	20000		<0.05	<0.05	0.11	0.13	0.07	0.09	<0.05		<0.05	<0.05	0.09	0.12	0.07		0.74
Phenanthrene	22000	6200		0.15	0.75	1.37	2.02	1.47	1.40	0.37		<0.05	0.16	1.17	1.80	1.20		8.73
Anthracene	520000	150000		<0.05	0.18	0.22	0.33	0.29	0.26	0.06		<0.05	<0.05	0.17	0.57	0.23		1.41
Fluoranthene	23000	6300		0.13	1.54	1.82	3.42	2.58	1.92	0.44		0.05	0.12	1.43	2.86	2.49		16.01
Pyrene	54000	15000		0.09	0.96	1.20	2.79	2.03	1.53	0.28		0.05	0.11	1.16	2.26	2.31		12.26
Benz(a)anthracene	170	49		<0.05	0.32	0.38	1.42	1.10	0.51	<0.05		<0.05	<0.05	0.48	1.14	0.93		5.43
Chrysene	350	93		<0.05	0.40	0.42	1.76	1.50	0.55	<0.05		<0.05	<0.05	0.65	1.40	1.01		5.53
Benzo(bk)fluoranthene	44	13																
Benzo(b)fluoranthene	44	13		<0.05	0.43	0.34	1.22	1.21	0.59	<0.05		<0.05	<0.05	0.43	0.80	0.95		5.97
Benzo(k)fluoranthene	1200	370		<0.05	0.11	0.11	0.31	0.40	0.17	<0.05		<0.05	<0.05	0.07	0.15	0.16		1.74
Benzo(a)pyrene	35	11	21	<0.05	0.44	0.37	1.19	1.15	0.67	<0.05		<0.05	<0.05	0.43	0.73	0.88		5.83
Indeno(123cd)pyrene	500	150		<0.05	0.39	0.31	1.14	0.96	0.52	<0.05		<0.05	<0.05	0.05	0.26	0.80		4.54
Dibenzo(ah)anthracene	3.5	1.1		<0.05	0.07	<0.05	0.22	0.18	0.10	<0.05		<0.05	<0.05	<0.05	0.06	0.12		**1.25**
Benzo(ghi)perylene	3900	1400		<0.05	0.42	0.32	1.10	0.92	0.55	<0.05		<0.05	<0.05	0.05	0.21	0.73		4.51
Coronene																		
PAH Total				0.68	7.20	7.91	18.21	14.82	9.35	1.58		0.10	0.39	6.97	13.95	12.86		77.24
PCB (7 congeners)																		
PCB 28																		
PCB 52																		
PCB 101																		
PCB 118																		
PCB 138																		
PCB 153																		
PCB 180																		
Total 7 PCBs	0.24 (5)	0.008 (5)																
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)		0.02	0.32	0.007	0.122	0.071	<0.001	0.041		<0.001	<0.001	0.044	0.152	<0.001		<0.001
Dioxins & Furans																		
Fraction of Organic Carbon					0.058	0.030					0.011						0.343	
VOCs																		
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001

Haulbowline Factory Site

Solid Analysis Results

				302-305 (1)	89-92 (1)	93-96 (1)	306-309 (1)	310-313 (1)	314-317 (1)	318-321 (1)	322-325 (1)			508-511	519-522	523-525	531-534	535-538
				TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	TP119-03	TP122-01	TP122-02	TP133-01	TP133-04	TP134-01	TP134-03	TP134-04
				2.5	0.0-1.0	0.0-0.9	1.1	2.0-2.5	0.4-0.7	1.7	2.2	1.0-2.0	3.0-3.8	0.0-0.7	3.5	0.0,-1.0	3.0	3.6
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	organic silt	MG - gravel, sands	MG - slag	MG - slag with furnace brick, concrete and steel	MG - slag with furnace brick, concrete and steel	MG - sand	MG - sand limestone fill with brick & concrete frag	MG - sand limestone fill with brick & concrete frag	MG - silt	MG silt	MG - clay with brick rubble	MG - slag with steel and furnace brick - strong HC odour	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick
				17/08/05	16/08/05	15/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	17/08/05	17/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05			23/08/05	23/08/05	23/08/05	23/08/05	23/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	Fact Geo Env rep 2005 WYG Appendix I	Fact Geo Env rep 2005 WYG Appendix I	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Benzene	27	90	230	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001		<0.001	<0.001	<0.001	0.007	<0.001		0.005
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Carbon Disulphide	11	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Chloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Ethylbenzene	5700	17000		0.001	0.001	0.002	0.001	0.001	<0.001	<0.001		0.002	0.001	<0.001	<0.001	<0.001		<0.001
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Naphthalene	190	1200		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
o-Xylene	6600	17000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.001	<0.001	<0.001	<0.001	<0.001		<0.001

Haulbowline Factory Site
Solid Analysis Results

				302-305 (1)	89-92 (1)	93-96 (1)	306-309 (1)	310-313 (1)	314-317 (1)	318-321 (1)	322-325 (1)			508-511	519-522	523-525	531-534	535-538
				TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	TP119-03	TP122-01	TP122-02	TP133-01	TP133-04	TP134-01	TP134-03	TP134-04
				2.5	0.0-1.0	0.0-0.9	1.1	2.0-2.5	0.4-0.7	1.7	2.2	1.0-2.0	3.0-3.8	0.0-0.7	3.5	0.0,-1.0	3.0	3.6
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	organic silt	MG - gravel, sands	MG - slag	MG - slag with furnace brick, concrete and steel	MG - slag with furnace brick, concrete and steel	MG - sand	MG - sand limestone fill with brick & concrete frag	MG - sand limestone fill with brick & concrete frag	MG - silt	MG silt	MG - clay with brick rubble	MG - slag with steel and furnace brick - strong HC odour	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick	MG - clay with slag, steel, red and furnce brick
				17/08/05	16/08/05	15/08/05	17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	17/08/05	17/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05			23/08/05	23/08/05	23/08/05	23/08/05	23/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	Fact Geo Env rep 2005 WYG Appendix I	Fact Geo Env rep 2005 WYG Appendix I	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
p/m-Xylene	5900	170000		0.001	0.002	0.004	0.003	0.003	0.001	<0.001		0.005	0.004	<0.001	<0.001	<0.001		<0.001
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	0.25	<0.001		0.064
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Toluene	56000	87000		0.003	0.003	0.003	0.003	0.004	0.001	<0.001		0.003	0.002	<0.001	0.008	0.007		0.009
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Trichloroethene	1.2	70		<0.001	0.003	<0.001	<0.001	0.002	<0.001	0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

						NAVAL	NAVAL			NAVAL	NAVAL							
				4082/46-48	4082/43-45	4082/49-51	4082/55-57	4082/52-57	4082/84-86	4082/58-60	4082/61-63	4082/64-66	4082/67-72	4082/73-75	4082/19-21	4082/22-24	4082/40-42	4082/37-39
				TP201	TP202	TP203	TP204	TP205	TP206	TP207	TP208	TP209	TP210	TP211	TP212	TP213	TP214	TP215
				1.8	1.05	1.0-1.95	1.3	1.3	1.0-1.8	1.3	1.9	1.4	0.9	1.6-2.4	0.5-1.0	0.1-1.0	2.4	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-sand with concrete	MG-clinker fill with concrete, stone an grave;	MG-clay with red brick	MG, brick and concrete in silt	Fill - coarse gravel	MG- sand with concrete, clinker	MG - silt with concrete frag	MG - gravelly sand	MG- silt with concrete blocks and concrete fill	MG- silt with concrete and bricks	MG, yellow and red brick, steel	MG silt and gravel	MG silt with concrete and bricks	MG - brick, rubble, clinker and fire bricks	MG- clay with red brick frag
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
Parameter																		
Arsenic	640	170	170	6.9	<0.5	12.3	79.5	5.2	7.9	11.3	36.6	14.5	58.9	17.4	10.2	5.3	144.6	6.3
Cadmium	190	532	880	2.8	1.9	1.9	32.1	<0.1	8.9	0.4	<0.1	0.5	2	1.2	0.1	0.8	1.4	0.2
Chromium	8600	33000		185.9	1269	129.9	527.5	26.2	564	37.3	111	35.4	238.3	160.5	35	42.7	257.4	43.8
Copper	68000	44000		58	172	62	429	19	154	57	519	74	1883	321	26	41	759	20
Mercury	1100	240		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.4	0.7	0.4
Nickel	1800 (4)	922**		26.2	54.6	31.9	95.5	34	51.7	46.9	157.5	53.7	323	98	21.8	33.6	215.2	19.7
Lead	4640 (4)	477**	1300	155	211	164	***5741***	19	**634**	76	82	28	228	169	81	73	**1290**	162
Selenium	12000	1800		3	10	2	4	1	7	2	3	1	8	3	1	1	7	<1
Zinc	730000	170000		739	526	470	8925	81	2497	266	188	255	1437	1149	107	344	829	114
Barium		1570**		127	365	82	328	16	277	52	31	185	52	138	51	67	429	38
Cobalt				6.6	11.9	9.8	14.6	10	11.5	12.3	23.3	12.8	58.5	19.9	6.7	7.3	45.5	6.5
Manganese				3054	12660	1460	4555	627	7213	874	1396	783	2736	1637	550	754	4327	407
Molybdenum				2.3	14.3	8.9	9.7	0.6	6.2	1.5	18.8	9.5	61.4	12.7	0.7	1.8	17.1	0.9
Aluminium				9192	18030	12440	10040	13600	17020	16200	14120	11460	1122	9184	12090	7652	11510	8860
Antimony		831**		<1.0	<1.0	<1.0	31	<1	<1	<1	<1	<1	<1	<1	<1	2	<1	<1
Calcium				125900	105600	61720	63890	5610	66740	17660	3249	20060	4142	34340	61080	137700	24890	52580
Iron				30670	94020	33890	96790	29030	75530	48050	120200	42320	706600	145100	22270	21340	269900	17780
Magnesium				8086	18670	7265	12180	7091	12540	6288	4699	5471	1078	4377	5327	8558	7189	4366
Thallium				3	18	1	6	<1	9	<1	2	<1	5	2	<1	<1	6	<1
Tin				7	12	10	194	<1	19	11	42	7	158	49	3	3	124	2
Vanadium	9000	5000		36	147	36	175	16	73	22	26	17	29	46	29	16	68	17
Water Soluble Boron	240000	46000		3.7	12.6	2.2	4	0.3	6.9	1.9	0.8	1	0.8	3.1	6.7	2.7	2.9	2.8
Sodium				452	368	404	462	92	294	183	112	129	136	382	489	180	1163	252
Potassium				995	913	1409	1043	393	715	485	394	617	108	733	1671	700	718	938
Hexavalent Chromium	33	220	250	0.3	2	<0.3	2.3	0.4	0.5	0.4	1.8	0.7	2.9	0.9	<0.3	<0.3	2.9	<0.3
Nitrate as NO_3				6.1	9.2	4.6	11.3	<2	<2	9.9	19	4	38	<2	4.2	<2	8.1	30.8
Sulphate - soluble 2:1 extract																		
Sulphate																		
Chloride - soluble				93	155	20	65	12	59	57	35	47	75	715	67	28	75	21
Free Cyanide*	36 (4)	34**		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Cyanide*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide *				<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	21	<10	<10	<10	<10
Water Soluble Sulphate				0.261	0.095	0.448	1.706	0.071	0.17	0.121	0.203	0.428	0.139	0.3	0.376	0.277	0.159	0.193
Acid Soluble Sulphide																		
Thiocyanate*				<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Complex cyanide				<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Total Sulphur				0.12	0.1	0.13	0.84	0.02	0.11	0.04	0.03	0.07	0.04	0.13	0.11	0.15	0.1	0.14
Total Sulphate																		
Elemental Sulphur																		
Ammoniacal Nitrogen as N				0.5	<0.4	1	1	0.6	1.2	0.5	0.8	1.2	1	1.1	1.1	0.7	<0.4	<0.4
Amm N2/Tot Ammonia as NH4 low																		

Haulbowline Factory Site

Solid Analysis Results

				4082/46-48	4082/43-45	4082/49-51	4082/55-57	4082/52-57	4082/84-86	4082/58-60	4082/61-63	4082/64-66	4082/67-72	4082/73-75	4082/19-21	4082/22-24	4082/40-42	4082/37-39
				TP201	TP202	TP203	TP204	TP205	TP206	TP207	TP208	TP209	TP210	TP211	TP212	TP213	TP214	TP215
				1.8	1.05	1.0-1.95	1.3	1.3	1.0-1.8	1.3	1.9	1.4	0.9	1.6-2.4	0.5-1.0	0.1-1.0	2.4	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-sand with concrete	MG-clinker fill with concrete, stone an grave;	MG-clay with red brick	MG, brick and concrete in silt	Fill - coarse gravel	MG- sand with concrete, clinker	MG - silt with concrete frag	MG - gravelly sand	MG- silt with concrete blocks and concrete fill	MG- silt with concrete and bricks	MG, yellow and red brick, steel	MG silt and gravel	MG silt with concrete and bricks	MG - brick, rubble, clinker and fire bricks	MG- clay with red brick frag
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
Parameter																		
Asbestos screen*				NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Speciated Phenols by HPLC																		
Resorcinol																		
Catechol																		
Phenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m/p-cresol		9910**																
o-cresol		9910**																
Total cresols		9910**																
Xylenols																		
1-naphthol																		
2,3,5-trimethyl phenol																		
2-isopropylphenol																		
Total Phenols	760	760		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenols Total Monohydric	760	760																
Natural Moisture Content				14.3	7.9	22.1	13.6	5.6	9.4	8.6	6	7.6	10.7	14.3	32.5	13.5	13.2	24.1
pH Value				10.23	11.37	8.44	9.52	9.51	10.42	10.41	8.61	8.69	8.33	7.89	8.13	10.06	9.04	8.26
Solvent Extract																		
Total Extractable Hydrocarbons																		
TPHCWG - Aliphatics																		
Aliphatics >C5-C6	3200	95000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C6-C8	7800	150000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C8-C10	2000	14000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C10-C12	9700	21000		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C12-C16	59000	25000		14	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C16-C21	1600000	450000		23	18	<0.1	16	0.1	25	<0.1	<0.1	<0.1	43	<0.1	<0.1	44	40.0	<0.1
Aliphatics >C21-C35	1600000	450000		49	164	<0.1	77	0.1	105	<0.1	<0.1	<0.1	603	222	<0.1	146	167.0	<0.1
Aliphatics >C35-C40	1600000	450000																
Total Aliphatics >C6-C40 (Min Oils)				86	182	<0.1	93	0.1	130	<0.1	<0.1	<0.1	646	222	<0.1	190	207.0	<0.1
TPHCWG - Aromatics																		
Aromatics >EC5-EC7	26000	76000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C7-C8	56000	87000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C8-C10	3500	7200		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C10-C12	16000	9200		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aromatics >C12-C16	36000	10000		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aromatics >C16-C21	28000	7600		<0.1	<0.1	<0.1	<0.1	<0.1	8	<0.1	<0.1	<0.1	12	22	<0.1	<0.1	44.0	<0.1
Aromatics >C21-C40	28000	7800		20	23	<0.1	52	<0.1	0.1	<0.1	<0.1	<0.1	294	45	<0.1	19	283.0	<0.1
Total Aromatics >C5-C40	28000	7800		20	23	<0.1	52	<0.1	8	<0.1	<0.1	<0.1	306	67	<0.1	19	327.0	<0.1
Total TPH >C5-C40				106	205	<0.1	145	<0.1	138	<0.1	<0.1	<0.1	952	289	<0.1	209	534.0	<0.1
BTEX/MTBE GC-FID																		
MTBE		15600**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Haulbowline Factory Site

Solid Analysis Results

				4082/46-48	4082/43-45	4082/49-51	4082/55-57	4082/52-57	4082/84-86	4082/58-60	4082/61-63	4082/64-66	4082/67-72	4082/73-75	4082/19-21	4082/22-24	4082/40-42	4082/37-39
				TP201	TP202	TP203	TP204	TP205	TP206	TP207	TP208	TP209	TP210	TP211	TP212	TP213	TP214	TP215
				1.8	1.05	1.0-1.95	1.3	1.3	1.0-1.8	1.3	1.9	1.4	0.9	1.6-2.4	0.5-1.0	0.1-1.0	2.4	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-sand with concrete	MG-clinker fill with concrete, stone an grave;	MG-clay with red brick	MG, brick and concrete in silt	Fill - coarse gravel	MG- sand with concrete, clinker	MG - silt with concrete frag	MG - gravelly sand	MG- silt with concrete blocks and concrete fill	MG- silt with concrete and bricks	MG, yellow and red brick, steel	MG silt and gravel	MG silt with concrete and bricks	MG - brick, rubble, clinker and fire bricks	MG- clay with red brick frag
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
Parameter																		
Benzene	27	90	230	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	56000	87000		<0.02	0.1	<0.01	<0.01	<0.01	<0.01	0.01	0.03	<0.01	<0.01	0.01	<0.03	0.02	<0.01	<0.01
Ethyl benzene	5700	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m/p-Xylene	5900	170000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-Xylene	6600	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Xylenes	312**	14500**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH 17 MS																		
Naphthalene	190	1200		<0.001	<0.050	<0.001	<0.270	<0.001	<0.001	<0.180	<0.001	<0.001	0.001	0.050	0.001	0.270	0.001	0.001
Acenaphthylene	83000	29000		<0.070	<0.030	<0.001	<0.780	<0.001	<0.001	<0.030	<0.001	<0.001	0.07	0.03	<0.001	0.78	<0.001	<0.001
Acenaphthene	84000	29000		<0.001	<0.050	<0.001	<0.150	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.05	<0.001	0.15	<0.001	<0.001
Fluorene	63000	20000		<0.001	<0.040	<0.001	<0.180	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.04	<0.001	0.18	<0.001	<0.001
Phenanthrene	22000	6200		<0.250	<0.660	<0.001	<3.620	<0.001	<0.120	<0.300	<0.001	<0.001	0.25	0.66	<0.001	3.62	<0.001	0.12
Anthracene	520000	150000		<0.130	<0.140	<0.001	<1.750	<0.001	<0.001	<0.090	<0.001	<0.001	0.13	0.14	<0.001	1.75	<0.001	<0.001
Fluoranthene	23000	6300		<0.470	<0.850	<0.120	<8.230	<0.001	<0.260	<0.470	<0.001	<0.001	0.47	0.85	0.12	8.23	<0.001	0.26
Pyrene	54000	15000		<0.470	<0.790	<0.120	<6.520	<0.001	<0.210	<0.480	<0.001	<0.001	0.47	0.79	0.12	6.52	<0.001	0.21
Benz(a)anthracene	170	49		<0.300	<0.430	<0.001	<4.920	<0.001	<0.130	<0.350	<0.001	<0.001	0.3	0.43	<0.001	4.92	<0.001	0.13
Chrysene	350	93		<0.430	<0.690	<0.001	<4.660	<0.001	<0.190	<0.480	<0.001	<0.001	0.43	0.69	<0.001	4.66	<0.001	0.19
Benzo(bk)fluoranthene	44	13		<0.770	<0.910	<0.001	<8.700	<0.001	<0.300	<0.850	<0.001	<0.001	0.77	0.91	<0.001	8.7	<0.001	0.3
Benzo(b)fluoranthene	44	13																
Benzo(k)fluoranthene	1200	370																
Benzo(a)pyrene	35	11	21	0.63	0.53	<0.001	4.94	<0.001	0.13	0.41	<0.001	<0.001	<0.001	0.19	0.26	0.49	2.170	0.310
Indeno(123cd)pyrene	500	150		0.87	0.41	<0.001	3.94	<0.001	0.11	0.45	<0.001	<0.001	<0.001	0.19	0.19	0.34	1.530	0.190
Dibenzo(ah)anthracene	3.5	1.1		0.16	0.11	<0.001	0.92	<0.001	<0.001	0.24	<0.001	<0.001	<0.001	0.06	<0.001	0.08	0.420	0.100
Benzo(ghi)perylene	3900	1400		1.05	0.36	<0.001	3.04	<0.001	0.1	0.31	0.001	0.001	<0.001	0.16	0.17	0.26	1.530	0.170
Coronene				0.19	<0.001	<0.001	0.68	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.06	0.380	0.070
PAH Total				5.79	6.05	0.24	53.3	<0.001	1.55	4.64	0.001	0.001	<0.001	3.27	2.9	6.49	32.990	3.430
PCB (7 congeners)																		
PCB 28				<0.001	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01	<0.001	<0.001
PCB 52				<0.001	0.004	<0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.019	<0.001	0.017	<0.001	<0.001
PCB 101				<0.001	0.004	<0.001	0.018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.049	<0.001	0.023	<0.001	<0.001
PCB 118				<0.001	<0.001	<0.001	0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.035	<0.001	0.019	<0.001	<0.001
PCB 138				0.003	0.008	<0.001	0.032	<0.001	0.018	<0.001	<0.001	0.074	<0.001	0.042	<0.001	0.011	<0.001	<0.001
PCB 153				0.006	0.011	<0.001	0.058	<0.001	0.018	<0.001	<0.001	0.107	<0.001	0.069	<0.001	0.019	<0.001	<0.001
PCB 180				0.002	0.008	<0.001	0.012	<0.001	0.019	<0.001	<0.001	0.088	<0.001	0.016	<0.001	0.003	<0.001	<0.001
Total 7 PCBs	0.24 (5)	0.008 (5)		<0.001	0.046	<0.001	0.136	<0.001	0.053	<0.001	0.001	0.268	<0.001	0.23	<0.001	0.103	<0.001	<0.001
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)																
Dioxins & Furans																		
Fraction of Organic Carbon				0.013	-	-	-	-	0.014	-	-	-	-	0.011	-	-	-	-
VOCs																		
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				4082/46-48	4082/43-45	4082/49-51	4082/55-57	4082/52-57	4082/84-86	4082/58-60	4082/61-63	4082/64-66	4082/67-72	4082/73-75	4082/19-21	4082/22-24	4082/40-42	4082/37-39
				TP201	TP202	TP203	TP204	TP205	TP206	TP207	TP208	TP209	TP210	TP211	TP212	TP213	TP214	TP215
				1.8	1.05	1.0-1.95	1.3	1.3	1.0-1.8	1.3	1.9	1.4	0.9	1.6-2.4	0.5-1.0	0.1-1.0	2.4	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-sand with concrete	MG-clinker fill with concrete, stone an grave;	MG-clay with red brick	MG, brick and concrete in silt	Fill - coarse gravel	MG- sand with concrete, clinker	MG - silt with concrete frag	MG - gravelly sand	MG- silt with concrete blocks and concrete fill	MG- silt with concrete and bricks	MG, yellow and red brick, steel	MG silt and gravel	MG silt with concrete and bricks	MG - brick, rubble, clinker and fire bricks	MG- clay with red brick frag
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
Parameter																		
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	27	90	230	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	190	1200		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				4082/46-48	4082/43-45	4082/49-51	4082/55-57	4082/52-57	4082/84-86	4082/58-60	4082/61-63	4082/64-66	4082/67-72	4082/73-75	4082/19-21	4082/22-24	4082/40-42	4082/37-39
				TP201	TP202	TP203	TP204	TP205	TP206	TP207	TP208	TP209	TP210	TP211	TP212	TP213	TP214	TP215
				1.8	1.05	1.0-1.95	1.3	1.3	1.0-1.8	1.3	1.9	1.4	0.9	1.6-2.4	0.5-1.0	0.1-1.0	2.4	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-sand with concrete	MG-clinker fill with concrete, stone an grave;	MG-clay with red brick	MG, brick and concrete in silt	Fill - coarse gravel	MG- sand with concrete, clinker	MG - silt with concrete frag	MG - gravelly sand	MG- silt with concrete blocks and concrete fill	MG- silt with concrete and bricks	MG, yellow and red brick, steel	MG silt and gravel	MG silt with concrete and bricks	MG - brick, rubble, clinker and fire bricks	MG- clay with red brick frag
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
Parameter																		
p/m-Xylene	5900	170000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

														NAVAL	NAVAL	NAVAL	NAVAL
				4082/16-18	4082/76-78	4082/7-9	4082/1-3	4082/4-6	4082/13-15	4082/10-12	4100/4-6	4100/1-3	222-225 (1)	226-229 (1)	97-99,120 (1	100-103 (1)	104-106 (1)	108-111 (1)
				TP216	TP217	TP218	TP219	TP220	TP221	TP222	TP223	TP223	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04
				1.4	0.5	3.6	2.8	1.3	2.3	2	1.8	2	1.5	2.5	1.0	2.0	2.0-3.0	3.0-4.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	clay with HC odour	MG- concrete fragments	clay	limestone	MG- clay	MG- clinker fill with fire bricks	MG - limestone collbers with red brick frag	MG-clay with HC odour	silt	MG - gravel with brick and rubble - quarry fill	MG - gravel with brick and rubble - quarry fill	MG- brick & rubble	MG - clay	MG - clay & organic from 2.4m	MG-organic clay
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	31/08/10	31/08/10	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	02/09/10	02/09/10	19/08/05	19/08/05	18/08/05	18/08/05	18/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
													Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Arsenic	640	170	170	12.4	17.6	13	7.8	16.7	6.4	6.5	13.0	5.8		9	6	9	6	4
Cadmium	190	532	880	0.2	<0.1	0.4	<0.1	0.1	0.5	<0.1	2.1	<0.1		<1	<1	<1	<1	<1
Chromium	8600	33000		17.7	372.1	31.6	18.6	18.7	1158	16.1	46.3	21.6	372	157	31	24	21	31
Copper	68000	44000		13	376	2155	16	31	190	29	46	9	77	58	35	13	15	7
Mercury	1100	240		0.2	<0.1	0.3	0.3	<0.1	<0.1	0.5	0.3	0.1	<1	<1	<1	<1	<1	<1
Nickel	1800 (4)	922**		29.8	109.0	29.9	17.5	31.0	74.4	17.0	29.4	18.5		36	23	30	33	23
Lead	4640 (4)	477**	1300	139	102	454	45	113	254	225	473	18		64	160	42	39	24
Selenium	12000	1800		1	5	2	<1	1	17	<1	2	<1		<3	<3	<3	<3	<3
Zinc	730000	170000		86	320	826	50	99	293	55	296	59	527	264	224	124	90	74
Barium		1570**		21	111	170	22	45	679	26	37	17						
Cobalt				9.3	26.2	9.3	5.2	13.7	15.3	5.1	10.6	5.7						
Manganese				434	3163	1382	302	862	41150	365	1102	341						
Molybdenum				1.8	20.4	1.9	1.0	1.0	7.5	1.2	5.7	2.4						
Aluminium				10780	10180	8473	10390	12390	12020	8050	10200	10510						
Antimony		831**		<1	<1	<1	<1	<1	<1	<1	<1	<1						
Calcium				51150	38190	78900	67720	7166	101100	75320	135200	73490						
Iron				20570	220900	34260	17600	27450	163100	16670	31890	20390						
Magnesium				4670	5276	4499	5379	2689	42510	5175	4625	5426						
Thallium				<1	4	1	<1	<1	<1	<1	1	<1						
Tin				<1	30	13	1	2	21	2	3	6						
Vanadium	9000	5000		19	37	25	22	18	310	16	23	25	68	32	25	23	28	22
Water Soluble Boron	240000	46000		3.9	1.8	3.9	13.9	0.8	26.5	5.3	4	10.9	3	4	<1	2	3	4
Sodium				355	151	1408	1859	82	1779	3991	573	2191						
Potassium				1176	494	807	1719	771	523	1146	1379	1945						
Hexavalent Chromium	33	220	250	<0.3	1.3	1.2	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3	0.5	<0.3	<0.3
Nitrate as NO_3				<2	5	<2	<2	<2	<2	<2	<2	<2						
Sulphate - soluble 2:1 extract																		
Sulphate																		
Chloride - soluble				157	44	2042	1816	14	2542	6252	881	2791						
Free Cyanide*	36 (4)	34**		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1
Total Cyanide*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1
Sulphide *				13	<10	<10	14	<10	<10	14	27	<10						
Water Soluble Sulphate				0.078	0.090	0.295	0.113	0.013	0.267	0.465	0.270	0.238	0.117	0.155	0.005	0.056	0.246	0.163
Acid Soluble Sulphide													<50	<50	<50	<50	<50	96
Thiocyanate*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1
Complex cyanide				<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<1	<1	<1	<1	<1	<1
Total Sulphur				0.47	0.05	0.13	0.76	0.02	0.14	0.59	0.24	0.69						
Total Sulphate													2177	1341	3248	646	1298	1291
Elemental Sulphur													<50	<50	<50	<50	109	120
Ammoniacal Nitrogen as N				1.4	<0.4	1.2	9.2	0.7	0.7	4.0	<0.4	13.7	33.5	22.2	14.2	7.1	10.6	3.9
Amm N2/Tot Ammonia as NH4 low																		

Haulbowline Factory Site
Solid Analysis Results

				4082/16-18	4082/76-78	4082/7-9	4082/1-3	4082/4-6	4082/13-15	4082/10-12	4100/4-6	4100/1-3	222-225 (1)	226-229 (1)	97-99,120 (1	100-103 (1)	104-106 (1)	108-111 (1)
				TP216	TP217	TP218	TP219	TP220	TP221	TP222	TP223	TP223	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04
				1.4	0.5	3.6	2.8	1.3	2.3	2	1.8	2	1.5	2.5	1.0	2.0	2.0-3.0	3.0-4.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	clay with HC odour	MG- concrete fragments	clay	limestone	MG- clay	MG- clinker fill with fire bricks	MG - limestone collbers with red brick frag	MG-clay with HC odour	silt	MG - gravel with brick and rubble - quarry fill	MG - gravel with brick and rubble - quarry fill	MG- brick & rubble	MG - clay	MG - clay & organic from 2.4m	MG-organic clay
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	31/08/10	31/08/10	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	02/09/10	02/09/10	19/08/05	19/08/05	18/08/05	18/08/05	18/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
													Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Asbestos screen*				NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD						
Speciated Phenols by HPLC																		
Resorcinol																		
Catechol																		
Phenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
m/p-cresol		9910**																
o-cresol		9910**																
Total cresols		9910**																
Xylenols																		
1-naphthol																		
2,3,5-trimethyl phenol																		
2-isopropylphenol																		
Total Phenols	760	760		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Phenols Total Monohydric	760	760											0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Natural Moisture Content				24.0	12.4	19.3	31.9	11.3	11.6	38.0	19.3	35.4						
pH Value				7.99	10.27	8.18	8.38	8.42	8.92	8.20	10.79	8.55	11.21	10.03	8.85	8.47	7.89	7.87
Solvent Extract													211	162	731	335	303	236
Total Extractable Hydrocarbons													80	108	48	<10	<10	<10
TPHCWG - Aliphatics																		
Aliphatics >C5-C6	3200	95000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Aliphatics >C6-C8	7800	150000		0.28	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.38	<0.01	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	2000	14000		22.61	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.06	<0.01	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	9700	21000		60.0	<0.1	6.0	<0.1	<0.1	<0.1	<0.1	19	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C12-C16	59000	25000		<0.1	<0.1	64.0	<0.1	<0.1	<0.1	<0.1	95	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21	1600000	450000		<0.1	18.0	84.0	<0.1	<0.1	<0.1	<0.1	188.0	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35	1600000	450000		550.0	165.0	23.0	<0.1	<0.1	<0.1	<0.1	1016.0	<0.1	60	31	<10	<10	<10	<10
Aliphatics >C35-C40	1600000	450000											<10	<10	<10	<10	<10	<10
Total Aliphatics >C6-C40 (Min Oils)				632.9	183.0	177.0	<0.1	<0.1	<0.1	<0.1	1319.4	<0.1	68	31	<10	<10	<10	<10
TPHCWG - Aromatics																		
Aromatics >EC5-EC7	26000	76000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	56000	87000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<10	<10	<10	<10	<10	<10
Aromatics >C8-C10	3500	7200		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<10	<10	<10	<10	<10	<10
Aromatics >C10-C12	16000	9200		11.0	<0.1	1.0	<0.1	<0.1	<0.1	<0.1	10	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >C12-C16	36000	10000		5.0	<0.1	13.0	<0.1	<0.1	<0.1	<0.1	66	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >C16-C21	28000	7600		<0.1	11.0	79.0	<0.1	<0.1	<0.1	<0.1	258	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >C21-C40	28000	7800		<0.1	62.0	243.0	12.0	<0.1	<0.1	<0.1	1752	<0.1	12	<10	25	<10	<10	<10
Total Aromatics >C5-C40	28000	7800		16.0	73.0	336.0	12.0	<0.1	<0.1	<0.1	2086.0	<0.1	12	<10	29	<10	<10	<10
Total TPH >C5-C40				648.9	256.0	513.0	12.0	<0.1	<0.1	<0.1	3405.4	<0.1	80	31	29	<10	<10	<10
BTEX/MTBE GC-FID																		
MTBE		15600**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						

Haulbowline Factory Site

Solid Analysis Results

				4082/16-18	4082/76-78	4082/7-9	4082/1-3	4082/4-6	4082/13-15	4082/10-12	4100/4-6	4100/1-3	222-225 (1)	226-229 (1)	7-99,120 (1	100-103 (1)	104-106 (1)	108-111 (1)
				TP216	TP217	TP218	TP219	TP220	TP221	TP222	TP223	TP223	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04
				1.4	0.5	3.6	2.8	1.3	2.3	2	1.8	2	1.5	2.5	1.0	2.0	2.0-3.0	3.0-4.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	clay with HC odour	MG- concrete fragments	clay	limestone	MG- clay	MG- clinker fill with fire bricks	MG - limestone collbers with red brick frag	MG-clay with HC odour	silt	MG - gravel with brick and rubble - quarry fill	MG - gravel with brick and rubble - quarry fill	MG- brick & rubble	MG - clay	MG - clay & organic from 2.4m	MG-organic clay
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	31/08/10	31/08/10	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	02/09/10	02/09/10	19/08/05	19/08/05	18/08/05	18/08/05	18/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
													Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Benzene	27	90	230	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Toluene	56000	87000		0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Ethyl benzene	5700	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
m/p-Xylene	5900	170000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
o-Xylene	6600	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
Total Xylenes	312**	14500**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01						
PAH 17 MS																		
Naphthalene	190	1200		0.180	0.001	0.001	0.001	0.001	0.001	0.001	0.180	0.001	0.001	0.001	0.200	0.001	0.001	0.001
Acenaphthylene	83000	29000		0.03	<0.001	<0.001	<0.001	<0.001	<0.001	0.03	0.350	<0.001	<0.001	<0.001	0.420	<0.001	<0.001	<0.001
Acenaphthene	84000	29000		<0.001	<0.001	<0.001	<0.001	0.24	<0.001	0.06	0.100	<0.001	<0.001	<0.001	0.070	<0.001	<0.001	<0.001
Fluorene	63000	20000		<0.001	<0.001	<0.001	<0.001	0.19	<0.001	0.05	0.260	<0.001	<0.001	<0.001	0.100	<0.001	<0.001	<0.001
Phenanthrene	22000	6200		0.3	<0.001	<0.001	<0.001	0.42	0.24	0.57	3.270	0.310	<0.001	<0.001	1.430	0.180	0.070	<0.001
Anthracene	520000	150000		0.09	<0.001	<0.001	<0.001	0.13	0.05	0.17	1.530	0.070	<0.001	<0.001	0.720	0.070	<0.001	<0.001
Fluoranthene	23000	6300		0.47	<0.001	<0.001	<0.001	0.45	0.45	1.26	5.950	0.480	<0.001	<0.001	3.450	0.220	0.080	<0.09
Pyrene	54000	15000		0.48	<0.001	<0.001	<0.001	0.37	0.41	1.19	4.560	0.450	<0.001	<0.001	3.190	0.180	0.080	<0.09
Benz(a)anthracene	170	49		0.35	<0.001	<0.001	<0.001	0.19	0.24	0.49	3.650	0.310	<0.001	<0.001	2.180	0.280	0.080	<0.001
Chrysene	350	93		0.48	<0.001	<0.001	<0.001	0.26	0.32	0.6	2.730	0.360	<0.001	<0.001	2.200	0.260	0.110	<0.001
Benzo(bk)fluoranthene	44	13		0.85	<0.001	<0.001	<0.001	0.42	0.57	0.84	4.380	0.610	<0.001	<0.001	3.900	0.400	0.220	<0.001
Benzo(b)fluoranthene	44	13											<0.05	<0.05	0.37	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1200	370											<0.05	<0.05	0.10	<0.05	<0.05	<0.05
Benzo(a)pyrene	35	11	21	<0.001	<0.001	2.450	0.210	0.120	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	0.40	<0.05	<0.05	<0.05
Indeno(123cd)pyrene	500	150		<0.001	<0.001	1.670	0.120	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	0.39	<0.05	<0.05	<0.05
Dibenzo(ah)anthracene	3.5	1.1		<0.001	<0.001	0.450	0.220	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	0.09	<0.05	<0.05	<0.05
Benzo(ghi)perylene	3900	1400		<0.001	<0.001	1.680	0.160	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	0.39	<0.05	<0.05	<0.05
Coronene				<0.001	<0.001	0.360	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PAH Total				<0.001	<0.001	24.470	2.300	0.760	<0.18	<0.001	0.300	<0.001	<0.05	<0.05	6.36	<0.05	0.65	0.60
PCB (7 congeners)																		
PCB 28				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCB 52				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCB 101				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCB 118				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCB 138				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCB 153				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCB 180				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Total 7 PCBs	0.24 (5)	0.008 (5)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)											0.049	0.027	<0.001	<0.001	<0.001	<0.001
Dioxins & Furans																		
Fraction of Organic Carbon				0.008	-	0.035	-	-	-	0.009	0.015	0.008					0.022	
VOCs																		
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				4082/16-18	4082/76-78	4082/7-9	4082/1-3	4082/4-6	4082/13-15	4082/10-12	4100/4-6	4100/1-3	222-225 (1)	226-229 (1)	7-99,120 (1	100-103 (1)	104-106 (1)	108-111 (1)
				TP216	TP217	TP218	TP219	TP220	TP221	TP222	TP223	TP223	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04
				1.4	0.5	3.6	2.8	1.3	2.3	2	1.8	2	1.5	2.5	1.0	2.0	2.0-3.0	3.0-4.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	clay with HC odour	MG- concrete fragments	clay	limestone	MG- clay	MG- clinker fill with fire bricks	MG - limestone collbers with red brick frag	MG-clay with HC odour	silt	MG - gravel with brick and rubble - quarry fill	MG - gravel with brick and rubble - quarry fill	MG- brick & rubble	MG - clay	MG - clay & organic from 2.4m	MG-organic clay
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	31/08/10	31/08/10	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	02/09/10	02/09/10	19/08/05	19/08/05	18/08/05	18/08/05	18/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
													Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		4.218	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		1.278	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		0.496	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	27	90	230	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	NA	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	0.026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000		0.084	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		0.162	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	190	1200		0.145	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000		0.024	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000

Haulbowline Factory Site
Solid Analysis Results

				4082/16-18	4082/76-78	4082/7-9	4082/1-3	4082/4-6	4082/13-15	4082/10-12	4100/4-6	4100/1-3	222-225 (1)	226-229 (1)	97-99,120 (1	100-103 (1)	104-106 (1)	108-111 (1)
				TP216	TP217	TP218	TP219	TP220	TP221	TP222	TP223	TP223	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04
				1.4	0.5	3.6	2.8	1.3	2.3	2	1.8	2	1.5	2.5	1.0	2.0	2.0-3.0	3.0-4.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	clay with HC odour	MG- concrete fragments	clay	limestone	MG- clay	MG- clinker fill with fire bricks	MG - limestone collbers with red brick frag	MG-clay with HC odour	silt	MG - gravel with brick and rubble - quarry fill	MG - gravel with brick and rubble - quarry fill	MG- brick & rubble	MG - clay	MG - clay & organic from 2.4m	MG-organic clay
				30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	30/08/10	31/08/10	31/08/10	18/08/05	18/08/05	17/08/05	17/08/05	17/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	01/09/10	02/09/10	02/09/10	19/08/05	19/08/05	18/08/05	18/08/05	18/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
													Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
p/m-Xylene	5900	170000		0.115	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	0.002	<0.001	0.002	0.002
Propylbenzene	1400 (2)	10000 (3)		0.372	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	0.013	<0.000	<0.000	0.002	<0.000	0.001	0.002
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NDP	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

				NAVAL					NAVAL								
				116-119 (1)	**231-234 (1)**	**235-238 (1)**	**239-242 (1)**	**243-246 (1)**	**121-124 (1)**	**606-609**	**247-250 (1)**	**251-254 (1)**	**255-258 (1)**	**259-262 (1)**	**263-266 (1)**	**396-399**	**408-411**	**267-270 (1)**
				BH102-06	**BH103-01**	**BH103-02**	**BH103-03**	**BH103-04**	**BH104-01**	**BH105-01**	**BH106-01**	**BH106-03**	**BH106-04**	**BH106-05**	**BH106-06**	**BH107-01**	**BH107-04**	**BH108-01**
				5.0-6.0	**1.2-1.65**	**2.9-3.2**	**3.8-4.2**	**4.7-5.2**	**3.35**	**3.0**	**1.0**	**2.0-3.0**	**3.0-4.0**	**4.0-5.0**	**5.0-6.0**	**1.5**	**4.75**	**1.5**
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**MG - organic silt with timber**	**MG-clay**	**MG - black clay**	**organic clay - alluvium**	**clay - glacial till**	**MG - hardcore**	**MG - slag**	**MG - chardcore with bricks and masonary**	**MG and nat alliuvium**	**silt - alluvium**	**silt - alluvium**	**silt - alluvium**	**MG - clay**	**clay - ablation till**	**MG - slag**
				17/08/05	**18/08/05**	**18/08/05**	**18/08/05**	**18/08/05**	**16/08/05**	**29/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**17/08/05**	**18/08/05**	**18/08/05**	**17/08/05**
				SOIL	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**
				18/08/05	**19/08/05**	**19/08/05**	**19/08/05**	**19/08/05**	**18/08/05**	**31/08/05**	**19/08/05**	**19/08/05**	**19/08/05**	**19/08/05**	**19/08/05**	**23/08/05**	**23/08/05**	**19/08/05**
				284-296_2005	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**	**284-296_2005**
				Alcontrol	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**
Parameter																		
Arsenic	640	170	170	9	11	9	3	9	10	<1	5	6	5	3	4	15	7	14
Cadmium	190	532	880	<1	<1	<1	<1	<1	1	1	<1	<1	<1	<1	<1	<1	<1	3
Chromium	8600	33000		21	27	17	15	16	32	867	69	19	19	21	20	65	22	560
Copper	68000	44000		10	16	12	5	12	34	124	24	14	6	4	6	128	4	173
Mercury	1100	240		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Nickel	1800 (4)	922**		22	28	20	11	24	50	62	29	21	16	14	15	58	28	47
Lead	4640 (4)	477**	1300	22	29	26	12	19	165	276	12	11	8	6	7	54	14	247
Selenium	12000	1800		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Zinc	730000	170000		90	283	80	43	92	238	2793	82	77	55	49	56	361	99	352
Barium		1570**																
Cobalt																		
Manganese																		
Molybdenum																		
Aluminium																		
Antimony		831**																
Calcium																		
Iron																		
Magnesium																		
Thallium																		
Tin																		
Vanadium	9000	5000		20	15	14	15	12	28	294	18	16	19	19	19	19	19	81
Water Soluble Boron	240000	46000		4	1	6	9	4	3	9	<1	2	6	8	8	2	3	6
Sodium																		
Potassium																		
Hexavalent Chromium	33	220	250	<0.3	<0.3	<0.3	<0.3	<0.3	3	<0.3	<0.3	<0.3	<0.3	<0.3	0.9	<0.3	<0.3	1.1
Nitrate as NO_3																		
Sulphate - soluble 2:1 extract																		
Sulphate																		
Chloride - soluble																		
Free Cyanide*	36 (4)	34**		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cyanide*				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphide *																		
Water Soluble Sulphate				0.071	0.108	0.281	0.401	0.150	0.225	0.571	0.072	0.319	0.495	0.733	0.701	0.068	0.161	0.165
Acid Soluble Sulphide				176	<50	<50	<50	<50	<50	229	<50	<50	<50	<50	<50	<50	<50	72
Thiocyanate*				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Complex cyanide				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Sulphur																		
Total Sulphate				923	1063	1639	2209	848	1284	4870	934	2771	2801	2944	2753	779	998	3231
Elemental Sulphur				165	<50	<50	<50	<50	<50	502	<50	<50	<50	<50	<50	<50	<50	1601
Ammoniacal Nitrogen as N				5.1	27.6	28.2	32.8	25.7	2.9	<5.5	27.0	25.7	33.4	18.0	21.4	10.7	7.1	1.0
Amm N2/Tot Ammonia as NH4 low																		

Haulbowline Factory Site
Solid Analysis Results

				116-119 (1)	231-234 (1)	235-238 (1)	239-242 (1)	243-246 (1)	121-124 (1)	606-609	247-250 (1)	251-254 (1)	255-258 (1)	259-262 (1)	263-266 (1)	396-399	408-411	267-270 (1)
				BH102-06	BH103-01	BH103-02	BH103-03	BH103-04	BH104-01	BH105-01	BH106-01	BH106-03	BH106-04	BH106-05	BH106-06	BH107-01	BH107-04	BH108-01
				5.0-6.0	1.2-1.65	2.9-3.2	3.8-4.2	4.7-5.2	3.35	3.0	1.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	1.5	4.75	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - organic silt with timber	MG-clay	MG - black clay	organic clay - alluvium	clay - glacial till	MG - hardcore	MG - slag	MG - chardcore with bricks and masonary	MG and nat alliuvium	silt - alluvium	silt - alluvium	silt - alluvium	MG - clay	clay - ablation till	MG - slag
				17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	16/08/05	29/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	19/08/05	19/08/05	19/08/05	19/08/05	18/08/05	31/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	23/08/05	23/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Asbestos screen*																		
Speciated Phenols by HPLC																		
Resorcinol																		
Catechol																		
Phenol																		
m/p-cresol		9910**																
o-cresol		9910**																
Total cresols		9910**																
Xylenols																		
1-naphthol																		
2,3,5-trimethyl phenol																		
2-isopropylphenol																		
Total Phenols	760	760																
Phenols Total Monohydric	760	760		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Natural Moisture Content																		
pH Value				7.98	8.87	8.06	8.07	8.13	8.12	8.86	9.16	8.01	8.02	8.07	8.06	8.35	8.08	8.95
Solvent Extract				41996	114	<100	<100	<100	1982	14556	215	<100	135	349	118	119	2702	933
Total Extractable Hydrocarbons				27	105	<10	<10	<10	<10	3344	<10	<10	41	81	26	42	203	182
TPHCWG - Aliphatics																		
Aliphatics >C5-C6	3200	95000																
Aliphatics >C6-C8	7800	150000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	2000	14000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	9700	21000		<10	<10	<10	<10	<10	<10	13	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C12-C16	59000	25000		<10	<10	<10	<10	<10	<10	116	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21	1600000	450000		<10	<10	<10	<10	<10	<10	369	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35	1600000	450000		<10	<10	<10	<10	<10	<10	1156	<10	<10	<10	<10	<10	<10	<10	49
Aliphatics >C35-C40	1600000	450000		<10	<10	<10	<10	<10	<10	96	<10	<10	<10	<10	<10	<10	<10	<10
Total Aliphatics >C6-C40 (Min Oils)				<10	<10	<10	<10	<10	<10	1752	<10	<10	<10	<10	<10	<10	<10	59
TPHCWG - Aromatics																		
Aromatics >EC5-EC7	26000	76000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	56000	87000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C8-C10	3500	7200		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C10-C12	16000	9200		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C12-C16	36000	10000		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C16-C21	28000	7600		<10	<10	<10	<10	<10	<10	38	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C21-C40	28000	7800		<10	23	<10	<10	<10	<10	245	<10	<10	<10	<10	<10	30	30	<10
Total Aromatics >C5-C40	28000	7800		<10	30	<10	<10	<10	<10	283	<10	<10	<10	<10	<10	33	30	<10
Total TPH >C5-C40				<10	30	<10	<10	<10	<10	2035	<10	<10	<10	<10	<10	33	30	59
BTEX/MTBE GC-FID																		
MTBE		15600**																

Haulbowline Factory Site

Solid Analysis Results

				116-119 (1)	231-234 (1)	235-238 (1)	239-242 (1)	243-246 (1)	121-124 (1)	606-609	247-250 (1)	251-254 (1)	255-258 (1)	259-262 (1)	263-266 (1)	396-399	408-411	267-270 (1)
				BH102-06	BH103-01	BH103-02	BH103-03	BH103-04	BH104-01	BH105-01	BH106-01	BH106-03	BH106-04	BH106-05	BH106-06	BH107-01	BH107-04	BH108-01
				5.0-6.0	1.2-1.65	2.9-3.2	3.8-4.2	4.7-5.2	3.35	3.0	1.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	1.5	4.75	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - organic silt with timber	MG-clay	MG - black clay	organic clay - alluvium	clay - glacial till	MG - hardcore	MG - slag	MG - chardcore with bricks and masonary	MG and nat alliuvium	silt - alluvium	silt - alluvium	silt - alluvium	MG - clay	clay - ablation till	MG - slag
				17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	16/08/05	29/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	19/08/05	19/08/05	19/08/05	19/08/05	18/08/05	31/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	23/08/05	23/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
Benzene	27	90	230															
Toluene	56000	87000																
Ethyl benzene	5700	17000																
m/p-Xylene	5900	170000																
o-Xylene	6600	17000																
Total Xylenes	312**	14500**																
PAH 17 MS																		
Naphthalene	190	1200		0.001	0.001	0.001	0.050	0.050	0.310	0.280	0.050	0.050	0.250	0.050	0.050	0.050	0.050	0.940
Acenaphthylene	83000	29000		<0.001	<0.001	<0.001	<0.05	<0.05	0.07	0.14	<0.05	<0.05	0.12	<0.05	<0.05	<0.05	<0.05	0.07
Acenaphthene	84000	29000		<0.001	<0.001	<0.001	<0.05	<0.05	0.10	0.32	<0.05	<0.05	0.19	<0.05	<0.05	<0.05	<0.05	0.26
Fluorene	63000	20000		<0.001	<0.001	<0.001	<0.05	<0.05	0.10	0.15	<0.05	<0.05	0.16	<0.05	<0.05	<0.05	<0.05	0.31
Phenanthrene	22000	6200		<0.001	<0.001	<0.001	<0.05	<0.05	0.80	0.30	<0.05	<0.05	0.20	<0.05	<0.05	<0.05	<0.05	0.70
Anthracene	520000	150000		<0.001	<0.001	<0.001	<0.05	<0.05	0.16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11
Fluoranthene	23000	6300		<0.001	<0.001	<0.001	<0.05	<0.05	1.52	0.17	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	0.57
Pyrene	54000	15000		<0.001	<0.001	<0.001	<0.05	<0.05	1.22	0.09	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	0.54
Benz(a)anthracene	170	49		<0.001	<0.001	<0.001	<0.05	<0.05	0.54	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.26
Chrysene	350	93		<0.001	0.300	<0.001	<0.05	<0.05	0.60	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.31
Benzo(bk)fluoranthene	44	13		<0.001	<0.001	<0.001												
Benzo(b)fluoranthene	44	13		<0.05	0.72	<0.05	<0.05	<0.05	0.59	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1200	370		<0.05	0.19	<0.05	<0.05	<0.05	0.16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	35	11	21	<0.05	0.69	<0.05	<0.05	<0.05	0.53	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(123cd)pyrene	500	150		<0.05	0.61	<0.05	<0.05	<0.05	0.54	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(ah)anthracene	3.5	1.1		<0.05	0.16	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	3900	1400		<0.05	0.62	<0.05	<0.05	<0.05	0.48	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Coronene																		
PAH Total				<0.05	9.01	<0.05	<0.05	<0.05	7.80	1.45	<0.05	<0.05	1.03	<0.05	<0.05	<0.05	<0.05	4.07
PCB (7 congeners)																		
PCB 28																		
PCB 52																		
PCB 101																		
PCB 118																		
PCB 138																		
PCB 153																		
PCB 180																		
Total 7 PCBs	0.24 (5)	0.008 (5)																
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dioxins & Furans																		
Fraction of Organic Carbon							0.010		0.008									
VOCs																		
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site

Solid Analysis Results

				116-119 (1)	231-234 (1)	235-238 (1)	239-242 (1)	243-246 (1)	121-124 (1)	606-609	247-250 (1)	251-254 (1)	255-258 (1)	259-262 (1)	263-266 (1)	396-399	408-411	267-270 (1)
				BH102-06	BH103-01	BH103-02	BH103-03	BH103-04	BH104-01	BH105-01	BH106-01	BH106-03	BH106-04	BH106-05	BH106-06	BH107-01	BH107-04	BH108-01
				5.0-6.0	1.2-1.65	2.9-3.2	3.8-4.2	4.7-5.2	3.35	3.0	1.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	1.5	4.75	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - organic silt with timber	MG-clay	MG - black clay	organic clay - alluvium	clay - glacial till	MG - hardcore	MG - slag	MG - chardcore with bricks and masonary	MG and nat alliuvium	silt - alluvium	silt - alluvium	silt - alluvium	MG - clay	clay - ablation till	MG - slag
				17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	16/08/05	29/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	19/08/05	19/08/05	19/08/05	19/08/05	18/08/05	31/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	23/08/05	23/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		0.205	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	27	90	230	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		<0.001	<0.001	<0.001	0.089	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	190	1200		0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000		<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	0.001

Haulbowline Factory Site

Solid Analysis Results

				116-119 (1)	231-234 (1)	235-238 (1)	239-242 (1)	243-246 (1)	121-124 (1)	606-609	247-250 (1)	251-254 (1)	255-258 (1)	259-262 (1)	263-266 (1)	396-399	408-411	267-270 (1)
				BH102-06	BH103-01	BH103-02	BH103-03	BH103-04	BH104-01	BH105-01	BH106-01	BH106-03	BH106-04	BH106-05	BH106-06	BH107-01	BH107-04	BH108-01
				5.0-6.0	1.2-1.65	2.9-3.2	3.8-4.2	4.7-5.2	3.35	3.0	1.0	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	1.5	4.75	1.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - organic silt with timber	MG-clay	MG - black clay	organic clay - alluvium	clay - glacial till	MG - hardcore	MG - slag	MG - chardcore with bricks and masonary	MG and nat alliuvium	silt - alluvium	silt - alluvium	silt - alluvium	MG - clay	clay - ablation till	MG - slag
				17/08/05	18/08/05	18/08/05	18/08/05	18/08/05	16/08/05	29/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	18/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				18/08/05	19/08/05	19/08/05	19/08/05	19/08/05	18/08/05	31/08/05	19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	23/08/05	23/08/05	19/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296_2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																		
p/m-Xylene	5900	170000		<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	0.004
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

				271-274 (1)	275-278 (1)	0,279-281 (	282-285 (1)	286-289 (1)	1-4 (1)	5-8 (1)	17-19,64 (1)	20-23 (1)	24-27 (1)	125-128 (1)	28-31 (1)	133-136 (1)
				BH108-02	BH108-03	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110	BH110-02
				4.5	5.5	6.5	7.0	8.5	1.2-1.65	2.7	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0	2.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	Silt	gravel - fluvial	silt	silt/clay	clay	MG - slag	MG - clay	MG - clay	MG - clay	MG - quarry fill and natural clay	Clay	MG - slag	MG - slag
				17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	15/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	17/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																
Arsenic	640	170	170	11		6	13	10	36	92	81	56	6	11	26	<1
Cadmium	190	532	880	<1		<1	<1	<1	<1	2	6	4	<1	<1	3	<1
Chromium	8600	33000		73		23	17	18	219	21	15	18	26	18	1010	1374
Copper	68000	44000		138		7	19	5	962	2068	3025	987	9	4	307	97
Mercury	1100	240		<1		<1	<1	<1	<1	2	5	4	<1	<1	<1	<1
Nickel	1800 (4)	922**		45		16	40	32	52	62	39	35	25	27	105	37
Lead	4640 (4)	477**	1300	**594**		12	45	87	***2114***	***2189***	***2989***	***3346***	42	15	**696**	83
Selenium	12000	1800		<3		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Zinc	730000	170000		249		60	166	113	1342	3528	4127	2175	448	92	974	239
Barium		1570**														
Cobalt																
Manganese																
Molybdenum																
Aluminium																
Antimony		831**														
Calcium																
Iron																
Magnesium																
Thallium																
Tin																
Vanadium	9000	5000		58		16	17	13	47	44	29	34	25	13	200	315
Water Soluble Boron	240000	46000		6		7	5	3	<1	2	3	5	5	3	11	18
Sodium																
Potassium																
Hexavalent Chromium	33	220	250	<0.3		<0.3	<0.3	0.6	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nitrate as NO_3																
Sulphate - soluble 2:1 extract																
Sulphate																
Chloride - soluble																
Free Cyanide*	36 (4)	34**		<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Cyanide*				<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphide *																
Water Soluble Sulphate				0.710		0.666	0.291	0.178	0.058	0.168	0.163	0.191	0.612	0.08	0.185	0.013
Acid Soluble Sulphide				<50		<50	<50	<50	101	<50	911	1178	86	<50	57	<50
Thiocyanate*				<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Complex cyanide				<1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Sulphur																
Total Sulphate				2783		2666	1644	965	1340	3917	2610	2876	2869	547	4186	3825
Elemental Sulphur				<50		<50	<50	<50	<50	<50	471	638	<50	<50	<50	71
Ammoniacal Nitrogen as N				4.5		27.7	1.0	<0.3	4	1.4	3.8	5.2	5.9	2.9	6	2.3
Amm N2/Tot Ammonia as NH4 low																

Haulbowline Factory Site
Solid Analysis Results

				271-274 (1)	275-278 (1)	0,279-281 (	282-285 (1)	286-289 (1)	1-4 (1)	5-8 (1)	17-19,64 (1)	20-23 (1)	24-27 (1)	125-128 (1)	28-31 (1)	133-136 (1)
				BH108-02	BH108-03	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110	BH110-02
				4.5	5.5	6.5	7.0	8.5	1.2-1.65	2.7	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0	2.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	Silt	gravel - fluvial	silt	silt/clay	clay	MG - slag	MG - clay	MG - clay	MG - clay	MG - quarry fill and natural clay	Clay	MG - slag	MG - slag
				17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	15/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	17/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																
Asbestos screen*											NFD	NFD	NFD		NFD	
Speciated Phenols by HPLC																
Resorcinol																
Catechol																
Phenol																
m/p-cresol		9910**														
o-cresol		9910**														
Total cresols		9910**														
Xylenols																
1-naphthol																
2,3,5-trimethyl phenol																
2-isopropylphenol																
Total Phenols	760	760														
Phenols Total Monohydric	760	760		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Natural Moisture Content																
pH Value				7.94		7.95	8.05	8.25	8.58	7.79	6.51	6.04	8.01	8.2	10.44	9.74
Solvent Extract				805		160	132	249	7976	18086	20796	3791	574	152	14824	320
Total Extractable Hydrocarbons				654		<10	<10	<10	221	418	1297	3054	<10	<10	236	32
TPHCWG - Aliphatics																
Aliphatics >C5-C6	3200	95000														
Aliphatics >C6-C8	7800	150000		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	2000	14000		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	9700	21000		<10		<10	<10	<10	<10	<10	29	<10	<10	<10	<10	<10
Aliphatics >C12-C16	59000	25000		<10		<10	<10	<10	<10	<10	251	86	<10	<10	<10	<10
Aliphatics >C16-C21	1600000	450000		94		<10	<10	<10	17	37	366	388	<10	<10	28	<10
Aliphatics >C21-C35	1600000	450000		188		<10	<10	<10	84	72	132	343	<10	<10	100	14
Aliphatics >C35-C40	1600000	450000		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total Aliphatics >C6-C40 (Min Oils)				282		<10	<10	<10	101	108	838	817	<10	<10	128	19
TPHCWG - Aromatics																
Aromatics >EC5-EC7	26000	76000		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	56000	87000		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C8-C10	3500	7200		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C10-C12	16000	9200		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C12-C16	36000	10000		<10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C16-C21	28000	7600		34		<10	<10	<10	<10	15	44	224	<10	<10	<10	<10
Aromatics >C21-C40	28000	7800		98		<10	<10	<10	56	43	23	210	<10	<10	17	<10
Total Aromatics >C5-C40	28000	7800		132		<10	<10				73	447	<10		17	
Total TPH >C5-C40				414		<10	<10				911	1264	<10		145	
BTEX/MTBE GC-FID																
MTBE		15600**														

Haulbowline Factory Site

Solid Analysis Results

				271-274 (1)	275-278 (1)	0,279-281 (	282-285 (1)	286-289 (1)	1-4 (1)	5-8 (1)	17-19,64 (1)	20-23 (1)	24-27 (1)	125-128 (1)	28-31 (1)	133-136 (1)
				BH108-02	BH108-03	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110	BH110-02
				4.5	5.5	6.5	7.0	8.5	1.2-1.65	2.7	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0	2.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	Silt	gravel - fluvial	silt	silt/clay	clay	MG - slag	MG - clay	MG - clay	MG - clay	MG - quarry fill and natural clay	Clay	MG - slag	MG - slag
				17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	15/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	17/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																
Benzene	27	90	230													
Toluene	56000	87000														
Ethyl benzene	5700	17000														
m/p-Xylene	5900	170000														
o-Xylene	6600	17000														
Total Xylenes	312**	14500**														
PAH 17 MS																
Naphthalene	190	1200		0.570		0.050	0.050	0.050	1.870	2.190	1.420	2.140	0.150	0.050	0.230	0.060
Acenaphthylene	83000	29000		0.15		<0.05	<0.05	<0.05	0.37	0.29	0.61	0.31	0.09	<0.05	0.14	<0.05
Acenaphthene	84000	29000		0.35		<0.05	<0.05	<0.05	0.51	0.46	1.33	0.67	0.12	<0.05	0.28	<0.05
Fluorene	63000	20000		0.23		<0.05	<0.05	<0.05	0.12	0.15	0.28	0.55	<0.05	<0.05	<0.05	<0.05
Phenanthrene	22000	6200		2.73		<0.05	<0.05	<0.05	1.12	1.12	3.37	3.51	0.2	<0.05	0.45	0.14
Anthracene	520000	150000		0.48		<0.05	<0.05	<0.05	0.12	0.07	0.64	0.53	<0.05	<0.05	<0.05	<0.05
Fluoranthene	23000	6300		3.13		<0.05	<0.05	<0.05	0.91	0.25	3.68	2.82	0.11	<0.05	0.43	0.31
Pyrene	54000	15000		2.72		<0.05	<0.05	<0.05	0.82	0.21	2.83	2.23	0.11	<0.05	0.4	0.15
Benz(a)anthracene	170	49		1.00		<0.05	<0.05	<0.05	0.27	<0.05	0.91	0.71	<0.05	<0.05	<0.05	0.07
Chrysene	350	93		1.19		<0.05	<0.05	<0.05	0.27	<0.05	1.01	0.7	<0.05	<0.05	<0.05	0.08
Benzo(bk)fluoranthene	44	13														
Benzo(b)fluoranthene	44	13		0.93		<0.05	<0.05	<0.05	0.26	<0.05	0.85	0.79	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1200	370		0.25		<0.05	<0.05	<0.05	<0.05	<0.05	0.28	0.17	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	35	11	21	0.83		<0.05	<0.05	<0.05	0.29	<0.05	0.93	0.88	<0.05	<0.05	<0.05	<0.05
Indeno(123cd)pyrene	500	150		0.41		<0.05	<0.05	<0.05	<0.05	<0.05	0.42	0.41	<0.05	<0.05	<0.05	<0.05
Dibenzo(ah)anthracene	3.5	1.1		0.07		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	3900	1400		0.40		<0.05	<0.05	<0.05	<0.05	<0.05	0.45	<0.05	<0.05	<0.05	<0.05	<0.05
Coronene																
PAH Total				15.44		<0.05	<0.05	<0.05	6.98	4.74	19.01	16.92	0.78	<0.05	1.93	0.81
PCB (7 congeners)																
PCB 28																
PCB 52																
PCB 101																
PCB 118																
PCB 138																
PCB 153																
PCB 180																
Total 7 PCBs	0.24 (5)	0.008 (5)														
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)		<0.001		0.001	<0.001	0.027	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	0.073	<0.001
Dioxins & Furans																
Fraction of Organic Carbon					0.006											
VOCs																
1,1,1,2-Tetrachloroethane	110	1500		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site
Solid Analysis Results

				271-274 (1)	275-278 (1)	0,279-281 (	282-285 (1)	286-289 (1)	1-4 (1)	5-8 (1)	17-19,64 (1)	20-23 (1)	24-27 (1)	125-128 (1)	28-31 (1)	133-136 (1)
				BH108-02	BH108-03	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110	BH110-02
				4.5	5.5	6.5	7.0	8.5	1.2-1.65	2.7	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0	2.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	Silt	gravel - fluvial	silt	silt/clay	clay	MG - slag	MG - clay	MG - clay	MG - clay	MG - quarry fill and natural clay	Clay	MG - slag	MG - slag
				17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	15/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	17/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																
1,1-Dichloropropene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromo-3-chloropropane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichlorobenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Benzene	27	90	230	<0.000		<0.001	<0.001	<0.001	0.042	0.061	0.02	0.024	<0.001	<0.001	<0.001	<0.001
Bromobenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon tetrachloride				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000		0.004		<0.001	<0.001	<0.001	0.011	0.015	0.013	0.016	0.003	<0.001	<0.001	<0.001
Hexachlorobutadiene	31	48		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001		<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Naphthalene	190	1200		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000		0.001		<0.001	<0.001	<0.001	<0.001	0.016		0.025	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site
Solid Analysis Results

				271-274 (1)	275-278 (1)	0,279-281 (	282-285 (1)	286-289 (1)	1-4 (1)	5-8 (1)	17-19,64 (1)	20-23 (1)	24-27 (1)	125-128 (1)	28-31 (1)	133-136 (1)
				BH108-02	BH108-03	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110	BH110-02
				4.5	5.5	6.5	7.0	8.5	1.2-1.65	2.7	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0	2.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	Silt	gravel - fluvial	silt	silt/clay	clay	MG - slag	MG - clay	MG - clay	MG - clay	MG - quarry fill and natural clay	Clay	MG - slag	MG - slag
				17/08/05	17/08/05	18/08/05	18/08/05	18/08/05	16/08/05	16/08/05	16/08/05	16/08/05	16/08/05	17/08/05	15/08/05	17/08/05
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				19/08/05	19/08/05	19/08/05	19/08/05	19/08/05	17/08/05	17/08/05	17/08/05	17/08/05	17/08/05	18/08/05	17/08/05	18/08/05
				284-296_2005	284-296_2005	284-296_2005	284-296_2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol
Parameter																
p/m-Xylene	5900	170000		0.009		0.001	<0.001	<0.001	0.046	0.095	0.042	0.054	0.003	<0.001	0.002	<0.001
Propylbenzene	1400 (2)	10000 (3)		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		0.012		<0.001	<0.001	<0.001	0.037	0.051	0.026	0.034	0.003	<0.001	0.001	<0.001
trans-1-2-Dichloroethene	22 (4)	212**		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene				<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		0.005		0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane				<0.001		<0.001	<0.001	<0.001	0.008	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

														NAVAL	NAVAL	NAVAL
				137-140 (1)	41-143,188 (1	416-419	610-613	542-545 (1)	554-557 (1)	558-561 (1)	32-35 (1)	36-39 (1)	144-147 (1)	64-66	80-81	82-84
				BH110-03	BH110-04	BH111-01	BH111-02	BH112-01	BH112-04	BH112-05	BH113-01	BH113-02	BH113-03	BH201	BH 201-2	BH 201-3
				3.5	4.5	1	2.5-3.7	4	6	7.5	0.0-1.0	1	6.5	0.25-0.5	0.3-2.2	3.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - slag	MG - slag	Mg - slag	MG - slag and Gravel from 3.3m	silt	silt	silt	MG - hardcore and quarry fill	MG - hardcore and quarry fill	MG - quarry fill	MG-gravel	MG-gravel	silt
				17/08/05	17/08/05	19/08/05	30/08/05	23/08/05	23/08/05	23/08/05	16/08/05	16/08/05	16/08/05	02/09/10	09/09/10	09/09/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	Soil	Soil	Soil
				18/08/05	18/08/05	23/08/05	31/08/05	24/08/05	24/08/05	24/08/05	17/08/05	17/08/05	18/08/05	03/09/10	09/09/10	09/09/10
				284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	4100_b2	4100_b4	4100_b4
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol		Jones	Jones	Jones
Parameter																
Arsenic	640	170	170	<1	12	18	33	4		3	19	8	<1	***704.0***	28.3	7.9
Cadmium	190	532	880	<1	2	6	<1	<1		<1	2	<1	<1	7.5	0.4	0.3
Chromium	8600	33000		1178	1228	734	208	22		21	504	153	12	37.6	164.8	32.2
Copper	68000	44000		77	167	224	348	<1		2	132	32	2	63	2150	42
Mercury	1100	240		<1	<1	<1	<1	<1		<1	<1	<1	<1	0.2	<0.1	0.4
Nickel	1800 (4)	922**		35	56	55	37	24		14	34	24	4	37.4	45.9	19.9
Lead	4640 (4)	477**	1300	**1271**	343	**604**	**632**	11		10	452	74	15	361	70	65
Selenium	12000	1800		<3	<3	<3	<3	<3		<3	<3	<3	<3	<1	2	<1
Zinc	730000	170000		323	855	10490	1732	61		62	859	144	23	1905	252	300
Barium		1570**												57	168	36
Cobalt														11.8	10.8	6.3
Manganese														1005	4251	569
Molybdenum														0.90	2.30	0.60
Aluminium														13750	10130	8577
Antimony		831**												<1	8	1
Calcium														40710	127300	97440
Iron														35740	42710	21240
Magnesium														5838	8224	5520
Thallium														<1	4	<1
Tin														16	241	4
Vanadium	9000	5000		352	307	126	37	20		22	74	31	4	27	47	23
Water Soluble Boron	240000	46000		24	35	7	9	26		10	2	<1	<1	2	3	4
Sodium														224	449	1254
Potassium														1151	942	1341
Hexavalent Chromium	33	220	250	<0.3	<0.3	0.4	<0.3	<0.3		<0.3	3	<0.3	<0.3	1.8	<0.3	<0.3
Nitrate as NO_3														4	5	5
Sulphate - soluble 2:1 extract														0.076	0.222	0.193
Sulphate																
Chloride - soluble														273.0	450	579
Free Cyanide*	36 (4)	34**		<1	<1	<1	<1	<1		<1	<1	<1	<1	<0.5	<0.5	<0.5
Total Cyanide*				<1	<1	<1	<1	<1		<1	<1	<1	<1	<0.5	<0.5	<0.5
Sulphide *														<10	<10	<10
Water Soluble Sulphate				0.019	0.386	0.485	0.698	0.352		0.48	0.043	0.045	0.071	0.076	0.222	0.193
Acid Soluble Sulphide				<50	109	<50	6295	<50		<50	<50	<50	<50			
Thiocyanate*				<1	<1	<1	<1	<1		<1	<1	<1	<1	<0.5	<0.5	<0.5
Complex cyanide				<1	<1	<1	<1	<1		<1	<1	<1	<1	<2.5	<2.5	<2.5
Total Sulphur														0.10	0.16	0.12
Total Sulphate				3910	4431	7689	4324	2066		3521	1930	1656	398			
Elemental Sulphur				<50	<50	<50	353	<50		<50	<50	<50	<50			
Ammoniacal Nitrogen as N				<0.3	11.6	5.5	16.3				4	0.6	5.4	<0.4	0.6	1.1
Amm N2/Tot Ammonia as NH4 low																

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Solid Analysis Results

				137-140 (1)	41-143,188 (1	416-419	610-613	542-545 (1)	554-557 (1)	558-561 (1)	32-35 (1)	36-39 (1)	144-147 (1)	64-66	80-81	82-84
				BH110-03	BH110-04	BH111-01	BH111-02	BH112-01	BH112-04	BH112-05	BH113-01	BH113-02	BH113-03	BH201	BH 201-2	BH 201-3
				3.5	4.5	1	2.5-3.7	4	6	7.5	0.0-1.0	1	6.5	0.25-0.5	0.3-2.2	3.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - slag	MG - slag	Mg - slag	MG - slag and Gravel from 3.3m	silt	silt	silt	MG - hardcore and quarry fill	MG - hardcore and quarry fill	MG - quarry fill	MG-gravel	MG-gravel	silt
				17/08/05	17/08/05	19/08/05	30/08/05	23/08/05	23/08/05	23/08/05	16/08/05	16/08/05	16/08/05	02/09/10	09/09/10	09/09/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	Soil	Soil	Soil
				18/08/05	18/08/05	23/08/05	31/08/05	24/08/05	24/08/05	24/08/05	17/08/05	17/08/05	18/08/05	03/09/10	09/09/10	09/09/10
				284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	4100_b2	4100_b4	4100_b4
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol		Jones	Jones	Jones
Parameter																
Asbestos screen*						NFD	NFD	NFD	-	NFD				NAD	NAD	NAD
Speciated Phenols by HPLC																
Resorcinol														<0.01	<0.01	<0.01
Catechol														<0.01	<0.01	<0.01
Phenol														<0.01	<0.01	<0.01
m/p-cresol		9910**												<0.01	<0.01	<0.01
o-cresol		9910**												<0.01	<0.01	<0.01
Total cresols		9910**												<0.01	<0.01	<0.01
Xylenols														<0.01	<0.01	<0.01
1-naphthol														<0.01	<0.01	<0.01
2,3,5-trimethyl phenol														<0.01	<0.01	<0.01
2-isopropylphenol														<0.01	<0.01	<0.01
Total Phenols	760	760												<0.01	<0.01	<0.01
Phenols Total Monohydric	760	760		<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01			
Natural Moisture Content														5.9	6.3	26.3
pH Value				9.15	9.27	10.74	8.15	7.89		8.07	8.31	8.73	8.28	11.58	10.75	8.87
Solvent Extract				458	2380	164	151	800		2571	20070	793	547			
Total Extractable Hydrocarbons				<10	157	227	3283	<10		<10	3330	260	11			
TPHCWG - Aliphatics																
Aliphatics >C5-C6	3200	95000												<0.01	<0.01	<0.01
Aliphatics >C6-C8	7800	150000		<10	<10	<10	<10	<10		<10	<10	<10	<10	<0.01	<0.01	<0.01
Aliphatics >C8-C10	2000	14000		<10	<10	<10	<10	<10		<10	<10	<10	<10	<0.01	<0.01	<0.01
Aliphatics >C10-C12	9700	21000		<10	<10	<10	68	<10		<10	<10	<10	<10	<0.1	<0.1	<0.1
Aliphatics >C12-C16	59000	25000		<10	<10	<10	512	<10		<10	90	<10	<10	<0.1	<0.1	<0.1
Aliphatics >C16-C21	1600000	450000		<10	18	<10	728	<10		<10	602	46	<10	<0.1	<0.1	<0.1
Aliphatics >C21-C35	1600000	450000		<10	61	<10	450	<10		<10	489	46	<10	<0.1	<0.1	<0.1
Aliphatics >C35-C40	1600000	450000		<10	<10	<10	15	<10		<10	<10	<10	<10			
Total Aliphatics >C6-C40 (Min Oils)				<10	85	<10	1774	<10		<10	1180	90	<10	<0.1	<0.1	<0.1
TPHCWG - Aromatics																
Aromatics >EC5-EC7	26000	76000		<10	<10	<10	<10	<10		<10	<10	<10	<10	<0.01	<0.01	<0.01
Aromatics >C7-C8	56000	87000		<10	<10	<10	<10	<10		<10	<10	<10	<10	<0.01	<0.01	<0.01
Aromatics >C8-C10	3500	7200		<10	<10	<10	<10	<10		<10	<10	<10	<10	<0.01	<0.01	<0.01
Aromatics >C10-C12	16000	9200		<10	<10	<10	31	<10		<10	<10	<10	<10	<0.1	<0.1	<0.1
Aromatics >C12-C16	36000	10000		<10	<10	<10	141	<10		<10	<10	<10	<10	<0.1	<0.1	<0.1
Aromatics >C16-C21	28000	7600		<10	11	19	444	<10		<10	162	14	<10	<0.1	<0.1	<0.1
Aromatics >C21-C40	28000	7800		<10	25	42	396	<10		<10	216	31	<10	28.00	<0.1	<0.1
Total Aromatics >C5-C40	28000	7800				61	1013	<10		<10				28.00	<0.1	<0.1
Total TPH >C5-C40						61	2786	<10		<10				28.00	<0.1	<0.1
BTEX/MTBE GC-FID																
MTBE		15600**												<0.01	<0.01	<0.01

Haulbowline Factory Site
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				BH110-03	BH110-04	BH111-01	BH111-02	BH112-01	BH112-04	BH112-05	BH113-01	BH113-02	BH113-03	BH201	BH 201-2	BH 201-3
				3.5	4.5	1	2.5-3.7	4	6	7.5	0.0-1.0	1	6.5	0.25-0.5	0.3-2.2	3.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - slag	MG - slag	Mg - slag	MG - slag and Gravel from 3.3m	silt	silt	silt	MG - hardcore and quarry fill	MG - hardcore and quarry fill	MG - quarry fill	MG-gravel	MG-gravel	silt
				17/08/05	17/08/05	19/08/05	30/08/05	23/08/05	23/08/05	23/08/05	16/08/05	16/08/05	16/08/05	02/09/10	09/09/10	09/09/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	Soil	Soil	Soil
				18/08/05	18/08/05	23/08/05	31/08/05	24/08/05	24/08/05	24/08/05	17/08/05	17/08/05	18/08/05	03/09/10	09/09/10	09/09/10
				284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	4100_b2	4100_b4	4100_b4
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol		Jones	Jones	Jones
Parameter																
Benzene	27	90	230											<0.01	<0.01	<0.01
Toluene	56000	87000												<0.01	<0.01	<0.01
Ethyl benzene	5700	17000												<0.01	<0.01	<0.01
m/p-Xylene	5900	170000												<0.01	<0.01	<0.01
o-Xylene	6600	17000												<0.01	<0.01	<0.01
Total Xylenes	312**	14500**												<0.01	<0.01	<0.01
PAH 17 MS																
Naphthalene	190	1200		0.050	0.340	0.440	0.440	0.050		0.190	0.670	0.230	0.050	0.001	0.040	0.040
Acenaphthylene	83000	29000		<0.05	0.06	0.09	0.28	<0.05		<0.05	0.73	0.14	<0.05	<0.001	0.050	<0.03
Acenaphthene	84000	29000		<0.05	0.14	0.17	0.22	<0.05		0.14	1.4	0.25	<0.05	<0.001	<0.05	<0.05
Fluorene	63000	20000		<0.05	0.06	0.35	0.14	<0.05		0.1	0.34	0.13	<0.05	<0.001	<0.04	<0.04
Phenanthrene	22000	6200		0.21	0.75	2	5.79	<0.05		0.67	1.4	1.25	<0.05	0.030	0.370	<0.03
Anthracene	520000	150000		<0.05	0.13	0.54	0.82	<0.05		0.15	0.36	0.24	<0.05	<0.001	0.100	<0.04
Fluoranthene	23000	6300		0.3	0.86	3.29	4.37	<0.05		0.7	0.65	1.52	<0.05	0.030	0.610	0.080
Pyrene	54000	15000		0.21	0.73	2.62	3.48	<0.05		0.66	0.58	1.19	<0.05	0.030	0.580	0.060
Benz(a)anthracene	170	49		0.07	0.31	1.08	1.3	<0.05		0.22	0.55	0.44	<0.05	<0.001	0.290	0.080
Chrysene	350	93		0.1	0.29	1.41	1.65	<0.05		0.26	0.36	0.42	<0.05	<0.001	0.400	0.080
Benzo(bk)fluoranthene	44	13												<0.001	0.500	0.130
Benzo(b)fluoranthene	44	13		<0.05	0.28	1.25	1.49	<0.05		<0.05	<0.05	0.53	<0.05			
Benzo(k)fluoranthene	1200	370		<0.05	0.06	0.3	0.47	<0.05		0.15	<0.05	0.16	<0.05			
Benzo(a)pyrene	35	11	21	<0.05	0.24	1.14	1.56	<0.05		0.14	<0.05	0.48	<0.05	<0.001	0.220	0.060
Indeno(123cd)pyrene	500	150		<0.05	0.17	0.71	1.17	<0.05		<0.05	<0.05	0.35	<0.05	<0.001	0.170	<0.04
Dibenzo(ah)anthracene	3.5	1.1		<0.05	<0.05	0.19	0.36	<0.05		<0.05	<0.05	0.08	<0.05	<0.001	<0.04	<0.04
Benzo(ghi)perylene	3900	1400		<0.05	0.16	0.68	1.12	<0.05		<0.05	<0.05	0.33	<0.05	<0.001	0.160	<0.04
Coronene														<0.001	<0.04	<0.04
PAH Total				0.89	4.58	16.26	24.66	<0.05		3.38	7.04	7.74	<0.05	0.090	3.450	<0.64
PCB (7 congeners)																
PCB 28														<0.001	<0.001	<0.001
PCB 52														<0.001	<0.001	<0.001
PCB 101														<0.001	<0.001	<0.001
PCB 118														<0.001	<0.001	<0.001
PCB 138														<0.001	<0.001	<0.001
PCB 153														<0.001	<0.001	<0.001
PCB 180														<0.001	<0.001	<0.001
Total 7 PCBs	0.24 (5)	0.008 (5)												<0.001	<0.001	<0.001
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)		<0.001	0.036	0.007	<0.02	<0.001		<0.001	0.095	0.009	<0.001			
Dioxins & Furans																
Fraction of Organic Carbon									0.01				0.002	0.001		
VOCs																
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.006	<0.006

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				BH110-03	BH110-04	BH111-01	BH111-02	BH112-01	BH112-04	BH112-05	BH113-01	BH113-02	BH113-03	BH201	BH 201-2	BH 201-3
				3.5	4.5	1	2.5-3.7	4	6	7.5	0.0-1.0	1	6.5	0.25-0.5	0.3-2.2	3.5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG - slag	MG - slag	Mg - slag	MG - slag and Gravel from 3.3m	silt	silt	silt	MG - hardcore and quarry fill	MG - hardcore and quarry fill	MG - quarry fill	MG-gravel	MG-gravel	silt
				17/08/05	17/08/05	19/08/05	30/08/05	23/08/05	23/08/05	23/08/05	16/08/05	16/08/05	16/08/05	02/09/10	09/09/10	09/09/10
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	Soil	Soil	Soil
				18/08/05	18/08/05	23/08/05	31/08/05	24/08/05	24/08/05	24/08/05	17/08/05	17/08/05	18/08/05	03/09/10	09/09/10	09/09/10
				284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	284-296 2005	4100_b2	4100_b4	4100_b4
				Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol	Alcontrol		Jones	Jones	Jones
Parameter																
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.007	<0.007
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.007	<0.007
1,2,4-Trimethylbenzene	42**	49.7**		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.006	<0.006
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.006	<0.006
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
Benzene	27	90	230	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	NA	NA
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Chloromethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.007	<0.007
Ethylbenzene	5700	17000		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
Isopropylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Methyl Tertiary Butyl Ether				<0.000	<0.000	<0.000	<0.000	<0.000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002
Naphthalene	190	1200		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.027	<0.02
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
o-Xylene	6600	17000		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003

Haulbowline Factory Site
Solid Analysis Results

				137-140 (1)	**41-143,188 (1**	**416-419**	**610-613**	**542-545 (1)**	**554-557 (1)**	**558-561 (1)**	**32-35 (1)**	**36-39 (1)**	**144-147 (1)**	**64-66**	**80-81**	**82-84**
				BH110-03	**BH110-04**	**BH111-01**	**BH111-02**	**BH112-01**	**BH112-04**	**BH112-05**	**BH113-01**	**BH113-02**	**BH113-03**	**BH201**	**BH 201-2**	**BH 201-3**
				3.5	**4.5**	**1**	**2.5-3.7**	**4**	**6**	**7.5**	**0.0-1.0**	**1**	**6.5**	**0.25-0.5**	**0.3-2.2**	**3.5**
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**MG - slag**	**MG - slag**	**Mg - slag**	**MG - slag and Gravel from 3.3m**	**silt**	**silt**	**silt**	**MG - hardcore and quarry fill**	**MG - hardcore and quarry fill**	**MG - quarry fill**	**MG-gravel**	**MG-gravel**	**silt**
				17/08/05	**17/08/05**	**19/08/05**	**30/08/05**	**23/08/05**	**23/08/05**	**23/08/05**	**16/08/05**	**16/08/05**	**16/08/05**	**02/09/10**	**09/09/10**	**09/09/10**
				SOIL	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**SOIL**	**Soil**	**Soil**	**Soil**
				18/08/05	**18/08/05**	**23/08/05**	**31/08/05**	**24/08/05**	**24/08/05**	**24/08/05**	**17/08/05**	**17/08/05**	**18/08/05**	**03/09/10**	**09/09/10**	**09/09/10**
				284-296 2005	**284-296 2005**	**284-296 2005**	**284-296 2005**	**284-296 2005**	**284-296 2005**	**284-296 2005**	**284-296 2005**	**284-296 2005**	**284-296 2005**	**4100_b2**	**4100_b4**	**4100_b4**
				Alcontrol	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**	**Alcontrol**		**Jones**	**Jones**	**Jones**
Parameter																
p/m-Xylene	5900	170000		<0.001	0.002	0.008	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.006	<0.006
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Toluene	56000	87000		<0.001	0.002	0.008	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Trichloroethene	1.2	70		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

								NAVAL	NAVAL	NAVAL	NAVAL	NAVAL					
				19-21	22-24	25-27	77-79	61-63		70-72	54-56	57-59	76	34-36	25-27			48-50
				BH202	BH202	BH202	BH204	BH205	BH207-2	BH 207-3	BH208	BH208	BH 209-1	BH210	BH211	BH-212-2	BH-212-3	BH 213
				1.0	2.0-2.5	2.8-3.0	0.4	0.3	1	4.5	0.5	1.0-2.0	7.9	0.8-0.9	0.9-1.3	1	4	0.5-1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-Clay	MG-clay and Nat silt	silt	concrete	MG- cinder and brick rubble	MG clay with brick and concrete	Clay	MG-sand & gravel	MG and nat silt	MG - limestone and concrete	MG-clay	MG-gravel	MG-concrete fill	marine gravel	MG- silt with brick and concrete
				31/08/10	31/08/10	31/08/10	06/09/10	02/09/10	02/09/10	06/09/10	01/09/10	01/09/10	06/09/10	30/08/10	30/08/10	02/09/10	02/09/10	01/09/10
				Soil	Soil	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	Soil	Soil	Soil	SOIL	SOIL	Soil
				02/09/10	02/09/10	02/09/10	08/09/10	03/09/10	06/09/10	08/09/10	03/09/10	03/09/10	08/09/10	01/09/10	01/09/10	06/09/10	06/09/10	03/09/10
				284-296_2005	284-296_2006	284-296_2007	4100_b3	4100_b2	284-296_2005	4100_b3	4100_b2	4100_b2	4100_b3	332-352_2010	4082_v2	284-296_2005	284-296_2005	4100_b2
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																		
Arsenic	640	170	170	10.8	13.8	5.9	8.1	24.6	10.5	16.5	20.1	10.7	11.5	9.3	10.3	27.6	7	15.5
Cadmium	190	532	880	1.2	0.3	0.1	0.8	0.5	0.2	0.2	9.0	0.3	0.4	<0.1	0.2	0.4	0.1	0.2
Chromium	8600	33000		17.9	17.8	19.8	130.7	661.8	40.6	21.8	49.6	19.8	14.1	26.2	34.2	27.8	19.1	165.7
Copper	68000	44000		34	23	7	66	1028	70	28	150	27	51	31	40	114	10	106
Mercury	1100	240		<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.3	0.2	0.7	<0.1	<0.1	4.2	0.2	<0.1
Nickel	1800 (4)	922**		25.3	32.9	18.2	38.2	299.7	44.9	37.0	62.3	28.8	14.9	37.6	40.6	47.1	24.7	64.3
Lead	4640 (4)	477**	1300	46	40	20	106	161	w	41	438	95	105	66	99	430	20	123
Selenium	12000	1800		<1	1	<1	2	5	1	1	1	<1	<1	1	2	1	<1	1
Zinc	730000	170000		224	111	55	436	879	215	130	453	223	156	82	424	382	78	195
Barium		1570**		22	24	15	102	126	37	31	75	45	92	23	35	309	24	123
Cobalt				9.4	16.8	5.7	15.2	44.4	12.6	15.3	14.9	9.6	5.3	10.9	12.8	15.3	7.7	16.2
Manganese				802	713	288	3222	5783	831	852	829	341	172	815	1031	605	634	1415
Molybdenum				0.70	2.10	1.70	4.90	49.10	1.7	0.90	5.80	1.50	0.80	0.1	0.8	3.4	2.1	4.70
Aluminium				7985	12480	9835	14880	9341	15660	13700	10030	10580	8463	16280	16000	10830	9747	15140
Antimony		831**		<1	<1	<1	3	<1	<1	2	<1	<1	1	<1	<1	1	<1	<1
Calcium				89030	22080	73220	89720	27470	8685	6156	71330	52170	36240	1204	7929	24810	66730	54070
Iron				28200	30180	19210	45700	359200	47530	34780	51170	23470	13900	32750	36920	41980	19010	51160
Magnesium				2732	2680	5005	6788	4953	4842	3511	4542	4136	3203	6017	6171	3688	5071	16370
Thallium				<1	<1	<1	3	7	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tin				1	1	<1	3	51	18	<1	13	2	3	1	4	11	1	8
Vanadium	9000	5000		14	19	22	32	83	21	20	24	22	24	18	20	27	22	47
Water Soluble Boron	240000	46000		2	3	9	9	<1	0.8	5	3	6	29	0.3	0.9	3	9.7	3
Sodium				386	469	1292	486	133	404	448	659	665	3787	68	156	342	2811	1176
Potassium				768	1018	1937	1103	195	454	915	1090	1175	1436	415	597	890	1440	1116
Hexavalent Chromium	33	220	250	<0.3	<0.3	<0.3	<0.3	0.8	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3	0.5	<0.3	0.7
Nitrate as NO_3				<2	<2	<2	<2	<2	3	<2	<2	<2	<2	<2	36	5	<2	18
Sulphate - soluble 2:1 extract				0.175	0.192	0.432	0.210	0.020										
Sulphate																		
Chloride - soluble				453.0	522.0	932.0	55.0	70.0	72	381.0	438.0	525.0	5326.0	13.0	65.0	27	4577	47.0
Free Cyanide*	36 (4)	34**		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5
Total Cyanide*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide *				18	11	<10	<10	<10	<10	<10	52	<10		<10	<10	<10	<10	<10
Water Soluble Sulphate				0.175	0.192	0.432	0.21	0.02	0.807	0.067	0.478	0.540	0.156	0.028	0.091	0.890	0.302	0.046
Acid Soluble Sulphide																		
Thiocyanate*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5
Complex cyanide				<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	<2.5	<2.5
Total Sulphur				0.09	0.07	0.66	0.10	0.02	0.09	0.05	0.18	0.26	0.64	<0.01	0.03	0.22	0.54	0.07
Total Sulphate																		
Elemental Sulphur																		
Ammoniacal Nitrogen as N				<0.4	1.3	10.8	0.7	<0.4	3.9	4.7	0.6	0.6	NDP	<0.4	<0.4	0.4	4.1	<0.4
Amm N2/Tot Ammonia as NH4 low																		

Haulbowline Factory Site
Solid Analysis Results

				19-21	22-24	25-27	77-79	61-63		70-72	54-56	57-59	76	34-36	25-27			48-50
				BH202	BH202	BH202	BH204	BH205	BH-207-2	BH 207-3	BH208	BH208	BH 209-1	BH210	BH211	BH-212-2	BH-212-3	BH 213
				1.0	2.0-2.5	2.8-3.0	0.4	0.3	1	4.5	0.5	1.0-2.0	7.9	0.8-0.9	0.9-1.3	1	4	0.5-1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-Clay	MG-clay and Nat silt	silt	concrete	MG- cinder and brick rubble	MG clay with brick and concrete	Clay	MG-sand & gravel	MG and nat silt	MG - limestone and concrete	MG-clay	MG-gravel	MG-concrete fill	marine gravel	MG- silt with brick and concrete
				31/08/10	31/08/10	31/08/10	06/09/10	02/09/10	02/09/10	06/09/10	01/09/10	01/09/10	06/09/10	30/08/10	30/08/10	02/09/10	02/09/10	01/09/10
				Soil	Soil	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	Soil	Soil	Soil	SOIL	SOIL	Soil
				02/09/10	02/09/10	02/09/10	08/09/10	03/09/10	06/09/10	08/09/10	03/09/10	03/09/10	08/09/10	01/09/10	01/09/10	06/09/10	06/09/10	03/09/10
				284-296_2005	284-296_2006	284-296_2007	4100_b3	4100_b2	284-296_2005	4100_b3	4100_b2	4100_b2	4100_b3	332-352_2010	4082_v2	284-296_2005	284-296_2005	4100_b2
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																		
Asbestos screen*				NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Speciated Phenols by HPLC																		
Resorcinol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Catechol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenol				<0.01	<0.01	<0.01	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m/p-cresol		9910**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-cresol		9910**		<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total cresols		9910**		<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenols				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1-naphthol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,3,5-trimethyl phenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-isopropylphenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phenols	760	760		<0.01	<0.01	<0.01	<0.01	<0.01	0.30	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenols Total Monohydric	760	760																
Natural Moisture Content				12.0	19.4	32.4	81.8	3.4	10.4	17.8	19.7	26.0	13.5	4.5	7.78	21.8	30.2	19.2
pH Value				8.08	8.19	8.10	7.93	9.67	9.39	8.14	9.20	7.99	8.50	8.26	8.95	8.66	8.19	9.48
Solvent Extract																		
Total Extractable Hydrocarbons																		
TPHCWG - Aliphatics																		
Aliphatics >C5-C6	3200	95000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01		<0.01	<0.01	0.19	<0.010	<0.01
Aliphatics >C6-C8	7800	150000		0.30	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	0.10	0.20		<0.01	<0.01	0.24	<0.010	<0.01
Aliphatics >C8-C10	2000	14000		0.57	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	0.60		<0.01	<0.01	<0.010	<0.010	<0.01
Aliphatics >C10-C12	9700	21000		12.00	<0.1	<0.1	<0.1	<0.1	<0.1	4.00	<0.1	12.00		<0.1	2	<0.100	<0.100	<0.1
Aliphatics >C12-C16	59000	25000		81.00	<0.1	<0.1	<0.1	<0.1	<0.1	11.00	<0.1	38.00		<0.1	31	<0.100	<0.100	<0.1
Aliphatics >C16-C21	1600000	450000		80.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	44.00	56.00		<0.1	24	<0.100	<0.100	<0.1
Aliphatics >C21-C35	1600000	450000		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1253.00	934.00		<0.1	<0.1	<0.100	<0.100	<0.1
Aliphatics >C35-C40	1600000	450000																
Total Aliphatics >C6-C40 (Min Oils)				173.80	<0.1	<0.1	<0.1	<0.1	<0.1	15.00	1297.10	1040.80		<0.1	57	0.4	<0.100	<0.1
TPHCWG - Aromatics																		
Aromatics >EC5-EC7	26000	76000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01		<0.01	<0.01	<0.1	<0.1	<0.01
Aromatics >C7-C8	56000	87000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01		<0.01	<0.01	<0.120	<0.01	<0.01
Aromatics >C8-C10	3500	7200		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01		<0.01	<0.01	<0.010	<0.01	<0.01
Aromatics >C10-C12	16000	9200		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.00		<0.1	<0.1	<0.1	<0.1	1.60
Aromatics >C12-C16	36000	10000		18.00	<0.1	<0.1	<0.1	5.00	<0.1	<0.1	<0.1	10.00		<0.1	<0.1	<0.1	<0.1	8.00
Aromatics >C16-C21	28000	7600		48.00	<0.1	<0.1	<0.1	12.00	<0.1	<0.1	90.00	56.00		<0.1	<0.1	<0.1	<0.1	12.00
Aromatics >C21-C40	28000	7800		18.00	<0.1	<0.1	<0.1	44.00	<0.1	<0.1	1702.00	814.00		<0.1	<0.1	<0.1	<0.1	46.00
Total Aromatics >C5-C40	28000	7800		84.00	<0.1	<0.1	<0.1	61.00	<0.1	<0.1	1792.00	883.00		<0.1	<0.1	0.1	<0.1	67.60
Total TPH >C5-C40				257.80	<0.1	<0.1	<0.1	61.00	<0.1	15.00	3089.10	1923.80		<0.1	57	0.5	<0.1	67.60
BTEX/MTBE GC-FID																		
MTBE		15600**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01

Haulbowline Factory Site
Solid Analysis Results

				19-21	22-24	25-27	77-79	61-63		70-72	54-56	57-59	76	34-36	25-27			48-50
				BH202	BH202	BH202	BH204	BH205	BH-207-2	BH 207-3	BH208	BH208	BH 209-1	BH210	BH211	BH-212-2	BH-212-3	BH 213
				1.0	2.0-2.5	2.8-3.0	0.4	0.3	1	4.5	0.5	1.0-2.0	7.9	0.8-0.9	0.9-1.3	1	4	0.5-1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-Clay	MG-clay and Nat silt	silt	concrete	MG- cinder and brick rubble	MG clay with brick and concrete	Clay	MG-sand & gravel	MG and nat silt	MG - limestone and concrete	MG-clay	MG-gravel	MG-concrete fill	marine gravel	MG- silt with brick and concrete
				31/08/10	31/08/10	31/08/10	06/09/10	02/09/10	02/09/10	06/09/10	01/09/10	01/09/10	06/09/10	30/08/10	30/08/10	02/09/10	02/09/10	01/09/10
				Soil	Soil	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	Soil	Soil	Soil	SOIL	SOIL	Soil
				02/09/10	02/09/10	02/09/10	08/09/10	03/09/10	06/09/10	08/09/10	03/09/10	03/09/10	08/09/10	01/09/10	01/09/10	06/09/10	06/09/10	03/09/10
				284-296_2005	284-296_2006	284-296_2007	4100_b3	4100_b2	284-296_2005	4100_b3	4100_b2	4100_b2	4100_b3	332-352_2010	4082_v2	284-296_2005	284-296_2005	4100_b2
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																		
Benzene	27	90	230	<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	0.03	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	56000	87000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	0.06	0.01		<0.01	<0.01	0.12	<0.01	0.03
Ethyl benzene	5700	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	0.01	<0.01		<0.01	<0.01	0.03	<0.01	0.02
m/p-Xylene	5900	170000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	0.02	<0.01		<0.01	<0.01	0.02	<0.01	<0.01
o-Xylene	6600	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	<0.01	0.01		<0.01	<0.01	0.02	<0.01	0.01
Total Xylenes	312**	14500**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.010	<0.01	0.02	0.01		<0.01	<0.01	0.04	<0.01	0.02
PAH 17 MS																		
Naphthalene	190	1200		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		0.001	0.001	0.001	0.001	0.550
Acenaphthylene	83000	29000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.120
Acenaphthene	84000	29000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Fluorene	63000	20000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Phenanthrene	22000	6200		<0.001	<0.001	<0.001	<0.001	<0.001	0.250	<0.001	0.340	0.130		<0.001	0.160	0.090	<0.001	0.700
Anthracene	520000	150000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.040	<0.001	0.160	0.050		<0.001	<0.001	<0.001	<0.001	0.190
Fluoranthene	23000	6300		<0.001	<0.001	<0.001	<0.001	<0.001	0.300	<0.001	0.740	0.320		<0.001	0.110	0.110	<0.001	0.880
Pyrene	54000	15000		<0.001	<0.001	<0.001	<0.001	<0.001	0.230	<0.001	0.590	0.250		<0.001	0.100	0.100	<0.001	0.810
Benz(a)anthracene	170	49		<0.001	<0.001	<0.001	<0.001	<0.001	0.170	<0.001	0.440	0.330		<0.001	<0.001	0.120	<0.001	0.520
Chrysene	350	93		<0.001	<0.001	<0.001	<0.001	<0.001	0.190	<0.001	0.540	0.290		<0.001	<0.001	0.120	<0.001	0.520
Benzo(bk)fluoranthene	44	13		<0.001	<0.001	<0.001	<0.001	<0.001	0.250	<0.001	0.560	0.340		<0.001	<0.001	0.150	<0.001	0.930
Benzo(b)fluoranthene	44	13																
Benzo(k)fluoranthene	1200	370																
Benzo(a)pyrene	35	11	21	<0.001	<0.001	<0.001	<0.001	<0.001	0.130	<0.001	0.380	0.200		<0.001	<0.001	0.070	<0.001	0.450
Indeno(123cd)pyrene	500	150		<0.001	<0.001	<0.001	<0.001	<0.001	0.100	<0.001	0.180	0.110		<0.001	<0.001	0.100	<0.001	0.480
Dibenzo(ah)anthracene	3.5	1.1		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.070
Benzo(ghi)perylene	3900	1400		<0.001	<0.001	<0.001	<0.001	<0.001	0.090	<0.001	0.190	0.090		<0.001	<0.001	0.100	<0.001	0.410
Coronene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.120
PAH Total				<0.001	<0.001	<0.001	<0.001	<0.001	1.750	<0.001	4.120	2.110		<0.001	0.370	0.960	<0.001	6.750
PCB (7 congeners)																		
PCB 28				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.124	<0.001	<0.001	<0.001
PCB 52				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.059	<0.001	<0.001	<0.001
PCB 101				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.023	<0.001	<0.001	<0.001
PCB 118				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.017	<0.001	<0.001	<0.001
PCB 138				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.019	<0.001	<0.001	<0.001
PCB 153				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.027	<0.001	<0.001	<0.001
PCB 180				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.012	<0.001	<0.001	<0.001
Total 7 PCBs	0.24 (5)	0.008 (5)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.281	<0.001	<0.001	<0.001
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)																
Dioxins & Furans																		
Fraction of Organic Carbon				0.001	0.032	0.007	0.001	0.002	0.005	0.004	0.062	0.042	0.582					0.071
VOCs																		
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Haulbowline Factory Site
Solid Analysis Results

				19-21	22-24	25-27	77-79	61-63		70-72	54-56	57-59	76	34-36	25-27			48-50
				BH202	BH202	BH202	BH204	BH205	BH-207-2	BH 207-3	BH208	BH208	BH 209-1	BH210	BH211	BH-212-2	BH-212-3	BH 213
				1.0	2.0-2.5	2.8-3.0	0.4	0.3	1	4.5	0.5	1.0-2.0	7.9	0.8-0.9	0.9-1.3	1	4	0.5-1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-Clay	MG-clay and Nat silt	silt	concrete	MG- cinder and brick rubble	MG clay with brick and concrete	Clay	MG-sand & gravel	MG and nat silt	MG - limestone and concrete	MG-clay	MG-gravel	MG-concrete fill	marine gravel	MG- silt with brick and concrete
				31/08/10	31/08/10	31/08/10	06/09/10	02/09/10	02/09/10	06/09/10	01/09/10	01/09/10	06/09/10	30/08/10	30/08/10	02/09/10	02/09/10	01/09/10
				Soil	Soil	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	Soil	Soil	Soil	SOIL	SOIL	Soil
				02/09/10	02/09/10	02/09/10	08/09/10	03/09/10	06/09/10	08/09/10	03/09/10	03/09/10	08/09/10	01/09/10	01/09/10	06/09/10	06/09/10	03/09/10
				284-296_2005	284-296_2006	284-296_2007	4100_b3	4100_b2	284-296_2005	4100_b3	4100_b2	4100_b2	4100_b3	332-352_2010	4082_v2	284-296_2005	284-296_2005	4100_b2
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																		
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.025
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.007
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.017
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009
Benzene	27	90	230	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.008
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Carbon Disulphide	11	1300		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1-3-Dichloropropene				<0.001	<0.001	0.052	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	5700	17000		<0.001	<0.001	<0.001	<0.001	<0.001	0.009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.027	<0.001	0.030
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Naphthalene	190	1200		<0.001	<0.001	<0.001	<0.001	<0.001	<0.035	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.03
o-Xylene	6600	17000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007

Haulbowline Factory Site
Solid Analysis Results

				19-21	22-24	25-27	77-79	61-63		70-72	54-56	57-59	76	34-36	25-27			48-50
				BH202	BH202	BH202	BH204	BH205	BH-207-2	BH 207-3	BH208	BH208	BH 209-1	BH210	BH211	BH-212-2	BH-212-3	BH 213
				1.0	2.0-2.5	2.8-3.0	0.4	0.3	1	4.5	0.5	1.0-2.0	7.9	0.8-0.9	0.9-1.3	1	4	0.5-1.0
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	MG-Clay	MG-clay and Nat silt	silt	concrete	MG- cinder and brick rubble	MG clay with brick and concrete	Clay	MG-sand & gravel	MG and nat silt	MG - limestone and concrete	MG-clay	MG-gravel	MG-concrete fill	marine gravel	MG- silt with brick and concrete
				31/08/10	31/08/10	31/08/10	06/09/10	02/09/10	02/09/10	06/09/10	01/09/10	01/09/10	06/09/10	30/08/10	30/08/10	02/09/10	02/09/10	01/09/10
				Soil	Soil	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	Soil	Soil	Soil	SOIL	SOIL	Soil
				02/09/10	02/09/10	02/09/10	08/09/10	03/09/10	06/09/10	08/09/10	03/09/10	03/09/10	08/09/10	01/09/10	01/09/10	06/09/10	06/09/10	03/09/10
				284-296_2005	284-296_2006	284-296_2007	4100_b3	4100_b2	284-296_2005	4100_b3	4100_b2	4100_b2	4100_b3	332-352_2010	4082_v2	284-296_2005	284-296_2005	4100_b2
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																		
p/m-Xylene	5900	170000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.011
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		<0.001	<0.001	0.05	<0.001	<0.001	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.081	0.048	0.048
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

				51-53	67-69			29-31	35-37	28-30		31-33	41-43	44-46			
				BH213	BH213	BH214	BH214	BH215	BH215	BH216	BH216	BH216	BH217	BH217	BH218	BH218	BH-219-2
				3	7.5	1.5	6	0.3	1.8	2.8-3.3	2.8-3.3	3.9-4.1	0.35-0.6	3-4	1	4.5	5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	silt-alluvium	silt-alluvium	MG- clay with brick and concrete	silt - alluvium	MG-brick rubble	silt - alluvium	MG-clinker, glass, brick, concrete, timber and steel	MG-clinker, glass, brick, concrete, timber and steel	MG and nat sand (marine)	MG-clay with brick, concrete	silt	MG-clay	silt	gravel- marine
				01/09/10	02/09/10	30/08/10	30/08/10	31/08/10	31/08/10	30/08/10	30/08/10	30/08/10	01/09/10	01/09/10	31/08/10	31/08/10	02/09/10
				Soil	Soil	SOIL	SOIL	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	SOIL	SOIL	SOIL
				03/09/10	03/09/10	01/08/10	01/08/10	02/09/10	02/09/10	01/09/10	01/08/10	01/09/10	02/09/10	02/09/10	02/09/10	02/09/10	06/09/10
				4100_b2	4100_b2	284-296_2005	284-296_2005	284-296_2005	284-296_2005	332-352_2010	284-296_2005	332-352_2010	4100	4100	284-296_2005	284-296_2005	284-296_2005
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																	
Arsenic	640	170	170	7.5	6.3	14.4	10.2	23.8	8.5	0.088	65.1	9.6	28.5	48.2	9.1	5.6	90.6
Cadmium	190	532	880	0.1	<0.1	0.7	0.2	0.6	<0.1	<0.0003	2.2	0.3	0.6	0.1	0.2	<0.1	3.0
Chromium	8600	33000		19.0	21.9	22.3	20.4	141.4	17.8	<0.002	35.6	12.9	29.3	10.0	17.8	16.1	9.5
Copper	68000	44000		10	21	35	33	240	12	<0.030	1737	85	122	354	16	8	519
Mercury	1100	240		0.2	<0.1	<0.1	0.3	<0.1	<0.1	<0.0001	3.1	1.2	12.0	8.9	<0.1	0.2	16.7
Nickel	1800 (4)	922**		22.5	28.0	36.3	22.3	76.0	20.7	0.390	75.2	20.2	26.0	27.6	27.6	15.2	35.3
Lead	4640 (4)	477**	1300	15	19	39	76	236	36	1.400	***18850***	***741***	**1242**	***3107***	23	17	***4176***
Selenium	12000	1800		<1	<1	1	1	2	<1	<0.012	4	<1	1	<1	<1	<1	2
Zinc	730000	170000		70	81	153	73	349	72	1.760	6361	458	474	949	90	46	2513
Barium		1570**		19	29	50	32	94	16	1.510	932	123	360	324	20	13	451
Cobalt				7.5	9.0	11.6	7.0	17.5	5.9	0.090	29.7	6.8	10.5	9.9	10.8	4.9	17.3
Manganese				333	196	275	419	3100	241	2.710	1022	267	593	344	424	271	211
Molybdenum				1.80	0.40	1.2	1.2	7.1	2.6	0.090	6.0	1.1	3.00	2.70	1.3	0.9	3.4
Aluminium				10040	10840	12030	11500	8975	9213	<0.015	5572	7569	4047	8795	10700	8194	4277
Antimony		831**		<1	1	<1	<1	<1	<1		<1	<1	1	6	<1	<1	52
Calcium				63790	5682	5653	44870	116300	55510		24800	32070	9869	53970	45770	93040	10360
Iron				19460	25230	28490	21800	103500	21560	<0.047	181800	18260	15260	32340	25460	16590	91900
Magnesium				4566	4233	3013	5047	4692	4192	2	1953	3226	889	2396	3041	4709	1103
Thallium				<1	<1	<1	<1	3	<1	<0.009	1	<1	<1	<1	<1	<1	<1
Tin				<1	<1	3	2	22	3	0.30	176	8	11	24	<1	<1	860
Vanadium	9000	5000		22	21	18	22	41	19	<0.006	82	14	29	19	19	19	27
Water Soluble Boron	240000	46000		7	5	1.5	13.8	1	8	0.79	1.9	2.0	1	6	4.0	8	9.2
Sodium				1360	906	145	988	186	1795	<1	429	303	213	3584	533	926	1780
Potassium				1289	908	773	1624	680	1154	<1	324	620	413	682	857	999	490
Hexavalent Chromium	33	220	250	0.4	<0.3	2.0	<0.3	<0.3	<0.3	<0.3	11.3	0.8	0.6	0.6	<0.3	<0.3	0.3
Nitrate as NO_3				<2	<2	4.7	4.8	<2	<2	<5	<2	<2	3	<2	<2	<2	<2
Sulphate - soluble 2:1 extract																	
Sulphate										1137							
Chloride - soluble				1352.0	1763.0	38	403	32	2532	49	127	120.0	25	3037	139	114	1829
Free Cyanide*	36 (4)	34**		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Cyanide*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphide *				<10	<10	<10	<13	<10	<10	<5	15	10.0	<10	13	57	10	50
Water Soluble Sulphate				0.470	0.123	0.073	0.695	0.032	0.417		0.216	0.096	0.020	0.253	0.030	0.259	2.907
Acid Soluble Sulphide																	
Thiocyanate*				<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Complex cyanide				<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Total Sulphur				0.42	0.04	0.05	0.88	0.04	0.74		0.57	0.57	0.05	0.43	0.17	0.51	1.35
Total Sulphate																	
Elemental Sulphur																	
Ammoniacal Nitrogen as N				1.8	6.5	1.2	36.8	<0.4	5.0		0.7	0.5	<0.4	<0.4	0.7	7.0	0.5
Amm N2/Tot Ammonia as NH4 low										1.5							

Haulbowline Factory Site
Solid Analysis Results

				51-53	67-69			29-31	35-37	28-30		31-33	41-43	44-46			
				BH213	BH213	BH214	BH214	BH215	BH215	BH216	BH216	BH216	BH217	BH217	BH218	BH218	BH-219-2
				3	7.5	1.5	6	0.3	1.8	2.8-3.3	2.8-3.3	3.9-4.1	0.35-0.6	3-4	1	4.5	5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	silt-alluvium	silt-alluvium	MG- clay with brick and concrete	silt - alluvium	MG-brick rubble	silt - alluvium	MG-clinker, glass, brick, concrete, timber and steel	MG-clinker, glass, brick, concrete, timber and steel	MG and nat sand (marine)	MG-clay with brick, concrete	silt	MG-clay	silt	gravel- marine
				01/09/10	02/09/10	30/08/10	30/08/10	31/08/10	31/08/10	30/08/10	30/08/10	30/08/10	01/09/10	01/09/10	31/08/10	31/08/10	02/09/10
				Soil	Soil	SOIL	SOIL	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	SOIL	SOIL	SOIL
				03/09/10	03/09/10	01/08/10	01/08/10	02/09/10	02/09/10	01/09/10	01/08/10	01/09/10	02/09/10	02/09/10	02/09/10	02/09/10	06/09/10
				4100_b2	4100_b2	284-296_2005	284-296_2005	284-296_2005	284-296_2005	332-352_2010	284-296_2005	332-352_2010	4100	4100	284-296_2005	284-296_2005	284-296_2005
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																	
Asbestos screen*				NAD	NAD	NAD	NAD	NAD	NAD		NAD	NAD	NAD	NAD	NAD	NAD	NAD
Speciated Phenols by HPLC																	
Resorcinol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Catechol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01
m/p-cresol		9910**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-cresol		9910**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total cresols		9910**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenols				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1-naphthol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	0.2	<0.01	<0.01
2,3,5-trimethyl phenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-isopropylphenol				<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.01
Total Phenols	760	760		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	0.3	<0.01	<0.01
Phenols Total Monohydric	760	760															
Natural Moisture Content				33.8	18.9	18.8	33.1	5.4	25.9		24.5	33.2	21.1	42.6	18.6	34.8	35.5
pH Value				8.03	8.14	8.63	8.37	8.50	8.19		7.61	6.88	7.64	7.59	8.35	8.25	6.96
Solvent Extract																	
Total Extractable Hydrocarbons																	
TPHCWG - Aliphatics																	
Aliphatics >C5-C6	3200	95000		<0.01	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	0.17	<0.01	<0.01	<0.01	<0.01	0.81	<0.01
Aliphatics >C6-C8	7800	150000		<0.01	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	3.57	0.42	<0.01	<0.01	0.32	0.57	<0.01
Aliphatics >C8-C10	2000	14000		<0.01	<0.01	0.82	<0.1	<0.01	<0.01	0.16	19.22	3.94	<0.01	2.88	2.49	0.26	<0.01
Aliphatics >C10-C12	9700	21000		<0.1	<0.1	22	<0.1	<0.1	<0.1		1555.0	14.0	<0.1	46	177	<0.1	<0.1
Aliphatics >C12-C16	59000	25000		<0.1	<0.1	<0.1	<0.1	5	15		5343.0	85.0	<0.1	336	20	<0.1	<0.1
Aliphatics >C16-C21	1600000	450000		<0.1	<0.1	<0.1	<0.1	54	75		4497.0	73.0	<0.1	330	210.0	<0.1	<0.1
Aliphatics >C21-C35	1600000	450000		<0.1	<0.1	<0.1	<0.1	113	13		1883.0	13.0	<0.1	161	22374.0	<0.1	<0.1
Aliphatics >C35-C40	1600000	450000															
Total Aliphatics >C6-C40 (Min Oils)				<0.1	<0.1	22.8	<0.1	172.00	103.00		13300.9	189.4	<0.1	875.90	22783.8	1.6	<0.1
TPHCWG - Aromatics																	
Aromatics >EC5-EC7	26000	76000		<0.01	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.1	<0.1	<0.1
Aromatics >C7-C8	56000	87000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C8-C10	3500	7200		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C10-C12	16000	9200		<0.1	<0.1	<0.1	4.0	<0.1	<0.1		194.0	<0.1	<0.1	4.00	45	<0.1	<0.1
Aromatics >C12-C16	36000	10000		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		1387.0	<0.1	<0.1	84	261	<0.1	<0.1
Aromatics >C16-C21	28000	7600		<0.1	<0.1	<0.1	15	8.00	23.00		2028.0	<0.1	<0.1	361.00	84	<0.1	18.0
Aromatics >C21-C40	28000	7800		<0.1	<0.1	<0.1	41	26.00	12.00		1239.0	<0.1	50.00	577.00	4781.0	<0.1	93.0
Total Aromatics >C5-C40	28000	7800		<0.1	<0.1	<0.1	60.0	34.00	35.00		4848.0	<0.1	50.00	1026.00	5171.0	<0.1	111.0
Total TPH >C5-C40				<0.1	<0.1	22.8	60.0	206.00	138.00		18148.9	189.4	50.00	1901.90	27954.8	1.6	111.0
BTEX/MTBE GC-FID																	
MTBE		15600**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Haulbowline Factory Site
Solid Analysis Results

				51-53	67-69			29-31	35-37	28-30		31-33	41-43	44-46			
				BH213	BH213	BH214	BH214	BH215	BH215	BH216	BH216	BH216	BH217	BH217	BH218	BH218	BH-219-2
				3	7.5	1.5	6	0.3	1.8	2.8-3.3	2.8-3.3	3.9-4.1	0.35-0.6	3-4	1	4.5	5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	silt-alluvium	silt-alluvium	MG- clay with brick and concrete	silt - alluvium	MG-brick rubble	silt - alluvium	MG-clinker, glass, brick, concrete, timber and steel	MG-clinker, glass, brick, concrete, timber and steel	MG and nat sand (marine)	MG-clay with brick, concrete	silt	MG-clay	silt	gravel- marine
				01/09/10	02/09/10	30/08/10	30/08/10	31/08/10	31/08/10	30/08/10	30/08/10	30/08/10	01/09/10	01/09/10	31/08/10	31/08/10	02/09/10
				Soil	Soil	SOIL	SOIL	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	SOIL	SOIL	SOIL
				03/09/10	03/09/10	01/08/10	01/08/10	02/09/10	02/09/10	01/09/10	01/08/10	01/09/10	02/09/10	02/09/10	02/09/10	02/09/10	06/09/10
				4100_b2	4100_b2	284-296_2005	284-296_2005	284-296_2005	284-296_2005	332-352_2010	284-296_2005	332-352_2010	4100	4100	284-296_2005	284-296_2005	284-296_2005
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																	
Benzene	27	90	230	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Toluene	56000	87000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		0.09	0.01	0.04	0.05	<0.01	<0.01	<0.01
Ethyl benzene	5700	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
m/p-Xylene	5900	170000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-Xylene	6600	17000		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Xylenes	312**	14500**		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PAH 17 MS																	
Naphthalene	190	1200		0.001	0.001	0.001	0.001	0.001	0.001	0.004	3.310	0.001	0.160	0.010	0.001	0.001	0.010
Acenaphthylene	83000	29000		<0.001	<0.001	<0.001	<0.001	0.060	<0.001	0.0009	2.190	0.050	0.220	<0.01	<0.001	<0.001	<0.01
Acenaphthene	84000	29000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026	2.100	<0.001	<0.001	<0.01	<0.001	<0.001	<0.01
Fluorene	63000	20000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0037	5.080	0.050	0.070	<0.01	<0.001	<0.001	<0.01
Phenanthrene	22000	6200		<0.001	<0.001	<0.001	<0.001	0.280	<0.001	0.0015	14.410	0.250	1.620	3.300	<0.001	<0.001	3.20
Anthracene	520000	150000		<0.001	<0.001	<0.001	<0.001	0.050	<0.001	0.0002	1.290	0.090	0.450	0.800	<0.001	<0.001	0.70
Fluoranthene	23000	6300		<0.001	<0.001	<0.001	0.16	0.720	<0.001	0.0016	9.650	0.450	2.340	7.700	<0.001	<0.001	4.70
Pyrene	54000	15000		<0.001	<0.001	<0.001	0.12	0.580	<0.001	0.0013	7.970	0.450	2.020	7.300	<0.001	<0.001	4.20
Benz(a)anthracene	170	49		<0.001	<0.001	<0.001	<0.001	0.430	<0.001	0.0005	4.580	0.430	1.530	4.600	<0.001	<0.001	2.40
Chrysene	350	93		<0.001	<0.001	<0.001	<0.001	0.480	<0.001	0.0005	5.170	0.440	1.210	5.200	<0.001	<0.001	2.70
Benzo(bk)fluoranthene	44	13		<0.001	<0.001	<0.001	<0.001	0.900	<0.001	0.0009	7.650	0.950	1.990	7.800	<0.001	<0.001	3.50
Benzo(b)fluoranthene	44	13															
Benzo(k)fluoranthene	1200	370															
Benzo(a)pyrene	35	11	21	<0.001	<0.001	<0.001	<0.001	0.570	<0.001	0.0004	4.670	0.450	1.300	5.200	<0.001	<0.001	1.80
Indeno(123cd)pyrene	500	150		<0.001	<0.001	<0.001	<0.001	0.460	<0.001	0.0003	2.840	0.330	1.190	3.400	<0.001	<0.001	1.50
Dibenzo(ah)anthracene	3.5	1.1		<0.001	<0.001	<0.001	<0.001	0.070	<0.001	<0.0001	0.750	0.440	0.150	0.700	<0.001	<0.001	<0.010
Benzo(ghi)perylene	3900	1400		<0.001	<0.001	<0.001	<0.001	0.330	<0.001	0.0003	3.050	0.400	0.730	3.000	<0.001	<0.001	1.20
Coronene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	0.560	0.370	0.120	<0.01	<0.001	<0.001	<0.010
PAH Total				<0.001	<0.001	<0.001	0.28	4.930	<0.001	0.0182	75.270	5.150	15.100	49	<0.001	<0.001	25.90
PCB (7 congeners)																	
PCB 28				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCB 52				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCB 101				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCB 118				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCB 138				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCB 153				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCB 180				<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
Total 7 PCBs	0.24 (5)	0.008 (5)		<0.001	<0.001	<0.01	<0.01	<0.001	<0.001	<0.0001	<0.01	<0.01	<0.001	<0.001	<0.010	<0.010	<0.001
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)															
Dioxins & Furans																	
Fraction of Organic Carbon				0.014	0.001	-	-	0.013	0.007				0.542	0.355	0.028	0.007	0.28
VOCs																	
1,1,1,2-Tetrachloroethane	110	1500		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane	660	57000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
1,1-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001

Haulbowline Factory Site
Solid Analysis Results

				51-53	67-69			29-31	35-37	28-30		31-33	41-43	44-46			
				BH213	BH213	BH214	BH214	BH215	BH215	BH216	BH216	BH216	BH217	BH217	BH218	BH218	BH-219-2
				3	7.5	1.5	6	0.3	1.8	2.8-3.3	2.8-3.3	3.9-4.1	0.35-0.6	3-4	1	4.5	5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	silt-alluvium	silt-alluvium	MG- clay with brick and concrete	silt - alluvium	MG-brick rubble	silt - alluvium	MG-clinker, glass, brick, concrete, timber and steel	MG-clinker, glass, brick, concrete, timber and steel	MG and nat sand (marine)	MG-clay with brick, concrete	silt	MG-clay	silt	gravel- marine
				01/09/10	02/09/10	30/08/10	30/08/10	31/08/10	31/08/10	30/08/10	30/08/10	30/08/10	01/09/10	01/09/10	31/08/10	31/08/10	02/09/10
				Soil	Soil	SOIL	SOIL	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	SOIL	SOIL	SOIL
				03/09/10	03/09/10	01/08/10	01/08/10	02/09/10	02/09/10	01/09/10	01/08/10	01/09/10	02/09/10	02/09/10	02/09/10	02/09/10	06/09/10
				4100_b2	4100_b2	284-296_2005	284-296_2005	284-296_2005	284-296_2005	332-352_2010	284-296_2005	332-352_2010	4100	4100	284-296_2005	284-296_2005	284-296_2005
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																	
1,1-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
1,2,3-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,3-Trichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001	<0.001	0.541	<0.001	<0.001	<0.001		0.914	<0.001	<0.001	<0.001	1.583	<0.001	<0.001
1,2-Dibromo-3-chloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dibromoethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane	0.67	21		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
1,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001	<0.001	0.269	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.302	<0.001	<0.001
1,3-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,3-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,4-Dichlorobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
2,2-Dichloropropane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
2-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Chlorotoluene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001	<0.001	0.034	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.233	<0.001	<0.001
Benzene	27	90	230	<0.001	<0.001	<0.001	<0.001	0.004	0.005		<0.001	<0.001	0.032	0.012	0.013	0.001	0.01
Bromobenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Bromodichloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Bromoform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Carbon Disulphide	11	1300		NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Chlorobenzene	56	1300		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Chloroform				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Chloromethane				<0.001	<0.001	<0.001	<0.001	0.015	<0.001		<0.001	<0.001	0.014	<0.001	<0.001	0.001	0.001
cis-1-2-Dichloroethene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
cis-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Dibromochloromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromomethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Dichlorodifluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	0.001	0.001	0.001	0.001
Dichloromethane	116 (4)	297**		<0.001	<0.001	<0.001	<0.001	0.560	0.760		<0.001	<0.001	0.159	0.640	0.082	0.001	0.001
Ethylbenzene	5700	17000		<0.001	<0.001	<0.001	<0.001	0.007	<0.001		<0.001	<0.001	0.048	<0.001	0.1	<0.001	<0.001
Hexachlorobutadiene	31	48		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.441	<0.001	<0.001	<0.001	0.063	<0.001	<0.001
Methyl Tertiary Butyl Ether				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Naphthalene	190	1200		<0.001	<0.001	0.341	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	0.694	<0.001	<0.001	0.141
n-Butylbenzene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		2.504	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Xylene	6600	17000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	0.1	<0.001	<0.001

Haulbowline Factory Site
Solid Analysis Results

				51-53	67-69			29-31	35-37	28-30		31-33	41-43	44-46			
				BH213	BH213	BH214	BH214	BH215	BH215	BH216	BH216	BH216	BH217	BH217	BH218	BH218	BH-219-2
				3	7.5	1.5	6	0.3	1.8	2.8-3.3	2.8-3.3	3.9-4.1	0.35-0.6	3-4	1	4.5	5
	S4ULs for Commercial / Industrial Use (mg/kg)	S4ULs Public Open (mg/kg)	C4SL Public Open Space 2 (mg/kg)	silt-alluvium	silt-alluvium	MG- clay with brick and concrete	silt - alluvium	MG-brick rubble	silt - alluvium	MG-clinker, glass, brick, concrete, timber and steel	MG-clinker, glass, brick, concrete, timber and steel	MG and nat sand (marine)	MG-clay with brick, concrete	silt	MG-clay	silt	gravel- marine
				01/09/10	02/09/10	30/08/10	30/08/10	31/08/10	31/08/10	30/08/10	30/08/10	30/08/10	01/09/10	01/09/10	31/08/10	31/08/10	02/09/10
				Soil	Soil	SOIL	SOIL	Soil	Soil	Soil	SOIL	Soil	Soil	Soil	SOIL	SOIL	SOIL
				03/09/10	03/09/10	01/08/10	01/08/10	02/09/10	02/09/10	01/09/10	01/08/10	01/09/10	02/09/10	02/09/10	02/09/10	02/09/10	06/09/10
				4100_b2	4100_b2	284-296_2005	284-296_2005	284-296_2005	284-296_2005	332-352_2010	284-296_2005	332-352_2010	4100	4100	284-296_2005	284-296_2005	284-296_2005
				Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones	Jones
Parameter																	
p/m-Xylene	5900	170000		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	0.015	<0.001	0.2	<0.001	<0.001
Propylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.780	<0.001	<0.001	<0.001	0.179	<0.001	<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.093	<0.001	<0.001	<0.001	0.187	<0.001	<0.001
Tetrachloroethene	19	810		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	56000	87000		<0.001	<0.001	<0.001	<0.001	0.034	0.031		<0.001	<0.001	0.176	0.058	0.131	0.014	0.021
trans-1-2-Dichloroethene	22 (4)	212**		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
trans-1-3-Dichloropropene				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethene	1.2	70		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Trichlorofluoromethane				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001
Vinyl Chloride	0.059	4.8		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Haulbowline Factory Site
Solid Analysis Results

				BH-220-1
				plicate of BH-21
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**Duplicate of BH-219-2**
				02/09/10
				SOIL
				06/09/10
				284-296_2005
				Jones
Parameter				
Arsenic	640	170	170	79.2
Cadmium	190	532	880	3.5
Chromium	8600	33000		13.2
Copper	68000	44000		1112
Mercury	1100	240		10.8
Nickel	1800 (4)	922**		48.4
Lead	4640 (4)	477**	1300	***2317***
Selenium	12000	1800		2
Zinc	730000	170000		2859
Barium		1570**		435
Cobalt				21.3
Manganese				503
Molybdenum				4.6
Aluminium				8148
Antimony		831**		158
Calcium				37730
Iron				69340
Magnesium				2791
Thallium				<1
Tin				2167
Vanadium	9000	5000		27
Water Soluble Boron	240000	46000		6.1
Sodium				1554
Potassium				623
Hexavalent Chromium	33	220	250	<0.3
Nitrate as NO_3				<2
Sulphate - soluble 2:1 extract				
Sulphate				
Chloride - soluble				1659
Free Cyanide*	36 (4)	34**		<0.5
Total Cyanide*				<0.5
Sulphide *				57
Water Soluble Sulphate				0.606
Acid Soluble Sulphide				
Thiocyanate*				<0.5
Complex cyanide				<2.5
Total Sulphur				1.22
Total Sulphate				
Elemental Sulphur				
Ammoniacal Nitrogen as N				<0.4
Amm N2/Tot Ammonia as NH4 low				

Haulbowline Factory Site
Solid Analysis Results

				BH-220-1
				plicate of BH-21
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**Duplicate of BH-219-2**
				02/09/10
				SOIL
				06/09/10
				284-296_2005
				Jones
Parameter				
Asbestos screen*				NAD
Speciated Phenols by HPLC				
Resorcinol				<0.01
Catechol				<0.01
Phenol				<0.01
m/p-cresol		9910**		<0.01
o-cresol		9910**		<0.01
Total cresols		9910**		<0.01
Xylenols				<0.01
1-naphthol				<0.01
2,3,5-trimethyl phenol				<0.01
2-isopropylphenol				<0.01
Total Phenols	760	760		<0.01
Phenols Total Monohydric	760	760		
Natural Moisture Content				34.0
pH Value				7.35
Solvent Extract				
Total Extractable Hydrocarbons				
TPHCWG - Aliphatics				
Aliphatics >C5-C6	3200	95000		<0.01
Aliphatics >C6-C8	7800	150000		<0.01
Aliphatics >C8-C10	2000	14000		<0.01
Aliphatics >C10-C12	9700	21000		8.0
Aliphatics >C12-C16	59000	25000		117.0
Aliphatics >C16-C21	1600000	450000		178.0
Aliphatics >C21-C35	1600000	450000		252.0
Aliphatics >C35-C40	1600000	450000		
Total Aliphatics >C6-C40 (Min Oils)				555.0
TPHCWG - Aromatics				
Aromatics >EC5-EC7	26000	76000		<0.1
Aromatics >C7-C8	56000	87000		<0.01
Aromatics >C8-C10	3500	7200		<0.01
Aromatics >C10-C12	16000	9200		1.0
Aromatics >C12-C16	36000	10000		19.0
Aromatics >C16-C21	28000	7600		171.0
Aromatics >C21-C40	28000	7800		629.0
Total Aromatics >C5-C40	28000	7800		820.0
Total TPH >C5-C40				1375.0
BTEX/MTBE GC-FID				
MTBE		15600**		<0.01

Haulbowline Factory Site
Solid Analysis Results

				BH-220-1
				plicate of BH-21
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**Duplicate of BH-219-2**
				02/09/10
				SOIL
				06/09/10
				284-296_2005
				Jones
Parameter				
Benzene	27	90	230	<0.01
Toluene	56000	87000		<0.01
Ethyl benzene	5700	17000		<0.01
m/p-Xylene	5900	170000		<0.01
o-Xylene	6600	17000		<0.01
Total Xylenes	312**	14500**		<0.01
PAH 17 MS				
Naphthalene	190	1200		0.001
Acenaphthylene	83000	29000		0.430
Acenaphthene	84000	29000		1.170
Fluorene	63000	20000		1.060
Phenanthrene	22000	6200		7.360
Anthracene	520000	150000		1.780
Fluoranthene	23000	6300		7.790
Pyrene	54000	15000		6.130
Benz(a)anthracene	170	49		3.420
Chrysene	350	93		3.500
Benzo(bk)fluoranthene	44	13		5.000
Benzo(b)fluoranthene	44	13		
Benzo(k)fluoranthene	1200	370		
Benzo(a)pyrene	35	11	21	3.590
Indeno(123cd)pyrene	500	150		1.980
Dibenzo(ah)anthracene	3.5	1.1		0.250
Benzo(ghi)perylene	3900	1400		1.970
Coronene				<0.001
PAH Total				45.430
PCB (7 congeners)				
PCB 28				<0.001
PCB 52				<0.001
PCB 101				<0.001
PCB 118				<0.001
PCB 138				<0.001
PCB 153				<0.001
PCB 180				<0.001
Total 7 PCBs	0.24 (5)	0.008 (5)		<0.001
PCBs (vs Aroclor 1254)	0.24 (5)	0.008 (5)		
Dioxins & Furans				
Fraction of Organic Carbon				-
VOCs				
1,1,1,2-Tetrachloroethane	110	1500		<0.001
1,1,1-Trichloroethane	660	57000		0.001
1,1,2,2-Tetrachloroethane	270	1800		<0.001
1,1,2-Trichloroethane				<0.001
1,1-Dichloroethane				0.001
1,1-Dichloroethene				0.001

Haulbowline Factory Site
Solid Analysis Results

				BH-220-1
				plicate of BH-21
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**Duplicate of BH-219-2**
				02/09/10
				SOIL
				06/09/10
				284-296_2005
				Jones
Parameter				
1,1-Dichloropropene				0.001
1,2,3-Trichlorobenzene				<0.001
1,2,3-Trichloropropane				<0.001
1,2,4-Trichlorobenzene				<0.001
1,2,4-Trimethylbenzene	42**	49.7**		<0.001
1,2-Dibromo-3-chloropropane				<0.001
1,2-Dibromoethane				<0.001
1,2-Dichlorobenzene				<0.001
1,2-Dichloroethane	0.67	21		0.001
1,2-Dichloropropane				<0.001
1,3,5-Trimethylbenzene (1)	42 (1)	49.7 (1)		<0.001
1,3-Dichlorobenzene				<0.001
1,3-Dichloropropane				<0.001
1,4-Dichlorobenzene				<0.001
2,2-Dichloropropane				0.001
2-Chlorotoluene				<0.001
4-Chlorotoluene				<0.001
4-Isopropyltoluene	1400 (2)	10000 (3)		<0.001
Benzene	27	90	230	0.016
Bromobenzene				<0.001
Bromochloromethane				0.001
Bromodichloromethane				<0.001
Bromoform				<0.001
Bromomethane				0.001
Carbon Disulphide	11	1300		NA
Carbon tetrachloride				0.001
Chlorobenzene	56	1300		<0.001
Chloroethane				0.001
Chloroform				0.001
Chloromethane				0.001
cis-1-2-Dichloroethene				0.001
cis-1-3-Dichloropropene				<0.001
Dibromochloromethane				<0.001
Dibromomethane				<0.001
Dichlorodifluoromethane				0.001
Dichloromethane	116 (4)	297**		0.001
Ethylbenzene	5700	17000		<0.001
Hexachlorobutadiene	31	48		<0.001
Isopropylbenzene	1400 (2)	10000 (3)		<0.001
Methyl Tertiary Butyl Ether				0.001
Naphthalene	190	1200		0.223
n-Butylbenzene				<0.001
o-Xylene	6600	17000		<0.001

				BH-220-1
				plicate of BH-21
	S4ULs for Commercial / Industrial Use (mg/kg)	**S4ULs Public Open (mg/kg)**	**C4SL Public Open Space 2 (mg/kg)**	**Duplicate of BH-219-2**
				02/09/10
				SOIL
				06/09/10
				284-296_2005
				Jones
Parameter				
p/m-Xylene	5900	170000		<0.001
Propylbenzene	1400 (2)	10000 (3)		<0.001
sec-Butylbenzene	1400 (2)	10000 (3)		<0.001
Styrene				<0.001
tert-Butylbenzene	1400 (2)	10000 (3)		<0.001
Tetrachloroethene	19	810		<0.001
Toluene	56000	87000		0.025
trans-1-2-Dichloroethene	22 (4)	212**		0.001
trans-1-3-Dichloropropene				<0.001
Trichloroethene	1.2	70		<0.001
Trichlorofluoromethane				0.001
Vinyl Chloride	0.059	4.8		0.001

yellow shading = result exceeds commercial human health standards

red bold text = result exceeds park standard

Italics bold text = result exceeds C4SL public open space 2 standard

Notes
1. GAC for 1,2,4, trimethylbenzene utilised
2. isopropylbenzene CLAIRE commercial GAC utilised (CLAIRE, 2009)
3. isopropropylbenzene CLAIRE conservative residential GAC utilised (CLAIRE, 2009)
4. Atrisk commercial standard utilised
5. SGV for total PCB utilised, Park Land Use SGV not availble so highly conservative residential land use GAC used instead
** Atrisk park GAC utilised
VOC screening value of 0.063mg/kg is smallest TSV for VOCs (vinyl chloride)

Appendix E Leachability Analysis Results

Sample Location	WQS	Exceednaces	Maximum	TP101-01	TP101-02	TP102-01	TP102-02	TP103-01	TP104-01	TP104-02	TP105-01	TP106-01	TP106-02	TP107-01	TP107-02	TP108-01	TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113 01
Sample Identity				0.4-1.8	1.8-3.2	0.0-1.3	1.3-1.9	0.0-1.4	0.3-1.0	1.0-2.0	0.3-1.1	1.0-2.0	2.0-3.0	0.80	2.70	0.8-1.5	2.5-2.7	0.60	1.50	1.20	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00
Inorganics																									
Chloride			462.00	7.00	12.00	8.00	19.00	7.00	1.00	3.00	7.00	1.00	2.00	16.00	95.00	6.00	19.00	2.00	1.00	1.00	1.00	1.00	10.00	7.00	1.00
COD, unfiltered			99.00	10.00	10.00	10.00	11.00	15.00	10.00	10.00	17.00	15.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	12.00	10.00	10.00	10.00	10.00	10.00
Cyanide, Free			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cyanide, Total (low level)*			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrate			1.80	0.60	0.30	0.30	1.20	0.30	0.60	0.30	0.30	0.30	0.30	0.50	0.50	0.90	0.80	0.50	0.30	0.30	0.30	0.30	1.00	0.30	0.60
pH	<4.5 >9	0	8.16	7.70	7.68	8.14	7.71	8.01	7.78	7.70	7.93	7.72	7.36	7.69	7.64	7.71	7.63	7.30	7.50	7.36	7.61	7.61	7.88	7.70	7.51
Sulphate			811.00	41.00	53.00	53.00	87.00	8.00	10.00	16.00	20.00	3.00	3.00	8.00	19.00	6.00	7.00	11.00	5.00	12.00	3.00	3.00	14.00	9.00	11.00
Sulphide			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulphur, Free			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Carbonate Alkalinity as CaCO3			70.00	2.00	2.00	2.00	2.00	2.00	2.00	20.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	70.00	2.00	2.00
Metals (Dissolved)																									
Arsenic	20 µg/l	0	20.00	13	3	<1	3	<1	<1	2	<1	6	6	5	9	7	3	14	2	2	2	3	7	<1	12
Boron			1741.00	126	103	295	576	17	24	33	63	<10	<10	41	134	25	31	31	17	18	<10	<10	52	35	<10
Cadmium	0.2 µg/l	1	0.60	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Calcium			107000.00	18710	21700	53330	48560	107000	15580	18550	69520	11020	7762	11210	14220	13470	11110	16520	9245	9806	15840	12360	34070	15330	15520
Chromium	4.7 µg/l	22	104.00	3	1	3	6	104	5	2	9	5	2	2	2	3	2	7	3	2	2	2	8	2	3
Copper	5 µg/l	27	123.00	6	3	7	11	20	3	3	46	6	3	3	2	3	3	4	3	4	3	7	15	5	20
Lead	1.3 µg/l	24	31.00	<1	2	12	13	3	2	3	1	<1	<1	<1	3	<1	2	<1	<1	<1	<1	1	1	2	2
Mercury	0.07 µg/l	5	0.11	<0.05	<0.05	<0.05	<0.05	0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Magnesium			26220.00	225	5449	20740	654	31	1904	2157	57	2225	1153	805	3049	216	1011	421	620	1308	1193	867	1154	3450	1333
Nickel	8.6	0	7.00	2	7	4	2	3	1	1	3	<1	2	1	2	2	3	2	1	2	1	<1	4	2	2
Potassium			27000.00	12300	12200	2900	7500	2400	4500	3900	5900	1100	2600	3300	7700	3000	3900	5000	4700	3200	1700	2000	12500	5400	2100
Selenium			6.00	2	2	<1	<1	3	<1	2	2	<1	2	2	1	<1	<1	3	<1	2	1	2	3	1	<1
Sodium			210000.00	11100	14700	2900	9900	2600	3500	3000	1400	1100	5400	16500	63000	6800	17300	2700	2000	2400	2000	1700	22500	8000	1500
Zinc	40 µg/l	4	209.00	13	22	40	30	26	15	14	16	14	15	14	15	14	16	14	17	14	25	20	16	20	87
Chromium, Hexavalent	0.60	2	110.00	<30	<30	<30	<30	110.00	30.00	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Phenols																									
Phenol	8 µg/l	3	30.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Sample Location	WQS	Exceednaces	Maximum	TP101-01	TP101-02	TP102-01	TP102-02	TP103-01	TP104-01	TP104-02	TP105-01	TP106-01	TP106-02	TP107-01	TP107-02	TP108-01	TP108-02	TP109-01	TP109-02	TP110-01	TP111-01	TP111-02	TP112-01	TP112-02	TP113-01
Sample Identity				0.4-1.8	1.8-3.2	0.0-1.3	1.3-1.9	0.0-1.4	0.3-1.0	1.0-2.0	0.3-1.1	1.0-2.0	2.0-3.0	0.80	2.70	0.8-1.5	2.5-2.7	0.60	1.50	1.20	1.0-1.5	2.0-2.5	0.3-1.0	1.4-1.6	0.00-1.00
Inorganics																									
Polyaromatic Hydrocarbons																									
Acenaphthene (aq)			1.75	0.19	0.40	0.07	0.13	0.11	<0.01	<0.01	0.06	<0.01	<0.01	0.06	0.18	0.24	0.50	0.23	0.08	0.19	0.11	<0.01	0.83	0.20	<0.01
Acenaphthylene (aq)			0.33	0.04	<0.015	<0.012	0.03	0.15	<0.01	<0.01	<0.016	<0.01	<0.01	<0.012	0.02	0.07	0.12	0.06	<0.01	0.03	<0.012	<0.01	0.02	0.04	<0.01
Anthracene (aq)	0.1µg/l	11	1.65	0.05	0.05	0.09	0.05	0.02	<0.01	<0.01	0.04	<0.01	<0.01	0.10	0.14	0.48	1.65	0.06	<0.013	0.04	<0.01	<0.01	0.56	0.13	<0.015
Benzo(a)anthracene (aq)			0.13	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06
Benzo(a)pyrene (aq)	0.00017 µg/l	3	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Benzo(b)fluoranthene (aq)	0.03µg/l	3	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07
Benzo(k)fluoranthene (aq)	0.03µg/l	3	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Benzo(g,h,i)perylene (aq)	0.002µg/l	1	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)			0.19	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05
Dibenzo(a,h)anthracene (aq)			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	42	0.86	0.22	0.15	0.10	0.16	0.11	0.03	<0.01	0.30	<0.01	<0.016	0.16	0.16	0.11	0.45	0.10	0.04	0.07	0.03	<0.01	0.48	0.05	0.10
Fluorene (aq)			2.95	0.08	0.10	0.04	0.09	0.14	<0.01	<0.01	0.02	<0.01	0.02	0.14	0.21	0.64	2.95	0.25	0.05	0.06	0.03	<0.01	1.01	0.38	<0.01
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	1	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l	1	3.06	0.93	0.13	0.15	1.03	0.39	0.04	<0.01	0.29	<0.01	0.07	0.85	0.63	0.20	0.40	0.57	0.30	0.07	0.17	<0.01	0.40	0.19	0.04
Phenanthrene (aq)			5.93	0.34	0.05	0.09	0.38	1.34	<0.01	<0.01	0.17	<0.01	0.03	0.93	1.13	4.26	5.93	0.38	0.05	0.49	0.02	<0.01	3.51	0.80	<0.019
Pyrene (aq)			1.06	0.23	0.43	0.12	0.14	0.12	0.11	<0.01	0.38	<0.01	0.14	0.14	0.35	0.29	1.06	0.16	0.11	0.77	0.08	<0.01	0.32	0.08	0.17
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			13.05	2.12	1.33	0.68	1.99	2.39	0.23	<0.01	1.82	<0.01	0.30	2.39	2.82	6.29	13.05	1.81	0.65	1.72	0.45	<0.01	7.14	1.86	0.61
Notes:																									
indicates value exceeds WQS																									

Sample Location	WQS	-	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01	TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04	BH102-06	BH103-01	BH103-02
Sample Identity			3.50	0.80	3.00	0.0-1.0	3.0-3.3	1.00	2.50	0.0-1.0	0.0-0.9	1.10	2.0-2.5	0.4-0.7	1.70	1.50	2.50	1.00	2.00	2.0-3.0	3.0-4.0	5.0-6.0	1.2-1.65	2.9-3.2
Inorganics																								
Chloride			43.00	23.00	95.00	9.00	10.00	2.00	10.00	1.00	7.00	2.00	43.00	4.00	120.00	25.00	63.00	3.00	15.00	30.00	33.00	111.00	26.00	279.00
COD, unfiltered			20.00	23.00	10.00	10.00	10.00	26.00	24.00	10.00	11.00	11.00	11.00	19.00	16.00	20.00	25.00	13.00	10.00	10.00	99.00	14.00	11.00	36.00
Cyanide, Free			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cyanide, Total (low level)*			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrate			0.30	1.10	1.40	0.80	0.30	0.30	0.30	0.30	0.50	0.70	0.80	1.30	0.60	0.30	0.30	0.40	0.30	0.30	0.30	0.30	0.30	0.30
pH	<4.5 >9		7.70	7.86	7.84	7.71	7.62	7.65	7.08	7.80	7.83	7.85	7.83	7.89	7.82	8.04	7.93	7.83	7.26	7.39	7.88	8.16	7.80	7.53
Sulphate			107.00	57.00	69.00	22.00	19.00	22.00	56.00	7.00	20.00	16.00	43.00	20.00	48.00	29.00	65.00	11.00	7.00	50.00	18.00	37.00	17.00	77.00
Sulphide			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulphur, Free			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Carbonate Alkalinity as CaCO3			2.00	40.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	9.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Metals (Dissolved)																								
Arsenic	20 µg/l		8	4	4	12	9	1	2	7	4	10	6	4	13	1	3	11	1	2		4	5	4
Boron			45	338	793	133	75	54	83	46	155	200	674	46	172	111	249	42	53	79		305	75	227
Cadmium	0.2 µg/l		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.6	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4	<0.4	<0.4	<0.4		<0.4	<0.4	<0.4
Calcium		)	49830	48490	70770	22110	12360	19550	34360	20300	47600	34710	33390	31390	17340	62310	30390	21120	5624	30520		30390	22970	13980
Chromium	4.7 µg/l		1	34	16	5	4	5	1	5	11	9	8	16	3	15	6	3	3	<1		1	3	2
Copper	5 µg/l		3	6	9	5	6	7	3	5	6	6	4	33	13	8	15	11	3	4		2	5	3
Lead	1.3 µg/l		<1	<1	2	<1	31	7	<1	<1	3	<1	<1	2	2	<1	1	<1	<1	2		1	<1	<1
Mercury	0.07 µg/l		<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	0.09	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Magnesium			6050	1537	165	366	4064	1638	3032	1827	71	64	149	93	4778	65	63	128	1458	4640		12030	107	12410
Nickel	8.6		1	6	2	2	2	3	1	3	3	2	2	3	4	4	2	2	5	2		2	2	3
Potassium			6000	11100	11000	9300	7100	4700	6800	3000	6800	7700	10200	11400	7200	5400	6500	21800	22500	10200	27000	14000	4800	13800
Selenium			1	1	3	2	1	<1	2	1	1	<1	<1	3	2	4	4	5	2	<1		4	4	2
Sodium			2700	15000	57000	8000	9000	3200	2900	1700	2400	3500	31500	6800	87000	10500	39000	8900	18000	21800	31500	84000	18000	52500
Zinc	40 µg/l		19	14	17	23	30	23	22	17	18	20	26	17	26	22	17	17	14	17		15	21	21
Chromium, Hexavalent	0.60		<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Phenols																								
Phenol	8 µg/l		<10	<10	<10	30.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10.00	<10	<10	<10	<10	<10	<10	<10

Sample Location	WQS	-	TP113-04	TP114-01	TP114-02	TP115-01	TP115-02	TP116-01	TP116-02	TP117-01	TP118-01	TP118-02	TP118-03	TP119	TP119-02	BH101-01	BH101-02	BH102-01	BH102-02	BH102-03	BH102-04	BH102-06	BH103-01	BH103-02
Sample Identity			3.50	0.80	3.00	0.0-1.0	3.0-3.3	1.00	2.50	0.0-1.0	0.0-0.9	1.10	2.0-2.5	0.4-0.7	1.70	1.50	2.50	1.00	2.00	2.0-3.0	3.0-4.0	5.0-6.0	1.2-1.65	2.9-3.2
Inorganics																								
Polyaromatic Hydrocarbons																								
Acenaphthene (aq)		l	0.04	1.00	0.32	<0.01	<0.01	<0.01	<0.01	<0.016	0.06	0.05	0.18	0.07	<0.01	0.03	<0.01	0.17	<0.01	0.05	1.08	<0.016	0.21	<0.01
Acenaphthylene (aq)			<0.015	0.06	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.016	<0.013	<0.01	<0.01	<0.01	<0.013	<0.01	0.03	<0.01	<0.013	0.13	<0.013	0.04	<0.01
Anthracene (aq)	0.1µg/l	5	0.12	0.04	0.36	<0.01	<0.01	<0.01	<0.01	<0.011	<0.017	<0.013	0.05	<0.019	<0.01	<0.01	<0.01	0.03	<0.01	<0.015	0.34	<0.01	0.05	<0.01
Benzo(a)anthracene (aq)			0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene (aq)	0.00017 µg/l		0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l		0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l		0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)			0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene (aq)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l		0.34	0.48	0.29	<0.01	<0.01	<0.01	<0.01	0.07	0.09	0.10	0.14	0.06	<0.01	<0.01	<0.01	0.10	<0.01	0.86	0.15	0.03	0.84	<0.01
Fluorene (aq)			0.10	0.19	0.36	<0.01	<0.01	<0.01	<0.01	0.02	0.03	0.03	0.10	<0.018	<0.01	0.04	<0.01	0.06	<0.01	0.03	0.93	<0.01	0.10	<0.01
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l		0.05	0.71	0.55	<0.01	<0.01	<0.01	<0.01	0.05	0.29	0.03	0.23	0.12	<0.01	0.21	<0.01	3.06	<0.01	0.14	0.33	0.08	0.11	<0.01
Phenanthrene (aq)		9	0.06	0.33	3.41	<0.01	<0.01	<0.01	<0.01	0.03	0.11	<0.017	0.20	0.12	<0.01	0.16	<0.01	0.15	<0.01	0.03	1.33	0.07	<0.018	<0.01
Pyrene (aq)			0.89	0.69	0.37	<0.01	<0.01	<0.01	<0.01	0.33	0.08	0.18	0.18	0.06	<0.01	<0.01	<0.01	0.15	<0.01	0.57	0.26	0.07	0.84	<0.01
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			1.95	3.49	5.71	<0.01	<0.01	<0.01	<0.01	0.54	0.69	0.44	1.08	0.46	<0.01	0.45	<0.01	3.75	<0.01	1.71	4.56	0.28	2.21	<0.01

Notes:

indicates value exceeds WQS

Sample Location	WQS	BH103-03	BH103-04	BH104-01	BH106-01	BH106-03	BH106-04	BH106-05	BH106-06	BH108-01	BH108-02	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110
Sample Identity		3.8-4.2	4.7-5.2	3.35	1.00	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	1.50	4.50	6.50	7.00	8.50	1.2-1.65	2.70	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0
Inorganics																					
Chloride		401.00	185.00	13.00	1.00	34.00	34.00	71.00	79.00	2.00	462.00	391.00	267.00	152.00	2.00	5.00	26.00	231.00	247.00	154.00	2.00
COD, unfiltered		31.00	22.00	19.00	17.00	31.00	23.00	33.00	28.00	18.00	31.00	67.00	16.00	21.00	10.00	10.00	17.00	23.00	28.00	10.00	13.00
Cyanide, Free		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Cyanide, Total (low level)*		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Nitrate		0.30	0.30	0.30	0.30	0.30	0.30	0.50	0.30	0.50	0.30	0.30	0.30	0.30	1.80	0.30	0.30	0.30	0.30	0.30	0.30
pH	<4.5 >9	7.57	7.55	7.91	7.76	7.02	6.64	7.91	7.88	7.81	7.63	7.45	7.47	7.54	7.67	8.00	7.67	7.74	7.72	7.65	7.92
Sulphate		110.00	42.00	28.00	7.00	56.00	93.00	92.00	104.00	811.00	123.00	91.00	49.00	23.00	15.00	27.00	95.00	85.00	101.00	17.00	38.00
Sulphide		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Sulphur, Free		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Carbonate Alkalinity as CaCO3		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	60.00
Metals (Dissolved)																					
Arsenic	20 µg/l	4	1	3	3	4	8	3	2	9	7	2	5	3	20	2	<1	5	5	8	6
Boron		395	178	79	17	121	145	296	299	125	309	319	210	144	13	22	<10	116	180	112	140
Cadmium	0.2 µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Calcium		17850	9721	15150	21050	20390	20720	12140	12140	21590	29350	17480	6891	10950	13630	32910	<5	36560	26140	5912	54020
Chromium	4.7 µg/l	2	<1	2	5	2	1	2	2	7	<1	3	<1	<1	3	1	<1	<1	<1	<1	13
Copper	5 µg/l	4	123	5	4	5	5	4	4	3	6	4	2	2	5	9	<1	2	3	3	11
Lead	1.3 µg/l	1	<1	1	8	<1	5	1	1	<1	1	<1	<1	3	1	3	<1	1	1	<1	2
Mercury	0.07 µg/l	0.10	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09
Magnesium		19330	7204	5445	161	1109	1256	8782	8422	1975	26220	19760	10950	6783	3052	5936	19	8370	12920	5413	105
Nickel	8.6	3	1	3	3	3	2	2	2	1	2	3	1	2	1	4	2	5	2	1	2
Potassium		24000	10200	7200	1500	9000	9900	13100	13700	3200	20300	24800	13100	7500	2100	1800	4100	8300	20300	8600	11100
Selenium		6	<1	2	1	2	2	4	3	<1	4	4	4	2	2	2	<1	2	5	3	<1
Sodium		165000	116300	15000	3300	25500	30000	78000	72000	2100	210000	45000	180000	7500	800	2600	23300	135000	138800	90000	5900
Zinc	40 µg/l	25	17	17	38	31	23	19	19	21	78	23	24	22	22	209	14	91	19	15	28
Chromium, Hexavalent	0.60	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Phenols																					
Phenol	8 µg/l	<10	<10	10.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10

Sample Location	WQS	BH103-03	BH103-04	BH104-01	BH106-01	BH106-03	BH106-04	BH106-05	BH106-06	BH108-01	BH108-02	BH108-04	BH108-05	BH108-06	BH109-01	BH109-01	BH109-04	BH109-05	BH109-06	BH109-07	BH110
Sample Identity		3.8-4.2	4.7-5.2	3.35	1.00	2.0-3.0	3.0-4.0	4.0-5.0	5.0-6.0	1.50	4.50	6.50	7.00	8.50	1.2-1.65	2.70	3.2-3.65	4.2-4.65	6.0-6.45	10.5-10.95	0.0-1.0
Inorganics																					
Polyaromatic Hydrocarbons																					
Acenaphthene (aq)		<0.01	<0.01	<0.011	0.03	<0.01	<0.01	<0.012	<0.012	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	1.75	0.07	<0.01	0.85	0.16
Acenaphthylene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.016	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.18	<0.011	<0.01	0.33	0.03
Anthracene (aq)	0.1µg/l	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	0.03	<0.01	<0.014	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02	<0.01	0.28	0.07
Benzo(a)anthracene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12	<0.01	<0.01	0.03	0.04
Benzo(a)pyrene (aq)	0.00017 µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	<0.01	<0.01	0.05	0.05
Dibenzo(a,h)anthracene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	<0.01	<0.01	0.06	0.07	<0.01	<0.01	<0.015	0.02	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.50	0.19	<0.01	0.11	0.40
Fluorene (aq)		<0.01	<0.01	<0.012	0.04	<0.01	<0.01	<0.013	0.30	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	1.24	0.07	<0.01	1.13	0.10
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l	<0.01	<0.01	0.07	0.11	<0.01	<0.01	0.18	0.13	<0.01	0.28	<0.01	<0.01	<0.01	<0.01	<0.01	1.31	0.08	<0.01	0.54	0.24
Phenanthrene (aq)		<0.01	<0.01	0.02	0.19	<0.01	<0.01	<0.018	0.02	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.69	<0.015	<0.01	2.77	0.14
Pyrene (aq)		<0.01	<0.01	0.07	0.05	<0.01	<0.01	0.10	0.08	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	0.82	0.18	<0.01	0.28	0.31
Polyaromatic hydrocarbons, Total USEPA 16 (aq)		<0.01	<0.01	0.24	0.52	<0.01	<0.01	0.34	0.60	<0.01	0.51	<0.01	<0.01	<0.01	<0.01	<0.01	6.83	0.63	<0.01	6.36	1.53

Notes:

indicates value exceeds WQS

Sample Location	WQS	BH110-02	BH110-03	BH110-04	BH113-01	BH113-02	BH113-03
Sample Identity		2.50	3.50	4.50	0.0-1.0	1.00	6.50
Inorganics							
Chloride		89.00	108.00	222.00	10.00	1.00	82.00
COD, unfiltered		10.00	10.00	10.00	36.00	14.00	10.00
Cyanide, Free		0.05	0.05	0.05	0.05	0.05	0.05
Cyanide, Total (low level)*		0.05	0.05	0.05	0.05	0.05	0.05
Nitrate		0.30	0.30	0.30	0.30	0.30	0.30
pH	<4.5 >9	7.72	7.74	7.41	7.89	7.42	7.13
Sulphate		34.00	33.00	48.00	10.00	3.00	15.00
Sulphide		0.05	0.05	0.05	0.05	0.05	0.05
Sulphur, Free		0.05	0.05	0.05	0.05	0.05	0.05
Carbonate Alkalinity as CaCO3		40.00	2.00	2.00	2.00	20.00	2.00
Metals (Dissolved)							
Arsenic	20 µg/l	1	2	1	13	20	2
Boron		903	997	1741	77	33	66
Cadmium	0.2 µg/l	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Calcium		54120	55840	75800	20520	12100	13480
Chromium	4.7 µg/l	3	2	1	4	8	<1
Copper	5 µg/l	7	4	3	12	6	2
Lead	1.3 µg/l	2	2	1	1	<1	<1
Mercury	0.07 µg/l	<0.05	<0.05	<0.05	<0.05	0.05	<0.05
Magnesium		330	948	4124	2855	1755	4563
Nickel	8.6	3	2	2	3	3	1
Potassium		3900	4800	7100	2600		3000
Selenium		2	2	2	2	2	3
Sodium		28500	45000	82500	8600	0	45000
Zinc	40 µg/l	25	19	14	25	17	16
Chromium, Hexavalent	0.60	<30	<30	<30	<30	<30	<30
Phenols							
Phenol	8 µg/l	<10	<10	<10	<10	<10	<10

Sample Location	WQS	BH110-02	BH110-03	BH110-04	BH113-01	BH113-02	BH113-03
Sample Identity		2.50	3.50	4.50	0.0-1.0	1.00	6.50
Inorganics							
Polyaromatic Hydrocarbons							
Acenaphthene (aq)		0.05	0.33	0.28	<0.01	<0.01	0.09
Acenaphthylene (aq)		<0.01	0.09	0.04	<0.01	<0.01	<0.01
Anthracene (aq)	0.1µg/l	<0.017	0.14	0.13	<0.01	<0.01	<0.011
Benzo(a)anthracene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene (aq)	0.00017 µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene (aq)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	0.10	0.12	0.24	<0.01	<0.01	0.04
Fluorene (aq)		0.04	0.40	0.21	<0.01	<0.01	0.05
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l	0.46	0.74	0.73	<0.01	<0.01	0.35
Phenanthrene (aq)		0.15	1.02	0.61	<0.01	<0.01	0.05
Pyrene (aq)		0.07	0.12	0.18	<0.01	<0.01	0.11
Polyaromatic hydrocarbons, Total USEPA 16 (aq)		0.89	2.97	2.40	<0.01	<0.01	0.71
Notes:							
indicates value exceeds WQS							

Appendix F Water Analysis Results

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location				BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
	WQS	Exceednaces	Maximum	Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Organic Carbon, Total			46.00	5.00	4.00	*<2*	*2.00*	3.00	3.00		12.00	13.00	9.00	9.00	3.00	3.00	8.00	10.00
Inorganics (mg/l)																		
Ammoniacal Nitrogen as N	40 mg/l	0	13.21	0.64	0.71	*0.52*	*0.64*	0.38	0.71		0.40	1.65	0.19	0.63	0.31	0.50	0.81	1.08
BOD, unfiltered			69.00	7.00	<1	*3.00*	*<1*	16.00	4.00		8.00	17.00	3.00	4.00	3.00	3.00	5.00	7.00
Chloride			16023.10	9400.40	9187.30	*13997.80*	*13874.70*	14151.80	11494.00		612.60	1051.20	389.70	844.30	16023.10	15535.80	3871.60	5876.20
COD, unfiltered			995.00	301.00	218.00	*365.00*	*536.00*	600.00	381.00		39.00	57.00	37.00	50.00	497.00	453.00	96.00	183.00
Conductivity @ 25 deg.C			42052.00	25585.00	26003.00	*38368.00*	*38840.00*	36928.00	30611.00		2671.00	3873.00	1863.00	3372.00	40200.00	40178.00	11808.00	16021.00
Cyanide, Complex			0.01	0.007	<0.005	*0.002*	*0.002*	<0.005	0.006		0.009	0.006	0.009	0.008	<0.005	<0.005	<0.005	<0.005
Cyanide, Free			0.02	0.008	<0.005	*<0.001*	*0.001*	<0.005	<0.005		0.007	0.010	<0.005	0.009	<0.005	<0.005	<0.005	<0.005
Cyanide, Total (low level)*			0.02	0.015	<0.005	*0.002*	*0.003*	<0.005	0.006		0.016	0.016	0.009	0.017	<0.005	<0.005	<0.005	<0.005
Fluoride			1.50	<0.3	<0.3	*1.50*	*1.50*	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nitrate as NO3			15.00	1.20	1.10	*0.80*	*0.60*	2.70	3.60		<0.2	<0.2	0.70	0.30	1.00	1.10	<0.2	<0.2
Nitrite as NO2			0.26	<0.02	<0.02	*<0.02*	*<0.02*	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
pH	<4.5 >9	0	8.46	8.07	8.06	*8.12*	*8.12*	7.76	7.96		7.42	7.40	7.28	7.60	7.80	7.76	6.92	6.81
Sulphate			2275.04	1343.40	1350.05	*1245.22*	*1239.31*	1948.30	1623.10		58.44	15.86	93.54	160.24	2275.04	2252.15	576.02	839.84
Sulphide			0.00	<0.3	<0.3	*<0.01*	*<0.01*	<0.3	<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Sulphur, Free			0.00															
Total Dissolved Sulphur	mg/l		835.00	484.30	486.50	*647.50*	*598.90*	773.40	589.60		16.38	6.69	31.11	61.47	835.00	815.70	248.50	345.30
Thiocyanate			0.04	<0.02	<0.02	*<0.02*	*<0.02*	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Carbonate Alkalinity as CaCO3			52.00	<1	<1	*<1*	*<1*	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Saline TON as NO3			2.10	1.10	1.00			1.60	1.00		<0.1	<0.1	<0.1	<0.1	1.60	2.10	0.40	0.60
Metals (Dissolved)(µg/l)																		
Aluminium (diss.filt)	200 µg/l	0	85.20	21.30	5.60	*<1.5*	*<1.5*	2.40	<1.5		3.50	2.60	2.60	9.40	6.50	4.60	3.20	7.80
Antimony (diss.filt)			14.00	3.00	<2	*<2*	*3.00*	<2	<2		3.00	<2	<2	<2	<2	<2	<2	<2
Arsenic (diss.filt)	20 µg/l	0	12.20	1.30	1.50	*<0.9*	*<0.9*	<0.9	<0.9		3.50	1.40	<0.9	2.30	2.70	3.20	<0.9	<0.9
Barium (diss.filt)			1258.00	32.50	38.00	*79.10*	*74.00*	<1.8	<1.8		63.40	82.40	34.60	48.20	59.30	58.20	58.50	61.80
Beryllium (diss.filt)			0.60	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (diss.filt)			3464.00	2354.00	2437.00	*2399.00*	*2423.00*	3161.00	2823.00		557.00	891.00	418.00	544.00	3352.00	3427.00	1355.00	1638.00
Cadmium (diss.filt) (low level)	0.2 µg/l	7	3.73	<0.03	<0.03			<0.03	<0.03		0.11	<0.03	0.05	0.04	0.22	0.06	0.97	0.35
Calcium (diss.filt)	mg/l		521.10	301.80	265.90	*332.60*	*336.70*	363.90	286.10		107.80	120.30	99.30	146.90	401.60	401.70	162.00	276.70
Chromium (diss.filt)	4.7µg/l	4	8.90	4.90	5.80	*8.90*	*8.90*	<0.2	<0.2		0.60	0.30	0.40	0.70	2.60	2.90	0.20	0.40
Cobalt (diss.filt)			3.10	<0.1	<0.1			<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	2.20
Copper (diss.filt)	5 µg/l	8	27.00	<3	4.00	*<3*	*<3*	<3	<3		<3	<3	5.00	7.00	3.00	<3	4.00	5.00
Iron (diss.filt)			47690.00	<4.7	5.20	*8.50*	*<4.7*	<4.7	<4.7		15.10	15.10	<4.7	68.50	7.80	<4.7	9832.00	7624.00
Lead (diss.filt)	1.3 µg/l	36	147.90	<0.4	<0.4	*1.20*	*0.70*	0.90	0.80		4.40	2.80	1.60	1.80	<0.4	<0.4	6.30	3.90
Magnesium (diss.filt)	mg/l		1339.00	761.70	830.80	*842.10*	*855.20*	1173.00	902.90		51.80	78.90	33.80	77.70	1339.00	1251.00	323.40	430.00
Manganese (diss.filt)	30 µg/l	42	6278.00	49.40	<1.5	*<1.5*	*<1.5*	<1.5	<1.5		269.30	624.40	90.10	276.90	<1.5	<1.5	1029.00	1848.00
Mercury (CVAF)	0.07 µg/l	11	2.10	0.05	0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	0.02	0.01	<0.01	0.02	0.04	<0.01	<0.01
Molybdenum (diss.filt)			87.00	5.00	4.90	*5.00*	*5.90*	5.60	4.80		5.80	2.90	1.80	1.20	6.80	6.90	2.50	3.00
Nickel (diss.filt)	8.6 µg/l	2	10.80	0.50	0.30	*<0.2*	*<0.2*	0.30	<0.2		2.00	1.70	0.80	0.80	0.30	<0.2	1.30	4.00
Potassium (diss.filt)	mg/l		406.20	246.80	228.20	*258.90*	*263.60*	336.30	262.20		41.80	55.80	30.50	48.10	357.80	358.80	84.00	146.90
Phosphorus (diss.filt)			2239.00	70.50	71.20			27.20	30.10		9.50	8.20	32.50	79.70	128.90	141.30	0.90	1.10
Selenium (diss.filt)			0.00	<1.2	<1.2	*<1.2*	*<1.2*	<1.2	<1.2		<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Sodium (diss.filt)	mg/l		12330.00	6515.00	6525.00	*7389.00*	*8229.00*	8187.00	7005.00		447.40	709.40	343.70	649.30	10940.00	11780.00	2603.00	3995.00
Thallium (diss.filt)			3.00	<0.9	3.00			2.90	<0.9		<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Tin (diss.filt)			6.00	<5	<5			<5	<5		<5	<5	<5	<5	<5	<5	<5	<5

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location				BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
	WQS	Exceednaces	Maximum	Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Vanadium (diss.filt)			8.70	<0.6	0.70	*<0.6*	*<0.6*	<0.6	<0.6		2.10	2.50	1.90	2.50	<0.6	<0.6	1.40	0.80
Zinc (diss.filt)	40 µg/l	16	986.00	29.30	54.10	*40.30*	*44.90*	4.90	4.70		30.30	6.40	12.60	33.80	12.00	12.30	18.40	10.50
Metals Unfiltered / Total (µg/l)																		
Boron (tot.unfilt)	7000	0	3485.00	2371.00	2479.00			3123.00	2453.00		597.00	823.00	416.00	553.00	3392.00	3485.00	1170.00	1679.00
Chromium, Hexavalent	0.60	8	8.00	5.00	6.00	*8.00*	*8.00*	<2	<2		<2	<2	<2	<2	2.00	2.00	<2	<2
Chromium (tot unfilt)	4.70	20	921.40	36.40	7.10			<0.2	<0.2		4.30	1.30	11.90	2.10	34.70	7.00	1.50	<0.2
Copper Ultra low			1982.00	13.00	4.00			<3	<3		12.00	4.00	35.00	9.00	149.00	23.00	14.00	13.00
Iron Ultra low			######	3317.00	55.20			15.60	14.30		1521.00	1310.00	8240.00	924.70	49650.00	3988.00	24890.00	24600.00
Lead Ultra Low			17720.00	16.00	<0.4			0.80	<0.4		22.60	6.80	26.10	4.30	180.90	35.60	4.40	4.10
Manganese Ultra low			13590.00	606.70	1.70			<1.5	<1.5		260.60	582.00	1074.00	277.40	8152.00	718.50	979.40	1866.00
Molybdenum			263.50	5.50	4.90			5.80	4.80		6.10	2.40	3.40	1.20	11.90	7.70	2.50	2.70
Nickel Ultra low			67.00	2.30	0.30			0.30	<0.2		1.90	1.50	9.20	0.90	48.80	7.40	1.30	3.90
Phenols (µg/l)																		
2,3-Dimethylphenol			0.00			*<0.1*	*<0.1*											
2,3,4,6-Tetrachlorophenol			0.00			*<0.1*	*<0.1*											
2,3,5,6-Tetrachlorophenol			0.00			*<0.1*	*<0.1*											
2,6-Dichlorophenol			0.00			*<0.1*	*<0.1*											
2,6-Dimethylphenol			0.00			*<0.1*	*<0.1*											
3-Methylphenol			0.00			*<0.1*	*<0.1*											
3,4-Dimethylphenol			0.00			*<0.1*	*<0.1*											
3,5-Dimethylphenol			0.00			*<0.1*	*<0.1*											
4-Chloro-2-methylphenol			0.00			*<0.1*	*<0.1*											
2,4,5-trichlorophenol			0.00	<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4,6-Dinitro-o-cresol (DNOC)			0.00			*<0.1*	*<0.1*											
2,4,6-trichlorophenol			0.00	<1	<1	*<0.1*	*<0.1*	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
2,4-dichlorophenol			0.00	<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5		<0.5	<0.5 [1]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol			0.00	<1	<1	*<0.1*	*<0.1*	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
2-chlorophenol			0.00	<1	<1	*<0.1*	*<0.1*	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
2-methylphenol			0.00	<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-nitrophenol			0.00	<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-chloro-3-methylphenol			0.00	<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-methylphenol			0.00	<1	<1	*<0.1*	*<0.1*	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
4-nitrophenol			0.00	<10	<10	*<0.1*	*<0.1*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol			0.00	<1	<1	*<0.1*	*<0.1*	<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Phenol	8 µg/l	0	0.00	<1	<1	*<0.1*	*<0.1*	<0.5	<1		<1	<1	<1	<1	<1	<1	<1	<1
Total Speciated phenols			0.00			*<2.1*	*<2.1*											
2.3.5 Trimethyl-Phenol			0.00	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Isopropyl Phenol			0.00	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cresols			1.10	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m/p-cresol			0.00															
o-cresol			0.00															
Phenols, Total (HPLC			0.00	<5	<5	*<0.1*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Xylenols			0.00	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Resorcinol			0.00	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Catechol			0.00	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1-naphthol			0.00	<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TPH Criteria Working Group (TPH CWG)(µg/l)																		

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location	WQS	Exceednaces	Maximum	BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
				Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Aliphatics >C5-C6			0.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aliphatics >C6-C8			10.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aliphatics >C8-C10			637.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aliphatics >C10-C12			9035.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aliphatics >C12-C16			34640.00	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21			47040.00	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35			17880.00	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Total Aliphatics C5-C35			######			*<10*	*<10*											
Aromatics >EC5-EC7			0.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aromatics >EC7-EC8			0.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aromatics >EC8-EC10			32.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aromatics >EC10-EC12			2135.00	<5	<5	*<5*	*<5*	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5
Aromatics >EC12-EC16			19450.00	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21			39000.00	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >EC21-EC35			17840.00	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
Total Aromatics C5-C35			78435.00			*<10*	*<10*											
Total aliphatics and aromatics C5-C35	10µg/l	7	######	<10	<10	*<10*	*<10*	<10	<10		<10	<10	<10	<10	<10	<10	<10	<10
MTBE			0.00	<5	<5	*<0.1*	*<0.1*		<5		<5	<5	<5	<5	<5	<5	<5	<5
Benzene	8µg/l	0	0.00	NA	<0.5	*<0.5*	*<0.5*		<0.5		NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA
Toluene			0.00			*<0.5*	*<0.5*											
Ethylbenzene			0.00	NA	<0.5	*<0.5*	*<0.5*		<0.5		NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA
m,p-Xylene	10µg/l	0	4.57	<0.01	<0.01	*<1*	*<1*		<0.01		0.23	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-Xylene	10µg/l	0	0.97	<0.01	<0.01	*<0.5*	*<0.5*		<0.01		0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polyaromatic Hydrocarbons (PAHs)(µg/l)																		
Acenaphthene (aq)			60.32	0.01	<0.01	*<0.01*	*<0.01*	0.01	<0.01		0.98	1.76	0.08	0.01	<0.01	0.02	0.01	0.01
Acenaphthylene (aq)			63.88	<0.01	<0.01	*0.01*	*0.01*	0.01	<0.01		0.01	0.01	0.07	<0.01	<0.01	0.03	<0.01	<0.01
Anthracene (aq)	0.1µg/l	6	46.23	0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		0.01	0.01	0.02	<0.01	<0.01	0.01	0.01	0.01
Benzo(a)anthracene (aq)			124.43	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01
Benzo(a)pyrene (aq)	0.00017µg/l	8	92.43	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l	6	109.84	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l	5	42.72	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(bk)fluoranthene (aq)			152.56	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l	7	34.98	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)			104.82	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene (aq)			4.41	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	44	255.52	0.01	<0.01	*0.01*	*<0.01*	0.01	<0.01		0.01	0.01	0.02	<0.01	<0.01	0.01	0.04	0.02
Fluorene (aq)			197.40	0.01	0.01	*<0.01*	*<0.01*	0.02	0.01		0.03	0.04	0.19	0.01	0.01	0.04	0.01	0.01
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	7	40.11	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l	2	3.30	<0.01	<0.01	*0.2*	*0.2*	<0.01	<0.01		3.04	3.30	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location				BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
	WQS	Exceednaces	Maximum	Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Phenanthrene (aq)			447.22	0.02	0.01	*0.02*	*0.01*	0.03	0.01		0.02	0.02	0.20	0.01	0.01	0.03	0.02	0.01
Pyrene (aq)			267.98	0.01	<0.01	*0.01*	*<0.01*	0.01	<0.01		0.01	0.01	0.02	<0.01	<0.01	0.01	0.04	0.04
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			1892.30	<0.1	<0.1	*0.3*	*0.2*	<0.1	<0.1		4.10	5.20	0.60	<0.1	<0.1	0.20	0.10	0.10
PCB's (µg/l)																		
PCB congener 101			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 118			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 138			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 153			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 180			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 28			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 52			0.00	<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1		<0.1	<0.1 $_2$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sum of detected EC7 PCB's			0.00	<0.7	<0.7	*<0.7*	*<0.7*	<0.7	<0.7		<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Volatile Organic Compounds (VOCs) (µg/l)																		
1.1.1.2-Tetrachloroethane			0.16	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1.1-Trichloroethane			0.23	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	0.11	0.14	<0.01	<0.01
1.1.2.2-Tetrachloroethane			0.00	NA	<4	*<4*	*<4*	<0.01	<4		NA	<4	<4	<4	<4	<4	<4	NA
1.1.2-Trichloroethane			0.00	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1-Dichloroethane			0.18	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	0.01	0.03	0.03	0.03	0.02
1.1-Dichloroethene			0.45	0.02	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1-Dichloropropene			0.56	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.3-Trichlorobenzene			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.3-Trichloropropane			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.4-Trichlorobenzene	0.4µg/l	1	3.72	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.4-Trimethylbenzene			2.84	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
1.2-Dibromo-3-chloropropane			0.00	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dibromoethane			0.37	<0.01	<0.01	*<2*	*<2*	<0.01	0.02		0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dichlorobenzene			1.05	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dichloroethane			0.20	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dichloropropane			0.00	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.3.5-Trimethylbenzene			1.73	<0.01	<0.01	*<3*	*<3*		<0.01		0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
1.3-Dichlorobenzene			1.32	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.3-Dichloropropane			0.00	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.4-Dichlorobenzene			1.77	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2.2-Dichloropropane			0.00	<0.01	<0.01	*<1*	*<1*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Chlorotoluene			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Chlorotoluene			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Isopropyltoluene			2.73	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzene	8µg/l	0	0.54	0.06	<0.01	*<0.5*	*<0.5*	<0.01	<0.01		0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromobenzene			0.60	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromochloromethane			0.24	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromodichloromethane			3.77	0.01	<0.01	*<2*	*<2*	1.70	3.77		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromoform			0.32	<0.01	<0.01	*<2*	*<2*	<0.01	0.32		0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromomethane			0.00	<0.01	<0.01	*<1*	*<1*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbon disulphide			0.00															
Carbontetrachloride			0.21	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorobenzene			0.93	0.15	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloroethane			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloroform			7.21	0.04	0.06	*<2*	*<2*	3.44	7.21		<0.01	<0.01	<0.01	<0.01	0.05	0.06	0.01	<0.01

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location				BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
	WQS	Exceednaces	Maximum	Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Chloromethane			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
cis-1,2-Dichloroethene			0.39	0.39	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
cis-1,3-Dichloropropene			0.00	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibromochloromethane			1.10	<0.01	<0.01	*<2*	*<2*	<0.01	1.10		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibromomethane			0.00	NA	<3	*<3*	*<3*	<0.01	<3		NA	<3	<3	<3	<3	<3	<3	NA
Dichlorodifluoromethane			0.00	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dichloromethane			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene			1.84	<0.01	<0.01	*<0.5*	*<0.5*	<0.01	<0.01		0.14	0.40	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.6µg/l	1	8.22	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isopropylbenzene			9.09	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		0.12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
m,p-Xylene	10µg/l	0	0.00			*<1*	*<1*	<0.01										
Methyl tertiary butyl ether (MTBE)			0.00	<0.01	<0.01	*<0.1*	*<0.1*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	2µg/l	2	36.48	<0.01	<0.01			<0.01	<0.01		4.32	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
n-Butylbenzene			59.22	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-Xylene	10µg/l	0	0.00	NA	<0.5	*<0.5*	*<0.5*	<0.01	<0.5		NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA
Propylbenzene			11.45	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
sec-Butylbenzene			43.87	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Styrene			0.93	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Xylenes			0.00															
tert-Amyl methyl ether (TAME)			0.00															
tert-Butylbenzene			13.38	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tetrachloroethene			1.64	<0.01	<0.01	*<3*	*<3*	<0.01	0.03		<0.01	<0.01	0.05	0.05	<0.01	<0.01	<0.01	<0.01
Toluene	10µg/l	0	1.01	0.07	0.05	*<0.5*	*<0.5*	<0.01	<0.01		0.13	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01
trans-1,2-Dichloroethene			0.65	0.03	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-1,3-Dichloropropene			0.01	<0.01	<0.01	*<2*	*<2*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trichloroethene	10µg/l	1	116.00	0.03	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trichlorofluoromethane			0.00	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vinyl Chloride			0.00	<0.01	<0.01	*<0.1*	*<0.1*	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VOC TIC			0.00															
semi Volatile Organic Compounds (sVOCs)																		
1,2-Dichlorobenzene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
2-Nitroaniline			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
2,4-Dinitrotoluene			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5 [3]	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
3-Nitroaniline			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
4-Bromophenylphenylether			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
4-Chloroaniline			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorophenylphenylether			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
4-Nitroaniline			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azobenzene			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location				BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
	WQS	Exceednaces	Maximum	Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Bis(2-chloroethoxy)methane			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Carbazole			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran			8.20	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorocyclopentadiene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Hexachloroethane			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
Isophorone			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-nitrosodi-n-propylamine			0.00	<0.5	<0.5			<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene			0.00	<1	<1			<1	<1		<1	<1	<1	<1	<1	<1	<1	<1
			0.00															
SVOC TICs			0.00	ND	ND			ND	ND		ND	ND	ND	ND	ND	ND	ND	ND
Nonadecane			423.00	NA	NA				NA		NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene, 1,4,6-trimethyl-			117.00	NA	NA				NA		NA	NA	NA	NA	NA	NA	NA	NA
Pentadecane, 2,6,10-trimethyl-			249.00	NA	NA				NA		NA	NA	NA	NA	NA	NA	NA	NA
Hexadecane, 2,6,11,15-tetramethyl-			350.00	NA	NA				NA		NA	NA	NA	NA	NA	NA	NA	NA
Dodecane, 2,6,10-trimethyl-			334.00	NA	NA				NA		NA	NA	NA	NA	NA	NA	NA	NA
Cyclic octaatomic sulfur			973.00	NA	NA				NA		NA	NA	NA	NA	NA	NA	NA	NA
			0.00															
de 2,3,4,6-tetrachlorophenol			0.00			*<100*	*<100*											
2,6-dichlorophenol			0.00			*<100*	*<100*											
2,3,5,6-tetrachlorophenol			0.00			*<100*	*<100*											
2,4-Dinitrophenol			0.00			*<100*	*<100*											
4-Chlorophenol			0.00			*<100*	*<100*											
Dinoseb			0.00			*<100*	*<100*											
DNOC			0.00			*<100*	*<100*											
			0.00															
Cyclohexane, butyl-			138.00			*NA*	*NA*											
trans-Decalin, 2-methyl-			119.00			*NA*	*NA*											
Naphthalene, decahydro-2-methyl-			186.00			*NA*	*NA*											
Benzene, 1,2,3,4-tetramethyl-			103.00			*NA*	*NA*											
Benzene, 1-methyl-4-(1-methylpropyl)-			147.00			*NA*	*NA*											
Benzene, (1-methyl-1-butenyl)-			121.00			*NA*	*NA*											
Naphthalene, 1-methyl-			145.00			*NA*	*NA*											
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-			157.00			*NA*	*NA*											
Dodecane, 2,6,11-trimethyl-			474.00			*NA*	*NA*											
Naphthalene, 2,7-dimethyl-			206.00			*NA*	*NA*											
Naphthalene, 1,4,6-trimethyl-			128.00			*NA*	*NA*											
Naphthalene, 1,6,7-trimethyl-			171.00			*NA*	*NA*											
Azulene, 4,6,8-trimethyl-			178.00			*NA*	*NA*											
Hexacosane			293.00			*NA*	*NA*											
Pentadecane, 2,6,10,14-tetramethyl-			537.00			*NA*	*NA*											
Dodecane, 2,6,10-trimethyl-			457.00			*NA*	*NA*											
4-Methylnaphtho[1,2-b]thiophene			196.00			*NA*	*NA*											
Octadecane, 1-chloro-			164.00			*NA*	*NA*											
2,7-Dimethyldibenzothiophene			121.00			*NA*	*NA*											

2015, Haulbowline Factory Site, Groundwater Analysis Results

Sample Location	WQS	Exceednaces	Maximum	BH105AL	BH105AH	*BH105-L*	*BH105-H*	BH113L	BH113H		BH102L	BH102H	BH106L	BH106H	BH108L	BH108H	BH109L	BH109H
Sample Identity depth						*2.6*	*2.6*											
High Water / Low Water				Low	High	*Low*	*High*	Low	High		Low	High	Low	High	Low	High	Low	High
Sampled Date				######	######	#######	#######	######	######		######	######	######	######	######	######	######	######
				Made ground	Made ground	*Made ground*	*Made ground*	Made ground	Made ground		composite	composite	composite	composite	composite	composite	composite	composite
Carbon																		
Benzene, 1-chlorodifluoromethoxy-4-nitro-			181.00			*NA*	*NA*											
shaded values indicate results exceed WQS																		
is a revoked Uk drinking water standard																		

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location			BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
	WQS	Exceednaces	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Organic Carbon, Total			2.00	3.00	3.00	5.00	6.00	6.00	5.00	6.00	4.00	4.00	6.00	6.00	5.00	6.00	*2.00*
Inorganics (mg/l)																	
Ammoniacal Nitrogen as N	40 mg/l	0	0.72	0.65	0.61	0.65	<0.03	0.12	0.47	0.69	3.19	2.50	3.79	4.08	0.23	0.57	*<0.03*
BOD, unfiltered			14.00	<1	<1	<1	2.00	1.00	2.00	5.00	3.00	4.00	9.00	9.00	2.00	4.00	*<1*
Chloride			15205.60	15137.00	14878.10	15318.90	126.90	73.00	1934.90	1989.20	13296.80	13435.80	810.20	749.90	114.30	540.20	*75.20*
COD, unfiltered			995.00	692.00	657.00	604.00	17.00	21.00	52.00	65.00	185.00	457.00	54.00	49.00	31.00	34.00	*12.00*
Conductivity @ 25 deg.C			39472.00	40651.00	40105.00	40208.00	979.00	831.00	6331.00	6438.00	34994.00	35526.00	2924.00	3045.00	1002.00	2499.00	*836.00*
Cyanide, Complex			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	0.008	0.005	<0.005	<0.005	*0.001*
Cyanide, Free			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	0.006	<0.005	<0.005	<0.005	<0.005	*0.001*
Cyanide, Total (low level)*			<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.017	0.014	0.008	0.005	<0.005	<0.005	*0.002*
Fluoride			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.30	<0.3	0.30	<0.3	*<0.3*
Nitrate as NO3			1.20	1.50	0.90	1.40	0.60	0.70	3.00	0.30	<0.2	1.20	<0.2	<0.2	0.40	<0.2	*<0.2*
Nitrite as NO2			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.02	0.03	<0.02	<0.02	<0.02	<0.02	*<0.02*
pH	<4.5 >9	0	8.41	8.34	7.97	7.85	7.63	7.39	7.55	7.74	7.37	7.41	8.46	8.19	7.27	7.43	*7.20*
Sulphate			2088.58	2174.72	2102.44	2017.58	64.96	51.47	288.12	289.11	1846.98	1831.54	108.82	114.54	72.18	124.14	*72.42*
Sulphide			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	*<0.01*
Sulphur, Free																	
Total Dissolved Sulphur	mg/l		734.40	799.50	821.40	798.30	22.58	17.51	111.80	110.40	715.20	687.50	39.22	35.60	26.08	45.13	*16.53*
Thiocyanate			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	*<0.02*
Carbonate Alkalinity as CaCO3			52.00	45.00	<1	<1	<1	<1	<1	<1	<1	<1	46.00	<1	<1	<1	*<1*
Saline TON as NO3			1.70	1.60	1.70	1.80	<0.1	<0.1	0.10	<0.1	1.60	1.40	<0.1	<0.1	<0.1	<0.1	
Metals (Dissolved)(µg/l)																	
Aluminium (diss.filt)	200 µg/l	0	<1.5	4.00	<1.5	<1.5	<1.5	2.80	<1.5	<1.5	<1.5	2.00	11.80	12.40	<1.5	<1.5	*<1.5*
Antimony (diss.filt)			<2	3.00	<2	<2	<2	3.00	2.00	<2	<2	<2	<2	3.00	<2	<2	*<2*
Arsenic (diss.filt)	20 µg/l	0	<0.9	<0.9	2.40	<0.9	<0.9	2.30	<0.9	2.30	2.40	<0.9	1.70	4.30	<0.9	<0.9	*<0.9*
Barium (diss.filt)			49.40	50.30	31.90	52.30	20.00	42.20	21.60	17.30	19.30	15.90	29.60	34.80	16.70	28.50	*29.30*
Beryllium (diss.filt)			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.5*
Boron (diss.filt)			3007.00	3396.00	3464.00	3383.00	189.00	200.00	766.00	913.00	2371.00	2810.00	525.00	601.00	191.00	378.00	*125.00*
Cadmium (diss.filt) (low level)	0.2 µg/l	7	<0.03	0.08	<0.03	0.12	<0.03	<0.03	<0.03	<0.03	<0.03	0.20	<0.03	<0.03	<0.03	<0.03	
Calcium (diss.filt)	mg/l		422.30	394.30	457.40	420.40	88.50	102.40	155.70	156.20	521.10	460.20	90.50	80.60	114.40	144.80	*112.10*
Chromium (diss.filt)	4.7µg/l	4	2.50	4.40	1.20	1.60	0.70	1.10	<0.2	0.30	<0.2	1.10	0.40	0.50	1.60	0.30	*0.30*
Cobalt (diss.filt)			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.20	0.10	0.10	<0.1	
Copper (diss.filt)	5 µg/l	8	<3	<3	<3	5.00	<3	4.00	<3	<3	<3	<3	<3	<3	13.00	<3	*<3*
Iron (diss.filt)			<4.7	<4.7	<4.7	<4.7	<4.7	4.90	<4.7	8.50	<4.7	6.00	13.80	19.60	6.10	<4.7	*<4.7*
Lead (diss.filt)	1.3 µg/l	36	<0.4	<0.4	0.60	0.60	4.90	5.40	0.90	3.40	<0.4	<0.4	3.10	2.50	4.20	3.30	*5.00*
Magnesium (diss.filt)	mg/l		1185.00	1114.00	1220.00	1242.00	17.70	14.10	173.30	144.50	915.90	1024.00	30.50	25.20	15.40	41.80	*13.20*
Manganese (diss.filt)	30 µg/l	42	<1.5	<1.5	<1.5	<1.5	2.50	2.50	301.30	467.20	620.90	400.80	494.10	502.60	113.60	371.20	*<1.5*
Mercury (CVAF)	0.07 µg/l	11	0.04	0.03	0.01	1.31	0.02	0.03	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.01	<0.01	*<0.01*
Molybdenum (diss.filt)			6.60	6.70	5.40	5.80	4.80	5.00	2.70	3.00	9.30	11.70	49.20	29.90	1.70	0.70	*2.30*
Nickel (diss.filt)	8.6 µg/l	2	<0.2	0.50	0.30	0.80	0.80	1.50	<0.2	0.90	1.00	4.60	2.10	2.90	10.80	<0.2	*0.50*
Potassium (diss.filt)	mg/l		365.80	349.10	406.20	380.40	14.80	11.60	47.20	47.60	346.90	318.20	113.60	106.90	15.40	25.20	*12.00*
Phosphorus (diss.filt)			58.10	67.10	79.60	105.30	70.00	66.30	342.00	423.20	53.60	43.60	79.00	76.10	38.10	42.00	
Selenium (diss.filt)			<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	*<1.2*
Sodium (diss.filt)	mg/l		8899.00	11120.00	10660.00	12330.00	94.90	54.90	1225.00	1336.00	8497.00	8184.00	604.90	519.30	85.10	349.90	*44.50*
Thallium (diss.filt)			<0.9	1.50	<0.9	<0.9	<0.9	<0.9	<0.9	1.40	<0.9	<0.9	<0.9	<0.9	<0.9	1.30	
Tin (diss.filt)			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	

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Sample Location			BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	*######*
	WQS	Exceednaces	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Vanadium (diss.filt)			<0.6	<0.6	<0.6	<0.6	2.20	1.70	0.90	1.30	<0.6	<0.6	1.50	2.70	0.70	1.00	*1.00*
Zinc (diss.filt)	40 µg/l	16	<1.5	27.70	156.00	134.90	45.60	123.20	1.90	22.00	2.60	6.70	3.00	2.00	2.90	4.60	*9.70*
Metals Unfiltered / Total (µg/l)																	
Boron (tot.unfilt)	7000	0	2864.00	3011.00	3203.00	3108.00	193.00	186.00	756.00	825.00	2459.00	2702.00	508.00	611.00	192.00	320.00	
Chromium, Hexavalent	0.60	8	2.00	4.00	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	*<2*
Chromium (tot unfilt)	4.70	20	14.10	4.50	2.20	12.20	1.50	0.80	<0.2	0.60	0.30	4.50	10.80	28.20	4.70	<0.2	
Copper Ultra low			12.00	<3	5.00	81.00	10.00	5.00	<3	<3	<3	<3	27.00	59.00	13.00	<3	
Iron Ultra low			2778.00	138.60	26.70	6517.00	1075.00	53.00	494.90	662.80	310.00	127.70	10760.00	28220.00	2972.00	512.50	
Lead Ultra Low			15.40	0.40	<0.4	104.60	11.40	5.10	11.60	4.00	<0.4	0.80	69.70	160.40	3.50	1.60	
Manganese Ultra low			816.10	82.50	<1.5	232.30	223.80	4.30	329.40	461.10	723.30	391.00	800.20	1155.00	265.20	353.90	
Molybdenum			6.30	6.40	5.60	5.60	4.90	5.00	3.10	2.20	10.30	12.10	49.40	31.10	1.00	0.80	
Nickel Ultra low			5.00	0.50	<0.2	1.30	1.60	0.60	<0.2	0.30	0.90	8.90	15.20	36.30	11.60	0.50	
Phenols (µg/l)																	
2,3-Dimethylphenol																	*<0.1*
2,3,4,6-Tetrachlorophenol																	*<0.1*
2,3,5,6-Tetrachlorophenol																	*<0.1*
2,6-Dichlorophenol																	*<0.1*
2,6-Dimethylphenol																	*<0.1*
3-Methylphenol																	*<0.1*
3,4-Dimethylphenol																	*<0.1*
3,5-Dimethylphenol																	*<0.1*
4-Chloro-2-methylphenol																	*<0.1*
2,4,5-trichlorophenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*
4,6-Dinitro-o-cresol (DNOC)																	*<0.1*
2,4,6-trichlorophenol			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*
2,4-dichlorophenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*
2,4-dimethylphenol			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*
2-chlorophenol			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*
2-methylphenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*
2-nitrophenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*
4-chloro-3-methylphenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*
4-methylphenol			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*
4-nitrophenol			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<0.1*
Pentachlorophenol			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*
Phenol	8 µg/l	0	<0.5	<1	<1	<1	<1	<1	<0.5	<1	<0.5	<1	<1	<1	<1	<1	*<0.1*
Total Speciated phenols																	*<2.1*
2.3.5 Trimethyl-Phenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
2-Isopropyl Phenol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Cresols			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
m/p-cresol																	
o-cresol																	
Phenols, Total (HPLC			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Xylenols			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Resorcinol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Catechol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
1-naphthol			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
TPH Criteria Working Group (TPH CWG)(µg/l)																	

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Sample Location	WQS	Exceednaces	BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	*######*
			composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Aliphatics >C5-C6			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aliphatics >C6-C8			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aliphatics >C8-C10			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aliphatics >C10-C12			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aliphatics >C12-C16			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
Aliphatics >C16-C21			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
Aliphatics >C21-C35			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
Total Aliphatics C5-C35																	*<10*
Aromatics >EC5-EC7			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aromatics >EC7-EC8			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aromatics >EC8-EC10			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aromatics >EC10-EC12			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	*<5*
Aromatics >EC12-EC16			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
Aromatics >EC16-EC21			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
Aromatics >EC21-EC35			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
Total Aromatics C5-C35																	*<10*
Total aliphatics and aromatics C5-C35	10µg/l	7	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	*<10*
MTBE				<5	<5	<5	<5	<5		<5		<5	<5	<5	<5	<5	*<0.1*
Benzene	8µg/l	0		NA	<0.5	<0.5	NA	<0.5		<0.5		<0.5	NA	NA	<0.5	NA	*<0.5*
Toluene																	*<0.5*
Ethylbenzene				NA	<0.5	<0.5	NA	<0.5		<0.5		<0.5	NA	NA	<0.5	NA	*<0.5*
m,p-Xylene	10µg/l	0		<0.01	<0.01	<0.01	<0.01	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	*<1*
o-Xylene	10µg/l	0		<0.01	<0.01	<0.01	<0.01	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*
Polyaromatic Hydrocarbons (PAHs)(µg/l)																	
Acenaphthene (aq)			0.02	<0.01	<0.01	0.04	<0.01	0.08	0.02	<0.01	0.01	<0.01	0.19	0.26	0.02	0.01	*<0.01*
Acenaphthylene (aq)			<0.01	<0.01	<0.01	0.04	<0.01	0.06	0.02	<0.01	0.01	<0.01	0.06	0.08	<0.01	<0.01	*0.01*
Anthracene (aq)	0.1µg/l	6	<0.01	<0.01	<0.01	0.01	0.01	0.02	0.01	<0.01	<0.01	<0.01	0.11	0.18	0.01	<0.01	*<0.01*
Benzo(a)anthracene (aq)			0.01	<0.01	<0.01	0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	*<0.01*
Benzo(a)pyrene (aq)	0.00017µg/l	8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	*<0.01*
Benzo(b)fluoranthene (aq)	0.03µg/l	6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*
Benzo(k)fluoranthene (aq)	0.03µg/l	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*
Benzo(bk)fluoranthene (aq)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*
Benzo(g,h,i)perylene (aq)	0.002µg/l	7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*
Chrysene (aq)			0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	*<0.01*
Dibenzo(a,h)anthracene (aq)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*
Fluoranthene (aq)	0.0063µg/l	44	0.01	<0.01	<0.01	0.02	<0.01	0.03	0.02	<0.01	0.01	<0.01	0.03	0.04	0.03	<0.01	*0.01*
Fluorene (aq)			0.01	0.01	0.01	0.09	0.01	0.18	0.04	0.01	0.03	0.01	0.28	0.39	0.04	0.01	*0.01*
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*
Naphthalene (aq)	2µg/l	2	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14	0.23	0.03	<0.01	*<0.1*

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Sample Location			BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
	WQS	Exceednaces	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Phenanthrene (aq)			0.01	0.01	0.01	0.10	0.01	0.20	0.07	0.01	0.04	0.01	0.40	0.61	0.05	0.01	*0.02*
Pyrene (aq)			0.01	<0.01	<0.01	0.02	<0.01	0.03	0.02	<0.01	0.01	0.01	0.03	0.04	0.05	<0.01	*0.01*
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			0.10	<0.1	<0.1	0.30	<0.1	0.60	0.20	<0.1	0.10	<0.1	1.30	1.80	0.30	<0.1	*<0.1*
PCB's (µg/l)																	
PCB congener 101			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
PCB congener 118			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
PCB congener 138			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
PCB congener 153			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
PCB congener 180			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
PCB congener 28			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
PCB congener 52			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*
Sum of detected EC7 PCB's			<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	*<0.7*
Volatile Organic Compounds (VOCs) (µg/l)																	
1.1.1.2-Tetrachloroethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.1.1-Trichloroethane			0.17	0.23	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.1.2.2-Tetrachloroethane			<0.01	NA	<4	<4	NA	<4	<0.01	<4	<0.01	<4	NA	NA	<4	NA	*<4*
1.1.2-Trichloroethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.1-Dichloroethane			0.03	0.03	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	0.11	<0.01	<0.01	*<3*
1.1-Dichloroethene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.1-Dichloropropene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.2.3-Trichlorobenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.2.3-Trichloropropane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.2.4-Trichlorobenzene	0.4µg/l	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.2.4-Trimethylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.2-Dibromo-3-chloropropane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.2-Dibromoethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.2-Dichlorobenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.2-Dichloroethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.2-Dichloropropane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.3.5-Trimethylbenzene				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.3-Dichlorobenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
1.3-Dichloropropane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
1.4-Dichlorobenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
2.2-Dichloropropane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<1*
2-Chlorotoluene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
4-Chlorotoluene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
4-Isopropyltoluene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Benzene	8µg/l	0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01	<0.01	*<0.5*
Bromobenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Bromochloromethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Bromodichloromethane			<0.01	0.01	0.08	0.06	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Bromoform			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Bromomethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<1*
Carbon disulphide																	
Carbontetrachloride			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Chlorobenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Chloroethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Chloroform			<0.01	0.03	0.15	0.11	0.02	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	*<2*

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location			BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
	WQS	Exceednaces	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Chloromethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
cis-1,2-Dichloroethene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
cis-1,3-Dichloropropene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Dibromochloromethane			<0.01	<0.01	0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Dibromomethane			<0.01	NA	<3	<3	NA	<3	<0.01	<3	<0.01	<3	NA	NA	<3	NA	*<3*
Dichlorodifluoromethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Dichloromethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Ethylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*
Hexachlorobutadiene	0.6µg/l	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Isopropylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
m,p-Xylene	10µg/l	0	<0.01						<0.01		<0.01						*<0.1*
Methyl tertiary butyl ether (MTBE)			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Naphthalene	2µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
n-Butylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*
o-Xylene	10µg/l	0	<0.01	NA	<0.5	<0.5	NA	<0.5	<0.01	<0.5	<0.01	<0.5	NA	NA	<0.5	NA	*<1*
Propylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
sec-Butylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Styrene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Total Xylenes																	
tert-Amyl methyl ether (TAME)																	
tert-Butylbenzene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Tetrachloroethene			<0.01	<0.01	0.01	0.03	0.14	0.02	0.07	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Toluene	10µg/l	0	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*
trans-1,2-Dichloroethene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
trans-1,3-Dichloropropene			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*
Trichloroethene	10µg/l	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Trichlorofluoromethane			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*
Vinyl Chloride			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.1*
VOC TIC																	
semi Volatile Organic Compounds (sVOCs)																	
1,2-Dichlorobenzene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
1,2,4-Trichlorobenzene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
1,3-Dichlorobenzene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
1,4-Dichlorobenzene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
2-Nitroaniline			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
2,4-Dinitrotoluene			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
2,6-Dinitrotoluene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
3-Nitroaniline			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Bromophenylphenylether			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Chloroaniline			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Chlorophenylphenylether			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Nitroaniline			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Azobenzene			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location	WQS	Exceednaces	BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
			composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Bis(2-chloroethoxy)methane			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis(2-chloroethyl)ether			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Carbazole			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenzofuran			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobenzene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Hexachlorobutadiene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Hexachlorocyclopentadiene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Hexachloroethane			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Isophorone			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
N-nitrosodi-n-propylamine			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Nitrobenzene			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
SVOC TICs			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	See Attached	See Attached	ND	ND	*ND*
Nonadecane				NA	NA	NA	NA	NA		NA		NA	NA	NA	NA	NA	
Naphthalene, 1,4,6-trimethyl-				NA	NA	NA	NA	NA		NA		NA	NA	NA	NA	NA	
Pentadecane, 2,6,10-trimethyl-				NA	NA	NA	NA	NA		NA		NA	NA	NA	NA	NA	
Hexadecane, 2,6,11,15-tetramethyl-				NA	NA	NA	NA	NA		NA		NA	NA	NA	NA	NA	
Dodecane, 2,6,10-trimethyl-				NA	NA	NA	NA	NA		NA		NA	NA	NA	NA	NA	
Cyclic octaatomic sulfur				NA	NA	NA	NA	NA		NA		NA	515.00	973.00	NA	NA	
de 2,3,4,6-tetrachlorophenol																	
2,6-dichlorophenol																	
2,3,5,6-tetrachlorophenol																	
2,4-Dinitrophenol																	
4-Chlorophenol																	
Dinoseb																	
DNOC																	
Cyclohexane, butyl-																	
trans-Decalin, 2-methyl-																	
Naphthalene, decahydro-2-methyl-																	
Benzene, 1,2,3,4-tetramethyl-																	
Benzene, 1-methyl-4-(1-methylpropyl)-																	
Benzene, (1-methyl-1-butenyl)-																	
Naphthalene, 1-methyl-																	
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-																	
Dodecane, 2,6,11-trimethyl-																	
Naphthalene, 2,7-dimethyl-																	
Naphthalene, 1,4,6-trimethyl-																	
Naphthalene, 1,6,7-trimethyl-																	
Azulene, 4,6,8-trimethyl-																	
Hexacosane																	
Pentadecane, 2,6,10,14-tetramethyl-																	
Dodecane, 2,6,10-trimethyl-																	
4-Methylnaphtho[1,2-b]thiophene																	
Octadecane, 1-chloro-																	
2,7-Dimethyldibenzothiophene																	

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Sample Location	WQS	Exceednaces	BH110AL	BH110AH	BH111H	BH111L	BH112H	BH112AL	BH114L	BH114H	BH201RL	BH201RH	BH202L	BH202H	BH207L	BH207H	*BH207 S-L*
Sample Identity depth																	
High Water / Low Water			Low	High	High	Low	High	Low	Low	High	Low	High	Low	High	Low	High	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
			composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	composite	*composite*
Carbon																	
Benzene, 1-chlorodifluoromethoxy-4-nitro-																	
shaded values indicate results exceed WQS																	
is a revoked Uk drinking water standard																	

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Sample Location			*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			*######*	*######*	*######*	######	######	######	######	######	######	######	######	######	######	*######*	*######*
	WQS	Exceednaces	*composite*	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Organic Carbon, Total			*2.00*	*3.00*	*3.00*	46.00	46.00	4.00	4.00	13.00	21.00	19.00	27.00	22.00	16.00	*23.00*	*7.00*
Inorganics (mg/l)																	
Ammoniacal Nitrogen as N	40 mg/l	0	*0.04*	*<0.03*	*0.12*	3.14	3.11	1.15	0.91	11.35	7.51	12.10	13.21	0.98	1.16	*0.91*	*1.23*
BOD, unfiltered			*<1*	*<1*	*<1*	10.00	9.00	4.00	<1	3.00	4.00	18.00	14.00	2.00	4.00	*<1*	*<1*
Chloride			*58.10*	*74.90*	*83.80*	1212.40	847.10	8857.00	10350.20	2691.10	2144.40	305.50	507.10	6379.50	10663.10	*2571.00*	*12170.30*
COD, unfiltered			*13.00*	*<7*	*<7*	156.00	289.00	541.00	159.00	87.00	105.00	62.00	80.00	166.00	399.00	*107.00*	*422.00*
Conductivity @ 25 deg.C			*802.00*	*871.00*	*937.00*	4687.00	3790.00	24616.00	27820.00	8826.00	7706.00	2744.00	3361.00	18489.00	29428.00	*8835.00*	*35571.00*
Cyanide, Complex			*0.001*	*0.003*	*0.003*	<0.005	<0.005	0.007	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	*0.001*	*<0.001*
Cyanide, Free			*0.001*	*<0.001*	*<0.001*	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	*0.001*	*0.003*
Cyanide, Total (low level)*			*0.002*	*0.003*	*0.003*	<0.005	<0.005	0.007	0.007	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	*0.002*	*0.003*
Fluoride			*0.30*	*0.30*	*0.40*	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.30	<0.3	<0.3	*<0.3*	*<0.3*
Nitrate as NO3			*<0.2*	*<0.2*	*<0.2*	<0.2	<0.2	1.80	1.30	2.10	3.10	<0.2	<0.2	<0.2	<0.2	*<0.2*	*<0.2*
Nitrite as NO2			*<0.02*	*<0.02*	*<0.02*	<0.02	<0.02	0.26	0.10	0.05	0.16	<0.02	<0.02	<0.02	<0.02	*<0.02*	*<0.02*
pH	<4.5 >9	0	*7.21*	*7.16*	*7.21*	7.30	7.25	7.44	7.37	7.38	7.36	7.49	7.53	7.33	7.53	*7.19*	*7.50*
Sulphate			*60.28*	*73.68*	*66.41*	13.97	8.54	1229.21	1450.43	203.68	224.75	224.04	241.86	884.48	1495.41	*403.70*	*1622.80*
Sulphide			*<0.01*	*<0.01*	*<0.01*	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	*<0.01*	*<0.01*
Sulphur, Free																	
Total Dissolved Sulphur	mg/l		*16.96*	*17.69*	*19.57*	7.61	5.90	464.20	603.50	83.13	89.95	98.10	97.39	356.00	544.40	*139.90*	*544.40*
Thiocyanate			*<0.02*	*<0.02*	*<0.02*	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	*<0.02*	*<0.02*
Carbonate Alkalinity as CaCO3			*<1*	*<1*	*<1*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	*<1*	*<1*
Saline TON as NO3						<0.1	<0.1	0.90	1.20	0.30	0.20	<0.1	<0.1	0.80	1.20		
Metals (Dissolved)(µg/l)																	
Aluminium (diss.filt)	200 µg/l	0	*13.10*	*2.40*	*85.20*	<1.5	6.90	<1.5	<1.5	<1.5	<1.5	<1.5	4.80	<1.5	3.20	*1.70*	*24.10*
Antimony (diss.filt)			*<2*	*<2*	*2.00*	<2	<2	<2	<2	2.00	<2	<2	<2	<2	<2	*<2*	*<2*
Arsenic (diss.filt)	20 µg/l	0	*2.80*	*2.90*	*1.50*	8.60	1.00	<0.9	1.10	7.80	1.40	8.60	2.80	12.20	<0.9	*6.80*	*1.50*
Barium (diss.filt)			*27.30*	*30.70*	*28.00*	269.60	209.10	14.90	24.50	54.80	62.80	10.50	<1.8	44.70	49.80	*140.50*	*71.20*
Beryllium (diss.filt)			*<0.5*	*<0.5*	*<0.5*	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.5*	*<0.5*
Boron (diss.filt)			*130.00*	*125.00*	*169.00*	1247.00	1215.00	2239.00	2498.00	1944.00	1997.00	2211.00	2717.00	1608.00	2776.00	*602.00*	*2558.00*
Cadmium (diss.filt) (low level)	0.2 µg/l	7				0.07	<0.03	<0.03	<0.03	<0.03	<0.03	0.11	<0.03	0.40	<0.03		
Calcium (diss.filt)	mg/l		*108.10*	*113.30*	*108.70*	266.50	165.50	258.00	313.00	370.60	330.10	155.90	144.30	201.10	363.20	*241.90*	*349.60*
Chromium (diss.filt)	4.7µg/l	4	*0.80*	*0.50*	*0.30*	2.50	2.20	0.30	0.30	<0.2	0.90	1.00	0.50	<0.2	0.40	*<0.2*	*<0.2*
Cobalt (diss.filt)						2.20	3.10	<0.1	<0.1	0.50	2.20	<0.1	1.60	0.10	<0.1		
Copper (diss.filt)	5 µg/l	8	*<3*	*<3*	*<3*	8.00	<3	<3	<3	<3	<3	<3	<3	<3	<3	*<3*	*<3*
Iron (diss.filt)			*10.60*	*9.00*	*299.20*	17.80	19.10	<4.7	37.20	17.00	14.50	79.40	79.00	7.70	14.80	*4051.00*	*1850.00*
Lead (diss.filt)	1.3 µg/l	36	*3.10*	*5.80*	*8.00*	5.90	6.90	0.50	<0.4	0.80	4.70	0.90	4.50	1.20	1.30	*7.10*	*3.60*
Magnesium (diss.filt)	mg/l		*14.50*	*13.80*	*18.50*	81.00	64.20	731.10	924.00	238.20	209.90	57.30	72.20	561.00	863.40	*209.80*	*819.10*
Manganese (diss.filt)	30 µg/l	42	*10.40*	*2.60*	*93.90*	5624.00	6278.00	<1.5	310.90	988.00	1552.00	564.10	572.60	810.10	832.10	*1228.00*	*682.20*
Mercury (CVAF)	0.07 µg/l	11	*<0.01*	*<0.01*	*<0.01*	0.02	0.02	0.02	<0.01	0.01	<0.01	<0.01	<0.01	0.02	<0.01	*0.14*	*<0.01*
Molybdenum (diss.filt)			*2.10*	*2.00*	*1.30*	5.70	1.60	4.60	4.80	3.00	4.30	1.60	7.00	13.10	3.70	*12.00*	*3.40*
Nickel (diss.filt)	8.6 µg/l	2	*0.40*	*<0.2*	*<0.2*	3.50	4.60	<0.2	2.70	<0.2	2.40	0.40	1.60	5.70	1.00	*4.50*	*0.50*
Potassium (diss.filt)	mg/l		*12.60*	*13.00*	*15.90*	64.60	55.10	188.60	235.60	79.00	62.60	43.40	52.40	165.20	285.30	*49.70*	*244.40*
Phosphorus (diss.filt)						27.30	2.90	201.90	167.70	52.00	83.50	2239.00	339.90	68.40	273.40		
Selenium (diss.filt)			*<1.2*	*<1.2*	*<1.2*	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	*<1.2*	*<1.2*
Sodium (diss.filt)	mg/l		*48.30*	*50.30*	*72.00*	734.10	674.50	5267.00	6221.00	1785.00	1538.00	432.60	590.30	4253.00	7491.00	*1461.00*	*5692.00*
Thallium (diss.filt)						<0.9	<0.9	1.40	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9		
Tin (diss.filt)						<5	<5	<5	<5	6.00	<5	<5	<5	<5	<5		

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Sample Location			*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			*######*	*######*	*######*	######	######	######	######	######	######	######	######	######	######	*######*	*######*
	WQS	Exceednaces	*composite*	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Vanadium (diss.filt)			*0.70*	*<0.6*	*<0.6*	8.70	5.30	<0.6	<0.6	<0.6	2.40	3.60	4.10	<0.6	<0.6	*1.50*	*1.80*
Zinc (diss.filt)	40 µg/l	16	*23.20*	*7.90*	*14.80*	8.70	3.80	2.20	5.00	2.40	2.00	<1.5	2.90	61.40	5.50	*5.00*	*9.50*
Metals Unfiltered / Total (µg/l)																	
Boron (tot.unfilt)	7000	0				1092.00	1041.00	1967.00	2199.00	1950.00	1739.00	2154.00	2413.00	1601.00	2517.00		
Chromium, Hexavalent	0.60	8	*<2*	*<2*	*<2*	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	*<2*	*<2*
Chromium (tot unfilt)	4.70	20				2.90	96.20	2.60	1.30	18.40	13.30	2.30	4.90	9.50	2.60		
Copper Ultra low						30.00	386.00	16.00	<3	61.00	35.00	<3	23.00	60.00	8.00		
Iron Ultra low						2272.00	105800.00	11750.00	2368.00	53420.00	29590.00	2960.00	20650.00	12430.00	3995.00		
Lead Ultra Low						10.10	96.40	4.70	<0.4	24.80	21.40	3.80	9.20	66.60	4.60		
Manganese Ultra low						5487.00	8568.00	13590.00	2103.00	1691.00	2063.00	561.80	644.30	1011.00	883.00		
Molybdenum						5.20	3.10	14.90	5.90	3.60	4.70	3.00	11.90	15.20	3.90		
Nickel Ultra low						3.60	67.00	11.30	1.00	20.10	18.00	1.60	8.50	17.90	3.60		
Phenols (µg/l)																	
2,3-Dimethylphenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
2,3,4,6-Tetrachlorophenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
2,3,5,6-Tetrachlorophenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
2,6-Dichlorophenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
2,6-Dimethylphenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
3-Methylphenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
3,4-Dimethylphenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
3,5-Dimethylphenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
4-Chloro-2-methylphenol			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
2,4,5-trichlorophenol			*<0.1*	*<0.1*	*<0.1*	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*	*<0.1*
4,6-Dinitro-o-cresol (DNOC)			*<0.1*	*<0.1*	*<0.1*											*<0.1*	*<0.1*
2,4,6-trichlorophenol			*<0.1*	*<0.1*	*<0.1*	<1	NA	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*	*<0.1*
2,4-dichlorophenol			*<0.1*	*<0.1*	*<0.1*	<0.5	*5* NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*	*<0.1*
2,4-dimethylphenol			*<0.1*	*<0.1*	*<0.1*	<1	NA	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*	*<0.1*
2-chlorophenol			*<0.1*	*<0.1*	*<0.1*	<1	NA	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*	*<0.1*
2-methylphenol			*<0.1*	*<0.1*	*<0.1*	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*	*<0.1*
2-nitrophenol			*<0.1*	*<0.1*	*<0.1*	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*	*<0.1*
4-chloro-3-methylphenol			*<0.1*	*<0.1*	*<0.1*	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	*<0.1*	*<0.1*
4-methylphenol			*<0.1*	*<0.1*	*<0.1*	<1	NA	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*	*<0.1*
4-nitrophenol			*<0.1*	*<0.1*	*<0.1*	<10	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<0.1*	*<0.1*
Pentachlorophenol			*<0.1*	*<0.1*	*<0.1*	<1	NA	<1	<1	<1	<1	<1	<1	<1	<1	*<0.1*	*<0.1*
Phenol	8 µg/l	0	*<0.1*	*<0.1*	*<0.1*	<1	NA	<1	<1	<0.5	<1	<1	<1	<0.5	<1	*<0.1*	*<0.1*
Total Speciated phenols			*<2.1*	*<2.1*	*<2.1*											*<2.1*	*<2.1*
2.3.5 Trimethyl-Phenol						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
2-Isopropyl Phenol						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Cresols						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
m/p-cresol																	
o-cresol																	
Phenols, Total (HPLC						<5	NA	<5	<5	<5	<5	<5	<5	<5	<5		
Xylenols						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Resorcinol						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Catechol						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
1-naphthol						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
TPH Criteria Working Group (TPH CWG)(µg/l)																	

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Sample Location	WQS	Exceednaces	*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			*######*	*######*	*######*	######	######	######	######	######	######	######	######	######	######	######	######
			composite	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Aliphatics >C5-C6			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aliphatics >C6-C8			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aliphatics >C8-C10			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aliphatics >C10-C12			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aliphatics >C12-C16			*<10*	*<10*	*<10*	190.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
Aliphatics >C16-C21			*<10*	*<10*	*<10*	400.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
Aliphatics >C21-C35			*<10*	*<10*	*<10*	1540.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
Total Aliphatics C5-C35			*<10*	*<10*	*<10*											*<10*	*<10*
Aromatics >EC5-EC7			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aromatics >EC7-EC8			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aromatics >EC8-EC10			*<5*	*<5*	*<5*	<5	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aromatics >EC10-EC12			*<5*	*<5*	*<5*	24.00	NA	<5	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*
Aromatics >EC12-EC16			*<10*	*<10*	*<10*	230.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
Aromatics >EC16-EC21			*<10*	*<10*	*<10*	520.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
Aromatics >EC21-EC35			*<10*	*<10*	*<10*	2210.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
Total Aromatics C5-C35			*<10*	*<10*	*<10*											*<10*	*<10*
Total aliphatics and aromatics C5-C35	10µg/l	7	*<10*	*<10*	*<10*	5114.00	NA	<10	<10	<10	<10	<10	<10	<10	<10	*<10*	*<10*
MTBE			*<0.1*	*<0.1*	*<0.1*	<5	NA	<5	<5		<5	<5	<5		<5	*<0.1*	*<0.1*
Benzene	8µg/l	0	*<0.5*	*<0.5*	*<0.5*	<0.5	NA	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	*<0.5*	*<0.5*
Toluene			*<0.5*	*<0.5*	*<0.5*											*<0.5*	*<0.5*
Ethylbenzene			*<0.5*	*<0.5*	*<0.5*	<0.5	NA	<0.5	<0.5		<0.5	<0.5	<0.5		<0.5	*<0.5*	*<0.5*
m,p-Xylene	10µg/l	0	*<1*	*<1*	*<1*	<0.01	NA	<0.01	<0.01		<0.01	<0.01	<0.01		<0.01	*<1*	*<1*
o-Xylene	10µg/l	0	*<0.5*	*<0.5*	*<0.5*	<0.01	NA	<0.01	<0.01		<0.01	<0.01	<0.01		<0.01	*<0.5*	*<0.5*
Polyaromatic Hydrocarbons (PAHs)(µg/l)																	
Acenaphthene (aq)			*0.01*	*<0.01*	*<0.01*	0.28	NA	0.01	<0.01	<0.01	0.01	0.04	0.03	0.06	0.02	*0.01*	*<0.01*
Acenaphthylene (aq)			*<0.01*	*<0.01*	*<0.01*	0.23	NA	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.02	0.02	*0.01*	*<0.01*
Anthracene (aq)	0.1µg/l	6	*<0.01*	*<0.01*	*<0.01*	0.08	NA	0.01	0.01	<0.01	0.01	0.02	0.01	<0.01	<0.01	*<0.01*	*<0.01*
Benzo(a)anthracene (aq)			*<0.01*	*<0.01*	*<0.01*	0.17	NA	0.01	0.01	0.01	0.01	0.02	<0.01	0.02	<0.01	*<0.01*	*<0.01*
Benzo(a)pyrene (aq)	0.00017µg/l	8	*<0.01*	*<0.01*	*<0.01*	0.11	NA	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Benzo(b)fluoranthene (aq)	0.03µg/l	6	*<0.01*	*<0.01*	*<0.01*	0.21	NA	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Benzo(k)fluoranthene (aq)	0.03µg/l	5	*<0.01*	*<0.01*	*<0.01*	0.08	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Benzo(bk)fluoranthene (aq)			*<0.01*	*<0.01*	*<0.01*	0.29	NA	0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Benzo(g,h,i)perylene (aq)	0.002µg/l	7	*<0.01*	*<0.01*	*<0.01*	0.05	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Chrysene (aq)			*<0.01*	*<0.01*	*<0.01*	0.40	NA	0.01	<0.01	0.01	0.01	0.01	<0.01	0.01	<0.01	*<0.01*	*<0.01*
Dibenzo(a,h)anthracene (aq)			*<0.01*	*<0.01*	*<0.01*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Fluoranthene (aq)	0.0063µg/l	44	*0.01*	*<0.01*	*<0.01*	0.40	NA	0.02	0.01	0.01	0.01	0.04	0.02	0.05	0.02	*0.01*	*0.01*
Fluorene (aq)			*0.01*	*<0.01*	*<0.01*	0.73	NA	0.03	0.01	0.01	0.01	0.04	0.02	<0.01	0.02	*<0.01*	*<0.01*
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	7	*<0.01*	*<0.01*	*<0.01*	0.06	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.01*	*<0.01*
Naphthalene (aq)	2µg/l	2	*<0.1*	*<0.1*	*<0.1*	0.03	NA	<0.01	<0.01	0.02	<0.01	0.01	<0.01	0.04	<0.01	*<0.1*	*<0.1*

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Sample Location			*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			######	######	######	######	######	######	######	######	######	######	######	######	######	######	######
	WQS	Exceednaces	*composite*	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Phenanthrene (aq)			*0.01*	*0.01*	*0.01*	0.33	NA	0.05	0.02	0.01	0.02	0.07	0.03	<0.01	0.02	*0.01*	*0.01*
Pyrene (aq)			*0.01*	*<0.01*	*<0.01*	0.52	NA	0.03	0.01	0.01	0.01	0.04	0.02	0.07	0.03	*0.04*	*0.02*
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			*<0.1*	*<0.1*	*<0.1*	3.70	NA	0.20	<0.1	<0.1	0.10	0.30	0.10	0.30	0.10	*<0.1*	*<0.1*
PCB's (µg/l)																	
PCB congener 101			*<0.1*	*<0.1*	*<0.1*	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
PCB congener 118			*<0.1*	*<0.1*	*<0.1*	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
PCB congener 138			*<0.1*	*<0.1*	*<0.1*	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
PCB congener 153			*<0.1*	*<0.1*	*<0.1*	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
PCB congener 180			*<0.1*	*<0.1*	*<0.1*	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
PCB congener 28			*<0.1*	*<0.1*	*<0.1*	<0.1	NA	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
PCB congener 52			*<0.1*	*<0.1*	*<0.1*	<0.1	NA_6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	*<0.1*	*<0.1*
Sum of detected EC7 PCB's			*<0.7*	*<0.7*	*<0.7*	<0.7	NA	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	*<0.7*	*<0.7*
Volatile Organic Compounds (VOCs) (µg/l)																	
1.1.1.2-Tetrachloroethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.1.1-Trichloroethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.1.2.2-Tetrachloroethane			*<4*	*<4*	*<4*	<4	NA	<4	<4	<0.01	<4	<4	<4	<0.01	<4	*<4*	*<4*
1.1.2-Trichloroethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.1-Dichloroethane			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.10	0.15	*<3*	*<3*
1.1-Dichloroethene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.1-Dichloropropene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.2.3-Trichlorobenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.2.3-Trichloropropane			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.2.4-Trichlorobenzene	0.4µg/l	1	*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.2.4-Trimethylbenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.2-Dibromo-3-chloropropane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.2-Dibromoethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.2-Dichlorobenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.2-Dichloroethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.2-Dichloropropane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.3.5-Trimethylbenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01		0.02	<0.01	<0.01		<0.01	*<3*	*<3*
1.3-Dichlorobenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
1.3-Dichloropropane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
1.4-Dichlorobenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
2.2-Dichloropropane			*<1*	*<1*	*<1*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<1*	*<1*
2-Chlorotoluene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
4-Chlorotoluene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
4-Isopropyltoluene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Benzene	8µg/l	0	*<0.5*	*<0.5*	*<0.5*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*	*<0.5*
Bromobenzene			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Bromochloromethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Bromodichloromethane			*<2*	*<2*	*<2*	0.07	NA	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Bromoform			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Bromomethane			*<1*	*<1*	*<1*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<1*	*<1*
Carbon disulphide																	
Carbontetrachloride			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Chlorobenzene			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Chloroethane			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Chloroform			*<2*	*<2*	*<2*	0.17	NA	0.04	0.05	0.05	<0.01	0.03	0.03	<0.01	<0.01	*<2*	*<2*

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Sample Location			*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			*######*	*######*	*######*	######	######	######	######	######	######	######	######	######	######	*######*	*######*
	WQS	Exceednaces	*composite*	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Chloromethane			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
cis-1,2-Dichloroethene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
cis-1,3-Dichloropropene			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Dibromochloromethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Dibromomethane			*<3*	*<3*	*<3*	<3	NA	<3	<3	<0.01	<3	<3	<3	<0.01	<3	*<3*	*<3*
Dichlorodifluoromethane			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Dichloromethane			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Ethylbenzene			*<0.5*	*<0.5*	*<0.5*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*	*<0.5*
Hexachlorobutadiene	0.6µg/l	1	*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Isopropylbenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
m,p-Xylene	10µg/l	0	*<0.1*	*<0.1*	*<0.1*					<0.01				<0.01		*<0.1*	*<0.1*
Methyl tertiary butyl ether (MTBE)			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Naphthalene	2µg/l	2	*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
n-Butylbenzene			*<0.5*	*<0.5*	*<0.5*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.5*	*<0.5*
o-Xylene	10µg/l	0	*<1*	*<1*	*<1*	<0.5	NA	<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.01	<0.5	*<1*	*<1*
Propylbenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
sec-Butylbenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Styrene			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Total Xylenes																	
tert-Amyl methyl ether (TAME)																	
tert-Butylbenzene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Tetrachloroethene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Toluene	10µg/l	0	*<0.5*	*<0.5*	*<0.5*	<0.01	NA	<0.01	0.03	<0.01	0.07	0.05	0.07	<0.01	0.03	*<0.5*	*<0.5*
trans-1,2-Dichloroethene			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
trans-1,3-Dichloropropene			*<2*	*<2*	*<2*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<2*	*<2*
Trichloroethene	10µg/l	1	*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Trichlorofluoromethane			*<3*	*<3*	*<3*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<3*	*<3*
Vinyl Chloride			*<0.1*	*<0.1*	*<0.1*	<0.01	NA	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	*<0.1*	*<0.1*
VOC TIC																	
semi Volatile Organic Compounds (sVOCs)																	
1,2-Dichlorobenzene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
1,2,4-Trichlorobenzene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
1,3-Dichlorobenzene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
1,4-Dichlorobenzene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
2-Nitroaniline						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
2,4-Dinitrotoluene						<0.5	7 NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
2,6-Dinitrotoluene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
3-Nitroaniline						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
4-Bromophenylphenylether						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
4-Chloroaniline						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
4-Chlorophenylphenylether						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
4-Nitroaniline						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Azobenzene						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		

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Sample Location	WQS	Exceednaces	*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			*######*	*######*	*######*	######	######	######	######	######	######	######	######	######	######	######	######
			composite	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Bis(2-chloroethoxy)methane						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Bis(2-chloroethyl)ether						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
Carbazole						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Dibenzofuran						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Hexachlorobenzene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
Hexachlorobutadiene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
Hexachlorocyclopentadiene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
Hexachloroethane						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
Isophorone						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
N-nitrosodi-n-propylamine						<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Nitrobenzene						<1	NA	<1	<1	<1	<1	<1	<1	<1	<1		
SVOC TICs			*ND*	*ND*	*ND*	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND		*ND*
Nonadecane						NA	NA	NA	NA		NA	NA	NA		NA		
Naphthalene, 1,4,6-trimethyl-						NA	NA	NA	NA		NA	NA	NA		NA		
Pentadecane, 2,6,10-trimethyl-						NA	NA	NA	NA		NA	NA	NA		NA		
Hexadecane, 2,6,11,15-tetramethyl-						NA	NA	NA	NA		NA	NA	NA		NA		
Dodecane, 2,6,10-trimethyl-						NA	NA	NA	NA		NA	NA	NA		NA		
Cyclic octaatomic sulfur						NA	NA	NA	NA		NA	NA	NA		NA		
de 2,3,4,6-tetrachlorophenol																	
2,6-dichlorophenol																	
2,3,5,6-tetrachlorophenol																	
2,4-Dinitrophenol																	
4-Chlorophenol																	
Dinoseb																	
DNOC																	
Cyclohexane, butyl-																	
trans-Decalin, 2-methyl-																	
Naphthalene, decahydro-2-methyl-																	
Benzene, 1,2,3,4-tetramethyl-																	
Benzene, 1-methyl-4-(1-methylpropyl)-																	
Benzene, (1-methyl-1-butenyl)-																	
Naphthalene, 1-methyl-																	
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-																	
Dodecane, 2,6,11-trimethyl-																	
Naphthalene, 2,7-dimethyl-																	
Naphthalene, 1,4,6-trimethyl-																	
Naphthalene, 1,6,7-trimethyl-																	
Azulene, 4,6,8-trimethyl-																	
Hexacosane																	
Pentadecane, 2,6,10,14-tetramethyl-																	
Dodecane, 2,6,10-trimethyl-																	
4-Methylnaphtho[1,2-b]thiophene																	
Octadecane, 1-chloro-																	
2,7-Dimethyldibenzothiophene																	

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Sample Location		Exceednaces	*BH207 D-L*	*BH207S-H*	*BH207D-H*	BH208L	BH208H	BH212AL	BH212AH	BH213L	BH213H	BH214L	BH214H	BH215L	BH215H	*BH215 S-L*	*BH215 D-L*
Sample Identity depth																	
High Water / Low Water			*Low*	*High*	*High*	Low	High	Low	High	Low	High	Low	High	Low	High	*Low*	*Low*
Sampled Date			*######*	*######*	*######*	######	######	######	######	######	######	######	######	######	######	######	######
	WQS		*composite*	*composite*	*composite*	composite	composite	composite	composite	composite		composite	composite	composite			
Carbon																	
Benzene, 1-chlorodifluoromethoxy-4-nitro-																	
shaded values indicate results exceed WQS																	
is a revoked Uk drinking water standard																	

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Sample Location			*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	*######*	*######*	*######*	*######*	######	######	######	######		######	######
	WQS	Exceednaces				composite					composite		composite				
Carbon																Limestone	Limestone
Organic Carbon, Total			*24.00*	*8.00*	29.00	30.00	*24.00*	*35.00*	*26*	*NA*	8.00	7.00	7.00	7.00		2.00	3.00
Inorganics (mg/l)																	
Ammoniacal Nitrogen as N	40 mg/l	0	*0.92*	*1.21*	0.75	0.57	*1.21*	*0.47*	*1.21*	*NA*	0.70	0.71	0.96	0.82		0.03	0.03
BOD, unfiltered			*<1*	*<1*	35.00	69.00	*3.00*	*17.00*	*1.00*	*NA*	53.00	42.00	4.00	4.00		2.00	<1
Chloride			*2650.30*	*11044.80*	32.00	47.50	*121.30*	*128.40*	*73.50*	*NA*	10315.10	10542.60	6558.40	6119.90		3042.90	3247.20
COD, unfiltered			*91.00*	*515.00*	481.00	95.00	*46.00*	*237.00*	*51.00*	*NA*	586.00	442.00	193.00	394.00		58.00	60.00
Conductivity @ 25 deg.C			*8710.00*	*34663.00*	1018.00	1092.00	*1256.00*	*1270.00*	*1153.00*	*NA*	28501.00	29883.00	18445.00	18124.00		9483.00	9857.00
Cyanide, Complex			*0.002*	*0.006*	<0.005	<0.005	*0.002*	*0.005*	*0.004*	*NA*	<0.005	0.006	<0.005	<0.005		<0.005	<0.005
Cyanide, Free			*0.002*	*0.003*	<0.005	<0.005	*<0.001*	*<0.001*	*<0.001*	*NA*	0.007	<0.005	<0.005	<0.005		<0.005	<0.005
Cyanide, Total (low level)*			*0.004*	*0.009*	<0.005	<0.005	*0.002*	*0.005*	*0.004*	*NA*	0.007	0.006	<0.005	<0.005		<0.005	<0.005
Fluoride			*<0.3*	*<0.3*	<0.3	<0.3	*<300*	*<0.3*	*<0.3*	*NA*	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3
Nitrate as NO3			*2.30*	*<0.2*	<0.2	<0.2	*<0.2*	*<0.2*	*0.40*	*NA*	<0.2	<0.2	<0.2	<0.2		15.00	14.70
Nitrite as NO2			*<0.02*	*<0.02*	<0.02	<0.02	*<0.02*	*<0.02*	*<0.02*	*NA*	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02
pH	<4.5 >9	0	*7.07*	*7.37*	6.82	6.85	*6.81*	*6.78*	*6.89*	*NA*	6.53	6.60	6.89	7.04		7.51	7.55
Sulphate			*405.16*	*1572.48*	2.43	10.07	*5.68*	*5.57*	*5.46*	*NA*	1492.56	1611.21	1198.47	1168.15		431.25	474.89
Sulphide			*<0.01*	*<0.01*	<0.3	<0.3	*<0.01*	*<0.01*	*<10*	*NA*	<0.3	<0.3	<0.3	<0.3		<0.3	<0.3
Sulphur, Free																	
Total Dissolved Sulphur	mg/l		*137.40*	*528.10*	2.83	3.82	*5.54*	*6.40*	*4.61*	*NA*	555.70	587.50	451.30	482.00		167.70	189.00
Thiocyanate			*<0.02*	*<0.02*	<0.02	<0.02	*<0.02*	*<0.02*	*<0.02*	*NA*	0.03	0.04	<0.02	<0.02		<0.02	<0.02
Carbonate Alkalinity as CaCO3			*<1*	*<1*	<1	<1	*<1*	*<1*	*<1*	*NA*	<1	<1	<1	<1		<1	<1
Saline TON as NO3					<0.1	<0.1					1.10	1.30	0.80	0.60		0.30	0.30
Metals (Dissolved)(µg/l)																	
Aluminium (diss.filt)	200 µg/l	0	*5.10*	*7.60*	<1.5	<1.5	*22.90*	*44.30*	*24.50*	*NA*	43.30	28.30	<1.5	<1.5		<1.5	2.20
Antimony (diss.filt)			*<2*	*4.00*	4.00	<2	*4.00*	*3.00*	*2.00*	*NA*	<2	4.00	<2	<2		2.00	<2
Arsenic (diss.filt)	20 µg/l	0	*4.10*	*6.00*	5.90	<0.9	*<0.9*	*9.40*	*<0.9*	*NA*	10.00	3.70	3.20	<0.9		<0.9	1.90
Barium (diss.filt)			*146.30*	*61.60*	801.20	964.10	*1182.00*	*1079.00*	*1258.00*	*NA*	74.40	90.90	30.90	35.60		9.30	9.70
Beryllium (diss.filt)			*<0.5*	*<0.5*	<0.5	<0.5	*<0.5*	*<0.5*	*<0.5*	*NA*	<0.5	0.60	<0.5	<0.5		<0.5	<0.5
Boron (diss.filt)			*634.00*	*2269.00*	220.00	266.00	*229.00*	*233.00*	*216.00*	*NA*	2102.00	2480.00	1480.00	1668.00		844.00	784.00
Cadmium (diss.filt) (low level)	0.2 µg/l	7			0.34	0.14				*NA*	3.73	2.06	<0.03	0.15		0.08	0.11
Calcium (diss.filt)	mg/l		*256.80*	*351.40*	179.90	191.20	*186.30*	*187.20*	*195.60*	*NA*	371.90	448.50	463.30	408.70		163.50	171.40
Chromium (diss.filt)	4.7µg/l	4	*0.50*	*<0.2*	<0.2	0.20	*<0.2*	*0.30*	*<0.2*	*NA*	0.60	0.30	<0.2	0.30		0.70	0.70
Cobalt (diss.filt)					0.40	0.40					<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
Copper (diss.filt)	5 µg/l	8	*7.00*	*<3*	<3	<3	*22.00*	*27.00*	*9.00*	*NA*	<3	19.00	<3	<3		<3	<3
Iron (diss.filt)			*4841.00*	*1769.00*	3344.00	1463.00	*25950.00*	*24100.00*	*30550.00*	*NA*	43550.00	47690.00	441.70	2988.00		<4.7	<4.7
Lead (diss.filt)	1.3 µg/l	36	*13.10*	*2.00*	27.90	3.90	*14.00*	*147.90*	*15.60*	*NA*	1.90	1.80	2.10	3.10		1.20	0.50
Magnesium (diss.filt)	mg/l		*228.90*	*895.80*	16.20	15.10	*21.60*	*22.50*	*20.20*	*NA*	639.60	883.90	541.50	497.50		228.10	240.30
Manganese (diss.filt)	30 µg/l	42	*1332.00*	*677.40*	304.50	302.90	*297.70*	*374.80*	*270.10*	*NA*	229.00	264.50	422.70	441.20		<1.5	8.50
Mercury (CVAF)	0.07 µg/l	11	*<0.01*	*<0.01*	1.18	0.53	*<0.01*	*1.11*	*0.02*	*NA*	0.60	0.29	0.53	0.21		0.02	0.01
Molybdenum (diss.filt)			*13.40*	*3.50*	0.30	0.90	*0.30*	*0.70*	*<0.2*	*NA*	1.90	3.10	0.50	1.20		2.70	3.50
Nickel (diss.filt)	8.6 µg/l	2	*3.00*	*<0.2*	3.30	2.50	*6.00*	*8.70*	*1.00*	*NA*	<0.2	0.70	0.40	3.70		0.30	0.90
Potassium (diss.filt)	mg/l		*50.40*	*262.30*	7.50	7.60	*10.50*	*11.20*	*10.20*	*NA*	244.40	287.80	172.20	159.30		64.70	69.60
Phosphorus (diss.filt)					9.20	2.80					3.70	3.60	3.40	2.20		142.20	121.80
Selenium (diss.filt)			*<1.2*	*<1.2*	<1.2	<1.2	*<1.2*	*<1.2*	*<1.2*	*NA*	<1.2	<1.2	<1.2	<1.2		<1.2	<1.2
Sodium (diss.filt)	mg/l		*1580.00*	*6781.00*	18.90	19.00	*56.20*	*63.50*	*41.70*	*NA*	5962.00	8520.00	3977.00	4072.00		2071.00	2144.00
Thallium (diss.filt)					<0.9	<0.9					<0.9	<0.9	<0.9	<0.9		<0.9	1.20
Tin (diss.filt)					<5	<5					<5	<5	<5	<5		<5	<5

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Sample Location			*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	*######*	*######*	*######*	*######*	######	######	######	######		######	######
	WQS	Exceednaces				composite					composite		composite				
Carbon																Limestone	Limestone
Vanadium (diss.filt)			*<0.6*	*<0.6*	2.60	2.00	*2.70*	*2.30*	*1.80*	*NA*	<0.6	<0.6	<0.6	<0.6		1.70	1.30
Zinc (diss.filt)	40 µg/l	16	*5.10*	*4.70*	99.10	20.80	*986.00*	*828.30*	*53.90*	*NA*	100.60	129.00	92.60	174.90		5.80	4.90
Metals Unfiltered / Total (µg/l)																	
Boron (tot.unfilt)	7000	0			214.00	217.00					2112.00	2336.00	1481.00	1741.00		830.00	767.00
Chromium, Hexavalent	0.60	8	*<2*	*<2*	<2	<2	*<2*	*<2*	*<2*	*<2*	<2	<2	<2	<2		<2	<2
Chromium (tot unfilt)	4.70	20			22.50	3.00					8.10	8.70	0.90	0.30		1.10	3.50
Copper Ultra low					1982.00	290.00					136.00	81.00	74.00	20.00		<3	5.00
Iron Ultra low					46110.00	24070.00					64070.00	62790.00	35310.00	12940.00		671.80	2080.00
Lead Ultra Low					17720.00	1952.00					1241.00	476.30	156.50	49.00		1.10	5.00
Manganese Ultra low					628.50	318.40					288.00	273.40	439.80	423.30		26.00	93.10
Molybdenum					2.30	0.40					3.00	3.30	0.40	1.50		2.50	3.20
Nickel Ultra low					31.70	5.60					3.40	4.50	1.30	3.60		0.70	1.70
Phenols (µg/l)																	
2,3-Dimethylphenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
2,3,4,6-Tetrachlorophenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
2,3,5,6-Tetrachlorophenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
2,6-Dichlorophenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
2,6-Dimethylphenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
3-Methylphenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
3,4-Dimethylphenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
3,5-Dimethylphenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
4-Chloro-2-methylphenol			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
2,4,5-trichlorophenol			*<0.1*	*<0.1*	<0.5	NA	*<0.1*	*<0.1*	*<0.1*		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
4,6-Dinitro-o-cresol (DNOC)			*<0.1*	*<0.1*			*<0.1*	*<0.1*	*<0.1*								
2,4,6-trichlorophenol			*<0.1*	*<0.1*	<1	NA	*<0.1*	*<0.1*	*<0.1*		<1	<1	<1	<1		<1	<1
2,4-dichlorophenol			*<0.1*	*<0.1*	<0.5	NA	*<0.1*	*<0.1*	*<0.1*		<0.5	<0.5	9 <0.5	<0.5		<0.5	<0.5
2,4-dimethylphenol			*<0.1*	*<0.1*	<1	NA	*<0.1*	*<0.1*	*<0.1*		<1	<1	<1	<1		<1	<1
2-chlorophenol			*<0.1*	*<0.1*	<1	NA	*<0.1*	*<0.1*	*<0.1*		<1	<1	<1	<1		<1	<1
2-methylphenol			*<0.1*	*<0.1*	<0.5	NA	*<0.1*	*<0.1*	*<0.1*		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
2-nitrophenol			*<0.1*	*<0.1*	<0.5	NA	*<0.1*	*<0.1*	*<0.1*		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
4-chloro-3-methylphenol			*<0.1*	*<0.1*	<0.5	NA	*<0.1*	*<0.1*	*<0.1*		<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
4-methylphenol			*<0.1*	*<0.1*	<1	NA	*<0.1*	*<0.1*	*<0.1*		<1	<1	<1	<1		<1	<1
4-nitrophenol			*<0.1*	*<0.1*	<10	NA	*<0.1*	*<0.1*	*<0.1*		<10	<10	<10	<10		<10	<10
Pentachlorophenol			*<0.1*	*<0.1*	<1	NA	*<0.1*	*<0.1*	*<0.1*		<1	<1	<1	<1		<1	<1
Phenol	8 µg/l	0	*<0.1*	*<0.1*	<1	NA	*<0.1*	*<0.1*	*<0.1*		<1	<1	<0.5	<1		<0.5	<1
Total Speciated phenols			*<2.1*	*<2.1*			*<2.1*	*<2.1*	*<2.1*								
2.3.5 Trimethyl-Phenol					<0.5	NA	*NA*	*NA*			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
2-Isopropyl Phenol					<0.5	NA	*NA*	*NA*			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Cresols					<0.5	NA	*NA*	*NA*			1.10	<0.5	<0.5	<0.5		<0.5	<0.5
m/p-cresol																	
o-cresol																	
Phenols, Total (HPLC					<5	NA	*NA*	*NA*			<5	<5	<5	<5		<5	<5
Xylenols					<0.5	NA	*NA*	*NA*			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Resorcinol					<0.5	NA	*NA*	*NA*			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Catechol					<0.5	NA	*NA*	*NA*			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
1-naphthol					<0.5	NA	*NA*	*NA*			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
TPH Criteria Working Group (TPH CWG)(µg/l)																	

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location			*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	*######*	*######*	*######*	*######*	######	######	######	######		######	######
	WQS	Exceednaces				composite					composite		composite				
Carbon																Limestone	Limestone
Aliphatics >C5-C6			*<5*	*<5*	<5	NA	*<5*	*<5*	*<5*	*NA*	<5	<5	<5	<5		<5	<5
Aliphatics >C6-C8			*<5*	*<5*	<5	NA	*<5*	*10*	*<5*	*NA*	<5	<5	<5	<5		<5	<5
Aliphatics >C8-C10			*<5*	*<5*	64	NA	*<5*	*637*	*<5*	*NA*	<5	<5	<5	<5		<5	<5
Aliphatics >C10-C12			*<5*	*<5*	9035	NA	*136*	*6444*	*28*	*NA*	<5	<5	<5	<5		<5	<5
Aliphatics >C12-C16			*<10*	*<10*	34640	NA	*590*	*22440*	*220*	*NA*	170.00	150.00	<10	<10		<10	<10
Aliphatics >C16-C21			*<10*	*<10*	47040	NA	*720*	*27010*	*260*	*NA*	140.00	210.00	<10	<10		<10	<10
Aliphatics >C21-C35			*<10*	*<10*	17880	NA	*200*	*9610*	*<10*	*NA*	<10	<10	<10	<10		<10	<10
Total Aliphatics C5-C35			*<10*	*<10*	108659		*1646*	*66151*	*508*	*NA*							
Aromatics >EC5-EC7			*<5*	*<5*	<5	NA	*<5*	*<5*	*<5*	*NA*	<5	<5	<5	<5		<5	<5
Aromatics >EC7-EC8			*<5*	*<5*	<5	NA	*<5*	*<5*	*<5*	*NA*	<5	<5	<5	<5		<5	<5
Aromatics >EC8-EC10			*<5*	*<5*	10	NA	*<5*	*32*	*<5*	*NA*	<5	<5	<5	<5		<5	<5
Aromatics >EC10-EC12			*<5*	*<5*	2135	NA	*106*	*1473*	*93*	*NA*	<5	<5	<5	<5		<5	<5
Aromatics >EC12-EC16			*<10*	*<10*	19450	NA	*430*	*11920*	*350*	*NA*	60.00	70.00	<10	<10		<10	<10
Aromatics >EC16-EC21			*<10*	*<10*	39000	NA	*450*	*21370*	*250*	*NA*	300.00	320.00	<10	<10		<10	<10
Aromatics >EC21-EC35			*<10*	*<10*	17840	NA	*110*	*9630*	*40*	*NA*	120.00	180.00	<10	<10		<10	<10
Total Aromatics C5-C35			*<10*	*<10*	78435		*1096*	*44425*	*733*	*NA*							
Total aliphatics and aromatics C5-C35	10µg/l	7	*<10*	*<10*	187094	NA	*2742*	*110576*	*1241*	*NA*	790.00	930.00	<10	<10		<10	<10
MTBE			*<0.1*	*<0.1*	<5	NA	*<0.1*	*<0.1*	*<0.1*	*NA*	<5	<5		<5			<5
Benzene	8µg/l	0	*<0.5*	*<0.5*	<0.5	NA	*<0.5*	*<0.5*	*<0.5*	*NA*	<0.5	NA		<0.5			<0.5
Toluene			*<0.5*	*<0.5*			*<0.5*	*<0.5*	*<0.5*	*NA*							
Ethylbenzene			*<0.5*	*<0.5*	<0.5	NA	*<0.5*	*<0.5*	*<0.5*	*NA*	<0.5	NA		<0.5			<0.5
m,p-Xylene	10µg/l	0	*<1*	*<1*	4.57	NA	*<1*	*<1*	*<1*	*NA*	<0.01	<0.01		<0.01			<0.01
o-Xylene	10µg/l	0	*<0.5*	*<0.5*	0.97	NA	*<0.5*	*<0.5*	*<0.5*	*NA*	<0.01	<0.01		<0.01			<0.01
Polyaromatic Hydrocarbons (PAHs)(µg/l)																	
Acenaphthene (aq)			*<0.01*	*<0.01*	60.32	NA	*0.9*	*20.5*	*0.9*	*NA*	0.02	0.03	0.02	0.01		0.01	<0.01
Acenaphthylene (aq)			*<0.01*	*<0.01*	63.88	NA	*0.61*	*23.51*	*0.69*	*NA*	0.02	0.02	0.01	0.01		<0.01	<0.01
Anthracene (aq)	0.1µg/l	6	*0.01*	*<0.01*	46.23	NA	*0.14*	*19.27*	*0.28*	*NA*	0.05	0.05	0.01	0.01		<0.01	<0.01
Benzo(a)anthracene (aq)			*<0.01*	*<0.01*	124.43	NA	*0.07*	*36.88*	*0.18*	*NA*	0.23	0.41	0.02	<0.01		0.01	<0.01
Benzo(a)pyrene (aq)	0.00017µg/l	8	*<0.01*	*<0.01*	92.43	NA	*0.05*	*38.34*	*0.16*	*NA*	0.13	0.32	0.01	<0.01		<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l	6	*<0.01*	*<0.01*	109.84	NA	*0.06*	*39.58*	*0.17*	*NA*	0.17	0.40	<0.01	<0.01		<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l	5	*<0.01*	*<0.01*	42.72	NA	*0.03*	*15.39*	*0.07*	*NA*	0.07	0.15	<0.01	<0.01		<0.01	<0.01
Benzo(bk)fluoranthene (aq)			*<0.01*	*<0.01*	152.56	NA	*0.09*	*54.97*	*0.24*	*NA*	0.24	0.55	<0.01	<0.01		<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l	7	*<0.01*	*<0.01*	34.98	NA	*0.02*	*16.75*	*0.05*	*NA*	0.07	0.14	<0.01	<0.01		<0.01	<0.01
Chrysene (aq)			*<0.01*	*<0.01*	104.82	NA	*0.08*	*32.01*	*0.16*	*NA*	0.09	0.20	0.02	<0.01		<0.01	<0.01
Dibenzo(a,h)anthracene (aq)			*<0.01*	*<0.01*	4.41	NA	*<0.01*	*3.67*	*0.01*	*NA*	<0.01	0.03	<0.01	<0.01		<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	44	*<0.01*	*0.01*	255.52	NA	*0.47*	*81.13*	*0.72*	*NA*	1.08	1.79	0.04	0.02		<0.01	<0.01
Fluorene (aq)			*0.01*	*<0.01*	197.40	NA	*2.29*	*67.3*	*2.34*	*NA*	0.05	0.05	0.01	0.01		0.01	0.01
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	7	*<0.01*	*<0.01*	40.11	NA	*0.02*	*21.19*	*0.07*	*NA*	0.06	0.15	<0.01	<0.01		<0.01	<0.01
Naphthalene (aq)	2µg/l	2	*<0.1*	*<0.1*	<2.00	NA	*<0.1*	*<1.0*	*0.3*	*NA*	<0.01	0.07	0.04	0.01		<0.01	<0.01

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Sample Location			*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	*######*	*######*	*######*	*######*	######	######	######	######		######	######
	WQS	Exceednaces				composite					composite		composite				
Carbon																Limestone	Limestone
Phenanthrene (aq)			*0.01*	*0.01*	447.22	NA	*1.96*	*116.46*	*2.61*	*NA*	0.07	0.10	0.03	0.01		0.01	0.01
Pyrene (aq)			*0.01*	*0.02*	267.98	NA	*0.39*	*78.34*	*0.65*	*NA*	0.86	1.36	0.07	0.05		<0.01	<0.01
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			*<0.1*	*<0.1*	1892.30	NA	*7.1*	*610.3*	*9.4*	*NA*	3.00	5.30	0.30	0.10		<0.1	<0.1
PCB's (µg/l)																	
PCB congener 101			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
PCB congener 118			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
PCB congener 138			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
PCB congener 153			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
PCB congener 180			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
PCB congener 28			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
PCB congener 52			*<0.1*	*<0.1*	<0.1	NA	*<0.1*	*<5.0*	*<0.1*	*NA*	<0.1	<0.1	$_{10}$<0.1	<0.1		<0.1	<0.1
Sum of detected EC7 PCB's			*<0.7*	*<0.7*	<0.7	NA	*<0.7*	*<35.0*	*<0.7*	*NA*	<0.7	<0.7	<0.7	<0.7		<0.7	<0.7
Volatile Organic Compounds (VOCs) (µg/l)																	
1.1.1.2-Tetrachloroethane			*<2*	*<2*	0.16	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.1.1-Trichloroethane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	0.02		<0.01	<0.01
1.1.2.2-Tetrachloroethane			*<4*	*<4*	<4	NA	*<4*	*<4*	*<4*	*<4*	<4	NA	<0.01	<4		<0.01	<4
1.1.2-Trichloroethane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.1-Dichloroethane			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	0.16	0.18		<0.01	<0.01
1.1-Dichloroethene			*<3*	*<3*	0.45	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.1-Dichloropropene			*<3*	*<3*	0.56	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2.3-Trichlorobenzene			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2.3-Trichloropropane			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2.4-Trichlorobenzene	0.4µg/l	1	*<3*	*<3*	3.72	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2.4-Trimethylbenzene			*<3*	*<3*	2.84	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	0.02		<0.01	<0.01
1.2-Dibromo-3-chloropropane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2-Dibromoethane			*<2*	*<2*	0.37	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2-Dichlorobenzene			*<3*	*<3*	1.05	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2-Dichloroethane			*<2*	*<2*	0.20	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.2-Dichloropropane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.3.5-Trimethylbenzene			*<3*	*<3*	1.73	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01		<0.01			<0.01
1.3-Dichlorobenzene			*<3*	*<3*	1.32	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.3-Dichloropropane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
1.4-Dichlorobenzene			*<3*	*<3*	1.77	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
2.2-Dichloropropane			*<1*	*<1*	<0.10	NA	*<1*	*<1*	*<1*	*<1*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
2-Chlorotoluene			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
4-Chlorotoluene			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
4-Isopropyltoluene			*<3*	*<3*	2.73	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Benzene	8µg/l	0	*<0.5*	*<0.5*	0.54	NA	*<0.5*	*<0.5*	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Bromobenzene			*<2*	*<2*	0.60	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Bromochloromethane			*<2*	*<2*	0.24	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Bromodichloromethane			*<2*	*<2*	0.16	NA	*<2*	*<2*	*<2*	*<2*	<0.01	0.01	<0.01	<0.01		0.06	<0.01
Bromoform			*<2*	*<2*	0.22	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Bromomethane			*<1*	*<1*	<0.10	NA	*<1*	*<1*	*<1*	*<1*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Carbon disulphide																	
Carbontetrachloride			*<2*	*<2*	0.21	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Chlorobenzene			*<2*	*<2*	0.93	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Chloroethane			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Chloroform			*<2*	*<2*	0.31	NA	*<2*	*<2*	*<2*	*<2*	<0.01	0.02	<0.01	<0.01		0.62	0.55

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Sample Location	WQS	Exceednaces	*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	*######*	*######*	*######*	*######*	######	######	######	######		######	######
						composite					composite		composite				
Carbon																Limestone	Limestone
Chloromethane			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
cis-1,2-Dichloroethene			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
cis-1,3-Dichloropropene			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Dibromochloromethane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		0.03	<0.01
Dibromomethane			*<3*	*<3*	<3	NA	*<3*	*<3*	*<3*	*<3*	<3	NA	<0.01	<3		<0.01	<3
Dichlorodifluoromethane			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Dichloromethane			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Ethylbenzene			*<0.5*	*<0.5*	1.84	NA	*<0.5*	*<0.5*	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Hexachlorobutadiene	0.6µg/l	1	*<3*	*<3*	8.22	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Isopropylbenzene			*<3*	*<3*	9.09	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
m,p-Xylene	10µg/l	0	*<0.1*	*<0.1*			*<1*	*<1*	*<0.1*	*<0.1*			<0.01			<0.01	
Methyl tertiary butyl ether (MTBE)			*<2*	*<2*	<0.10	NA	*<0.1*	*<0.1*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Naphthalene	2µg/l	2	*<3*	*<3*	36.48	NA			*<3*	*<3*	<0.01	<0.01	<0.01	0.05		<0.01	<0.01
n-Butylbenzene			*<0.5*	*<0.5*	59.22	NA	*<3*	*<3*	*<0.5*	*25*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
o-Xylene	10µg/l	0	*<1*	*<1*	<0.5	NA	*<0.5*	*<0.5*	*<1*	*<1*	<0.5	NA	<0.01	<0.5		<0.01	<0.5
Propylbenzene			*<3*	*<3*	11.45	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
sec-Butylbenzene			*<3*	*<3*	43.87	NA	*<3*	*<3*	*<3*	*25*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Styrene			*<2*	*<2*	0.93	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Total Xylenes																	
tert-Amyl methyl ether (TAME)																	
tert-Butylbenzene			*<3*	*<3*	13.38	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Tetrachloroethene			*<3*	*<3*	1.64	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	0.10		<0.01	<0.01
Toluene	10µg/l	0	*<0.5*	*<0.5*	1.01	NA	*<0.5*	*<0.5*	*<0.5*	*<0.5*	<0.01	<0.01	0.05	<0.01		<0.01	0.03
trans-1,2-Dichloroethene			*<3*	*<3*	0.65	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
trans-1,3-Dichloropropene			*<2*	*<2*	<0.10	NA	*<2*	*<2*	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01		0.01	<0.01
Trichloroethene	10µg/l	1	*<3*	*<3*	0.70	NA	*<3*	*<3*	*<3*	*116.00*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Trichlorofluoromethane			*<3*	*<3*	<0.10	NA	*<3*	*<3*	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
Vinyl Chloride			*<0.1*	*<0.1*	<0.10	NA	*<0.1*	*<0.1*	*<0.1*	*<0.1*	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01
VOC TIC																	
semi Volatile Organic Compounds (sVOCs)																	
1,2-Dichlorobenzene					<1	NA					<1	<1	<1	<1		<1	<1
1,2,4-Trichlorobenzene					<1	NA					<1	<1	<1	<1		<1	<1
1,3-Dichlorobenzene					<1	NA					<1	<1	<1	<1		<1	<1
1,4-Dichlorobenzene					<1	NA					<1	<1	<1	<1		<1	<1
2-Nitroaniline					<1	NA					<1	<1	<1	<1		<1	<1
2,4-Dinitrotoluene					<0.5	NA					<0.5	<0.5	11 <0.5	<0.5		<0.5	<0.5
2,6-Dinitrotoluene					<1	NA					<1	<1	<1	<1		<1	<1
3-Nitroaniline					<1	NA					<1	<1	<1	<1		<1	<1
4-Bromophenylphenylether					<1	NA					<1	<1	<1	<1		<1	<1
4-Chloroaniline					<1	NA					<1	<1	<1	<1		<1	<1
4-Chlorophenylphenylether					<1	NA					<1	<1	<1	<1		<1	<1
4-Nitroaniline					<0.5	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Azobenzene					<0.5	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5

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Sample Location			*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	######	######	######	######	######	######	######	######		######	######
	WQS	Exceednaces				composite					composite		composite				
Carbon																Limestone	Limestone
Bis(2-chloroethoxy)methane					<0.5	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Bis(2-chloroethyl)ether					<1	NA					<1	<1	<1	<1		<1	<1
Carbazole					<0.5	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Dibenzofuran					8.20	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Hexachlorobenzene					<1	NA					<1	<1	<1	<1		<1	<1
Hexachlorobutadiene					<1	NA					<1	<1	<1	<1		<1	<1
Hexachlorocyclopentadiene					<1	NA					<1	<1	<1	<1		<1	<1
Hexachloroethane					<1	NA					<1	<1	<1	<1		<1	<1
Isophorone					<0.5	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
N-nitrosodi-n-propylamine					<0.5	NA					<0.5	<0.5	<0.5	<0.5		<0.5	<0.5
Nitrobenzene					<1	NA					<1	<1	<1	<1		<1	<1
SVOC TICs			*ND*	*ND*	See Attached	NA			*ND*	*NA*	ND	ND	ND	ND		ND	ND
Nonadecane					423.00	NA					NA	NA		NA			NA
Naphthalene, 1,4,6-trimethyl-					117.00	NA					NA	NA		NA			NA
Pentadecane, 2,6,10-trimethyl-					249.00	NA					NA	NA		NA			NA
Hexadecane, 2,6,11,15-tetramethyl-					350.00	NA					NA	NA		NA			NA
Dodecane, 2,6,10-trimethyl-					334.00	NA					NA	NA		NA			NA
Cyclic octaatomic sulfur					NA	NA					NA	NA		NA			NA
de 2,3,4,6-tetrachlorophenol							*<100*	*<100*									
2,6-dichlorophenol							*<100*	*<100*									
2,3,5,6-tetrachlorophenol							*<100*	*<100*									
2,4-Dinitrophenol							*<100*	*<100*									
4-Chlorophenol							*<100*	*<100*									
Dinoseb							*<100*	*<100*									
DNOC							*<100*	*<100*									
Cyclohexane, butyl-							*NA*	*138*									
trans-Decalin, 2-methyl-							*NA*	*119*									
Naphthalene, decahydro-2-methyl-							*NA*	*186*									
Benzene, 1,2,3,4-tetramethyl-							*NA*	*103*									
Benzene, 1-methyl-4-(1-methylpropyl)-							*NA*	*147*									
Benzene, (1-methyl-1-butenyl)-							*NA*	*121*									
Naphthalene, 1-methyl-							*NA*	*145*									
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-							*NA*	*157*									
Dodecane, 2,6,11-trimethyl-							*NA*	*474*									
Naphthalene, 2,7-dimethyl-							*NA*	*206*									
Naphthalene, 1,4,6-trimethyl-							*NA*	*128*									
Naphthalene, 1,6,7-trimethyl-							*NA*	*171*									
Azulene, 4,6,8-trimethyl-							*NA*	*178*									
Hexacosane							*NA*	*293*									
Pentadecane, 2,6,10,14-tetramethyl-							*NA*	*537*									
Dodecane, 2,6,10-trimethyl-							*NA*	*457*									
4-Methylnaphtho[1,2-b]thiophene							*NA*	*196*									
Octadecane, 1-chloro-							*NA*	*164*									
2,7-Dimethyldibenzothiophene							*NA*	*121*									

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Sample Location			*BH215S-H*	*BH215D-H*	BH216L	BH216H	*BH216S-L*	*BH216D-L*	*BH216S-H*	*BH216D-H*	BH217L	BH217H	BH219L	BH219H		BH107AL	BH107AH
Sample Identity depth							*3.5*	*4.5*									
High Water / Low Water			*High*	*High*	Low	High	*Low*	*Low*	*High*	*High*	Low	High	Low	High		Low	High
Sampled Date			*######*	*######*	######	######	*######*	*######*	*######*	*######*	######	######	######	######		######	######
	WQS	Exceednaces				composite					composite		composite				
Carbon																Limestone	Limestone
Benzene, 1-chlorodifluoromethoxy-4-nitro-							*NA*	*181*									
shaded values indicate results exceed WQS																	
is a revoked Uk drinking water standard																	

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location	WQS	Exceednaces	BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Organic Carbon, Total			3.00	3.00	*<2*	*<2*	9.00	10.00	9.00	9.00
Inorganics (mg/l)										
Ammoniacal Nitrogen as N	40 mg/l	0	0.16	0.33	*0.13*	*0.73*	0.61	0.73	1.32	1.51
BOD, unfiltered			21.00	2.00	*<1*	*<1*	7.00	6.00	4.00	3.00
Chloride			12453.60	11622.40	*13347.10*	*13561.70*	5012.10	4324.00	1941.00	2357.60
COD, unfiltered			472.00	495.00	*780.00*	*578.00*	173.00	128.00	64.00	78.00
Conductivity @ 25 deg.C			33976.00	31125.00	*42052.00*	*41965.00*	14795.00	13174.00	5996.00	7497.00
Cyanide, Complex			0.005	<0.005	*0.002*	*0.005*	0.005	<0.005	0.005	0.005
Cyanide, Free			<0.005	<0.005	*<0.001*	*0.003*	<0.005	<0.005	0.009	0.013
Cyanide, Total (low level)*			0.005	<0.005	*0.002*	*0.008*	0.005	<0.005	0.014	0.018
Fluoride			<0.3	<0.3	*<0.3*	*<0.3*	<0.3	<0.3	<0.3	<0.3
Nitrate as NO3			2.20	0.90	*2.10*	*0.80*	<0.2	<0.2	<0.2	<0.2
Nitrite as NO2			<0.02	<0.02	*<0.02*	*<0.02*	<0.02	<0.02	<0.02	<0.02
pH	<4.5 >9	0	8.06	8.24	*7.90*	*7.95*	7.92	7.97	7.67	7.79
Sulphate			1728.68	1618.81	*1885.51*	*1935.71*	654.99	567.92	244.14	282.67
Sulphide			<0.3	<0.3	*<10*	*<0.01*	<0.3	<0.3	<0.3	<0.3
Sulphur, Free										
Total Dissolved Sulphur	mg/l		676.00	574.80	*663.60*	*616.00*	233.60	253.30	99.73	120.70
Thiocyanate			<0.02	<0.02	*<0.02*	*<0.02*	<0.02	<0.02	<0.02	<0.02
Carbonate Alkalinity as CaCO3			<1	<1	*<1*	*<1*	<1	<1	<1	<1
Saline TON as NO3			1.40	1.30			0.50	0.30	0.10	0.10
Metals (Dissolved)(µg/l)										
Aluminium (diss.filt)	200 µg/l	0	2.20	2.80	*<1.5*	*<1.5*	4.20	<1.5	2.30	1.70
Antimony (diss.filt)			<2	<2	*5.00*	*<2*	<2	<2	14.00	6.00
Arsenic (diss.filt)	20 µg/l	0	<0.9	<0.9	*<0.9*	*<0.9*	<0.9	<0.9	<0.9	<0.9
Barium (diss.filt)			33.40	35.60	*28.10*	*30.90*	45.70	38.60	42.80	42.40
Beryllium (diss.filt)			<0.5	<0.5	*<0.5*	*<0.5*	<0.5	<0.5	<0.5	<0.5
Boron (diss.filt)			2711.00	2306.00	*2509.00*	*2293.00*	1398.00	1392.00	664.00	765.00
Cadmium (diss.filt) (low level)	0.2 µg/l	7	0.06	<0.03			<0.03	<0.03	<0.03	0.03
Calcium (diss.filt)	mg/l		358.10	406.50	*400.90*	*436.50*	154.10	141.20	122.70	147.10
Chromium (diss.filt)	4.7µg/l	4	1.70	1.10	*1.50*	*2.00*	0.90	0.60	0.70	0.70
Cobalt (diss.filt)			<0.1	<0.1			<0.1	<0.1	<0.1	<0.1
Copper (diss.filt)	5 µg/l	8	<3	<3	*<3*	*<3*	<3	<3	<3	<3
Iron (diss.filt)			<4.7	<4.7	*<4.7*	*<4.7*	7.10	5.50	97.90	7.10
Lead (diss.filt)	1.3 µg/l	36	<0.4	<0.4	*<0.4*	*<0.4*	1.60	1.30	<0.4	3.20
Magnesium (diss.filt)	mg/l		981.10	867.00	*937.20*	*950.80*	373.20	336.50	146.30	166.70
Manganese (diss.filt)	30 µg/l	42	7.10	<1.5	*<1.5*	*<1.5*	773.80	743.30	503.70	571.00
Mercury (CVAF)	0.07 µg/l	11	<0.01	<0.01	*0.02*	*<0.01*	0.01	0.01	2.10	0.68
Molybdenum (diss.filt)			10.60	14.00	*7.80*	*9.30*	4.00	3.30	87.00	13.20
Nickel (diss.filt)	8.6 µg/l	2	0.50	0.50	*<0.2*	*<0.2*	0.70	1.40	6.10	1.60
Potassium (diss.filt)	mg/l		271.90	287.00	*327.50*	*346.10*	129.20	98.50	75.00	84.90
Phosphorus (diss.filt)			30.00	23.40			237.80	274.00	7.40	40.70
Selenium (diss.filt)			<1.2	<1.2	*<1.2*	*<1.2*	<1.2	<1.2	<1.2	<1.2
Sodium (diss.filt)	mg/l		7918.00	6920.00	*8183.00*	*8181.00*	3317.00	2702.00	1517.00	1818.00
Thallium (diss.filt)			1.40	1.00			1.20	1.10	<0.9	<0.9
Tin (diss.filt)			<5	<5			<5	<5	<5	<5

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Sample Location			BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
	WQS	Exceednaces								
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Vanadium (diss.filt)			<0.6	<0.6	*<0.6*	*<0.6*	0.60	0.80	<0.6	0.70
Zinc (diss.filt)	40 µg/l	16	7.40	8.40	*3.50*	*8.40*	5.30	3.20	3.10	9.50
Metals Unfiltered / Total (µg/l)										
Boron (tot.unfilt)	7000	0	2641.00	2207.00			1316.00	1215.00	667.00	719.00
Chromium, Hexavalent	0.60	8	<2	<2	*<2*	*<2*	<2	<2	<2	<2
Chromium (tot unfilt)	4.70	20	1.40	0.40			<0.2	0.70	921.40	17.00
Copper Ultra low			<3	<3			<3	<3	671.00	13.00
Iron Ultra low			54.40	166.10			38.00	77.60	86690.00	1540.00
Lead Ultra Low			<0.4	<0.4			<0.4	<0.4	675.50	14.80
Manganese Ultra low			18.50	67.80			715.20	713.70	1381.00	538.50
Molybdenum			10.20	13.30			3.90	3.00	263.50	15.30
Nickel Ultra low			<0.2	<0.2			<0.2	0.80	56.70	2.00
Phenols (µg/l)										
2,3-Dimethylphenol					*<0.1*	*<0.1*				
2,3,4,6-Tetrachlorophenol					*<0.1*	*<0.1*				
2,3,5,6-Tetrachlorophenol					*<0.1*	*<0.1*				
2,6-Dichlorophenol					*<0.1*	*<0.1*				
2,6-Dimethylphenol					*<0.1*	*<0.1*				
3-Methylphenol					*<0.1*	*<0.1*				
3,4-Dimethylphenol					*<0.1*	*<0.1*				
3,5-Dimethylphenol					*<0.1*	*<0.1*				
4-Chloro-2-methylphenol					*<0.1*	*<0.1*				
2,4,5-trichlorophenol			<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5	<0.5	<0.5
4,6-Dinitro-o-cresol (DNOC)					*<0.1*	*<0.1*				
2,4,6-trichlorophenol			<1	<1	*<0.1*	*<0.1*	<1	<1	<1	<1
2,4-dichlorophenol			<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol			<1	<1	*<0.1*	*<0.1*	<1	<1	<1	<1
2-chlorophenol			<1	<1	*<0.1*	*<0.1*	<1	<1	<1	<1
2-methylphenol			<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5	<0.5	<0.5
2-nitrophenol			<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5	<0.5	<0.5
4-chloro-3-methylphenol			<0.5	<0.5	*<0.1*	*<0.1*	<0.5	<0.5	<0.5	<0.5
4-methylphenol			<1	<1	*<0.1*	*<0.1*	<1	<1	<1	<1
4-nitrophenol			<10	<10	*<0.1*	*<0.1*	<10	<10	<10	<10
Pentachlorophenol			<1	<1	*<0.1*	*<0.1*	<1	<1	<1	<1
Phenol	8 µg/l	0	<1	<1	*<0.1*	*<0.1*	<1	<1	<1	<1
Total Speciated phenols					*<2.1*	*<2.1*				
2.3.5 Trimethyl-Phenol			<0.5	<0.5	*<0.01*	*<0.01*	<0.5	<0.5	<0.5	<0.5
2-Isopropyl Phenol			<0.5	<0.5	*<0.01*	*<0.01*	<0.5	<0.5	<0.5	<0.5
Cresols			<0.5	<0.5	*<0.03*	*<0.03*	<0.5	<0.5	<0.5	<0.5
m/p-cresol					*<0.02*	*<0.02*				
o-cresol					*<0.01*	*<0.01*				
Phenols, Total (HPLC			<5	<5	*<0.01*	*<0.01*	<5	<5	<5	<5
Xylenols			<0.5	<0.5	*<0.06*	*<0.06*	<0.5	<0.5	<0.5	<0.5
Resorcinol			<0.5	<0.5	*<0.01*	*<0.01*	<0.5	<0.5	<0.5	<0.5
Catechol			<0.5	<0.5	*<0.01*	*<0.01*	<0.5	<0.5	<0.5	<0.5
1-naphthol			<0.5	<0.5	*<0.01*	*<0.01*	<0.5	<0.5	<0.5	<0.5
TPH Criteria Working Group (TPH CWG)(µg/l)										

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Sample Location	WQS	Exceednaces	BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Aliphatics >C5-C6			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aliphatics >C6-C8			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aliphatics >C8-C10			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aliphatics >C10-C12			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aliphatics >C12-C16			<10	<10	*<10*	*<10*	<10	<10	<10	<10
Aliphatics >C16-C21			<10	<10	*<10*	*<10*	<10	<10	<10	<10
Aliphatics >C21-C35			<10	<10	*<10*	*<10*	<10	<10	<10	<10
Total Aliphatics C5-C35					*<10*	*<10*				
Aromatics >EC5-EC7			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aromatics >EC7-EC8			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aromatics >EC8-EC10			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aromatics >EC10-EC12			<5	<5	*<5*	*<5*	<5	<5	<5	<5
Aromatics >EC12-EC16			<10	<10	*<10*	*<10*	<10	<10	<10	<10
Aromatics >EC16-EC21			<10	<10	*<10*	*<10*	<10	<10	<10	<10
Aromatics >EC21-EC35			<10	<10	*<10*	*<10*	<10	<10	<10	<10
Total Aromatics C5-C35					*<10*	*<10*				
Total aliphatics and aromatics C5-C35	10µg/l	7	<10	<10	*<10*	*<10*	<10	<10	<10	<10
MTBE			<5	<5	*<0.1*	*<0.1*	<5	<5	<5	<5
Benzene	8µg/l	0	NA	<0.5	*<0.5*	*<0.5*	<0.5	<0.5	NA	NA
Toluene					*<0.5*	*<0.5*				
Ethylbenzene			NA	<0.5	*<0.5*	*<0.5*	<0.5	<0.5	NA	NA
m,p-Xylene	10µg/l	0	<0.01	<0.01	*<1*	*<1*	<0.01	<0.01	<0.01	<0.01
o-Xylene	10µg/l	0	<0.01	<0.01	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01
Polyaromatic Hydrocarbons (PAHs)(µg/l)										
Acenaphthene (aq)			0.06	0.13	*<0.01*	*<0.01*	0.01	<0.01	0.01	0.01
Acenaphthylene (aq)			0.01	0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	0.01
Anthracene (aq)	0.1µg/l	6	<0.01	0.01	*<0.01*	*<0.01*	<0.01	0.01	<0.01	0.01
Benzo(a)anthracene (aq)			<0.01	<0.01	*<0.01*	*<0.01*	<0.01	0.01	<0.01	0.01
Benzo(a)pyrene (aq)	0.00017µg/l	8	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l	6	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l	5	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Benzo(bk)fluoranthene (aq)			<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l	7	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)			<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	0.01	0.01
Dibenzo(a,h)anthracene (aq)			<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	44	0.01	0.01	*<0.01*	*<0.01*	<0.01	0.01	0.01	0.05
Fluorene (aq)			0.02	0.05	*<0.01*	*<0.01*	0.01	0.01	0.01	0.02
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	7	<0.01	<0.01	*<0.01*	*<0.01*	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l	2	0.04	0.27	*<0.1*	*<0.1*	<0.01	<0.01	<0.01	<0.01

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location	WQS	Exceednaces	BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Phenanthrene (aq)			0.01	0.03	*0.01*	*0.01*	0.01	0.02	0.01	0.02
Pyrene (aq)			0.01	0.01	*<0.01*	*<0.01*	<0.01	0.01	0.02	0.04
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			0.20	0.50	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	0.20
PCB's (µg/l)										
PCB congener 101			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
PCB congener 118			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
PCB congener 138			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
PCB congener 153			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
PCB congener 180			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
PCB congener 28			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
PCB congener 52			<0.1	<0.1	*<0.1*	*<0.1*	<0.1	<0.1	<0.1	<0.1
Sum of detected EC7 PCB's			<0.7	<0.7	*<0.7*	*<0.7*	<0.7	<0.7	<0.7	<0.7
Volatile Organic Compounds (VOCs) (µg/l)										
1.1.1.2-Tetrachloroethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.1.1-Trichloroethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.1.2.2-Tetrachloroethane			NA	<4	*<4*	*<4*	<4	<4	NA	NA
1.1.2-Trichloroethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.1-Dichloroethane			<0.01	<0.01	*<3*	*<3*	<0.01	0.05	<0.01	<0.01
1.1-Dichloroethene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.1-Dichloropropene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.2.3-Trichlorobenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.2.3-Trichloropropane			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.2.4-Trichlorobenzene	0.4µg/l	1	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.2.4-Trimethylbenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.2-Dibromo-3-chloropropane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.2-Dibromoethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.2-Dichlorobenzene			<0.01	<0.01	*<3*	*<3*	<0.01	0.07	<0.01	<0.01
1.2-Dichloroethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.2-Dichloropropane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.3.5-Trimethylbenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.3-Dichlorobenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
1.3-Dichloropropane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
1.4-Dichlorobenzene			<0.01	<0.01	*<3*	*<3*	<0.01	0.03	<0.01	<0.01
2.2-Dichloropropane			<0.01	<0.01	*<1*	*<1*	<0.01	<0.01	<0.01	<0.01
2-Chlorotoluene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
4-Chlorotoluene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
4-Isopropyltoluene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Benzene	8µg/l	0	<0.01	<0.01	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01
Bromobenzene			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Bromochloromethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Bromodichloromethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	0.01
Bromoform			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Bromomethane			<0.01	<0.01	*<1*	*<1*	<0.01	<0.01	<0.01	<0.01
Carbon disulphide										
Carbontetrachloride			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Chlorobenzene			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Chloroethane			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Chloroform			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	0.02

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location	WQS	Exceednaces	BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Chloromethane			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
cis-1,2-Dichloroethene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
cis-1,3-Dichloropropene			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Dibromochloromethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Dibromomethane			NA	<3	*<3*	*<3*	<3	<3	NA	NA
Dichlorodifluoromethane			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Dichloromethane			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Ethylbenzene			<0.01	<0.01	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.6µg/l	1	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Isopropylbenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
m,p-Xylene	10µg/l	0			*<0.1*	*<0.1*				
Methyl tertiary butyl ether (MTBE)			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Naphthalene	2µg/l	2	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
n-Butylbenzene			<0.01	<0.01	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01
o-Xylene	10µg/l	0	NA	<0.5	*<1*	*<1*	<0.5	<0.5	NA	NA
Propylbenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
sec-Butylbenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Styrene			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Total Xylenes										
tert-Amyl methyl ether (TAME)										
tert-Butylbenzene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Tetrachloroethene			<0.01	<0.01	*<3*	*<3*	<0.01	0.02	<0.01	<0.01
Toluene	10µg/l	0	<0.01	<0.01	*<0.5*	*<0.5*	<0.01	<0.01	<0.01	<0.01
trans-1,2-Dichloroethene			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
trans-1,3-Dichloropropene			<0.01	<0.01	*<2*	*<2*	<0.01	<0.01	<0.01	<0.01
Trichloroethene	10µg/l	1	<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Trichlorofluoromethane			<0.01	<0.01	*<3*	*<3*	<0.01	<0.01	<0.01	<0.01
Vinyl Chloride			<0.01	<0.01	*<0.1*	*<0.1*	<0.01	<0.01	<0.01	<0.01
VOC TIC										
semi Volatile Organic Compounds (sVOCs)										
1,2-Dichlorobenzene			<1	<1			<1	<1	<1	<1
1,2,4-Trichlorobenzene			<1	<1			<1	<1	<1	<1
1,3-Dichlorobenzene			<1	<1			<1	<1	<1	<1
1,4-Dichlorobenzene			<1	<1			<1	<1	<1	<1
2-Nitroaniline			<1	<1			<1	<1	<1	<1
2,4-Dinitrotoluene			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene			<1	<1			<1	<1	<1	<1
3-Nitroaniline			<1	<1			<1	<1	<1	<1
4-Bromophenylphenylether			<1	<1			<1	<1	<1	<1
4-Chloroaniline			<1	<1			<1	<1	<1	<1
4-Chlorophenylphenylether			<1	<1			<1	<1	<1	<1
4-Nitroaniline			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
Azobenzene			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location	WQS	Exceednaces	BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Bis(2-chloroethoxy)methane			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether			<1	<1			<1	<1	<1	<1
Carbazole			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
Dibenzofuran			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene			<1	<1			<1	<1	<1	<1
Hexachlorobutadiene			<1	<1			<1	<1	<1	<1
Hexachlorocyclopentadiene			<1	<1			<1	<1	<1	<1
Hexachloroethane			<1	<1			<1	<1	<1	<1
Isophorone			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
N-nitrosodi-n-propylamine			<0.5	<0.5			<0.5	<0.5	<0.5	<0.5
Nitrobenzene			<1	<1			<1	<1	<1	<1
SVOC TICs			ND	ND	*ND*	*ND*	ND	See Attached	ND	ND
Nonadecane			NA	NA			NA	NA	NA	NA
Naphthalene, 1,4,6-trimethyl-			NA	NA			NA	NA	NA	NA
Pentadecane, 2,6,10-trimethyl-			NA	NA			NA	NA	NA	NA
Hexadecane, 2,6,11,15-tetramethyl-			NA	NA			NA	NA	NA	NA
Dodecane, 2,6,10-trimethyl-			NA	NA			NA	NA	NA	NA
Cyclic octaatomic sulfur			NA	NA			NA	304.00	NA	NA
de 2,3,4,6-tetrachlorophenol										
2,6-dichlorophenol										
2,3,5,6-tetrachlorophenol										
2,4-Dinitrophenol										
4-Chlorophenol										
Dinoseb										
DNOC										
Cyclohexane, butyl-										
trans-Decalin, 2-methyl-										
Naphthalene, decahydro-2-methyl-										
Benzene, 1,2,3,4-tetramethyl-										
Benzene, 1-methyl-4-(1-methylpropyl)-										
Benzene, (1-methyl-1-butenyl)-										
Naphthalene, 1-methyl-										
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-										
Dodecane, 2,6,11-trimethyl-										
Naphthalene, 2,7-dimethyl-										
Naphthalene, 1,4,6-trimethyl-										
Naphthalene, 1,6,7-trimethyl-										
Azulene, 4,6,8-trimethyl-										
Hexacosane										
Pentadecane, 2,6,10,14-tetramethyl-										
Dodecane, 2,6,10-trimethyl-										
4-Methylnaphtho[1,2-b]thiophene										
Octadecane, 1-chloro-										
2,7-Dimethyldibenzothiophene										

2015, Haulbowline Factory Site, Groundwater Anal

Sample Location	WQS	Exceednaces	BH204H	BH204L	*BH204R-L*	*BH204R-H*	BH206H	BH206L	BH209RH	BH209RL
Sample Identity depth										
High Water / Low Water			High	Low	*Low*	*High*	High	Low	High	Low
Sampled Date			######	######	######	######	######	######	######	######
Carbon			Limestone	Limestone			Limestone	Limestone	Limestone	Limestone
Benzene, 1-chlorodifluoromethoxy-4-nitro-										
shaded values indicate results exceed WQS										
is a revoked Uk drinking water standard										

2015, Haulbowline Factory Site, Surface Water Analysis Results

Sample Location		exceedances		SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW	SW6 HIGH	SW6 LOW	
Sampled Date				26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	
Carbon																
Organic Carbon, Total			7.00	<2	<2	<2	2.00	<2	<2	2.00	<2	<2	<2	<2	<2	
Inorganics (mg/l)																
Ammoniacal Nitrogen as N	40 mg/l	0	0.75	0.70	0.06	0.69	0.17	0.16	0.71	0.16	0.75	0.16	0.12	0.70	0.75	
BOD, unfiltered			78.00	10.00	10.00	10.00	20.00	<1	10.00	20.00	32.00	10.00	10.00	<1	20.00	
Chloride			17812.70	16565.80	14506.90	15640.90	14464.70	14518.20	16401.30	14782.00	16308.60	15060.00	17812.70	17051.90	16404.70	
COD, unfiltered			989.00	282.00	251.00	292.00	331.00	271.00	327.00	301.00	393.00	271.00	332.00	326.00	338.00	
Conductivity @ 25 deg.C			50988.00	42384.00	37676.00	41840.00	37900.00	39163.00	43182.00	38614.00	41770.00	39754.00	46735.00	43437.00	42199.00	
Cyanide, Complex			0.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cyanide, Free			0.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Cyanide, Total (low level)*			0.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Fluoride			0.00	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Nitrate as NO3			3.50	1.90	3.50	2.30	3.40	2.80	1.90	3.10	2.00	2.60	1.60	1.60	1.90	
Nitrite as NO2			0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
pH	<4.5 >9	0	8.11	7.96	7.94	7.96	8.11	7.93	7.96	7.94	7.96	7.94	7.97	7.97	7.98	
Sulphate			2430.42	2275.07	1912.54	2159.12	1895.43	2035.23	2253.52	2067.13	2389.94	2028.99	2430.42	2352.31	2226.81	
Sulphide			0.00	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Sulphur, Free			0.00													
Total Dissolved Sulphur	mg/l		986.80	322.40	857.00	326.60	312.40	879.00	335.10	304.40	916.00	317.30	342.50	986.80	957.60	
Thiocyanate			0.00	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Carbonate Alkalinity as CaCO3			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Saline TON as NO3			0.00													
Metals (Dissolved)(µg/l)																
Aluminium (diss.filt)	200 µg/l	0	23.20	<1.5	<1.5	<1.5	2.70	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	
Antimony (diss.filt)			3.00	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Arsenic (diss.filt)	20 µg/l	0	4.50	<0.9	2.30	<0.9	2.00	1.80	2.20	1.70	3.20	1.30	<0.9	1.70	<0.9	
Barium (diss.filt)			43.70	2.20	2.30	2.30	5.30	2.00	2.00	2.10	1.90	<1.8	<1.8	<1.8	<1.8	
Beryllium (diss.filt)			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Boron (diss.filt)			3500.00	2908.00	2667.00	3008.00	2634.00	2813.00	3217.00	3171.00	3007.00	3008.00	3270.00	3500.00	3234.00	
Cadmium (diss.filt) (low level)	0.2 µg/l	0	0.00	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
Calcium (diss.filt)	mg/l		439.00	335.20	313.20	321.00	303.40	302.50	344.40	329.90	331.10	331.00	368.60	351.60	338.60	
Chromium (diss.filt)	4.7µg/l	0	0.00	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Cobalt (diss.filt)			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Copper (diss.filt)	5 µg/l	0	5.00	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	
Iron (diss.filt)			116.50	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	
Lead (diss.filt)	1.3 µg/l	6	4.80	<0.4	0.80	1.70	<0.4	<0.4	1.30	1.00	1.20	<0.4	2.00	1.40	1.30	
Magnesium (diss.filt)	mg/l		1282.00	1135.00	959.30	1118.00	977.40	972.10	1166.00	1036.00	1108.00	1027.00	1282.00	1241.00	1055.00	
Manganese (diss.filt)	30 µg/l	1	91.00	<1.5	7.10	3.10	7.30	5.10	2.40	4.30	2.80	5.30	1.60	1.60	<1.5	
Mercury (CVAF)	0.07 µg/l	0	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Molybdenum (diss.filt)			5.80	4.70	4.50	4.90	4.90	4.70	5.10	4.30	5.00	4.90	5.80	4.90	4.60	
Nickel (diss.filt)	8.6 µg/l	0	2.40	<0.2	<0.2	0.40	<0.2	<0.2	<0.2	<0.2	0.40	<0.2	<0.2	<0.2	<0.2	
Potassium (diss.filt)	mg/l		418.60	334.90	308.00	317.40	300.20	299.50	344.40	322.70	329.20	326.60	367.70	349.40	335.10	
Phosphorus (diss.filt)			29.50	11.00	28.50	24.90	29.50	26.00	24.40	26.60	26.10	26.10	24.30	25.50	22.30	
Selenium (diss.filt)			3.70	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	1.80	<1.2	<1.2	<1.2	<1.2	
Sodium (diss.filt)	mg/l		10270.00	9381.00	7756.00	9277.00	7989.00	8060.00	9071.00	8244.00	9034.00	10270.00	9603.00	9071.00	8761.00	
Thallium (diss.filt)			1.70	<0.9	<0.9	<0.9	<0.9	<0.9	1.50	1.70	1.00	<0.9	<0.9	1.00	<0.9	
Tin (diss.filt)			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Vanadium (diss.filt)			0.80	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	
Zinc (diss.filt)	40 µg/l	1	226.40	<1.5	<1.5	<1.5	2.80	1.70	2.70	1.50	1.90	<1.5	1.50	<1.5	<1.5	

2015, Haulbowline Factory Site, Surface Water Analysis Results

Sample Location		exceedances		SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW	SW6 HIGH	SW6 LOW	
Sampled Date				26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	
Carbon																
Metals Unfiltered / Total (µg/l)																
Boron (tot.unfilt)	7000	0	3371.00	2822.00	2717.00	2913.00	2450.00	2836.00	3210.00	3173.00	2835.00	2843.00	3371.00	3193.00	3051.00	
Chromium, Hexavalent	0.60	0	0.00	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Chromium (tot unfilt)	4.70	0	1.20	0.40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.20	
Copper Ultra low			0.00	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	
Iron Ultra low			103.20	68.10	88.00	95.40	21.20	18.10	103.20	75.20	48.10	41.80	82.30	58.30	59.70	
Lead Ultra Low	1.3		1.90	<0.4	<0.4	1.60	<0.4	<0.4	1.30	0.90	1.10	1.00	1.90	1.40	1.10	
Manganese Ultra low			10.40	2.10	10.40	6.60	8.20	6.20	5.70	4.10	6.90	6.90	4.30	3.90	3.70	
Molybdenum			5.90	4.80	4.30	5.10	4.70	4.80	5.00	5.10	4.90	4.70	5.90	4.70	5.30	
Nickel Ultra low			0.90	<0.2	0.60	0.50	0.50	0.40	0.20	0.50	0.30	0.30	<0.2	0.90	0.50	
Phenols (µg/l)																
2,3-Dimethylphenol			0.00													
2,3,4,6-Tetrachlorophenol			0.00													
2,3,5,6-Tetrachlorophenol			0.00													
2,6-Dichlorophenol			0.00													
2,6-Dimethylphenol			0.00													
3-Methylphenol			0.00													
3,4-Dimethylphenol			0.00													
3,5-Dimethylphenol			0.00													
4-Chloro-2-methylphenol			0.00													
2,4,5-trichlorophenol			0.00													
4,6-Dinitro-o-cresol (DNOC)			0.00													
2,4,6-trichlorophenol			0.00													
2,4-dichlorophenol			1.00							1						
2,4-dimethylphenol			2.40													
2-chlorophenol			0.00													
2-methylphenol			5.50													
2-nitrophenol			0.00													
4-chloro-3-methylphenol			0.00													
4-methylphenol			6.80													
4-nitrophenol			0.00													
Pentachlorophenol			0.00													
Phenol	8 µg/l	0	3.60													
Total Speciated phenols			18.30													
2.3.5 Trimethyl-Phenol			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
2-Isopropyl Phenol			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Cresols			0.00	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	
m/p-cresol			0.00	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
o-cresol			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Phenols, Total (HPLC			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Xylenols			0.00	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	
Resorcinol			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Catechol			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
1-naphthol			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
TPH Criteria Working Group (TPH CWG)(µg/l)																
Aliphatics >C5-C6			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aliphatics >C6-C8			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aliphatics >C8-C10			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aliphatics >C10-C12			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aliphatics >C12-C16			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	

2015, Haulbowline Factory Site, Surface Water Analysis Results

Sample Location		exceedances		SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW	SW6 HIGH	SW6 LOW	
Sampled Date				26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	
Carbon																
Aliphatics >C16-C21			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Aliphatics >C21-C35			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Total Aliphatics C5-C35			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Aromatics >EC5-EC7			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aromatics >EC7-EC8			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aromatics >EC8-EC10			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aromatics >EC10-EC12			0.00	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Aromatics >EC12-EC16			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Aromatics >EC16-EC21			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Aromatics >EC21-EC35			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Total Aromatics C5-C35			0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Total aliphatics and aromatics C5-C35	10µg/l	0	0.00	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
MTBE			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Benzene	8µg/l	0	0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Toluene			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Ethylbenzene			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
m,p-Xylene	10µg/l	0	0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
o-Xylene	10µg/l	0	0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Polyaromatic Hydrocarbons (PAHs)(µg/l)																
Acenaphthene (aq)			0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	
Acenaphthylene (aq)			0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	
Anthracene (aq)	0.1µg/l	0	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Benzo(a)anthracene (aq)			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Benzo(a)pyrene (aq)	0.00017µg/l	0	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Benzo(b)fluoranthene (aq)	0.03µg/l	0	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Benzo(k)fluoranthene (aq)	0.03µg/l	0	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Benzo(bk)fluoranthene (aq)			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Benzo(g,h,i)perylene (aq)	0.002µg/l	0	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Chrysene (aq)			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Dibenzo(a,h)anthracene (aq)			0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Fluoranthene (aq)	0.0063µg/l	2	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	
Fluorene (aq)			0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	0	0.00	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Naphthalene (aq)	2µg/l	0	0.05	0.05	0.01	0.01	<0.01	0.02	0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	
Phenanthrene (aq)			0.01	<0.01	0.01	<0.01	0.01	<0.01	0.01	0.01	0.01	0.01	0.01	<0.01	<0.01	
Pyrene (aq)			0.01	<0.01	0.01	<0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	<0.01	0.01	
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
PCB's (µg/l)																
PCB congener 101			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
PCB congener 118			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
PCB congener 138			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	

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Sample Location		exceedances		SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW	SW6 HIGH	SW6 LOW	
Sampled Date				26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	
Carbon																
PCB congener 153			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
PCB congener 180			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
PCB congener 28			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
PCB congener 52			0.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Sum of detected EC7 PCB's			0.00	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	2 <0.7	<0.7	<0.7	<0.7	<0.7	<0.7	
Volatile Organic Compounds (VOCs) (µg/l)																
1.1.1.2-Tetrachloroethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1.1-Trichloroethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1.2.2-Tetrachloroethane			0.00	<4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1.2-Trichloroethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1-Dichloroethane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1-Dichloroethene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.1-Dichloropropene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.3-Trichlorobenzene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.3-Trichloropropane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.4-Trichlorobenzene	0.4µg/l	1	0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2.4-Trimethylbenzene			0.07	<3	0.03	0.02	0.02	0.06	0.06	0.02	0.07	0.02	0.05	0.02	0.03	0.06
1.2-Dibromo-3-chloropropane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dibromoethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dichlorobenzene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dichloroethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.2-Dichloropropane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.3.5-Trimethylbenzene			0.03	<3	0.01	<0.01	<0.01	0.03	0.03	<0.01	0.03	0.01	0.02	<0.01	0.01	0.03
1.3-Dichlorobenzene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.3-Dichloropropane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1.4-Dichlorobenzene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2.2-Dichloropropane			0.00	<1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Chlorotoluene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Chlorotoluene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Isopropyltoluene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzene	8µg/l	0	0.14	<0.5	0.04	0.03	0.03	0.03	0.11	0.14	0.08	0.14	0.11	0.06	0.05	0.02
Bromobenzene			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromochloromethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromodichloromethane			0.07	<2	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07
Bromoform			0.16	<2	0.16	0.05	0.07	0.05	0.1	0.05	0.06	0.05	0.04	0.05	0.06	0.05
Bromomethane			0.00	<1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbon disulphide			0.00		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbontetrachloride			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorobenzene			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloroethane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chloroform			0.12	<2	<0.01	0.07	<0.01	0.1	0.05	0.04	0.05	0.04	0.05	<0.01	<0.01	0.12
Chloromethane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
cis-1,2-Dichloroethene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
cis-1,3-Dichloropropene			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibromochloromethane			0.04	<2	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Dibromomethane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dichlorodifluoromethane			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dichloromethane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene			0.09	<0.5	0.04	<0.01	0.02	0.02	0.09	0.04	0.06	0.04	0.07	0.02	0.04	0.02
Hexachlorobutadiene	0.6µg/l	0	0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Sample Location		exceedances		SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW	SW6 HIGH	SW6 LOW	
Sampled Date				26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	
Carbon																
Isopropylbenzene			0.01	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
m,p-Xylene	10µg/l	0	0.29	<0.1	0.13	<0.01	0.06	0.06	0.29	0.09	0.2	0.09	0.24	0.06	0.14	0.06
Methyl tertiary butyl ether (MTBE)			0.11	<2	0.08	0.11	0.11	0.09	0.1	0.09	0.11	0.1	0.1	0.09	0.09	0.08
Naphthalene	2µg/l	0	0.06	<3	0.03	0.03	0.06	0.04	0.02	<0.01	0.01	<0.01	<0.01	<0.01	0.02	0.03
n-Butylbenzene			0.00	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o-Xylene	10µg/l	0	0.13	<1	0.05	<0.01	0.03	0.05	0.13	0.06	0.09	0.06	0.11	0.03	0.06	0.07
Propylbenzene			0.02	<3	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.01	<0.01	0.01	<0.01	<0.01	0.01
sec-Butylbenzene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Styrene			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Xylenes			0.00		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
tert-Amyl methyl ether (TAME)			0.00		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
tert-Butylbenzene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tetrachloroethene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	10µg/l	0	0.63	<0.5	0.24	0.1	0.12	0.17	0.63	0.36	0.43	0.38	0.57	0.19	0.28	0.13
trans-1,2-Dichloroethene			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-1,3-Dichloropropene			0.00	<2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trichloroethene	10µg/l	0	0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trichlorofluoromethane			0.00	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vinyl Chloride			0.00	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
VOC TIC			0.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
semi Volatile Organic Compounds (sVOCs)																
1,2-Dichlorobenzene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
1,2,4-Trichlorobenzene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
1,3-Dichlorobenzene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
1,4-Dichlorobenzene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
2-Nitroaniline			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
2,4-Dinitrotoluene			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	$<_3$0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
2,6-Dinitrotoluene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
3-Nitroaniline			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Bromophenylphenylether			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Chloroaniline			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Chlorophenylphenylether			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
4-Nitroaniline			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Azobenzene			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis(2-chloroethoxy)methane			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Bis(2-chloroethyl)ether			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Carbazole			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Dibenzofuran			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Hexachlorobenzene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Hexachlorobutadiene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Hexachlorocyclopentadiene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Hexachloroethane			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Isophorone			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
N-nitrosodi-n-propylamine			0.00	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Nitrobenzene			0.00	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
			0.00													
SVOC TICs			0.00							acetone 0.5						

2015, Haulbowline Factory Site, Surface Water Analysis Results

Sample Location		exceedances		SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW	SW6 HIGH	SW6 LOW	
Sampled Date				26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	26/01/2015	26/01/2015	26/01/2015	######	
Carbon																
Nonadecane			0.00													
Naphthalene, 1,4,6-trimethyl-			0.00													
Pentadecane, 2,6,10-trimethyl-			0.00													
Hexadecane, 2,6,11,15-tetramethyl-			0.00													
Dodecane, 2,6,10-trimethyl-			0.00													
Cyclic octaatomic sulfur			0.00													
de 2,3,4,6-tetrachlorophenol																
2,6-dichlorophenol																
2,3,5,6-tetrachlorophenol																
2,4-Dinitrophenol																
4-Chlorophenol																
Dinoseb																
DNOC																
Cyclohexane, butyl-																
trans-Decalin, 2-methyl-																
Naphthalene, decahydro-2-methyl-																
Benzene, 1,2,3,4-tetramethyl-																
Benzene, 1-methyl-4-(1-methylpropyl)-																
Benzene, (1-methyl-1-butenyl)-																
Naphthalene, 1-methyl-																
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-																
Dodecane, 2,6,11-trimethyl-																
Naphthalene, 2,7-dimethyl-																
Naphthalene, 1,4,6-trimethyl-																
Naphthalene, 1,6,7-trimethyl-																
Azulene, 4,6,8-trimethyl-																
Hexacosane																
Pentadecane, 2,6,10,14-tetramethyl-																
Dodecane, 2,6,10-trimethyl-																
4-Methylnaphtho[1,2-b]thiophene																
Octadecane, 1-chloro-																
2,7-Dimethyldibenzothiophene																
Benzene, 1-chlorodifluoromethoxy-4-nitro-																
shaded values indicate results exceed																
is a revoked Uk drinking water standard																

2015, Haulbowline Factory Site, Surface Water Analysis

Sample Location		exceedances	OT07	OT08	SW03	SW11		HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6
Sampled Date			######	######	######	######		######	######	######	######	######	######
Carbon													
Organic Carbon, Total			3.00	7.00	<2	<2		<2	<2	<2	<2	<2	<2
Inorganics (mg/l)													
Ammoniacal Nitrogen as N	40 mg/l	0	0.75	0.11	0.75	0.72		0.71	0.65	0.64	0.71	0.67	0.75
BOD, unfiltered			<1	2.00	<1	<1		7.00	13.00	78.00	<1	<1	<1
Chloride			13802.90	822.80	14032.90	15610.20		16897.50	16671.00	16094.10	16017.90	15415.50	15249.20
COD, unfiltered			897.00	31.00	989.00	598.00		536.00	718.00	442.00	485.00	596.00	390.00
Conductivity @ 25 deg.C			46811.00	2968.00	47974.00	48436.00		49408.00	50988.00	47742.00	47054.00	45981.00	45973.00
Cyanide, Complex			<0.001	0.00	0.00	0.00		0.003	0.002	0.003	0.003	0.003	0.003
Cyanide, Free			<0.001	<0.001	<0.001	<0.001		0.001	0.001	<0.001	<0.001	<0.001	<0.001
Cyanide, Total (low level)*			<0.001	0.00	0.00	0.00		0.004	0.003	0.003	0.003	0.003	0.003
Fluoride			<0.3	<0.3	<0.3	<0.3							
Nitrate as NO3			1.00	0.70	0.90	0.80		0.60	0.60	1.60	1.60	2.00	2.30
Nitrite as NO2			0.05	<0.02	0.04	0.05		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
pH	<4.5 >9	0	7.85	7.46	7.87	7.87		7.83	7.79	7.82	7.81	7.84	7.83
Sulphate			2057.30	120.70	1338.30	2282.38		2335.59	2398.21	2232.52	2215.54	2149.20	2113.04
Sulphide			<0.01	<0.01	<0.01	<0.01							
Sulphur, Free													
Total Dissolved Sulphur	mg/l		754.90	37.65	699.70	800.40		783.00	723.00	694.40	725.50	722.00	760.50
Thiocyanate			<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Carbonate Alkalinity as CaCO3			<1	<1	<1	<1		<1	<1	<1	<1	<1	<1
Saline TON as NO3													
Metals (Dissolved)(µg/l)													
Aluminium (diss.filt)	200 µg/l	0	1.70	5.80	<1.5	<1.5		2.10	<1.5	2.70	6.30	5.80	23.20
Antimony (diss.filt)			<2	<2	<2	3.00		<2	2.00	<2	<2	<2	<2
Arsenic (diss.filt)	20 µg/l	0	<0.9	<0.9	<0.9	<0.9		<0.9	4.50	1.70	<0.9	3.80	3.20
Barium (diss.filt)			<1.8	43.70	2.30	2.00		2.80	3.90	2.60	2.20	3.10	2.80
Beryllium (diss.filt)			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron (diss.filt)			2966.00	331.00	3231.00	3198.00		3077.00	3118.00	2913.00	2933.00	2845.00	2747.00
Cadmium (diss.filt) (low level)	0.2 µg/l	0											
Calcium (diss.filt)	mg/l		372.70	70.20	406.00	439.00		388.90	415.00	344.70	366.50	372.40	335.70
Chromium (diss.filt)	4.7µg/l	0	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cobalt (diss.filt)													
Copper (diss.filt)	5 µg/l	0	<3	5.00	<3	<3		<3	<3	<3	<3	<3	<3
Iron (diss.filt)			<4.7	116.50	<4.7	<4.7		<4.7	<4.7	<4.7	12.00	8.60	58.00
Lead (diss.filt)	1.3 µg/l	6	4.80	3.70	1.40	<0.4		<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Magnesium (diss.filt)	mg/l		1167.00	52.20	1183.00	1239.00		1251.00	1153.00	997.20	1098.00	1036.00	955.70
Manganese (diss.filt)	30 µg/l	1	6.40	91.00	4.30	5.10		5.70	<1.5	7.20	7.70	10.00	11.80
Mercury (CVAF)	0.07 µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum (diss.filt)			4.10	2.60	4.30	4.00		5.60	4.90	4.50	5.40	4.30	3.70
Nickel (diss.filt)	8.6 µg/l	0	<0.2	2.40	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Potassium (diss.filt)	mg/l		335.60	24.80	378.90	418.60		391.70	418.40	349.10	375.60	366.30	336.20
Phosphorus (diss.filt)													
Selenium (diss.filt)			<1.2	<1.2	<1.2	<1.2		<1.2	<1.2	3.70	3.70	<1.2	<1.2
Sodium (diss.filt)	mg/l		9105.00	541.60	9303.00	9808.00		9593.00	9111.00	8950.00	8585.00	8350.00	8218.00
Thallium (diss.filt)													
Tin (diss.filt)													
Vanadium (diss.filt)			<0.6	0.80	<0.6	<0.6		<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Zinc (diss.filt)	40 µg/l	1	2.10	226.40	<1.5	2.30		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5

2015, Haulbowline Factory Site, Surface Water Analysis

Sample Location		exceedances	OT07	OT08	SW03	SW11		HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6
Sampled Date			######	######	######	######		######	######	######	######	######	######
Carbon													
Metals Unfiltered / Total (µg/l)													
Boron (tot.unfilt)	7000	0											
Chromium, Hexavalent	0.60	0	<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Chromium (tot unfilt)	4.70	0											
Copper Ultra low													
Iron Ultra low													
Lead Ultra Low	1.3												
Manganese Ultra low													
Molybdenum													
Nickel Ultra low													
Phenols (µg/l)													
2,3-Dimethylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,3,4,6-Tetrachlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,3,5,6-Tetrachlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,6-Dichlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,6-Dimethylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
3-Methylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
3,4-Dimethylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
3,5-Dimethylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-Chloro-2-methylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-trichlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4,6-Dinitro-o-cresol (DNOC)			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,6-trichlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4-dichlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4-dimethylphenol			<0.1	2.40	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-chlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylphenol			<0.1	5.50	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-nitrophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-chloro-3-methylphenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-methylphenol			<0.1	6.80	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
4-nitrophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pentachlorophenol			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenol	8 µg/l	0	<0.1	3.60	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Speciated phenols			<2.1	18.30	<2.1	<2.1		<0.1	<2.1	<2.1	<2.1	<2.1	<2.1
2.3.5 Trimethyl-Phenol					<0.01			<0.01	<0.01	<0.01	<0.01		
2-Isopropyl Phenol					<0.01			<0.01	<0.01	<0.01	<0.01		
Cresols					<0.03			<0.03	<0.03	<0.03	<0.03		
m/p-cresol					<0.02			<0.02	<0.02	<0.02	<0.02		
o-cresol					<0.01			<0.01	<0.01	<0.01	<0.01		
Phenols, Total (HPLC					<5			<0.1	<0.1	<0.1	<0.1		
Xylenols					<0.06			<0.06	<0.06	<0.06	<0.06		
Resorcinol					<0.01			<0.01	<0.01	<0.01	<0.01		
Catechol					<0.01			<0.01	<0.01	<0.01	<0.01		
1-naphthol					<0.01			<0.01	<0.01	<0.01	<0.01		
TPH Criteria Working Group (TPH CWG)(µg/l)													
Aliphatics >C5-C6			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aliphatics >C6-C8			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aliphatics >C8-C10			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aliphatics >C10-C12			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aliphatics >C12-C16			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10

2015, Haulbowline Factory Site, Surface Water Analysis

Sample Location		exceedances	OT07	OT08	SW03	SW11		HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6
Sampled Date			######	######	######	######		######	######	######	######	######	######
Carbon													
Aliphatics >C16-C21			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Aliphatics >C21-C35			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Total Aliphatics C5-C35			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Aromatics >EC5-EC7			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aromatics >EC7-EC8			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aromatics >EC8-EC10			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aromatics >EC10-EC12			<5	<5	<5	<5		<5	<5	<5	<5	<5	<5
Aromatics >EC12-EC16			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Aromatics >EC21-EC35			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Total Aromatics C5-C35			<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
Total aliphatics and aromatics C5-C35	10µg/l	0	<10	<10	<10	<10		<10	<10	<10	<10	<10	<10
MTBE			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzene	8µg/l	0	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m,p-Xylene	10µg/l	0	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1
o-Xylene	10µg/l	0	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Polyaromatic Hydrocarbons (PAHs)(µg/l)													
Acenaphthene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene (aq)	0.1µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene (aq)	0.00017µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene (aq)	0.03µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene (aq)	0.03µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(bk)fluoranthene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene (aq)	0.002µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene (aq)	0.0063µg/l	2	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene (aq)	0.002µg/l	0	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene (aq)	2µg/l	0	<0.1	<0.1	<0.1	<0.1		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene (aq)			0.01	0.01	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene (aq)			<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Polyaromatic hydrocarbons, Total USEPA 16 (aq)			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB's (µg/l)													
PCB congener 101			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 118			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 138			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

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Sample Location		exceedances	OT07	OT08	SW03	SW11		HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6
Sampled Date			######	######	######	######		######	######	######	######	######	######
Carbon													
PCB congener 153			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 180			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 28			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB congener 52			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sum of detected EC7 PCB's			<0.7	<0.7	<0.7	<0.7		<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Volatile Organic Compounds (VOCs) (µg/l)													
1.1.1.2-Tetrachloroethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.1.1-Trichloroethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.1.2.2-Tetrachloroethane			<4	<4	<4	<4		<4	<4	<4	<4	<4	<4
1.1.2-Trichloroethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.1-Dichloroethane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.1-Dichloroethene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.1-Dichloropropene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2.3-Trichlorobenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2.3-Trichloropropane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2.4-Trichlorobenzene	0.4µg/l	1	<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2.4-Trimethylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2-Dibromo-3-chloropropane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.2-Dibromoethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.2-Dichlorobenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2-Dichloroethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.2-Dichloropropane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.3.5-Trimethylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.2-Dichloropropane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.3.5-Trimethylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.3-Dichlorobenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
1.3-Dichloropropane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
1.4-Dichlorobenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
2.2-Dichloropropane			<1	<1	<1	<1		<1	<1	<1	<1	<1	<1
2-Chlorotoluene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
4-Chlorotoluene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
4-Isopropyltoluene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Benzene	8µg/l	0	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromobenzene			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Bromochloromethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Bromodichloromethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Bromoform			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Bromomethane			<1	<1	<1	<1		<1	<1	<1	<1	<1	<1
Carbon disulphide													
Carbontetrachloride			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Chlorobenzene			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Chloroethane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Chloroform			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Chloromethane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
cis-1,2-Dichloroethene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
cis-1,3-Dichloropropene			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Dibromochloromethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Dibromomethane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Dichlorodifluoromethane			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Dichloromethane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Ethylbenzene			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	0.6µg/l	0	<3	<3	<3	<3		<3	<3	<3	<3	<3	<3

2015, Haulbowline Factory Site, Surface Water Analysis

Sample Location		exceedances	OT07	OT08	SW03	SW11		HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6
Sampled Date			######	######	######	######		######	######	######	######	######	######
Carbon													
Isopropylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
m,p-Xylene	10µg/l	0	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methyl tertiary butyl ether (MTBE)			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Naphthalene	2µg/l	0	<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
n-Butylbenzene			<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	10µg/l	0	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1
Propylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
sec-Butylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Styrene			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Total Xylenes													
tert-Amyl methyl ether (TAME)													
tert-Butylbenzene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Tetrachloroethene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Toluene	10µg/l	0	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
trans-1,3-Dichloropropene			<2	<2	<2	<2		<2	<2	<2	<2	<2	<2
Trichloroethene	10µg/l	0	<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Trichlorofluoromethane			<3	<3	<3	<3		<3	<3	<3	<3	<3	<3
Vinyl Chloride			<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
VOC TIC													
semi Volatile Organic Compounds (sVOCs)													
1,2-Dichlorobenzene													
1,2,4-Trichlorobenzene													
1,3-Dichlorobenzene													
1,4-Dichlorobenzene													
2-Nitroaniline													
2,4-Dinitrotoluene													
2,6-Dinitrotoluene													
3-Nitroaniline													
4-Bromophenylphenylether													
4-Chloroaniline													
4-Chlorophenylphenylether													
4-Nitroaniline													
Azobenzene													
Bis(2-chloroethoxy)methane													
Bis(2-chloroethyl)ether													
Carbazole													
Dibenzofuran													
Hexachlorobenzene													
Hexachlorobutadiene													
Hexachlorocyclopentadiene													
Hexachloroethane													
Isophorone													
N-nitrosodi-n-propylamine													
Nitrobenzene													
SVOC TICs								ND	ND	ND	ND	ND	ND

2015, Haulbowline Factory Site, Surface Water Analysis

Sample Location		exceedances	OT07	OT08	SW03	SW11		HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6
Sampled Date			######	######	######	######		######	######	######	######	######	######
Carbon													
Nonadecane													
Naphthalene, 1,4,6-trimethyl-													
Pentadecane, 2,6,10-trimethyl-													
Hexadecane, 2,6,11,15-tetramethyl-													
Dodecane, 2,6,10-trimethyl-													
Cyclic octaatomic sulfur													
de 2,3,4,6-tetrachlorophenol													
2,6-dichlorophenol													
2,3,5,6-tetrachlorophenol													
2,4-Dinitrophenol													
4-Chlorophenol													
Dinoseb													
DNOC													
Cyclohexane, butyl-													
trans-Decalin, 2-methyl-													
Naphthalene, decahydro-2-methyl-													
Benzene, 1,2,3,4-tetramethyl-													
Benzene, 1-methyl-4-(1-methylpropyl)-													
Benzene, (1-methyl-1-butenyl)-													
Naphthalene, 1-methyl-													
Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-													
Dodecane, 2,6,11-trimethyl-													
Naphthalene, 2,7-dimethyl-													
Naphthalene, 1,4,6-trimethyl-													
Naphthalene, 1,6,7-trimethyl-													
Azulene, 4,6,8-trimethyl-													
Hexacosane													
Pentadecane, 2,6,10,14-tetramethyl-													
Dodecane, 2,6,10-trimethyl-													
4-Methylnaphtho[1,2-b]thiophene													
Octadecane, 1-chloro-													
2,7-Dimethyldibenzothiophene													
Benzene, 1-chlorodifluoromethoxy-4-nitro-													
shaded values indicate results exceed													
is a revoked Uk drinking water standard													

Appendix G Ground Gas Assessment Methodology

Ground Gas Assessment Methodology

The methodology used to assess ground gas monitoring results have been taken from CIRIA Document, C665 (CIRIA, 2007). This provides guidance on the collection of relevant and valid data to allow the gassing regime to be adequately characterised. The assessment methodology of the risks posed by soil gas to be undertaken utilises, both gas concentrations and boreholes flow rates to define a "Characteristic Situation" based on limiting borehole gas volume flow for methane and carbon dioxide, called the Gas Screening Value (GSV). The GSV (litre of gas per hour (l/hr)) = borehole flow rate (l/h) x gas concentration. This calculation is carried out for both carbon dioxide and methane, and the worst-case value adopted. One of two assessment methods can be utilized depending on the floor construction of the properties being considered. In this instance the Wilson and Card method has been utilised in preference to the NHBC Traffic Light system. The Traffic light system is for residential properties which have a clear 150mm underfloor void. As the foundation construction of the one site buildings and potential future buildings on site is not known, the Wilson and Card method is considered to be more appropriate as it is relevant for all foundation/floor types. The Wilson and Card method is shown in Table below.

Table – Wilson & Card method for classifying gassing sites

Characteristic Situation	**Gas Screening Value (CH_4 or CO_2) (l/hr)[1]**	**Additional limiting factors**	**Typical source of generation**
1	<0.07	Typically methane ≤ 1% and or carbon dioxide =/ >5% otherwise consider increasing to situation 2.	Natural soils with low organic content
2	<0.7	Borehole air flow rate not to exceed 70l/hr otherwise increase to characteristic situation3	Natural soil, high peat/organic content
3	<3.5		Old landfill, inert waste, mine working flooded
4	<15	Quantitative risk assessment required to evaluate scope of protection measures	Mine working – susceptible to flooding, completed landfill, inert waste (WMP 26B criteria)
5	<70		Mine working unflooded inactive
6	>70		Recent landfill site

Notes:
Gas screening value: litres of gas/hour is calculated by multiplying the gas concentration (%) by the measured borehole flow rate (l/h)
Site characteristics should be based on gas monitoring of gas concentrations and borehole flow rates for specified minimum periods in table 5.5 of the CIRIA guidance
Source of gas and generation potential/performance must be identified
Soil gas investigation to be in accordance with guidance provided in chapters 4-6 of CIRIA guidance.
If there is not a detectable flow use the limit of detection of the instrument.
The boundaries between the Partners in Technology classification do not fit exactly with the boundaries for the CIRIA classification.

Appendix H Ground Gas Assessment

Ground Gas Assessment

This gas assessment includes consideration of gas concentrations (methane and carbon dioxide) monitored at the site. In total 6 No. monitoring rounds were completed at all available boreholes from the 17th November to 9th December 2014 and four rounds completed in September 2015, December 2015 and January 2016. The last two moniutoring rounds were completed under likely worst case weather conditions, ie falling and low atmospheric pressure.

Meteorological Conditions

Over the monitoring periods in 2014 and 2015, atmospheric pressure was typically high (>1000mb). However for the two rounds completed in 2016, atmospheric pressure was typically low. Atmospheric pressure varied from 1031mb to 984mb, with falling pressure observed on all occassions with the exception of one round on 8th December 2015. Weather conditions varied between wet, breezy and overcast conditions to calmer, drier conditions.

Metrological conditions have an influence on the generation and migration of soil gases. Atmospheric pressure will increase emission rates during low and falling atmospheric pressures. The solubility of gases also increases with pressure, lowering concentrations within the ground as more gas will be dissolved in the groundwater. Whilst monitoring was completed under falling pressure conditions, low pressure was generally not recorded during the monitoring.

High rainfall and also tidal fluctuations may cause shallow groundwater levels to rise, reducing the available pore space in which gases can exist, increasing the concentration of gas and therefore the release of gas to the atmosphere. Monitoring was completed during periods of rainfall.

Site Gas Concentrations

Methane (CH_4) and carbon dioxide (CO_2) were detected at concentrations above recommended threshold values, 1% for CH_4 and 5% for CO_2 (CIRIA C665), at BH208, BH214 and BH218. More significant concentrations were detected at BH218 during all monitoring rounds. This is considered to be due to the presence of hydrocarbon vapours associated with LNAPL hydrocarbons on groundwater at this location. Maximum detected concentrations are presented in Table below for each monitoring location across all visits.

Table – Summary Ground Gas Monitoring

Location	CH_4 (%) (max conc. range)	CO_2 (%) (max conc. range)	O_2 (%) Min Conc. Range	Flow (l/hr) (range)	GSV (l/hr)	CS
BH102	0.0	0.1-0.5	18.7-20.2	-0.1-0.3	0.0015	1
BH105A	0.0	0.0-0.3	17.6-20.1	0.2-0.3	0.0009	1
BH106	0.0	0.8-2.1	17.1-19.7	0.1-0.3	0.006	1
BH107A	0.0	0.1-2.0	18.4-20	0.2-0.3	0.0006	1
BH108	0.0	0.0-0.5	18.5-20.9	0.0-0.2	0.0006	1
BH109	0.0	0.8-2.3	15.3-19.9	-0.1-4.2	0.1	2
BH110A	0.0	0.0-0.3	18.5-21.1	-0.3-0.3	0.0009	1
BH111	0.0-0.7	0.0-0.1	19.7-21.0	0.2-0.3	0.002	1
BH112A	0.0	0.6-1.1	16.2-19.3	0.2-0.3	0.03	1
BH113	0.0	0.1-0.3	18.9-21.2	0.2-0.4	0.001	1
BH114	0.0	0.1-1	17.2-20.0	0.2-0.3	0.003	1
BH201R	0.0	0.3	18.8-20.7	0.2-0.3	0.0009	1
BH202	0.0-5.4	0.1-1.9	15.4-19.3	0-0.3	0.007	2
BH204R	0.0	0.2-0.3	17.4-20.2	-0.1-0.3	0.0009	1
BH206	0.0	0-1.9	15.3-19.7	0.0-0.4	0.008	1
BH207	0.0	0.8-3.9	13.7-16.7	0.2-0.3	0.01	1
BH208	0.0	0.1-5.5	10.1-20.2	0.1-0.6	0.001	1
BH209R	0.0	0.1-1.7	18.2-19.9	0.1-0.5	0.009	1
BH211	0.0	0.5-1.1	17.5-20.4	0.2-0.3	0.003	1
BH212A	0.0	0.1-1.0	17.2-21.2	-3.3-0.7	0.03	1
BH213	0.0	0.3-1.6	15.0-20.3	-2.6- -4.1	0.07	2
BH214	0.0-3.5	0.2-3.3	7.9-20.1	0.2-0.4	0.01	1
BH215	0.0	0.0-3.2	11.6-18.3	-6.6- -8.4	0.27	2
BH216	0.0	2.4-6.7	10.8-17.6	0.1-0.3	0.02	1
BH217	0.0	0.0-6.0	14.5-20.3	0.1-0.3	0.02	1
BH218	12.4-90.2	1.3-11.7	0-17.1	-3.3-0.0	2.98	3
BH219	0.0	0.2-0.9	-18.3-20.6	-0.1-0.3	0.001	1

Gas concentrations considered in conjunction with gas flows have resulted in the most monitored locations being classificed as characteristic situation 1 according to CIRIA guidance as they have gas screening values (GSVs) of less than 0.07l/hr. BH109, BH213 and BH215 have been classified as characteristic situation 2, due to elevated carbon dioxide with elevated gas flows. BH202 and BH214 have been classified as characteristic situation 2 based on methane concentrations being in excess of 1% and BH216 and BH217 in respect of carbon dioxide concentrations in excess of 5%. BH218, where LNAPL hydrocarbon is present on groundwater has been classified as characteristic situation 3 with a maximum GSV of 2.98l/hr (CIRIA, 2007). Both characteristic 2 and 3 would require gas protection measures to be installed into any buildings to be constructed on site.

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Date	Weather Conditions	Borehole ID	Background O2%	Steady Flow Rate (l/hr	Atmospheric Pressure (mb) at Sample Point	Time Atm Pressure Start of Round	Steady Methane CH4 (%)	Peak Methane CH4 (%)	Steady Carbon Dioxide CO2 (%)	Peak Carbon Dioxide CO2 (%)	Steady Oxygen O2 (%)	Min. O2 (%)	Balance (%)	Steady Carbon Monoxide CO (ppm)	Steady Hydrogen Sulphide H2S (ppm)	Atmospheric Pressure (mb) End of Round	Time of Atm Pressure End of Round	Water Depth TOC (m)
17/11/2014	DRY	BH109	19.9	-0.1	1009	09:20	0.0	0.0	0.2	1.5	19.6	17.9	80.3	0.0	0.0	1009	09:38	4.08 (plastic), 4.29 (steel)
17/11/2014	DRY	BH219	20.0	-0.1	1009	09:50	0.0	0.0	0.3	0.3	19.7	19.6	80.0	0.0	0.0	1009	10:02	3.08 (plastic), 3.36 (steel)
17/11/2014	DRY	BH108	19.9	0.1	1009	10:25	0.0	0.0	0.0	0.0	19.9	19.8	80.0	0.0	0.0	1009	10:32	3.37 (plastic), 3.56 (steel)
17/11/2014	DRY	BH110A	20.0	-0.3	1009	10:08	0.0	0.0	0.0	0.0	19.5	19.4	80.5	0.0	0.0	1009	10:20	3.6 (plastic), 3.70 (steel)
17/11/2014	DRY	BH215	19.7	-6.6	1008	10:40	0.0	0.0	0.0	0.0	19.0	18.3	80.5	0.0	0.0	1008	10:50	1.71 (plastic), 1.97 (steel)
17/11/2014	DRY	BH213	19.7	-2.6	1008	15:08	0.0	0.0	1.2	1.5	15.3	15.0	83.4	0.0	0.0	1008	15:18	2.75 (plastic), steel (3.13)
17/11/2014	DRY	BH107A	19.8	0.2	1008	11:38	0.0	0.0	0.1	0.2	19.9	19.5	80.0	0.0	0.0	1008	11:47	2.75 (plastic), steel (2.98)
17/11/2014	DRY	BH105A	19.1	0.3	1008	11:25	0.0	0.0	0.0	0.3	18.6	17.6	81.4	0.0	0.0	1008	11:36	2.87(plastic), 2.99 (steel)
17/11/2014	DRY	BH201R	19.8	0.3	1008	11:53	0.0	0.0	0.0	0.1	19.5	19.3	80.4	0.0	0.0	1008	12:05	3.81 (plastic), 4.02 (steel)
17/11/2014	DRY	BH202	19.5	0.0	1009	12:26	0.3	1.2	0.0	0.1	19.7	19.3	79.9	0.0	0.0	1009	12:35	1.34 (plastic), 1.5 (steel)
17/11/2014	DRY	BH106	19.9	0.1	1009	13:00	0.0	0.0	0.8	2.1	18.9	17.9	80.3	0.0	0.0	1009	13:12	2.8 (plastic), 3.3
17/11/2014	DRY	BH207	20.2	0.3	1008	12:41	0.0	0.0	2.3	2.3	14.2	14.2	83.6	0.0	0.0	1008	12:41	3.11 (plastic), 3.21 (steel)
17/11/2014	DRY	BH206	20.2	0.4	1009	13:19	0.0	0.0	0.0	0.0	20.2	19.7	79.8	0.0	0.0	1008	13:27	3.13 (plastic), 3.43 (steel)
17/11/2014	DRY	BH211	19.7	0.2	1007	14:40	0.0	0.0	0.5	0.5	20.3	20.3	79.2	0.0	0.0	1007	14:49	DRY
17/11/2014	DRY	BH112A	20.5	0.2	1007	14:26	0.0	0.0	0.1	0.8	20.3	17.8	79.6	0.0	0.0	1007	14:37	2.45 (plastic), 2.79 (steel)
17/11/2014	DRY	BH212A	19.7	-3.3	1007	13:59	0.0	0.0	0.0	0.3	19.2	18.2	80.8	0.0	0.0	1007	14:09	2.88 (plastic), 3.13 (steal)
17/11/2014	DRY	BH113	19.8	0.2	1007	14:10	0.0	0.0	0.2	0.2	19.7	19.7	80.1	0.0	0.0	1007	14:23	2.44 (plastic), 2.90 (steel)
17/11/2014	DRY	BH217	19.9	0.1	1009	10:54	0.0	0.0	0.0	0.0	18.4	18.1	80.8	0.0	0.0	1009	11:04	2.6 (plastic), 3.15 (steel)
17/11/2014	DRY	BH216	19.8	0.1	1009	11:09	0.0	0.0	6.7	6.7	10.8	10.8	82.4	0.0	0.0	1009	11:18	2.58 (plastic), 2.95 (steel)
17/11/2014	DRY	BH214	20.6	0.2	1008	15:55	0.8	2.4	0.9	2.3	17.7	12.8	80.6	0.0	0.0	1008	16:06	2.51 (plastic), 2.74 (steel)
17/11/2014	DRY	BH209R	20.2	0.1	1008	15:24	0.0	0.0	0.1	0.4	20.3	19.8	79.6	0.0	0.0	1008	15:33	2.32 (plastic), 2.60 (steel)
17/11/2014	DRY	BH208	20.5	0.1	1008	15:35	0.0	0.0	0.0	0.2	20.5	20.2	79.4	0.0	0.0	1008	15:45	NO RECORD
17/11/2014	DRY	BH218	20.3	-3.3	1008	16:10	15.0	39.7	1.7	4.6	16.9	11.1	66.5	18.0	4.0	1008	16:27	No signal from dipper, all product
17/11/2014	DRY	BH111	20.4	0.2	1008	16:52	0.0	0.4	0.0	0.1	20.3	20.3	79.7	0.0	0.0	1008	16:59	3.13 (steel)

Date	Weather Conditions	Borehole ID	Describe possible defects	Background O2 (%)	Steady Flow Rate (l/hr)	Atmospheric Pressure at Sample Point (mb)	Time Atm Pressure Start of Round	Steady Methane CH4 (%)	Peak Methane CH4 (%)	Steady Carbon Dioxide CO2 (%)	Peak Carbon Dioxide CO2 (%)	Steady Oxygen O2 (%)	Min. O2 (%)	Balance (%)	Steady Carbon Monoxide CO (ppm)	Steady Hydrogen Sulphide H2S (ppm)	Atmospheric Pressure (mb) End of Round	Time of Atm Pressure End of Round	Water Depth TOC (m)
24/11/2014	DRY	BH109	NONE	19.7	-4.2	1026	09:18	0.0	0.0	0.3	1.9	19.1	18.0	80.6	0.0	0.0	1026	09:27	3.03 STEEL, 0.12 UPSTAND
24/11/2014	DRY	BH219	NONE	19.6	0.3	1027	09:30	0.0	0.0	0.6	0.6	18.3	18.3	81.1	0.0	0.0	1027	09:40	3.10 STEEL, 0.19 UPSTAND
24/11/2014	DRY	BH108	NONE	19.7	0.2	1027	10:07	0.0	0.0	0.1	0.1	19.6	19.5	80.3	0.0	0.0	1027	10:16	3.19 STEEL, 0.5 UPSTAND
24/11/2014	DRY	BH110A	NONE	19.7	0.3	1029	09:41	0.0	0.0	0.0	0.3	18.6	18.6	81.4	0.0	0.0	1026	09:50	3.23 STEEL, 0.48 UPSTAND
24/11/2014	DRY	BH215	NONE	19.7	-8.4	1027	09:54	0.0	0.0	0.4	0.7	18.6	18.1	80.9	0.0	0.0	1027	10:04	1.7 STEEL, 0.25 UPSTAND
24/11/2014	DRY	BH213	NONE	19.7	-4.1	1027	10:20	0.0	0.0	0.9	1.4	15.3	15.0	83.7	0.0	0.0	1027	10:29	3.08 STEEL, 0.35 UPSTAND
24/11/2014	DRY	BH107A	NONE	19.5	0.3	1027	10:35	0.0	0.0	0.1	0.1	19.6	19.4	80.3	0.0	0.0	1027	10:44	2.73 STEEL, 0.33 UPSTAND
24/11/2014	DRY	BH105A	NONE	19.7	0.2	1027	10:47	0.0	0.0	0.0	0.1	19.5	19.5	80.4	0.0	0.0	1027	10:56	2.57 STEEL, 0.4 UPSTAND
24/11/2014	DRY	BH204R	NONE	19.8	0.3	1027	11:00	0.0	0.0	0.0	0.1	19.7	19.7	80.3	0.0	0.0	1027	11:10	2.8 STEEL, 0.22 UPSTAND
24/11/2014	DRY	BH201R	NONE	19.5	0.2	1027	11:14	0.0	0.0	0.1	0.1	18.9	18.8	81.0	0.0	0.0	1027	11:23	4.46 STEEL, 0.41 UPSTAND
24/11/2014	DRY	BH102	NONE	19.5	0.3	1027	11:25	0.0	0.0	0.2	0.2	18.8	18.7	81.2	0.0	0.0	1027	08:38	4.02 STEEL, 0.71 UPSTAND
24/11/2014	DRY	BH202	NONE	19.3	0.2	1027	11:40	0.0	0.1	0.0	0.1	19.5	19.1	80.5	0.0	0.0	1027	11:52	1.44 STEEL, 0.47 UPSTAND
24/11/2014	DRY	BH114	NONE	19.7	0.2	1026	13:54	0.0	0.0	0.0	0.1	19.3	18.9	80.6	0.0	0.0	1026	NO RECORD	5.01 STEEL, 0.75 UPSTAND
24/11/2014	DRY	BH106	Monitoring equipment on BH. Cannot confirm bung is sealed tightly.	18.8	0.3	1027	12:12	0.0	0.0	1.0	1.0	17.9	17.7	81.1	0.0	0.0	1027	12:24	4.33 STEEL, 0.33 UPSTAND
24/11/2014	DRY	BH207	NONE	19.4	0.3	1027	12:25	0.0	0.0	1.8	1.8	15.9	15.9	82.4	0.0	0.0	1027	12:36	4.19 STEEL, 0.14 UPSTAND
24/11/2014	DRY	BH206	Log and other probes present. Cannot guarantee tight sealed bung.	19.6	0.3	1027	12:38	0.0	0.0	0.0	1.2	19.6	18.5	80.4	0.0	0.0	1027	12:49	4.44 STEEL, 0.45 UPSTAND
24/11/2014	DRY	BH211	NONE	19.7	0.3	1027	12:55	0.0	0.0	1.1	1.1	17.5	17.5	81.4	0.0	0.0	1027	13:04	DRY, 0.42 UPSTAND
24/11/2014	DRY	BH112A	NONE	19.2	0.3	1027	13:06	0.0	0.0	1.1	1.1	17.2	17.1	81.7	0.0	0.0	1026	13:18	4.77 STEEL, 0.11 UPSTAND
24/11/2014	DRY	BH212A	NONE	19.4	0.2	1026	13:22	0.0	0.0	0.2	1.0	19.4	18.7	80.5	0.0	0.0	1026	13:32	4.74 STEEL, 0.32 UPSTAND
24/11/2014	DRY	BH113	NONE	19.2	0.2	1026	13:36	0.0	0.0	0.1	0.1	19.2	18.9	80.7	0.0	0.0	1026	13:46	5.05 STEEL, 0.17 UPSTAND
24/11/2014	DRY	BH217	NONE	19.6	0.3	1026	14:26	0.0	0.0	2.0	6.0	17.3	17.1	80.7	0.0	0.0	1026	14:35	3.07 STEEL, 0.415 UPSTAND
24/11/2014	DRY	BH216	NONE	18.9	0.2	1026	14:13	0.0	0.0	5.6	5.6	12.5	12.5	81.9	0.0	0.0	1026	14:22	2.91 STEEL; 0.28 UPSTAND
24/11/2014	DRY	BH214	NONE	19.6	0.3	1026	14:38	0.0	0.0	0.0	1.0	19.6	18.4	80.4	0.0	0.0	1026	14:37	3.86 STEEL, 0.35 UPSTAND
24/11/2014	DRY	BH209R	NONE	20.0	0.2	1026	14:52	0.0	0.0	0.0	0.1	19.9	19.9	80.0	0.0	0.0	1026	15:01	2.54 STEEL, 0.23 UPSTAND
24/11/2014	DRY	BH208	NONE	20.0	0.2	1026	15:02	0.0	0.0	0.0	0.1	19.9	19.9	80.1	0.0	0.0	1026	15:11	1.38 STEEL, 0.0 UPSTAND
24/11/2014	DRY	BH218	NONE	20.2	0.0	1026	15:16	4.1	12.4	0.4	1.3	18.9	17.1	76.5	7.0	1.0	NO RECORD	15:24	4.5, OIL 2.13
24/11/2014	DRY	BH111	NONE	19.9	0.2	1026	15:27	0.0	0.7	0.0	0.1	19.8	19.7	80.2	3.0	0.0	1026	15:36	0.47 UPSTAND

Date	Weather Conditions	Borehole ID	Describe possible defects	Background O2 (%)	Steady Flow Rate (l/hr)	Atmospheric Pressure (mb) At Sampling Point	Time Atm Pressure Start of Round	Steady Methane CH4 (%)	Peak Methane CH4 (%)	Steady Carbon Dioxide CO2 (%)	Peak Carbon Dioxide CO2 (%)	Steady Oxygen O2 (%)	Min. O2 (%)	Balance (%)	Steady Carbon Monoxide CO (ppm)	Steady Hydrogen Sulphide H2S (ppm)	Atmospheric Pressure (mb) End of Round	Time of Atm Pressure End of Round	Water Depth TOC (m)
03/12/2014	DRY AND CLEAR	BH109	NONE	20.1	-3.6	1031	09:.38	0.0	0.0	0.4	2.3	19.8	18.8	79.8	0.0	0.0	1031	9.46	3.62
03/12/2014	DRY AND CLEAR	BH219	NONE	20.2	0.3	1031	09:50	0.0	0.0	0.3	0.3	19.9	19.9	79.8	0.0	0.0	1031	9.58	3.53
03/12/2014	DRY AND CLEAR	BH108	NONE	20.1	0.0	1031	10:01	0.0	0.0	0.1	0.3	20.0	20.0	80.7	0.0	0.0	1031	10.1	3.75
03/12/2014	DRY AND CLEAR	BH110A	NONE	20.1	0.2	1031	10:13	0.0	0.0	0.0	0.1	19.3	19.3	8.7	0.0	0.0	1031	10.22	3.93
03/12/2014	DRY AND CLEAR	BH215	NONE	19.9	-8.3	1031	10:25	0.0	0.0	0.6	1.0	18.8	18.5	80.5	0.0	0.0	1031	10.36	4.77
03/12/2014	DRY AND CLEAR	BH213	NONE	20.2	-0.4	1031	10:46	0.0	0.0	0.5	0.6	17.4	17.3	82.1	0.0	0.0	1031	10.55	4.76
03/12/2014	DRY AND CLEAR	BH107A	NONE	20.2	0.2	1031	10:58	0.0	0.0	0.1	0.1	20.2	20.0	79.7	0.0	0.0	1031	11.08	4.19
03/12/2014	DRY AND CLEAR	BH105A	NONE	20.4	0.2	1031	11:11	0.0	0.0	0.0	0.0	19.6	19.6	80.4	0.0	0.0	1031	11.21	3.03
03/12/2014	DRY AND CLEAR	BH204R	NONE	20.4	-0.1	1031	11.24	0.0	0.0	0.0	0.1	20.3	20.1	71.6	0.0	0.0	1031	11.34	3.18
03/12/2014	DRY AND CLEAR	BH201R	NONE	20.1	0.3	1031	11:37	0.0	0.0	0.1	0.1	19.8	19.7	80.1	0.0	0.0	1031	11.46	4.67
03/12/2014	DRY AND CLEAR	BH102	NONE	20.1	-0.1	1031	11:49	0.0	0.0	0.4	0.5	19.5	19.4	80.1	0.0	0.0	1030	11.58	4.44
03/12/2014	DRY	BH202	NONE	20.1	0.3	1030	12:02	0.0	0.2	0.3	0.5	19.7	19.0	80.0	0.0	0.0	1030	12.12	1.76
03/12/2014	DRY	BH114	NONE	19.5	0.3	1022	12:02	0.0	0.0	0.7	1.0	18.2	17.2	81.1	0.0	0.0	1022	12.29	4.40
03/12/2014	DRY	BH106	Monitoring equipment on BH. Cannot guarantee bung is sealed tightly.	19.3	0.1	1022	12:38	0.0	0.0	0.8	0.8	18.4	18.1	80.8	0.0	0.0	1029	12.49	3.68
03/12/2014	DRY	BH207	NONE	20.0	0.2	1029	12:05	0.0	0.0	2.2	2.2	16.7	16.7	81.2	0.0	0.0	1029	12.59	3.52
03/12/2014	DRY	BH206	Monitoring equipment on BH. Cannot guarantee bung is sealed tightly.	20.2	0.0	1029	13.01	0.0	0.0	0.0	0.0	20.1	19.1	79.8	0.0	0.0	1029	13.1	3.75
03/12/2014	DRY	BH211	NONE	19.6	0.3	1029	13:12	0.0	0.0	0.5	0.5	19.7	19.5	79.0	0.0	0.0	1029	13.2	DRY
03/12/2014	DRY	BH112A	NONE	20.1	0.3	1029	13:23	0.0	0.0	1.1	1.1	17.5	17.5	81.4	0.0	0.0	1029	13.32	3.07
03/12/2014	DRY	BH212A	NONE	20.0	0.7	1029	13:36	0.0	0.0	0.3	0.8	19.8	17.2	79.4	0.0	0.0	1029	13.45	2.62
03/12/2014	DRY	BH113	NONE	20.2	0.4	1029	13:48	0.0	0.0	0.2	0.2	19.9	19.8	70.9	0.0	0.0	1029	13.59	2.77
03/12/2014	DRY	BH217	NONE	19.6	0.2	1028	14:07	0.0	0.0	3.9	3.9	14.5	14.5	81.7	0.0	0.0	1028	14:18	3.35
03/12/2014	DRY	BH216	NONE	19.6	0.3	1028	14:23	0.0	0.0	3.3	3.7	16.3	16.3	80.4	0.0	0.0	1028	14:31	3.16
03/12/2014	DRY	BH214	NONE	19.6	0.4	1028	14:39	0.4	2.7	0.5	2.8	18.4	12.4	80.6	0.0	0.0	1028	14:48	2.76
04/12/2014	DRY	BH209R	NONE	20.0	0.5	1028	14:55	0.0	0.0	0.2	0.5	20.0	NO RE	79.8	0.0	0.0	1028	15:04	2.71
05/12/2014	DRY	BH208	Gas valve found open.	20.0	0.6	1028	15:06	0.0	0.0	0.1	0.2	20.4	20.2	79.6	0.0	0.0	1028	15:17	WATER 1.7, OIL 1.59
06/12/2014	DRY	BH218	NONE	20.7	-2.3	1028	15:29	12.5	35.3	1.0	2.9	15.2	6.0	71.3	16.0	4.0	1028	15:39	WATER 5.03, OIL 2.66
07/12/2014	DRY	BH111	NONE	20.4	0.3	1028	16:01	0.0	0.0	0.1	0.1	20.3	20.2	79.7	0.0	0.0	1028	16:01	2.51

Date	Weather Conditions	Borehole ID	Describe possible defects	Background O2 (%)	Steady Flow Rate (l/hr)	Atmospheric Pressure (mb) at Sample Point	Time Atm Pressure Start of Round	Steady Methane CH4 (%)	Peak Methane CH4 (%)	SteadyCarbon Dioxide CO2 (%)	Peak Carbon Dioxide CO2 (%)	Steady Oxygen O2 (%)	Min. O2 (%)	Balance	Steady Carbon Monoxide CO (ppm)	Steady Hydrogen Sulphide H2S (ppm)	Atmospheric Pressure (mb) End of Round	Time of Atm Pressure End of Round	Water Depth TOC (m)
09/12/2014	WET	BH109	NONE	19.8	-5.4	1020	09:17	0.0	0.0	1.4	2.7	16.2	15.5	82.5	0.0	0.0	1020	09:24	3.14
09/12/2014	WET	BH219	NONE	19.8	0.1	1020	09:27	0.0	0.0	0.2	0.2	19.6	19.5	80.1	0.0	0.0	1020	09:36	3.39
09/12/2014	WINDY	BH108	NONE	20.1	-11.1	1020	10:02	0.0	0.0	0.1	0.1	20.0	20.0	80.0	0.0	0.0	1020	10:12	3.52
09/12/2014	WET	BH110A	NONE	19.9	0.4	1020	09:39	0.0	0.0	0.0	0.0	18.2	18.2	81.8	0.0	0.0	1020	09:47	3.43
09/12/2014	WET	BH215	NONE	19.6	-13.2	1021	09:50	0.0	0.0	0.7	0.9	18.7	18.7	80.6	0.0	0.0	1021	10:00	1.70
09/12/2014	WET	BH213	NONE	19.9	-1.8	1019	10:16	0.0	0.0	0.8	1.6	17.3	16.3	81.9	0.0	0.0	1019	10:24	3.33
09/12/2014	WET	BH107A	NONE	19.8	0.4	1019	10:26	0.0	0.0	0.0	0.1	19.8	19.5	80.2	0.0	0.0	1019	10:36	2.91
09/12/2014	WET	BH105A	NONE	20.1	0.4	1020	10:50	0.0	0.0	0.0	0.1	19.4	19.3	80.6	0.0	0.0	1020	11:00	2.70
09/12/2014	WET	BH204R	NONE	19.7	-1.4	1019	10:38	0.0	0.0	0.0	0.1	19.9	19.6	80.1	0.0	0.0	1019	10:47	2.71
09/12/2014	WET	BH201R	NONE	19.9	0.4	1019	11:03	0.0	0.0	0.0	0.2	18.9	18.9	81.1	0.0	0.0	1019	11:15	4.38
09/12/2014	WET	BH102	NONE	19.9	0.4	1019	11:19	0.0	0.0	0.2	0.3	19.0	18.8	80.8	0.0	0.0	1019	11:29	4.05
09/12/2014	WET	BH202	NONE	19.8	0.3	1018	11:31	0.0	0.0	0.3	0.6	19.5	18.9	80.3	0.0	0.0	1018	11:41	1.75
09/12/2014	WET	BH114	NONE	19.9	0.3	1018	11:52	0.0	0.0	0.0	0.2	19.6	19.0	80.3	0.0	0.0	1018	12:02	4.69
09/12/2014	WINDY	BH106	Monitoring equipment on BH. Cannot guarantee bung is sealed tightly.	20.2	0.2	1017	12:45	0.0	0.0	1.2	1.2	18.6	18.5	80.3	0.0	0.0	1017	12:54	4.40
09/12/2014	NO RECORD	BH207	NONE	20.4	0.4	1017	12:55	0.0	0.0	2.7	2.7	16.6	16.6	81.3	0.0	0.0	1017	13:05	4.28
09/12/2014	NO RECORD	BH206	Monitoring equipment on BH. Cannot guarantee bung is sealed tightly.	20.5	-10.0	1017	13:07	0.0	0.0	0.2	2.0	20.1	19.3	79.7	0.0	0.0	1017	13:16	4.53
09/12/2014	WINDY	BH211	NONE	20.4	0.3	1014	12:33	0.0	0.0	1.1	1.1	17.6	17.6	81.2	0.0	0.0	1014	12:42	DRY
09/12/2014	NO RECORD	BH112A	NONE	19.8	0.4	1017	13:28	0.0	0.0	1.6	1.6	16.8	16.8	81.6	0.0	0.0	NO RECORD	13:37	4.87
09/12/2014	WET	BH212A	NONE	20.0	0.4	1018	12:19	0.0	0.0	0.2	0.2	20.0	20.0	79.8	0.0	0.0	1018	12:29	4.63
09/12/2014	WET	BH113	NONE	19.8	0.5	1018	12:07	0.0	0.0	0.1	0.1	19.8	19.5	80.1	0.0	0.0	1018	12:17	4.91
09/12/2014	WINDY	BH217	NONE	19.4	0.3	1016	13:45	0.0	0.0	1.6	1.6	19.0	18.4	79.4	0.0	0.0	1016	13:56	3.37
09/12/2014	WINDY	BH216	NONE	20.1	0.3	1016	13:59	0.0	0.0	6.8	6.8	11.5	11.5	81.7	0.0	0.0	1016	14:07	2.89
09/12/2014	WINDY	BH214	NONE	20.4	0.2	1016	14:48	0.0	0.1	0.0	0.3	20.5	19.6	79.5	3.0	0.0	1015	14:58	3.85
09/12/2014	WINDY	BH209R	NONE	20.1	0.2	1016	14:11	0.0	0.0	0.0	6.8	20.3	17.4	79.7	0.0	0.0	1016	14:21	3.11
09/12/2014	WINDY	BH208	NONE	20.4	0.4	1016	14:23	0.0	0.0	0.0	0.0	20.5	CORD	79.5	0.0	0.0	1016	14:31	1.28 OIL, 1.70 WATER
09/12/2014	WET	BH218	NONE	20.4	-5.3	1016	14:34	8.6	9.3	0.8	0.9	16.4	15.9	74.3	11.0	3.0	1016	14:43	2.35 OIL, 4.75 WATER
09/12/2014	WINDY	BH111	NONE	19.8	0.4	1015	15:06	0.0	0.0	0.0	0.0	20.1	19.8	79.8	0.0	0.0	1015	15:17	3.90

SITE/REF:	Haulbowline Factory Site
DATE:	15-Sep-15
OPERATORS	Stephen O' Connell

Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2
Before monitoring	999.0	0.0	0.1	21.6
After monitoring	998.0	0.0	0.1	21.6
Weather Conditions	Dry warm day, no wind at time of testing			

General Site comments
Dry warm day, no wind at time of testing

Equipment	
Instrument/Model Type	Serial number
GFM Series	11762

Borehole ID	Time	Steady CH4	CO_2	O_2	Peak CH_4	Dipper (m)BGL	Top of bore to ground (m)	Notes
114	11.44	0.0	0.6	19.9	0.0	3.47	0.73	Hit solids
113	11.55	0.0	0.3	21.2	0.0	4.44	0.16	
112A	12.05	0.0	1.1	19.3	0.0	4.05	0.09	
212A	12.19	0.0	0.1	21.2	0.0	4	0.3	
211	12.25	0.0	0.9	20.4	0.0	1.88	0.39	
206	12.33	0.0	1.9	15.3	0.0	3.73	0.45	
207	12.38	0.0	3.9	16.2	0.0	3.82	0.13	
106	12.44	0.0	1.8	17.1	0.0	3.81	0.31	
202	12.53	2.4	1.9	15.4	2.4	0.97	0.47	
102	12.59	0.0	0.4	20.2	0.0	3.07	0.69	
201R	13.05	0.0	0.3	20.7	0.0	4.19	0.4	
204R	13.13	0.0	0.2	18.8	0.0	2.75	0.21	

SITE/REF:	Haulbowline Factory Site
DATE:	16-Sep-15
OPERATORS	Stephen O' Connell

General Site comments
Dry day, light winds at times.

LW/HW Timesfor Cobh as per PoC website		
Low water times	0.54	13.07
High water times	6.53	19.06

Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2
monitoring	996.0	0.0	0.1	20.9
monitoring	992.0	0.0	0.1	21.3
Conditions	Dry day, light wind at times			

Equipment	
Instrument/Model Type	Serial number
GFM 416	11762

Borehole ID	Time	Steady CH4	CO_2 (30secs)	CO_2 (60secs)	CO_2 (90secs)	CO_2 (120secs)	O_2 (30secs)	O_2 (60secs)	O_2 (90secs)	O_2 (120secs)	Peak CH_4	Dipper (m)BGL	Top of bore to ground (m)	Notes
204R	14.01	0.0	0.3	0.3	0.2	0.2	17.4	17.8	18.4	18.9	0.0	2.72	0.21	
BH110A	12.42	0.0	0.0	0.0	0.0	0.0	20.1	20.1	20.0	20.1	0.0	2.77	0.49	
BH219	12.50	0.0	0.8	0.9	0.9	0.9	19.3	19.2	19.1	19.1	0.0	2.87	0.20	
BH111	14.23	0.0	0.1	0.1	0.1	0.1	21.0	21.0	21.0	21.0	0.0	3.58	0.40	
BH214	13.22	0.0	0.5	0.5	0.6	0.7	20.1	20.0	19.7	19.1	0.0	2.72	0.35	
BH218	13.29	90.1	9.8	9.7	9.7	9.6	0.0	0.0	0.0	0.2	90.2	Unknown	0.41	Dipper did not sound. Hydrocarbon was evident
BH108	12.37	0.0	0.5	0.5	0.5	0.5	18.5	18.5	18.6	18.7	0.0	2.62	0.50	
BH215	12.30	0.0	3.1	3.2	3.2	3.2	12.1	11.7	11.6	11.6	0.0	1.52	0.25	
BH217	12.58	0.0	2.6	2.7	2.8	2.8	15.1	14.7	14.6	14.6	0.0	2.62	0.42	
BH213	13.38	0.0	1.6	1.5	1.5	1.8	16.8	16.7	16.5	15.9	0.0	2.82	0.35	
BH208														Unable to locate
BH107A	14.08	0.0	2.0	2.0	2.0	1.9	18.5	18.4	18.4	18.7	0.0	2.43	0.33	
BH216	13.03	0.0	6.4	6.5	6.6	6.6	12.8	12.6	12.5	12.5	0.0	2.69	0.28	Smell of oil and fuel on dipper
BH109	13.15	0.0	2.2	2.1	1.8	1.5	15.6	15.8	16.5	17.1	0.0	3.07	0.11	
BH209R	13.47	0.0	1.7	1.6	1.5	1.5	19.1	19.2	19.4	19.5	0.0	2.55	0.23	
BH105A	13.54	0.0	0.0	0.0	0.0	0.0	20.1	20.0	20.0	19.9	0.0	2.20	0.40	

SITE/REF:	Haulbowline Factory Site				General Site comments						LW/HW Times for Cobh as per PoC website			
DATE:	17-Sep-15				Dry day, no wind									
OPERATORS	Stephen O' Connell, Padraig Barrett										Low water times	1.25	13.38	
Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2							High water times	7.23	19.36	
					Equipment									
monitoring	1000.0	0.0	0.1	20.9	Instrument/Model Type		Serial number							
monitoring	1002.0	0.0	0.1	20.9	GFM 416		11762							
Conditions	Dry day, light wind at times													

Borehole ID	Time	Steady CH4	CO_2 (30secs)	CO_2 (60secs)	CO_2 (90secs)	CO_2 (120secs)	O_2 (30secs)	O_2 (60secs)	O_2 (90secs)	O_2 (120secs)	Peak CH_4	Dipper (m)BGL	Top of bore to ground (m)	Notes
BH218	14.03	60	7.1	7.2	7.1	7	6.7	6.2	6.9	7.1	61.7	Unknown	0.41	Dip not recorded
BH208	14.1	0.0	5.5	5.5	5.5	5.4	10.4	10.2	10.1	10.1	0.0	1.20	0.00	Fuel on dipper

SITE/REF:	Haulbowline Factory Site			
DATE:	08-Dec-15			
OPERATORS	Stephen O' Connell			
Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2
monitoring	1014.0	0.0	0.0	20.4
monitoring	1015.0	0.0	0.0	20.4
Conditions	Windy day with occassional heavy showers			

General Site comments
Battery on pack required charging on 2 occassions during testing.

Equipment	
Instrument/Model Type	Serial number
GFM 416	11756

LW/HW Times for Cobh as per PoC website		
Low water times	3.03	9.31
High water times	15.27	21.54

Borehole ID	Time	Steady CH4	$CO_{2\ (30secs)}$	$CO_{2\ (60secs)}$	$CO_{2\ (90secs)}$	$CO_{2\ (120secs)}$	$O_{2\ (30secs)}$	$O_{2\ (60secs)}$	$O_{2\ (90secs)}$	$O_{2\ (120secs)}$	Peak CH_4	Dipper (m)BGL	Top of bore to ground (m)	Notes
BH110A	11.25	0.0	0	0	0.0	0	19.8	19.8	19.7	19.7	0	3.17	0.49	
BH219	11.34	0	0.8	0.8	0.8	0.9	19.7	19.6	19.6	19.6	0	3.09	0.2	
BH214	9.45	3.3	2.3	2.3	2.3	2.3	8.5	8	7.9	7.9	3.5	3.04	0.35	
BH108	11.06	0	0.1	0.2	0.2	0.2	20.3	20.3	20.3	20.3	0	2.59	0.5	
BH215	11.18	0	1.3	1.3	1.3	1.3	15.8	15.4	15.3	15.3	0	1.78	0.25	
BH217	11.43	0	0.2	0.2	0.2	0.2	20.3	20.3	20.3	20.3	0	2.67	0.42	
BH216	11.51	0	4.8	4.8	4.8	4.8	17.6	17.3	17.3	17.3	0	2.82	0.28	Fuel on dipper
BH109	10.55	0	1.2	1.1	0.9	0.9	18.4	18.3	18.4	18.6	0	3.18	0.11	

SITE/REF:	Haulbowline Factory Site			
DATE:	09-Dec-15			
OPERATORS	Stephen O' Connell			
Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2
monitoring	1024.0	0.0	0.0	20.3
monitoring	1023.0	0.0	0.0	20.4
Conditions				

General Site comments

Equipment	
Instrument/Model Type	Serial number
GFM 416	11762

LW/HW Times for Cobh as per PoC website		
Low water times	3.48	10.14
High water times	16.10	22.34

Borehole ID	Time	Steady CH4	$CO_{2\ (30secs)}$	$CO_{2\ (60secs)}$	$CO_{2\ (90secs)}$	$CO_{2\ (120secs)}$	$O_{2\ (30secs)}$	$O_{2\ (60secs)}$	$O_{2\ (90secs)}$	$O_{2\ (120secs)}$	Peak CH_4	Dipper (m)BGL	Top of bore to ground (m)	Notes
BH114	11.50	0.00	0.20	0.20	0.30	0.30	20.00	19.90	19.90	19.90	0.00	3.97	0.73	
BH113	12.00	0.00	0.00	0.00	0.00	0.00	20.30	20.30	20.30	20.30	0.00	4.83	0.16	
BH112A	12.30	0.00	1.00	1.10	1.10	1.10	16.40	16.30	16.20	16.20	0.00	3.94	0.09	
BH212A	13.17	0.00	0.00	0.00	0.00	0.10	20.40	20.20	20.30	20.20	0.00	3.65	0.3	
BH211	13.24	0.00	0.10	0.10	0.10	0.10	20.20	20.10	20.10	20.10	0.00		0.39	Hit solids at 1.88
BH206	12.39	0.00	1.30	1.10	1.10	1.10	18.80	18.90	18.90	18.90	0.00	3.57	0.45	
BH207	12.44	0.00	2.00	2.00	2.00	2.10	13.90	13.80	13.70	13.70	0.00	3.59	0.13	
BH106	12.49	0.00	1.10	1.10	1.10	1.10	17.80	17.70	17.70	17.70	0.00	3.51	0.31	
BH202	13.03	0.00	0.50	0.50	0.50	0.50	19.20	19.20	19.20	19.20	0.00	1.07	0.47	
BH102	11.17	0.00	0.30	0.30	0.30	0.30	19.20	19.20	19.20	19.20	0.00	3.27	0.69	
BH201R	11.08	0.00	0.00	0.10	0.10	0.10	19.90	19.90	19.90	19.80	0.00	4.43	0.4	
BH204R	11.00	0.00	0.00	0.00	0.00	0.00	20.20	20.10	20.00	19.80	0.00	2.93	0.21	
BH111	11.42	0.00	0.00	0.00	0.00	0.00	20.10	20.10	20.00	20.00	0.00	3.82	0.4	
BH218	10.18	86.30	7.20	7.40	7.40	7.30	0.00	0.00	0.00	0.00	87.40	4.57	0.41	Dipper sounded at 4.57m (solid ground)but fuel was on dipper tape at a much lesser depth
BH213	10.30	0.00	0.50	0.60	0.60	0.60	18.30	18.20	18.10	18.10	0.00	3.08	0.35	
BH208														Flooded
BH107A	11.27	0.00	0.60	0.60	0.60	0.60	19.50	19.40	19.40	19.40	0.00	2.6	0.33	
BH209R	10.42	0.00	1.20	1.00	1.00	0.80	18.20	18.40	18.60	19.00	0.00	2.7	0.23	
BH105A	10.50	0.00	0.00	0.00	0.00	0.00	19.90	19.80	19.80	19.80	0.00	2.43	0.4	

SITE/REF:	Haulbowline Factory Site			
DATE:	08-Jan-16			
OPERATORS	Stephen O' Connell			
Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2
monitoring	994.0	0.0	0.0	21.2
monitoring	993.0	0.0	0.0	20.9
Conditions	Cold dry morning			

General Site comments
A number of boreholes had rain water present which was drained through opening the bungs

Equipment	
Instrument/Model Type	Serial number
GFM 416	11762

LW/HW Times for Cobh as per PoC website		
Low water times	10.30	22.51
High water times	4.02	16.25

Borehole ID	Time	$CH4_{(30secs)}$	$CH4_{(60secs)}$	$CH4_{(90secs)}$	$CH4_{(120secs)}$	$CO_{2\ (30secs)}$	$CO_{2\ (60secs)}$	$CO_{2\ (90secs)}$	$CO_{2\ (120sec}$	$O_{2\ (30secs)}$	$O_{2\ (60secs)}$	$O_{2\ (90secs)}$	$O_{2\ (120secs)}$	Dipper (m)BGL	Top BH to ground (m)	Notes	
BH114															0.73		
BH113	12.21	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.5	20.4	20.4	20.4	4.57	0.16		4.73
BH112A															0.09		
BH212A	10.55	0.0	0.0	0.0	0.0	0.2	0.3	0.3	0.3	20.5	20.4	20.3	20.3	4.05	0.30		4.35
BH211	11.02	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.7	20.6	20.6	20.6	1.88	0.39		2.27
BH206															0.45		
BH207															0.13		
BH106															0.31		
BH202															0.47		
BH102	12.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	19.9	19.9	3.06	0.69		3.75
BH201R	11.58	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	20.3	20.2	20.2	20.2	4.21	0.40		4.61
BH204R	11.51	0.0	0.0	0.0	0.0	0.2	0.3	0.3	0.3	19.4	19.3	19.3	19.3	2.83	0.21		3.04
BH110A	10.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.2	21.1	21.1	21.1	2.95	0.49		3.44
BH219	10.22	0.0	0.0	0.0	0.0	0.2	0.3	0.3	0.3	20.7	20.6	20.6	20.6	2.99	0.20		3.19
BH111	12.14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.6	20.5	20.5	20.5	3.75	0.40		4.15
BH214	10.48	0.0	0.0	0.0	0.0	0.9	1.4	1.6	1.6	15.8	13	11.9	11.2	2.97	0.35		3.32
BH218	11.11	87.7	88.2	88.3	87.7	11.7	11.7	11.7	11.4	0.0	0.0	0.0	0.0	See notes	0.41	Dipper did not sound, very heavy oil on dipper	
BH108	10.03	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.9	20.9	20.9	20.8	2.77	0.50		3.27
BH215	10.08	0.0	0.0	0.0	0.0	0.6	0.7	0.7	0.7	15.7	15.6	15.5	15.5	1.71	0.25		1.96
BH217	10.34	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	19.6	19.6	19.5	19.5	2.62	0.42		3.04
BH213	11.21	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	20.4	20.4	20.4	20.3	2.81	0.35	Valve was since last round of samples	3.16
BH208															0.00	Could not open bung, borehole was flooded	
BH107A	11.37	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	20.1	20.1	20.1	20.1	2.47	0.33		2.8
BH216	10.41	0.0	0.0	0.0	0.0	2.4	2.4	2.5	2.5	17.4	17.3	17.2	17.2	2.65	0.28		2.93
BH109	10.28	0.0	0.0	0.0	0.0	0.8	0.7	0.6	0.5	19	19.3	19.5	19.8	3.1	0.11		3.21
BH209R	11.26	0.0	0.0	0.0	0.0	1.2	1.2	1.1	0.9	18.4	18.6	18.8	19.1	2.5	0.23		2.73
BH105A	11.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.1	20.0	20.0	20.0	2.33	0.40		2.73

SITE/REF:	Haulbowline Factory Site																
DATE:	11-Jan-16																
OPERATORS	Stephen O' Connell																
Ambient Conditions:	Barometric Pressure (mb)	CH_4	CO2	O_2													
monitoring	984.0	0.0	0.0	20.4													
monitoring	989.0	0.0	0.0	20.9													
Conditions	Cold dry day																

General Site comments

Equipment	
Instrument/Model Type	Serial number
GFM 416	11762

LW/HW Times for Cobh as per PoC website		
Low water times	0.12	12.33
High water times	6.10	18.25

Borehole ID	Time	CH_4 (30secs)	CH_4 (60secs)	CH_4 (90secs)	CH_4 (120secs)	CO_2 (30secs)	CO_2 (60secs)	CO_2 (90secs)	CO_2 (120sec)	O_2 (30secs)	O_2 (60secs)	O_2 (90secs)	O_2 (120secs)	Dipper (m)BGL	Top BH to ground (m)	Notes
BH114	12.21	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	19.9	19.8	19.8	19.8	3.66	0.73	
BH113	13.30	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.8	20.7	20.7	20.7	4.83	0.16	
BH112A	13.24	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	17.8	17.7	17.7	17.6	4.4	0.09	
BH212A	14.30	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	20.3	20.2	20.1	20.1	3.95	0.30	
BH206	12.42	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.7	17.7	17.8	17.9	18.0	3.77	0.45	
BH207	12.37	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8	16.0	15.8	15.8	15.8	3.84	0.13	
BH106	12.32	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8	17.8	17.7	17.6	17.5	3.79	0.31	
BH202	12.56	5.4	5.3	5.1	4.8	0.4	0.4	0.4	0.3	18.2	18.1	18.2	18.5	0.88	0.47	
BH102	13.05	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.3	20.3	20.2	20.0	3.01	0.69	
BH201R	13.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	19.8	19.8	19.8	4.14	0.40	
BH110A	13.39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	19.9	19.9	19.9	2.77	0.49	
BH219	13.57	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	20.5	20.5	20.5	20.5	2.70	0.20	
BH214	14.22	0.0	0.0	0.0	0.0	0.2	0.3	0.5	0.7	19.9	19.7	18.8	17.3	3.03	0.35	Noticable sound of air expelled when valve opened and also when bung released
BH108	13.45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4	20.4	20.4	20.4	2.53	0.50	
BH215	13.50	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	16.1	16.0	16.0	16.0	1.70	0.25	
BH217	14.15	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	19.3	19.1	19.0	19.0	2.44	0.42	
BH216	14.09	0.0	0.0	0.0	0.0	2.5	2.5	2.6	2.6	16.4	16.3	16.2	16.2	2.44	0.28	
BH109	14.04	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.8	15.3	15.5	16.0	16.9	2.89	0.11	

Appendix I Summary Statistical Analysis Sheets

Client/client ref: Cork County Council
Project ref: Haulbowline Factory Site
Site ref: A092989
Data description:
Contaminant(s):
Test scenario: Planning
Date: 18 December 2015
User details: Yvonne Buchanan

	arsenic	lead	PCB							
Critical concentration, C_c	**170**	**477**	**0.008**							
Notes										
Sample size, n	42	41	42	0	0	0	0	0	0	0
Sample mean, $\bar{x}$	34.797619	525.341463	0.12903571	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	106.584906	1295.79621	0.61599284							
Number of non-detects	0	0	**26**							
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Outliers?	Yes	Yes	No							
Distribution	Non-normal	Non-normal	Non-normal							
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto	Auto	Auto

Test scenario:	Planning: is true mean lower than critical concentration (μ < Cc)?			**Evidence level required:**			95%	Use Log-Normal distribution to test for outliers		
t statistic, t_0 (or k_0)	-8.220784777	0.238877373	1.273393183							
Upper confidence limit (on true mean concentration, μ)	106.48585	1407.44909	0.54334801							
Evidence level	**99%**	**0%**	**0%**							
Base decision on:	evidence level	evidence level	evidence level							
Result	**μ < Cc**	**μ ≥ Cc**	**μ ≥ Cc**							
Select dataset	○ Y	○ Y	◉ Y	○ Y	○ Y	○ Y	○ Y	○ Y	○ Y	○ Y

Back to data | **Go to outlier test** | **Go to normality test** | **Show individual summary**

Appendix J Method Statements, Field Monitoring and Laboratory Certificates for November 2015 Sampling

Arup

Method statement for water sampling Haulbowline Steelworks site

Minerex Doc. Ref.:Samp091 - 2702 - Arup (Method statement for water sampling .doc
Date: Thursday, 4th Dec 2014

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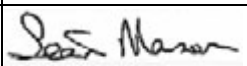
Document Verification

ARUP

Job title		Haulbowline Site Assessment			**Job number** 235946.00
Document title		Method statement for water sampling Haulbowline Steelworks site			**File reference**
Document ref		Samp091 - 2702 - Arup (Method statement for water sampling .doc			
Revision	**Date**	**Filename**			
issue 1	9 Jan 2015	**Description**	For Issue		
			Prepared by	Checked by	Approved by
		Name	Christopher Newton	Olivia Holmes	Sean Mason
		Signature			
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		Name			
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		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
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			Issue Document Verification with Document		✓

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1. Introduction

1.1 Objectives

The objectives of the sampling are to determine the extent of groundwater and surface water contamination on site at high and low tide. Minerex and Arup will be sampling 27 no. boreholes on site On the 12th and 13th of January 2015. The sampling locations are indicated on the plans contained in Appendix A. A list of the proposed personnel on site is given in Section 4 below.

1.2 Activities on Site

1.	Mobilise to Site and report to Cork County Council (CCC) Site Office
2.	Complete CCC Site induction and sign in
3.	Complete groundwater and surface water sampling in accordance with sections 2.1 and 2.2 of this Method Statement
4.	Demobilise from Site and sign out

2. Water sampling

2.1 Groundwater sampling

1. The types of containers required for each type of analysis are itemised in a Chain of Custody (C-of-C) form generated by Arup. See attached draft template contained in Appendix B.
2. The analysing laboratory will supply bottles for the sampling event.
3. The lag time between high and low tide and low and high water levels in each borehole has been calculated from data obtained on site to date. Sampling of each well will be timed based on the Cork Harbour predicted tides and the lag times calculated for each well to ensure that each well is sampled as close to its lowest or highest level during the tidal cycle. High and low water samples will only be taken from each well within 1 hour of either high or low tides. Refer to Appendix C for the sampling schedule.
4. Record groundwater level in mbTOC and record the presence of and thickness of any hydrocarbon (free product) layer in each borehole, compare these to previous readings and borehole logs.
5. The sampling methodology will follow standards and protocols based on ISO 5667 Water Quality – Sampling (MEL Doc Ref: F173 and F838), BS10175:2011, and MEL best practice, whereby every practical effort will be made to purge each monitoring borehole prior to sampling.
6. A 12V submersible Wasp pump, peristaltic pump with LDPE tubing or an inertial pump will be used to purge the wells.
7. If a significant level of free product was measured on any well then either a peristaltic or inertial pump will be used for purging and sampling.
8. Purging will continue until EC and pH change <5% over 3 measurements. Record groundwater hydrochemistry (EC, pH, Temperature) at appropriate intervals which should be decided based upon site specific knowledge, generally every 5litres.

9. Wearing disposable gloves, each bottle will be filled. Ensure that no air bubbles are entrapped within the bottle, tapping the sides to dislodge those trapped on the sides. Rinse all caps before use. Plastic bottles may be gently squeezed when screwing on cap to raise the meniscus to ensure an air tight seal. Attempt to fill the sample bottle whilst submerged in the water if sufficient depth is available.
10. EC, pH, temperature and Dissolved Oxygen will be measured and recorded on site.
11. Decontaminate all equipment used during the procedure between sampling points in accordance with best practice.
12. Wipe and label bottles and containers and put them into a coolbox, with ice packs to ensure samples are kept at 4°C.
13. The samples are packaged for transportation on site and dispatched as soon as possible to analysing laboratory.
14. All purged water will be disposed of in the contaminated waste IBC located on site in agreement with CCC.

2.2 Surface water sampling

Sampling equipment

Sequential actions

1. The types of containers required for each type of analysis are itemised in a Chain of Custody (C-of-C) form generated by Arup. Refer to Appendix B.
2. The analysing laboratory will supply bottles for the sampling event.
3. The sampling point will be located along the edge of the site in accordance with the surface water locations map provided in Appendix A. CCC will contact the Navy to facilitate access to the locations of SW5 and SW6 before the sampling event.
4. The samples will be taken using a bucket or wide-mouthed bottle on a rope or long armed sampler dropped into the sea and hauled out after filling. Personnel taking the surface water samples will wear a harness anchored to a suitable fixed point.
5. Wearing disposable gloves, each bottle will be filled. Ensure that no air bubbles are entrapped within the bottle, tapping the sides to dislodge those trapped on the sides. Rinse all caps before use. Plastic bottles may be gently squeezed when screwing on cap to raise the meniscus to ensure an air tight seal. Attempt to fill the sample bottle whilst submerged in the water if sufficient depth is available. Lifejackets will be worn by all operatives and safety harnesses will be secured to an appropriate anchor point, as approved by CCC.
6. EC, pH, temperature and Dissolved Oxygen will be measured and recorded onsite.
7. Decontaminate all equipment used during the procedure between sampling points in accordance with best practice.
8. Wipe and label bottles and containers and put them into a coolbox, with ice packs to ensure samples are kept at 4°C.
9. The samples are packaged for transportation on site and dispatch as soon as possible to analysing laboratory.

Notify Cork County that sampling operation is complete.

3. Materials and equipment, and how mobilized to site and transported around site

No.	Item	Quantity	Mobilised to site and moved around site
1.	**Tool boxes** (comprising socket set, wire brushes, grease, open and ring spanner set, chain vice grips, pipe wrenches, hammers, ranges of screw drivers, penknife, material accessories etc.)	1	Jeep then equipment transport by hand to monitoring wells if required.
2.	**Water level meter ('Dipper')** - Solinst	2	Jeep then equipment transport by hand to well head
3.	**Gas Analyser**	1	Jeep then equipment transport by hand to well head
4.	**Pumps**	3	Jeep then equipment transport by hand to well head
5.	**Car batteries**	2	Jeep then equipment transport by hand to well head
6.	**EC, pH, DO meters**	4	Jeep then equipment transport by hand to well head

4. HEALTH & SAFETY

4.1 Project staff & contact details

Conor Quinlan is the main MEL point of contact for this work. The following table provides staff contact details.

Name	*Role/ Responsibility*	*Company*	*Contact No.*
Cecil Shine (cecil.shine@minerex.ie)	Project Director	MEL	086-617 5881
Conor Quinlan (conor.quinlan@minerex.ie)	Project Manager	MEL	086-604 8127
Sven Klinkenberg Sven.klinkenberg@minerex.ie	Project Scientist	MEL	087 2198416
Olivia Holmes Olivia.holmes@arup.com	Project Manager	Arup	087 9223323
Christopher Newton Christopher.newton@arup.com Alison Orr Alison.orr@arup.com	Project Hydrogeologist	Arup	087 2271684

4.2 Cork County Council contact details

Name	***Company***	***Contact No.***
Cormac O'Suilleabhain	Cork County Council	086 0407431
Eleanor Lehane	Cork County Council	086 0233470
David France	Cork County Council	087 2933374
Stephen O'Connell	Cork County Council	087 9644580

4.2 Site Personnel

Name	***Role/ Responsibility***	***Company***
Conor Quinlan	Project Manager	MEL
Sven Klinkenberg	Field Scientist	MEL
Matteo Viganotti	Field Scientist	MEL
Javier Leonor	Field Scientist	MEL
Christopher Newton	Field Scientist	Arup
Alison Orr	Field Scientist	Arup

4.3 General

Health and safety, and labour regulations are to be adhered to. The environment is to be protected during the course of the work.

The following lists mitigation measures and general site activities that are planned to reduce risk of injury to people and the environment:-

1. Site personnel to be made aware and trained as necessary of the hazards associated with the activities.
2. All site personnel will have read and be familiar with the CCC Site Safety protocol document and have completed the CCC site induction. All site personnel will sign in and out of the site each time personnel enter and leave the site.
3. No unauthorised persons shall be allowed within the work area during site activities.
4. Site personnel to be provided with appropriate PPE gear.
5. All activities to be planned and executed in a safe manner.
6. Near misses, incidents and accidents to be recorded and reported as necessary.
7. MEL to provide a first aid kit on site which is contained in the company vehicle and this is to be used as necessary.
8. In the event of an emergency, site personnel to contact and liaise with the project and site manager as to the appropriate action to be taken.
9. A Site Specific Risk Assessment and Method Statement briefing will be completed with Minerex and Arup personnel prior to works commencing.
10. Site personnel will each sign the Mission Statement document at the end of this Method Statement to signify agreement to the methods and health and safety regulations set out.

4.4 Personal Protective Equipment Requirements

All MEL and Arup staff has been issued with the following PPE:

1. Hard hat
2. Hi Vis Vest / coat
3. Safety boots (toe and mid-sole protection)
4. Gloves

4.5 Emergency numbers and procedure

In the event of an emergency, staff on site is to carry out the following (as contained in appendix D of the specification):

1. Contact the Cork Co. Co. and Arup representative.
2. Request emergency services on 999 or 112 and specify Fire Brigade, Garda or Ambulance Services and hang up last.
3. Provide the address or location where help is required.
4. Be as precise as possible to save time.
5. Request that the site contact place a delegated person in place to direct Emergency Services to scene of accident.

EMERGENCY CONTACT NUMBERS

Carrigaline Garda Station:	021-4919370
Carrigaline Fire Station:	021-4374147
Emergency Services:	999 or 112
Cork County Council Safety Dept:	021-4275770
Doctor O'Sullivan (Naval Base):	021-4864915
Medical admin office (Naval Base):	021-4864899
Duty medic (Naval Base)	021-4864899 (up to 16.20)
Duty medic (Naval Base)	021 4864920 (after 16.20)

4.6 Site-specific safety risks and associated mitigation measures

A more detailed risk assessment with associated mitigation measures is attached to this document (Appendix D). The main potential safety risks and associated mitigation measures are as follows:-

RISK - General trips, slips and falls
MITIGATION – Safe plans will be communicated to staff before work commences; hazards will be highlighted and spoken about to team members before / as work commences and agreements made; a first aid kit will be brought to the site.

RISK – Illness caused by contaminants or pathogens picked up during borehole works.
MITIGATION – Gloves will be work by all staff at all times and hand washing will be completed at the site compound before breaks are taken.

RISK - Others not currently anticipated
MITIGATION – Those risks, which have not been anticipated, will be discussed and safe plans agreed with site staff.

5. Mission Statement Agreement

Signatures here state that these persons have read and understood the above Mission Statement I and agree to adhere to the aforementioned methods and health and safety regulations.

Name	***Company Name***	***Signature***
Conor Quinlan	MEL	
Sven Klinkenberg	MEL	
Matteo Viganotti	MEL	
Javier Leonor	MEL	
Christopher Newton	Arup	
Alison Orr	Arup	

Appendix A

Map of Sampling Locations

A3

24/11/2014 14:52:43

SW6
BH201R
BH202
SW5
BH105A
BH206
BH207
BH106
BH107A
BH209R
BH208
BH213
SW4
BH211
BH215
BH217
BH216
BH218
BH112A
BH108
BH109
BH214
BH219
BH110A
BH212A
BH111
BH113
SW3
SW1
SW2

Legend

- Surface Water Locations
- Gas_monitoring_wells_2014
- Site Boundary
- Storm and process
- Storm
- Surface water and sanitary
- Clean water cooling
- Scale water overflow and surface water and sanitary
- Sanitary
- Sea water cooling

Issue	Date	By	Chkd	Appd
P0	06-01-2015	JO	OH	OH

ARUP

15 Oliver Plunkett Street
Cork
021-4223200
www.arup.com

Client
Cork County Council

Job Title
Haulbowline Steelworks Site Assessment

Metres
0 20 40 80

Proposed Surface Water Locations

Scale at A3
1:2,000

Job No	Drawing Status
235946-00	**Information**

Drawing No	Issue
SK-002	**P0**

\\crknts04\Cork_Jobs\235000\235946-00\4. Internal\4-03 Design\4-03-03 Infrastructure\GIS\02_Maps\MXD\140701_Haulbowlined.mxd

© Arup

A3

24/11/2014 14:52:43

BH102
BH201R
BH202
BH204R
BH105A
BH106
BH206
BH207
BH107A
BH209R
BH208
BH213
BH211
BH114
BH215
BH217
BH216
BH112A
BH218
BH108
BH109
BH214
BH219
BH110A
BH212A
BH111
BH113

Legend

- Ground Water Monitoring Well
- Site Boundary

Issue	Date	By	Chkd	Appd
P0	06-01-2015	JO	OH	OH

ARUP

15 Oliver Plunkett Street
Cork
021-4223200
www.arup.com

Client
Cork County Council

Job Title
Haulbowline Steelworks Site Assessment

Metres
0 20 40 80

Groundwater Monitoring Wells

Scale at A3
1:2,000

Job No	Drawing Status
235946-00	**Information**

Drawing No	Issue
SK-003	**P0**

\\crknts04\Cork_Jobs\235000\235946-00\4. Internal\4-03 Design\4-03-03 Infrastructure\GIS\02_Maps\MXD\140701_Haulbowlined.mxd

© Arup

A3

24/11/2014 14:52:43

SW6
BH201R
BH202
SW5
BH105A
BH206
BH207
BH106
BH107A
BH209RBH208
BH213
SW4
BH211
BH215
BH217
BH216
BH218
BH112A
BH108
BH109
BH214
BH219
BH110A
BH212A
BH111
BH113
SW3
SW1
SW2

Legend

- Surface Water Locations
- Gas_monitoring_wells_2014
- Site Boundary
- Storm and process
- Storm
- Surface water and sanitary
- Clean water cooling
- Scale water overflow and surface water and sanitary
- Sanitary
- Sea water cooling

Issue	Date	By	Chkd	Appd
P0	06-01-2015	JO	OH	OH

ARUP

15 Oliver Plunkett Street
Cork
021-4223200
www.arup.com

Client
Cork County Council

Job Title
Haulbowline Steelworks Site Assessment

Metres
0 20 40 80

Proposed Surface Water Locations

Scale at A3
1:2,009

Job No	Drawing Status
235946-00	**Information**

Drawing No	Issue
SK-002	**P0**

\\crknts04\Cork_Jobs\235000\235946-00\4. Internal\4-03 Design\4-03-03 Infrastructure\GIS\02_Maps\MXD\140701_Haulbowlined.mxd

© Arup

Appendix B

Chain of Custody Sheet template

CHAIN OF CUSTODY

CLIENT: Arup	If Electronic File Required please select file format below		SAMPLER: Conor Quinlan/ Matt Viaganotti
ADDRESS: 15 Oliver Plunkett Street, Cork, Ireland			MOBILE: 086 6048 127/ 086 6048 127
	EQUIS		EMAIL REPORT TO: Christopher.Newton@arup.com
PROJECT MANAGER (PM): Olivia Holmes	CROSSTAB		cc REPORT TO: olivia.holmes@arup.com
MOBILE: 00 353 21 422 3372	CLIENT		INVOICE TO: (if different to report) Cork County Council, County Hall, Carrigrohane Road, County Cork, Ireland
PROJECT ID: Haulbowline Steelworks Site	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)		QUOTE NUMBER: 5974 JL v2 / P.O No:
SITE: Haulbowline Island, County Cork			**ANALYSIS REQUIRED including SUITE names**

Jones Environmental Laboratory

Chain of Custody sheet page ..... of .....

TURNAROUND - please tick						**All waters -** tick for samples to be tested shaken or settled	**FOR LABORATORY USE ONLY**
10 DAY		4 DAY		Other	7		AVERAGE COOL BOX TEMP.(if required):
5 DAY		3 DAY					SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

Sample ID	**AGS SAMP TYPE**	**AGS SAMP REF**	Shaken	Settled	S/GW/SW /L/E/OW/P	Date	Time	Depth in Metres	Preser-vation	Asbestos risk: High	Asbestos risk: Medium	Asbestos risk: Low	TOC; Amm N – N; BOD; Cl; COD; EC; CCN; CN free; CN tot; F; NO3; NO2; pH; SO4; Sulphide; Tot S; Thio; Carb Alk; Metals low (DISSOLVED); Hg CVAF; Earth Metals (DISSOLVED); Exotics (Sn); Metals low (TOTAL); Hex Cr low (TOTAL); Salinity	spec phenol HPLC - low; TPH-CWG; PAH 16 low; PCB 7; VOC PT; SVOC + TICs; fuel MS;	TOC; Amm N – N; BOD; Cl; COD; EC; CCN; CN free; CN tot; F; NO3; NO2; pH; SO4; Sulphide; Tot S; Thio; Carb Alk; Metals low (DISSOLVED); Hg CVAF; Earth Metals (DISSOLVED); Exotics (Sn); Metals low (TOTAL); Hex Cr low (TOTAL); spec phenol HPLC – low; TPH-CWG; PAH 16 low; PCB 7; VOC PT; SVOC + TICs; fuel MS; Salinity	W Oil / age
													SUITE 1: 54 GW samples (27 Boreholes)	**SUITE 2: 48 GW samples (24 Boreholes)**	**SUITE 3: 12 SW samples (6 sampling pts)**	**SUITE 4: 3 GW samples (3 Boreholes)**

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required.
WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

RELINQUISHED BY:		**RECIEVED BY:**		**METHOD of SHIPMENT**
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.
Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

Appendix C

Sampling Schedule

Mondat 13th Individual Site Schedules

MATTEO	BH	Depth	JAVI	BH	Depth	CHRIS	BH	Depth	ALISON	BH	Depth	CONOR	BH	Depth
8-8:30			8-8:30			8-8:30			8-8:30			8-8:30		
8:30-9			8:30-9			8:30-9			8:30-9			8:30-9	BH217*	2.5
9-9:30	BH112A	6.45	9-9:30	BH211	1.5	9-9:30	BH208	2.85	9-9:30	BH109	6.9	9-9:30	BH202	2.43
9:30-10	BH113	6	9:30-10	BH207	5.15	9:30-10	BH102	7.95	9:30-10	BH204R	5.5	9:30-10	S	
10-10:30	BH106	4.8	10-10:30	BH206	7.65	10-10:30	BH209R*	9	10-10:30	BH214**	8.6	10-10:30	S	
10:30-11	BH114	5.31	10:30-11	BH212A	7	10:30-11	BH110A	7.35	10:30-11	BH107A	10.4	10:30-11	BH218	3.5
11-11:30	BH111	4.25	11-11:30	BH215	4.35	11-11:30	BH202	2.43	11-11:30	BH213	5.85	11-11:30		
11:30-12	BH219	3.25	11:30-12	BH108	5.45	11:30-12	BH217*	2.5	11:30-12	BH201-R?	8.5	11:30-12		
12-12:30	BH216	3	12-12:30			12-12:30			12-12:30	BH105A	3.4	12-12:30		
12:30-1			12:30-1			12:30-1			12:30-1			12:30-1		
1-1:30			1-1:30			1-1:30			1-1:30			1-1:30		
1:30-2			1:30-2			1:30-2			1:30-2			1:30-2		
2-2:30			2-2:30			2-2:30			2-2:30			2-2:30		
2:30-3			2:30-3			2:30-3			2:30-3			2:30-3		
3-3:30	BH112A	6.45	3-3:30	BH211	1.5	3-3:30	BH209R*	9	3-3:30	BH109	6.9	3-3:30	S	
3:30-4	BH106	4.8	3:30-4	BH207	5.15	3:30-4	BH102	7.95	3:30-4	BH204R	5.5	3:30-4	S	
4-4:30	BH114	5.31	4-4:30	BH206	7.65	4-4:30	BH113	6	4-4:30	BH214**	8.6	4-4:30	S	
4:30-5	BH111	4.25	4:30-5	BH212A	7	4:30-5	BH201-R?	8.5	4:30-5	BH107A	10.4	4:30-5	BH218	3.5
5-5:30	BH215	4.35	5-5:30	BH110A	7.35	5-5:30	BH219	3.25	5-5:30	BH213	5.85	5-5:30		

Appendix D

Risk Assessments

SSRA
Rev 8

ARUP

Staff Safety
Site Specific Risk Assessment (SSRA) Form

Job No.	235946
Date:	09-01-2015
Prepared by:	Alison Orr

Note 1: This form is used to carry out a Site Specific Risk Assessment (SSRA) prior to site visits. It is intended to supplement the Site Risk Assessments included in the Arup Safety Statement.
Note 2: Based on the conditions on the site and the level of training and experience of the staff carrying out the site visit, this form may be used by Project Managers and staff visiting site to document the risk assessment prior to site visit (see also IP1-Safety of Staff on Site).
Note 3: It is mandatory to complete a Site Specific Risk Assessment (SSRA) for the scenarios listed in Table 1 on the following page and when transition year students or other students or persons under 18 years of age visit sites. For visits undertaken by transition year students or other students or persons under 18 years of age, the SSRA must be completed in conjunction with the local Safety Officer. Such students should be accompanied by an Arup staff member during site visits.
Note 4: It is Arup policy that expectant mothers do not participate in site visits to construction or production sites.

1. What is the site, what is the purpose of the site visit, what activities will be carried out by the Arup and Minerex employees?

   Site visit to Haulbowline Former Steelworks site to complete groundwater sampling on 27 no. groundwater monitoring wells and surface water sampling from 6 no. locations in the harbour around the perimeter of the Site, as per the details of the Method Statement

2. Describe any Site Specific Risks ***not*** addressed in the Arup Safety Statement ***or*** if appropriate provide additional information on known Site Specific Risks present on the site (see Checklist in Table 2 on the following page)

   All site specific risks are described in the Cork County Council Haulbowline Steelworks Site Assessment Project Site Safety Protocol
   Additionally, contact with hydrocarbons and contaminated groundwater as a result of sampling.
   Working in reduced daylight conditions.

3. What particular measures or mitigation will be employed by the Arup employee to avoid the hazards and stay safe?

   The site rules contained in the Cork County Council Haulbowline Steelworks Site Assessment Project Site Safety Protocol **will be adhered to at all times**
   Cover all skin to prevent contact with contaminated water and hydrocarbons.
   Carry fresh water to wash away **and** contaminated water or hydrocarbons which makes contact with skin
   Personnel working adjacent to the water edge will wear safety harness connected to a fixed anchor point
   Provision of adequate temporary lighting during sampling of boreholes in reduced daylight conditions.

4. Is there any co-ordination required with third parties, e.g. the site owner or manager?

   The site is controlled by Cork County Council. Prior to any works commencing on site Arup and Minerex personnel will be required to attend a site induction by Cork County Council and will be required to work in accordance with the Cork County Council Site Protocol.
   Arup and Minerex personnel to sign in and out of site at all times when entering and leaving the site.
   Coordination is required with Cork County Council site personnel.

5. Is lone working required? Has the Arup Lone Working Procedure (IP11) been considered?

   No

6. Consider the experience/competency of staff visiting the site. Is there any additional training required for the employee, due to the site specific risks?

   No

7. What PPE is required? (See Table 3 for a list of PPE that might be required)

   Hard hat, HI-visibility vest, protective footwear, gloves

8. Record names, dates and signature of relevant staff once they have received appropriate briefing / training/ equipment.

Name	Date	Signature
ALISON ORR	9-1-15	
CHRISTOPHER NEWTON	"	

Project Manager: OLIVIA HOLMES — Date: 9-1-15

Circulation: Project Director, Local Safety Officer and all above named Staff

Table 1: Mandatory SSRA List

SSRA must be completed where Arup employee may be exposed to risks from the following site activities:
Demolition work, e.g. where the Arup employee may be inspecting or advising closely on site regarding demolition
Work On, Over or Near Water, e.g. where the Arup employee may be carrying out a survey beside a river or working on a boat
Live Electrical Equipment e.g. where employees may be inspecting existing electrical installations such as Motor Control Panels
Work on Roadways e.g. where the Arup employee may be required to carry out works on public roadways
Contaminated Sites and buildings, e.g. where the Arup employee may be involved in a contamination survey or contamination removal project, recently flooded sites, fire-damaged sites or similar
Lone Working in remote or isolated sites, e.g. where the Arup employee may be working alone in remote sites (refer to Arup Lone Working Policy)
Agricultural Land where livestock may be present, e.g. where the Arup employee may be entering sites where livestock could be present (N.B. Consent must always be obtained from the Landowner but accessing such lands should be avoided if possible)
Helicopter Journeys and Offshore Work, e.g. where the Arup employee is travelling by boat or helicopter to offshore platforms
Derelict Buildings, e.g. where the Arup employee is entering a derelict building to carry out a condition survey
Flooded Site e.g. where the Arup employee is attending a site which is flooded, river banks are burst, high tidal flows etc.
Asbestos e.g. where the Arup employee is attending a site which contains asbestos containing materials that present a hazard of exposure (N.B. refer to Arup Asbestos Awareness procedure)
Works on roadways e.g. where the Arup employee is carrying out investigations of signage, structures, cabling etc.
Mobile Elevated Working Platforms (MEWPs) and other significant work at heights e.g. where the Arup employee may be required to work at heights in MEWPs and other working platforms. Only trained personnel are to operate the MEWP.
Transition year and work experience students e.g. where a student accompanies an Arup employee to site (N.B Students must not carry out lone working or attend a site alone)
High voltage power lines present
Working in confined space - only personnel with the required training are permitted to work in a confined space

Table 2: Risks to be Considered (not exhaustive)

Is there demolition being carried out on site? To whom should visitors report to prior to entering the site?
Will the site visit require work on, near or over water? What measures should be put in place to ensure safe work?
Will the Arup employee be exposed to contact with electrical equipment carrying greater than 50 volts? What co-ordination is needed with the electrical manager of the site?
Is there safe site access?
Is there a risk of exposure to hazardous substances such as asbestos or contaminated land? Will the Arup employee be exposed to the hazard by the nature of the work, e.g. taking soil samples, disturbing pipe insulation during visual inspections?
Will the Arup employee be working alone? What precautions are required if so?
Is there a risk of exposure to hazard by livestock or animals?
Does the site visit involve travel offshore? Is there helicopter travel involved?
Is there a risk of exposure to Weil's disease or other biological agents?
Is there a potential for slips/ trips/falls? – open holes, steep slopes etc
Are there areas of confined access?
Does the work require specialist access equipment? – Ladders, scaffold towers, mobile plant, MEWPs?
Does the work involve access onto existing roofs or areas at high level? Is there edge protection present in these high areas? Are there fragile roof materials present?
Are there safe walking areas available with non-slippery surfaces?
Are there unsafe structures onsite e.g. derelict buildings subject to collapse?
Does the site lack control by the owner/ contractor?
Is there a potential for violence?
Does the work involve access to a highway / road?
Are First Aid and welfare facilities available?

Table 3: Personal Protective Equipment Checklist

Hard hat	Ear protection
High visibility vest / jacket	Gas detector / Respiratory protection
Protective footwear	Life jacket
Safety glasses/ Goggles	Mobile phone or Radio (where appropriate)
Gloves	Other case specific

MINEREX RISK ASSESSMENT AND MITIGATION MEASURES FOR ACTIVITES / TASKS CONDUCTED

RISK MATRIX

Likelihood X Consequence = Risk

Likely Target of the Risk	CONSEQUENCE / SEVERITY / IMPACT SCORE ASSOCIATED WITH HAZARD				
		3 = High eg Loss of life, permanent disability / Major injury, Extensive loss of plant, equipment or property.	**MEDIUM RISK (1 x 3 = 3)**	**HIGH RISK (2 x 3 = 6)**	**HIGH RISK (3 x 3 = 9)**
		2 = Medium eg Serious Injury or illness / temporary disability.	**LOW RISK (1 x 2 = 2)**	**MEDIUM RISK (2 x 2 = 4)**	**HIGH RISK (3 x 2 = 6)**
		1 = Low eg Some damage to plant, equipment or property, Minor / non disabling injury or illness, Minor disruption to plant, equipment or	**LOW RISK (1 x 1 =1)**	**LOW RISK (2 x 1 = 2)**	**MEDIUM RISK (3 x 1 = 3)**
			1 = **Improbable**	2 = **Occasional.**	3 = **Frequent**
			LIKELIHOOD / PROBABILITY OF OCCURRENCE SCORE		

PPE recommended (Y = Yes)

Minerex Staff	Other site personnel	General public	Potential Hazard	Hazard Consequence	Unmitigated Risk = Likelihood X Consequence (ie R = L x C)				Planned Actions to mitigate risk.	Residual Risk			Hard hat / helmet	High-Vis jacket or vest	Boots - Steel toe capped and steel insoled / arched water proof rubber boots (wellingtons) when wet underfoot	Boots - Steel toe capped laced ankle boots for dry work	Gloves - Rubber - wrist length	Gloves - Gauntlet - elbow length	Gloves - Latex (ivory colour) or Nitrile (blue colour)	Gloves - General purpose (Dry work)	Gloves - Long sleeved heat resistant	Gloves - Cut resistant	Work pants	Work jacket	Ear protection	Eye protection - Glasses	Face protection	Respiratory (lung) protection - Half mask respirator	Respiratory (lung) protection - Full mask respirator	Buoyancy aid	Harness	Wetsuit	Acid resistant clothing - Overalls (blue) - Disposal	Acid resistant clothing - Apron (black)
					Likelihood (L)	Consequence (C)	Risk (R) (Likelihood x Consequence = Risk)			L	C	R																					
y			**Working in, on or around the harbour wall and surface ponds**	Personal Injury	2	3	6	1	Pre-work briefing and awareness through induction.	1	3	3	Y	Y		Y							Y	Y	Y	Y					Y				
y								2	Correct use of PPE. Including lifejacket and harness for all staff working near quay walls. Harness will be secured to a suitable anchor point as approved by CCC.																								
y								3	Communicate with Port staff during ship docking or loading operations at all times to assess safe areas and path ways and make them aware of your presence.																								
y								4	Place hazard tape (red and white plastic tape) and erect barriers and signage appropriate to the type of site, activities on site, temporary nature of site or otherwise and experience of persons on and around the contaminated site.																								
y			**Manual handling of heavy equipment, materials and tools, with or without others assisting.**	Personal Injury	2	2	4	1	Ensure staff have HAS approved, Kinetic training (Manual Handling) and employ teamwork techniques to reduce risk of injury.	1	2	2		Y		Y	Y						Y	Y											
y								2	Use of mechanical aids or machinery where present and helpful instead of manual lifting.																								
y								3	Correct use of PPE (e.g. gloves).																								
y			**Injury incurred as a result of falling materials.**	Personal Injury	2	2	4	1	Safety footwear, hard hat, glasses, protective clothing to be worn at all times.	1	2	2	Y	Y		Y							Y	Y										
y								2	Awareness of scaffolding and other overhead activities eg demolition. Site will only be entered if considered safe by the Minerex superviser.																								
y			**Lack of or inadequate communication and clarity between team members while carrying out very safety sensitive tasks.**	Personal Injury	3	2	6	1	Supervisors to fully brief site teams regarding planned works and have tool box talks and Questions and Answers sessions as considered necessary.	1	2	2											Y	Y										
y								2	Staff must be made aware of the public in and around the works area.																								
y								3	Plant must only be moved with a Banksman in place (e.g. lifting tank with crane).																								
y								4	Works area must be secured with hand barriers (e.g. top of tanks) and appropriate safety signage.																								
y			**Medical emergency situation on site.**	Obstruction of emergency services	1	2	2	1	In the event of emergency all pedestrian walkways and vehicular routes must be cleared immediately.	1	2	2		Y									Y	Y										
y								2	Plant must be parked in a safe area leaving clear access / egress routes for emergency service access.																								
y			**Slips, Trips & Falls**	Personal Injury	2	2	4	1	A clear, safe walkway around works must be kept at all times.	1	1	1	Y	Y	Y	Y	Y						Y	Y							Y			
y								2	Staff should avoid walking close to bench / cliff / ridge edges.																								
y								3	No materials are permitted to be stored where members of public are likely to be walking.																								
y								4	When working at heights always risk assess each task and employ the relevant safety procedures.																								
y								5	Public should be segregated from the works area.																								
y			**Contracting Weils Disease while working on sites where rats may have been present.**	Personal Injury	1	2	2	1	Staff to wear gloves during excavation operations.	1	2	2					Y		Y				Y	Y										
y								2	Wash hands prior to eating.																								
y								3	Staff will bring first aid kit and know how to use it.																								
y								4	Ensure all cuts / open wounds are covered.																								

MINEREX RISK ASSESSMENT AND MITIGATION MEASURES FOR ACTIVITES / TASKS CONDUCTED

RISK MATRIX

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		2 = Medium eg Serious Injury or illness / temporary disability.	**LOW RISK (1 x 2 = 2)**	**MEDIUM RISK (2 x 2 = 4)**	**HIGH RISK (3 x 2 = 6)**
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Minerex Staff	Other site personnel	General public	Potential Hazard	Hazard Consequence	Unmitigated Risk = Likelihood X Consequence (ie R = L x C) Likelihood (L)	Consequence (C)	Risk (R) (Likelihood x Consequence = Risk)		Planned Actions to mitigate risk.	Residual Risk L	C	R	PPE recommended (Y = Yes) Hard hat / helmet	High-Vis jacket or vest	Boots - Steel toe capped and steel insoled / arched water proof rubber boots (wellingtons) when wet underfoot	Boots - Steel toe capped laced ankle boots for dry work	Gloves - Rubber - wrist length	Gloves - Gauntlet - elbow length	Gloves - Latex (ivory colour) or Nitrile (blue colour)	Gloves - General purpose (Dry work)	Gloves - Long sleeved heat resistant	Gloves - Cut resistant	Work pants	Work jacket	Ear protection	Eye protection - Glasses	Face protection	Respiratory (lung) protection - Half mask respirator	Respiratory (lung) protection - Full mask respirator	Buoyancy aid	Harness	Wetsuit	Acid resistant clothing - Overalls (blue) - Disposal	Acid resistant clothing - Apron (black)
y			**Working on sites / away from office by oneself.**	Personal injury	3	1	3	1	Hazards will be highlighted and spoken about to team members before and during the work and the mitigation measures to reduce risk.	3	1	3		Y								Y	Y											
y								2	A mobile phone will be carried with the staff member wherever they go and emergency contacts will be placed in health and safety sections of the site specific method statements and / or on fieldsheets used for the work.																								
y								3	Safe work plans will be discussed and agreed before work commences including having regular ring in times / reporting times (unless otherwise agreed this will be necessary just before going onto site and just before leaving site) to discuss work progress and associated safety aspects with clients' representative and / or Minerex staff.																								
y								4	No unnecessary risks will be taken. For example, during poor weather conditions such as high winds and heavy rainfall, the work programme and schedule will be reassessed with the project manager and changed as necessary to take into consideration the weather conditions.																								
y								5	Hazardous routes will be avoided and no unnecessary risks taken.																								
y								6	Attend the clients's site induction programme and follow the any guidance, advice and policy given / stated.																								
y								7	Work will cease on site at such time as to allow the person reach their evenings destination safely without being unreasonably tired. This is pursued in order to reduce the risk of accidents due to tiredness.																								
y								8	In general, no work will be conducted after dark and an assessment will be made at the end of the site regarding driving back from site or staying in accommodation locally.																								
y			**Working around or within sumps, trial pits, slit trenches, any kind of excavations, tanks and drains with or without water in. Also slipping and falling off piers and docks. Also working with moderately pressurised water hoses that burst or come undone from connections.**	Personal injury	1	2	2	1	Safe plans will be communicated to relevant staff before work commences.	1	2	2	Y	Y	Y	Y	Y					Y	Y				Y	Y	Y				
y								2	Adequate lighting will be arranged for twilight hours eg head torches will be provided to free up hands for safe working.																								
y								3	Welded ladders or ladders with hooks and hand rails will be provided for access to tops of settlement tanks. Also the tops of the tanks will be provided with welded gratings underfoot.																								
y								4	Hazards will be highlighted and spoken about to team members before / as work commences.																								
y								5	Hazardous routes will be avoided and no unnecessary risks taken.																								
y								6	Mobile phone will be carried with person wherever they go and emergency contacts will be placed on MEL contacts list (off-049.xls).																								
y								7	Buoys, harnesses, floatation devices, wet suits and / or life vests will be worn as appropriate. A life jacket will be worn at all times when working near deep water or where excavations possess >0.5m standing water.																								
y								8	Excavations will not be entered without risks of collapse being assessed and considered low with relevant safety personnel. If pit is required to be entered, then shoring up of sides will be done where risk of collapse is consider moderate or greater.																								
y								9	Hazard areas will be cordoned off with cones and warning tape or fencing depending on nature of site and hazard. Warning signs will be placed in prominent positions as considered necessary and client site inductions will be attended and safety procedures followed.																								

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PPE recommended (Y = Yes)

Minerex Staff	Other site personnel	General public	Potential Hazard	Hazard Consequence	Unmitigated Risk = Likelihood X Consequence (ie R = L x C) Likelihood (L)	Consequence (C)	Risk (R) (Likelihood x Consequence = Risk)		Planned Actions to mitigate risk.	Residual Risk L	C	R	Hard hat / helmet	High-Vis jacket or vest	Boots - Steel toe capped and steel insoled / arched water proof rubber boots (wellingtons) when wet underfoot	Boots - Steel toe capped laced ankle boots for dry work	Gloves - Rubber - wrist length	Gloves - Gauntlet - elbow length	Gloves - Latex (ivory colour) or Nitrile (blue colour)	Gloves - General purpose (Dry work)	Gloves - Long sleeved heat resistant	Gloves - Cut resistant	Work pants	Work jacket	Ear protection	Eye protection - Glasses	Face protection	Respiratory (lung) protection - Half mask respirator	Respiratory (lung) protection - Full mask respirator	Buoyancy aid	Harness	Wetsuit	Acid resistant clothing - Overalls (blue) - Disposal	Acid resistant clothing - Apron (black)
y								10	The position of gate values will be known in advance and should a pipe burst or connection leak the valve can be turned off and the repair made without having to deal with the water hazard. Also the connections will be secured after being heated up and tightened around snap lock etc with jubilee clips.																									
y								11	The person will inform team and local personnel as necessary of daily plans and specify ring/text in times.																									

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y			**Sampling, transportation, and disposal of potentially contaminated materials**	Affecting Skin / Inhalation / Eyes / Ingestion (accidental)	3	2	6	1	Wear appropriate PPE equipment which comprise a selection of glasses, gloves, disposal suits, half mask respirator especially where vapours are significant and unpleasant and might affect a persons welfare.	1	2	2		Y	Y		Y		Y	Y			Y	Y		Y									
y								2	Work in well ventilated areas.																										
y								3	Wash hands prior to eating.																										
y								4	Seal sample containers and store safely (if sit has licence to do so) by protecting the containers from damage.																										
y								5	Transportation and disposal of the waste and containers should be carried out by a suitably licenced haulier and waste disposal contractor, and if it has to be carried in the compamy vehicles and if the volumes are relatively small then make sure the material is well secured in the vehicle, adequately sealed and there is sufficient ventiliation.																										
y			**Use of Minerex vehicle on any site**	Personal Injury, death or damage to property through accidents involving vehicles.	2	3	6	1	Any Minerex vehicle brought onto site should have a revolving hazard beacon on the roof so that drivers and those not using vehicles can be alerted to the vehicle on the site and take precautions as necessary. The beacon can be powered by the 12v cigarette lighter socket in the dash.	1	3	3	Y	Y		Y							Y	Y	Y	Y									
y								2	The driver should at all times be aware of the construction traffic around him, follow right of way siganage etc, follow the designated routes that can be taken, and any restrictions on activities that can be conducted, as instructed by the Site Manager / Site Safety Manager.																										
y								3	Areas where materials can be placed and where activities relevant to Minerex work can be carried out should be clarified with Site Management at the time of induction.																										
y								4	The line of site through all glass windows in the vehicle should not be impaired to the extent that safety and good judgement puts the vehicle, the driver and others at unnecessary risk. To that end, windows should be kept relatively clear and clean, and washed /cleaned down as necessary.																										
y								5	All road sign warnings should be heeded and speed restrictions followed.																										
y	y		**Physical violence, verbal abuse and theft by members of the public.**	Personal Injury, death or damage to property through accidents with or without vehicles being involved.	2	3	6	1	Work in pairs , remain calm and non-reactionary.	1	3	3	Y	Y		Y							Y	Y	Y	Y									
y	y							2	All vehicles to remain locked and equipment to be stored within vehicles when not in use.																										
y	y							3	Safety cordon and signage to be in place around working area and extended as considered helpful to the situation.																										
y	y							4	The Client's project engineer to be consulted and a decision may be taken that they should communicate with the public in an attempt to dissipate the issue.																										
y	y							5	Staff should have local Garda station phone numbers stored in mobile phones and Garda should be called as necessary.																										
y	y		**Gases harmful to human health, for example, Hydrogen Sulphide (H_2S), Methane (CH_4) and Carbon Monoxide (CO).**	Personal injury or death through inhalation.	2	3	6	1	Wear appropriate PPE equipment. If an half mask respirator is deemed necessary for use depending on concentrations and conclusions drawn in the site specific method statement, then it should have the appropriate Hydrogen sulphide and other gas removal / reduction filters (and spares) at all times. The dates that filters are placed on respirators should be written with indellibel ink on the filters together with any best before dates and dates and durations filters have been used and initials of Minerex personel.	1	3	3	Y	Y		Y							Y	Y	Y	Y		Y						

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y	y							2	Carry a personal gas detection meter with appropriately set alarms or use the GA 2000 or GA 5000 instruments as an early warning. If the concentrations exceed the recommended ambient guidance for workers then leave the area where the concentrations exist and employ mitigation measures after consulting the Minerex team.																								
y	y							3	Work in pairs on the site initially until an approved procedure can be established which reduces risk to acceptable levels.																								
y	y							4	Inform Minerex team and client when and where you will be, and what time you are starting and finishing.																								
y	y							5	Know the explosive limits and health and safety limits and consult the site specific method statement including risk assessment																								
y	y							6	Spend as little time as possible directly next to gas source by careful planning of the work, having the right equipment, tools and materials.																								
y	y							7	When removing the bung from well head, do without delay and move away from well head to allow any gas build-up to vent off for a couple of minutes before dipping.																								
y	y							8	Work only in well ventilated areas upgradient of the gas source.																								
y	y		**Working on and around the steelworks sitewhere there could be needles, sharp metal objects, uneven surfaces, contaminated surface and groundwater, methane gas, ponds, ditches, drains and rivers.**	Personal injury	2	3	6	1	Follow the risk assessment sections in this document especially planned actions to mitigate risk where there is a risk of gas inhalation, when one is working alone, when one is working beside water ways and where there is a risk of weils disease.	1	3	3	Y	Y	Y	Y			Y	Y	Y		Y	Y	Y	Y		Y		Y				
y	y							2	Wear the appropriate PPE as specified on the right hand side of this document.																								
y	y							3	Wash hands prior to eating.																								
y	y							4	Work in pairs on the site initially until an approved procedure can be established which reduces risk to acceptable levels.																								
y	y							5	Inform Minerex team and client when and where you will be, and what time you are starting and finishing.																								

Cork County Council

Haulbowline Steelworks Site Assessment

Method Statement for Water Sampling at Haulbowline

REP/1

Draft 1 | 20 January 2015

Draft

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 235946-00

Ove Arup & Partners Ireland Ltd

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ARUP

Document Verification

ARUP

Job title		Haulbowline Steelworks Site Assessment			**Job number** 235946-00
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Draft 1	20 Jan 2015	**Description**	First draft		
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		Name	Padraig Coakley Kieran O'Shea Olivia Holmes	Olivia Holmes	Sean Mason
		Signature			
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		Name			
		Signature			
		Filename			
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		Signature			
				Issue Document Verification with Document	✓

Draft

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Appendices

Appendix A

Map of Sampling Locations, Photographs and Site Access Routes

Appendix B

Chain of Custody Sheet Template

Appendix C

Mobile Man-anchor Details

Draft

Appendix D

Risk Assessments

Draft

1 Introduction

1.1 Proposed Activities

This method Statement has been prepared to set out in detail (including all necessary safety measures and considerations) how the following works will be carried out:

- Collection of 12 no. seawater samples from quay walls around or adjacent to the Haulbowline Steelworks Site.

The works are being carried out by Arup as part of the Haulbowline Steelworks Site Assessment project. The samples will be collected on site and then shipped to a laboratory for testing. The results of the tests will feed into the Arup technical assessments as part of this project.

In general terms the samples are to be collected by the dipping of a collection bucket/sample taker into the sea at each collection point and the decanting of the seawater sample into a sterile sample bottle which will be transported to the laboratory. There is no intrusive work required (e.g. excavation or installation of bolts/rods/anchors, etc.).

Arup considers that this work falls under the heading "site survey" and that it does not constitute "construction work" as defined in the 2013 Construction Regulations.

It is intended that the works will be completed in one day. Samples are required from each location around high tide and low tide, therefore there are two "sets" of samples to be taken. The tide times are as follows for 26 January at Cobh:

- High tide: 09.37
- Low tide: 16.06

1.2 Location of the Sampling Points

The sampling locations are indicated on the site plan contained in Appendix A. Further information is provided on each location in Section 2 below.

1.3 Personnel

The personnel who are proposed to take part in these works are:

- Arup Works Leader – Kieran O'Shea
- Assistant Safety Officer – Darragh McCormack
- Sampling Technician – John O'Donovan, Arup

(Two personnel from the following Minerex personnel will take part in the works)

- Sampling Technician – Metteo Viganotti, Minerex
- Sampling Technician – Sven Klinkenbergh, Minerex
- Sampling Technician – Javier Leonor, Minerex

- Minerex Project Director – Cecil Shine, Minerex

Kieran O'Shea is a senior health and safety consultant with Arup and is an experienced site supervisor for large infrastructural projects – Kieran will lead the Arup team on the site for the day. Kieran is familiar with the site and has previously assisted in drafting the general site risk assessment (previously completed by Arup for CCC).

Arup are engaging the services of Minerex to act as sub-consultants on this work. Minerex have access to the necessary sampling equipment, chemicals, cleaning solutions etc. for the work and will provide two sampling technicians from the Minerex personnel listed above who will work under the control of Arup on the site.

Minerex have entered into a sub-consultancy agreement with Arup and are working under the control and supervision of Arup for the works.

1.4 Summary Overview of the Activities in the Works

A general summary overview of the proposed activities is provided as follows:

1. Arup complete the risk assessments and prepare the method statement (this document) after careful consideration of all the specific site issues and safety issues.
2. Arup issue the MS and RA to CCC in advance of the works for their information/approval (note: Arup retain responsibility for executing the work safely). Arup receive permission from CCC for the work to proceed.
3. Arup carry out a pre-visit safety meeting with the Arup site team, talking through the following documents:
   - Method Statement and Risk Assessments,
   - CCC Site Safety Protocol document
   - CCC Site Risk Assessment document
   - One-page CCC Induction sheet

   Ensure that all Arup team are clear on all aspects of their activities, the safety issues involved, the hazards and the proposed mitigation measures. All Arup team members sign of the Arup MS and RA.
4. Ensure that all equipment which is to be used in the work is ready and packed for transport to the site on the morning of the work.

   If necessary, transport any equipment to the site the working day before the work (i.e. Friday, 23 January), arrange drop-off and storage details in advance with CCC.
5. Report to site at 8.00am on the morning of the works. Receive CCC induction. Sign in as necessary (and sign out subsequently as necessary).
6. Carry out Arup Toolbox-talk to go over the specific safety issues related to the work once more.
7. Commence the work. Carry out the actual sampling in accordance with the detailed section below.

8. Survey sampling locations with a handheld GPS.
9. Organise the storage of the collected samples and the transportation to the laboratory as required.
10. Once the work is complete, sign out and leave the site.

2 Water Sampling – Detailed Methodology

2.1 Sampling Equipment

1. The types of containers required for each type of analysis are itemised in a Chain of Custody (C-of-C) form generated by Arup. Refer to Appendix B.
2. The analysing laboratory has supplied bottles for the sampling event to Arup/Minerex.

2.2 Sequential Actions – High Tide

1. The team will commence the sampling works on completion of the CCC site induction, method statement/risk assessment review and toolbox talk meeting. The central sample collection station will be set up at an agreed location with CCC. The necessary collection equipment will be placed here. The team will get their bearings, set up their equipment and prepare to start taking samples.
2. The nature of this task requires staff to work near quay walls. Having inspected the six sampling points, three of them have been found to have existing safety railings and three are unprotected as per the table below. We consider that it will be necessary to use a safety harness (tied to an anchor point) at the three unprotected sites (but not at the other three sites).
3. For works taking place near unprotected quay walls, a "mobile man anchor" system will be used to tie the safety harness to (see details in Appendix C). The mobile anchor point will be assembled at each point by KOS and DMcC, prior to use by the sampling staff. The mobile anchor point will be moved in small sections from point to point by KOS and DMcC, who are fully trained in manual handling. The maximum weight of any section is 28kg. The anchor pieces will either be moved by wheelbarrow and by foot, from the initial drop off point along the designated safe paths, as set out in the site safety protocol to the sampling locations at SW3, SW4 & SW5.

   The length of the harness/lanyard will be set at approximately 2.5 metres and the location of the mobile anchor point at each site will be approximately 3.2 meters from the edge of the quay wall. The mobile anchor point will be set up at SW3 prior to the start of any sampling (i.e. at approximately 08.45).
4. The following is the proposed sequence of high-tide sample taking:

Location by time of sample	Proposed Time	Existing Safety Rail?	Harness and Anchor Required?
SW1	09.00	Yes	No

Location by time of sample	Proposed Time	Existing Safety Rail?	Harness and Anchor Required?
SW3	09.20	No	Yes
SW2	09.40	Yes	No
SW4	10.00	No	Yes
SW6	10.20	Yes	No
SW5	10.40	No	Yes

5. The first site is **SW1**. Because there is a 1.0m wide footpath at this location, it is not considered necessary to deploy active traffic management measures for the sampling activity.

   The sampling task is of short duration.

   All staff will wear high-visibility vests and take all due care and attention on the roads.

   The sampling will be carried out by the sampling personnel using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. When the sampling at **SW1** is complete, the sampling team will proceed to **SW3**.

   KOS/DMcC will go with the sampling staff to **SW3** to ensure that they harness up correctly to carry out the sampling there.

6. The samplers will go to location SW3 and harness up and take the sample there using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod.

7. Once this has been completed, the sampling team will go to **SW2** and take the sample there using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. There is a grass verge here which means that it is not considered necessary to deploy active traffic management measures for the sampling activity.

   In the meantime KOS and DMC will move the mobile anchor point to location **SW4**. The samplers will then take the sample at SW4 using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. Access to this area is controlled by the Navy – an arrangement with CCC will be made by Arup in advance to facilitate entry by the sampling team to this location.

8. Once SW4 is done, the sampling team will proceed to site **SW6** and take the sample there using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod from behind the railing. Access to this area is controlled by the Navy – an arrangement with CCC will be made by Arup in advance to facilitate entry by the sampling team to this location.

9. In the meantime, KOS and DMcC will move the mobile anchor point to location **SW5**. Access to this area is controlled by the Navy – an arrangement with CCC will be made by Arup in advance to facilitate entry by the sampling team to this location.

10. When the samplers are finished at SW6 they will proceed to **SW5** and take the sample using sections of 50mm ID diameter 3m long screw jointed flush

threaded pipe and a 12v pump or a 5m length sampler rod. This will be the last sample for the high tide set. The mobile anchor point will be moved to location SW3 after this sample, in preparation for the low-tide set to be taken later in the day.

11. **Relating to all samples** - Wearing disposable gloves, each bottle will be filled. Ensure that no air bubbles are entrapped within the bottle, tapping the sides to dislodge those trapped on the sides. Rinse all caps before use. Plastic bottles may be gently squeezed when screwing on cap to raise the meniscus to ensure an air tight seal. Attempt to fill the sample bottle whilst submerged in the water if sufficient depth is available.
12. EC, pH, temperature and Dissolved Oxygen will be measured and recorded onsite.
13. Decontaminate all equipment used during the procedure between sampling points in accordance with best practice.
14. Wipe and label bottles and containers and put them into a coolbox, with ice packs to ensure samples are kept at 4°C.
15. The samples are packaged for transportation on site and dispatch as soon as possible to analysing laboratory.
16. Notify Cork County that sampling operation is complete for high-tide se.

2.3 Sequential Actions – Low Tide

1. The same sequence followed when taking samples at high tide earlier in the day will be followed when taking samples at low tide. Low tide sampling will commence at approximately 15.15 and the sampling team will be prepared in advance to start taking the samples.
2. The nature of this task requires staff to work near quay walls. Having inspected the six sampling points, three of them have been found to have existing safety railings and three are unprotected as per the table below. We consider that it will be necessary to use a safety harness (tied to an anchor point) at the three unprotected sites (but not at the other three sites).
3. For works taking place near unprotected quay walls, a “mobile man anchor” system will be used to tie the safety harness to (see details in Appendix C). The mobile anchor point will be assembled at each point by KOS and DMcC, prior to use by the sampling staff. The mobile anchor point will be moved in small sections from point to point by KOS and DMcC, who are fully trained in manual handling. The maximum weight of any section is 28kg. The anchor pieces will either be moved by wheelbarrow and by foot, from the initial drop off point along the designated safe paths, as set out in the site safety protocol to the sampling locations at SW3, SW4 & SW5.
4. The length of the harness/lanyard will be set at approximately 2.5 metres and the location of the mobile anchor point at each site will be approximately 3.2 meters from the edge of the quay wall. The mobile anchor point will be set up again at SW3 following the completion of the sampling at high tide in preparation for sampling at low tide.
5. The following is the proposed sequence of low-tide sample taking:

Location by time of sample	Proposed Time	Existing Safety Rail?	Harness and Anchor Required?
SW1	15.00	Yes	No
SW3	15.20	No	Yes
SW2	15.40	Yes	No
SW4	16.00	No	Yes
SW6	16.20	Yes	No
SW5	16.40	No	Yes

6. The first site is **SW1**. Because there is a 1.0m wide footpath at this location, it is not considered necessary to deploy active traffic management measures for the sampling activity.

   The sampling task is of short duration.

   All staff will wear high-visibility vests and take all due care and attention on the roads.

   The sampling will be carried out by the sampling personnel using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. When the sampling at SW1 is complete, the sampling team will proceed to **SW3**.

   KOS/DMcC will go with the sampling staff to SW3 to ensure that they harness up correctly to carry out the sampling there.

7. The samplers will go to location SW3 and harness up and take the sample there using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod.

8. Once this has been completed, the sampling team will go to SW2 and take the sample there using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. There is a green verge here which means that it is not considered necessary to deploy active traffic management measures for the sampling activity.

   In the event that the sample is unable to be taken from road level due to the distance to the water level at low tide the sample will be taken from the shore. Access to the shore is available approximately 25m east of SW2 where the railing ends. The shore will be accessed from a ladder provided by Arup at this location and the person undertaking the sampling will walk carefully to the sampling location and back along the same route on completion of the sampling. The sampling equipment will be lowered to the operative on the shore from above with a bucket/rope, on completion of the sampling the equipment and samples will be lifted back up to road level by the bucket/rope.

   The ladder will be secured to the railing and held at the top when the ladder is being used by the person undertaking the sampling from the shore.

   In the meantime KOS and DMC will move the mobile anchor point to location SW4. The samplers will then take the sample at **SW4** using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. Access to this area is controlled by the Navy – an arrangement with CCC will be made by Arup in advance to facilitate entry by the sampling team to this location.

9. Once SW4 is done, the sampling team will proceed to site SW6 and take the sample there using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod from behind the railing. Access to this area is controlled by the Navy – an arrangement with CCC will be made by Arup in advance to facilitate entry by the sampling team to this location.
10. In the meantime, KOS and DMcC will move the mobile anchor point to location **SW5**. Access to this area is controlled by the Navy – an arrangement with CCC will be made by Arup in advance to facilitate entry by the sampling team to this location.
11. When the samplers are finished at SW6 they will proceed to **SW5** and take the sample using sections of 50mm ID diameter 3m long screw jointed flush threaded pipe and a 12v pump or a 5m length sampler rod. This will be the last sample for the low tide set. The mobile anchor point will be moved to the initial drop off point ready for removal off site.
12. **Relating to all samples** - Wearing disposable gloves, each bottle will be filled. Ensure that no air bubbles are entrapped within the bottle, tapping the sides to dislodge those trapped on the sides. Rinse all caps before use. Plastic bottles may be gently squeezed when screwing on cap to raise the meniscus to ensure an air tight seal. Attempt to fill the sample bottle whilst submerged in the water if sufficient depth is available. Lifejackets will be worn by all operatives.
13. EC, pH, temperature and Dissolved Oxygen will be measured and recorded onsite.
14. Decontaminate all equipment used during the procedure between sampling points in accordance with best practice.
15. Wipe and label bottles and containers and put them into a coolbox, with ice packs to ensure samples are kept at 4°C.
16. The samples are packaged for transportation off site and dispatch as soon as possible to analysing laboratory.
17. Notify Cork County that sampling operation is complete for low-tide set.

3 Materials and Equipment, and how mobilized to Site and Transported around Site

No.	Item	Supplied by	Quantity	Mobilised to site and moved around site
1.	Tool boxes (comprising socket set, wire brushes, grease, open and ring spanner set, chain vice grips, pipe wrenches, hammers, ranges of screw drivers, penknife, material accessories etc.)	Minerex	1	Jeep/car then equipment transport by hand to sampling point if required.

No.	Item	Supplied by	Quantity	Mobilised to site and moved around site
2.	5m length sampler rod	Minerex	2	Jeep/car then equipment transport by hand to sampling point
3.	Sections of 50mm ID diameter 3m long screw jointed flush threaded pipe	Minerex	10	Jeep/car then equipment transport by hand to sampling point
4.	Gas Analyser	Minerex	1	Jeep/car then equipment transport by hand to sampling point
5.	Pumps	Minerex	3	Jeep/car then equipment transport by hand to sampling point
6.	Car batteries	Minerex	2	Jeep/car then equipment transport by hand to sampling point
7.	EC, pH, DO meters	Minerex	4	Jeep/car then equipment transport by hand to sampling point
8.	Handheld GPS	Arup / Minerex	1	Jeep/car then equipment transport by hand to sampling point
9.	Mobile Man-Anchor System	Arup	1	Jeep/car then equipment transport by hand to sampling point
10.	Ladder	Arup	1	Delivered to site prior to works and transport by hand to sampling point
11.	Wheelbarrow	Arup	2	Delivered to site prior to works and transport by hand to sampling point
12.	Shovel and brush (to clear around man anchor set up locations if required)	Arup	1	Delivered to site prior to works and transport by hand to sampling point
13.	Rope	Arup	1	Delivered to site prior to works and transport by hand to sampling point
14.	First Aid Kit	Arup	1	Jeep/car. Will remain in jeep/car for duration of works and used if required

Draft

4 Project Staff and Contact Details

4.1 Project Staff & Contact Details

Arup are managing this work. Olivia Holmes is the Arup overall project manager. Kieran O'Shea will supervise the work on site on the day. Cecil Shine is the main Minerex point of contact for Arup this work. The following table provides all staff contact details.

Name	Role/ Responsibility	Site Based?	Company	Contact No.
Olivia Holmes Olivia.holmes@arup.com	Project Manager	No	Arup	087 9223323
Kieran O'Shea Kieran.oshe@arup.com	Site Supervisor Arup	Yes	Arup	087 9761480
Darragh McCormack Darragh.mccormack@arup.com	Assisting Safety Officer	Yes	Arup	087 2748525
John O'Donovan	Project Hydrogeologist	Yes	Arup	087-7704487
Cecil Shine (cecil.shine@minerex.ie)	Minerex Project Director	No	Minerex	086-617 5881
Matteo Viganotti	Sampling Technician	Yes	Minerex	TBC
Sven Klinkenbergh	Sampling Technician	Yes	Minerex	TBC
Javier Leonor	Sampling Technician	Yes	Minerex	TBC

4.2 Cork County Council Contact Details

Name	Company	Contact No.
Cormac O'Suilleabhain	Cork County Council	086 0407431
Eleanor Lehane	Cork County Council	086 0233470
David France	Cork County Council	087 2933374
Stephen O'Connell	Cork County Council	087 9644580

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5 Health and Safety Considerations

5.1 General

Health and safety regulations and site rules will be complied with at all times. The environment will be protected during the course of the work (i.e. spillages will be avoided).

The following general safety measures will be put in place:

A. Arup have completed the risk assessments (see below) and prepared the method statement (this document) after careful consideration of all the specific site issues and safety issues.

B. Arup will carry out a pre-visit safety meeting with the Arup site team, talking through the following documents:

   (i) Method Statement and Risk Assessments,

   (ii) CCC Site Safety Protocol document

   (iii) CCC Site Risk Assessment document

   (iv) One-page CCC Induction sheet

   (v) Ensure that all Arup team are clear on all aspects of their activities, the safety issues involved, the hazards and the proposed mitigation measures. All Arup team members sign off the Arup MS and RA.

C. Ensure that all equipment which is to be used in the work is ready and packed for transport to the site on the morning of the work.

D. CCC induction to be received on site prior to commencement. Sign in as necessary (and sign out subsequently as necessary).

E. Arup Toolbox-talk to be presented to go over the specific safety issues related to the work prior to commencement.

F. Refer to the detailed task-specific risk assessments below for further information.

G. No unauthorised persons shall be allowed within the work area during site activities.

H. Site personnel will wear the appropriate PPE gear.

I. Any near misses, incidents and accidents will be recorded and reported to CCC as necessary.

J. Site personnel will each sign the Method Statement sign-off at the end of this Method Statement to signify agreement to the methods and health and safety regulations set out.

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5.2 Personal Protective Equipment Requirements

All MEL and Arup staff has been issued with the following PPE:

1. Hard hat
2. Hi Vis Vest / coat
3. Safety boots (toe and mid-sole protection)
4. Gloves
5. Safety glasses
6. Safety harness and lanyard (for sampling personnel attached to man-anchor system)
7. Life jacket (if accessing the shore at SW2 and for works at SW3, SW4 and SW5)

5.3 First Aid

In the event of minor cute or bruises (e.g. caused by slips, trips or falls), first aid will be provided by Darragh McCormack who is a trained first-aider.

A fully stocked first aid kit will be brought to site by these personnel.

5.4 Emergency numbers and procedure

In the event of an emergency, staff on site are to carry out the following:

1. Request emergency services on 999 or 112 and specify Fire Brigade, Garda or Ambulance Services as appropriate.
2. Provide the address or location where help is required.
3. Be as precise as possible to save time.
4. Notify the Cork Co. Co. on site (or off-site if necessary).
5. Place a delegated person in a suitable location to direct Emergency Services to scene of accident.

EMERGENCY CONTACT NUMBERS

Carrigaline Garda Station:	021-4919370
Carrigaline Fire Station:	021-4374147
Emergency Services:	999 or 112
Cork County Council Safety Dept:	021-4275770
Doctor O'Sullivan (Naval Base):	021-4864915
Medical Admin Office (Naval Base):	021-4864899
Duty Medic (Naval Base):	021-4864899 (up to 16:20)
Duty Medic (Naval Base):	021-4864920 (after 16:20)

5.5 Site-Specific Safety Risks and Associated Mitigation Measures

A detailed risk assessment with associated mitigation measures is attached to this document (Appendix D).

6 Method Statement Sign-off

Signatures here state that these persons have read and understood the above Method Statement and agree to adhere to the aforementioned methods and health and safety rules.

Name	Company Name	Signature	Date
Kieran O'Shea	Arup		
Darragh McCormack	Arup		
John O'Donovan	Arup		
Matteo Viganotti	Minerex		
Sven Klinkenbergh	Minerex		
Javier Leonor	Minerex		
Cecil Shine	Minerex		

Draft

Appendix A

Map of Sampling Locations, Photographs and Site Access Routes

Draft

A1 Map of Sampling Locations

Please see map of sampling locations overleaf.

Draft

A3

24/11/2014 14:52:43

SW6
BH201R
BH202
SW5
BH105A
BH206
BH207
BH106
BH107A
BH209RBH208
BH213
SW4
BH211
BH215
BH217
BH216
BH218
BH112A
BH108
BH109
BH214
BH219
BH110A
BH212A
BH111
BH113
SW3
SW1
SW2

Legend

- Surface Water Locations
- Gas_monitoring_wells_2014
- Site Boundary
- Storm and process
- Storm
- Surface water and sanitary
- Clean water cooling
- Scale water overflow and surface water and sanitary
- Sanitary
- Sea water cooling

Issue	Date	By	Chkd	Appd
P0	06-01-2015	JO	OH	OH

ARUP

15 Oliver Plunkett Street
Cork
021-4223200
www.arup.com

Client
Cork County Council

Job Title
Haulbowline Steelworks Site Assessment

Metres
0 20 40 80

Proposed Surface Water Locations

Scale at A3
1:2,009

Job No	Drawing Status
235946-00	**Information**

Drawing No	Issue
SK-002	**P0**

\\crknts04\Cork_Jobs\235000\235946-00\4. Internal\4-03 Design\4-03-03 Infrastructure\GIS\02_Maps\MXD\140701_Haulbowlined.mxd

© Arup

A2 Photographs of Sampling Locations

Please see photographs of sampling locations overleaf.

Photo 1 – SW1

Photo 2 – SW2

Photo 3 – SW2 Access to shore if required

Photo 4 – SW3, SW4

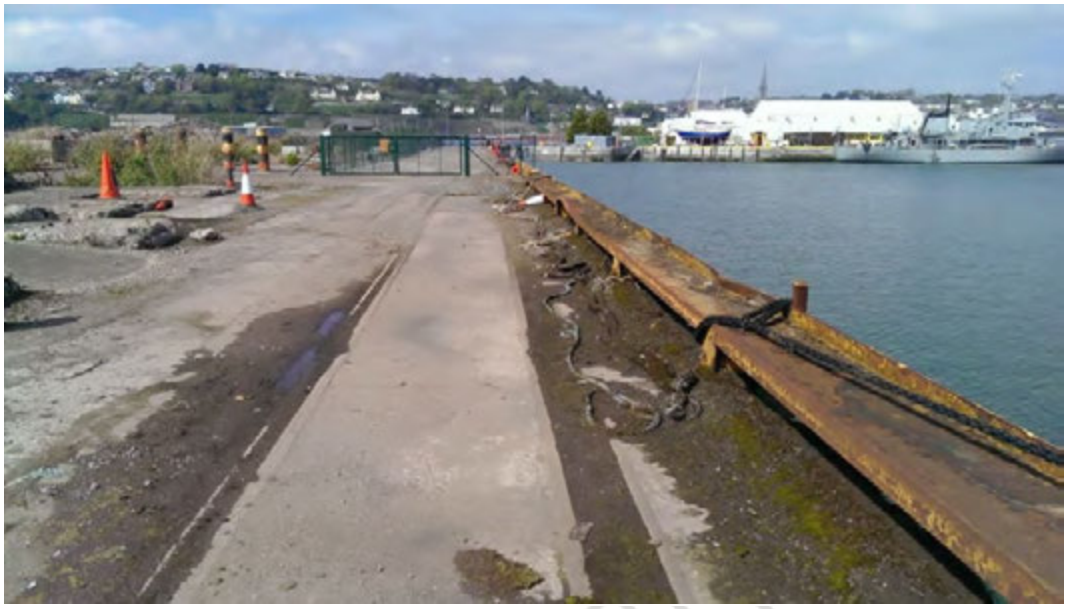


Photo 5 – SW5 beyond gates

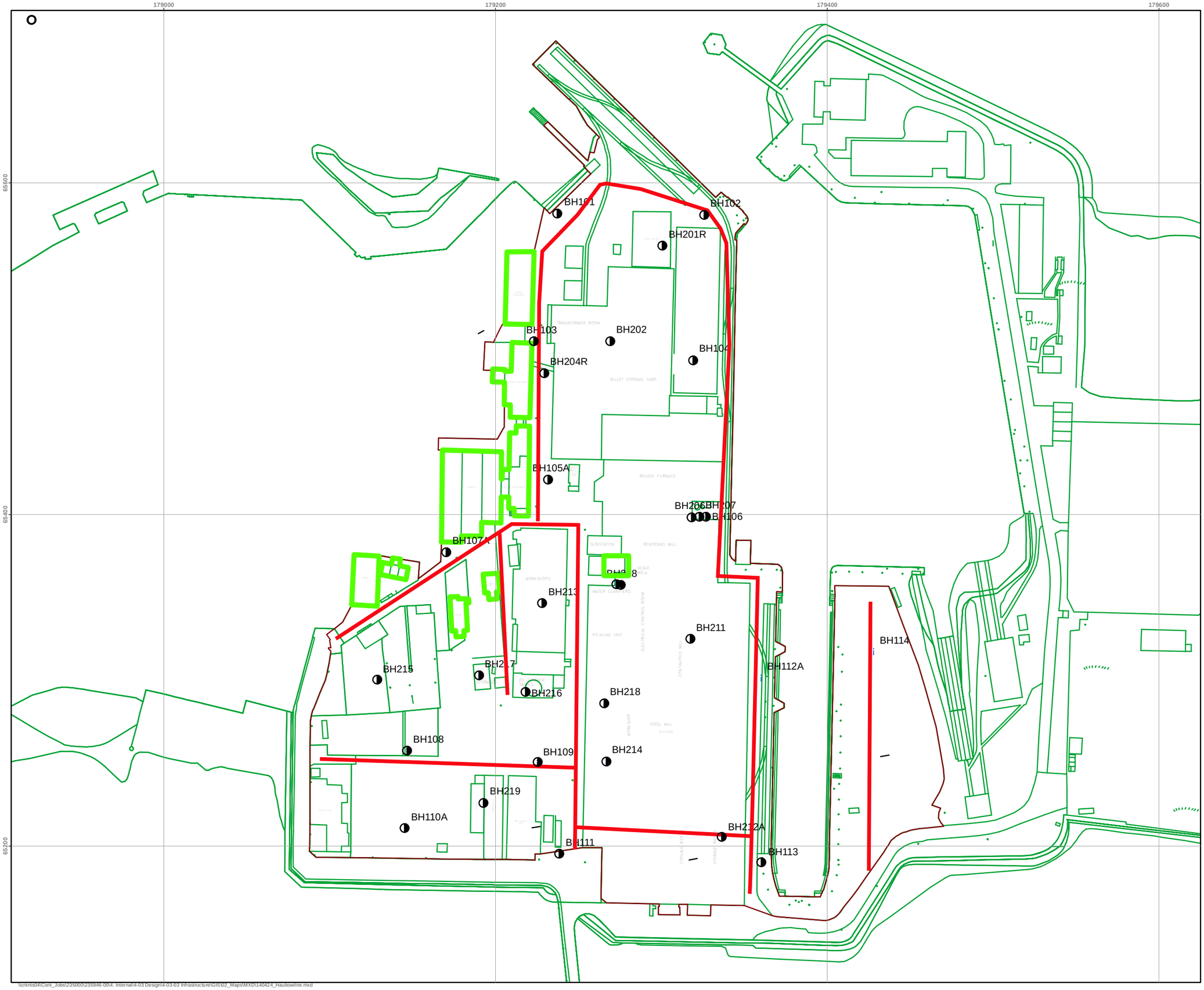
Photo 6 – SW6

A3 Site Access Routes

Please see map of site access routes as per the CCC Site Protocol overleaf.

Draft

A3



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Legend

- Existing Buildings 140430
- DRAFT Site Boundary dwg Polyline
- Monitoring Well
- Main Existing Site Pathways

Note - Sketch issued for general information only. Pathways shown are indicative only

02/05/2014 10:31:05

Issue	Date	By	Chkd	Appd
P0	2014-04-30	JO	JO	JO

Metres
0 25 50 100

ARUP

15 Oliver Plunkett Street
Cork
Tel 021 427 7670
www.arup.com

Client

Cork County Council

Job Title

Former Irish Steel Plant Haulbowline

SITE SAFETY PROTOCAL 01- SITE ACCESS ROUTES

Scale at A3

1:2,147

Job No	Drawing Status
235946	FOR INFORMATION

Sketch No	Issue
SK-SSP-001	P0

© Arup

Appendix B

Chain of Custody Sheet Template

Draft

B1 Chain of Custody Sheet Template

Please see Chain of Custody Sheet Template overleaf.

Draft

CHAIN OF CUSTODY

CLIENT: Arup	If Electronic File Required please select file format below		SAMPLER: Matt Viaganotti
ADDRESS: 15 Oliver Plunkett Street, Cork, Ireland			MOBILE: 086 6048 127
	EQUIS		EMAIL REPORT TO: Christopher.Newton@arup.com
PROJECT MANAGER (PM): Olivia Holmes	CROSSTAB		cc REPORT TO: olivia.holmes@arup.com
MOBILE: 00 353 21 422 3372	CLIENT		INVOICE TO: (if different to report) Cork County Council, County Hall, Carrigrohane Road, County Cork, Ireland
PROJECT ID: Haulbowline Steelworks Site	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)		QUOTE NUMBER: 5974 JL v2 — P.O No:
SITE: Haulbowline Island, County Cork			**ANALYSIS REQUIRED including SUITE names**

Jones Environmental Laboratory

Chain of Custody sheet page ..... of .....

TURNAROUND - please tick

10 DAY		4 DAY		Other	7
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

Sample ID	AGS SAMP TYPE	AGS SAMP REF	Shaken	Settled	S/GW/SW /L/E/OW/P	Date	Time	Depth in Metres	Preser-vation	Asbestos risk: High	Asbestos risk: Medium	Asbestos risk: Low	TOC; Amm N – N; BOD; Cl; COD; EC; CCN; CN free; CN tot; F; NO3; NO2; pH; SO4; Sulphide; Tot S; Thio; Carb Alk; Metals low (DISSOLVED); Hg CVAF; Earth Metals (DISSOLVED); Exotics (Sn); Metals low (TOTAL); Hex Cr low (TOTAL); Salinity	spec phenol HPLC - low; TPH-CWG; PAH 16 low; PCB 7; VOC PT; SVOC + TICs; fuel MS;	TOC; Amm N – N; BOD; Cl; COD; EC; CCN; CN free; CN tot; F; NO3; NO2; pH; SO4; Sulphide; Tot S; Thio; Carb Alk; Metals low (DISSOLVED); Hg CVAF; Earth Metals (DISSOLVED); Exotics (Sn); Metals low (TOTAL); Hex Cr low (TOTAL); spec phenol HPLC – low; TPH-CWG; PAH 16 low; PCB 7; VOC PT; SVOC + TICs; fuel MS; Salinity	W Oil / age
													SUITE 1: 54 GW samples (27 Boreholes)	**SUITE 2: 48 GW samples (24 Boreholes)**	**SUITE 3: 12 SW samples (6 sampling pts)**	**SUITE 4: 3 GW samples (3 Boreholes)**

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required.
WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

RELINQUISHED BY:		RECIEVED BY:		METHOD of SHIPMENT
Name:	Date:	Name:	Date:	Consignment note No:
Of:	Time:	Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, High PAHs expected, provide PID readings if available

Jones Environmental Forensics Ltd.

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

Appendix C

Mobile Man-anchor Details

Draft

C1 Mobile Man-anchor Details

Please see Mobile Man-anchor Details overleaf.

Draft

Operating manual

Mobile Man Anchor IM-200
Reference No. IM 200

EN 795:1996 class E

CE 0194

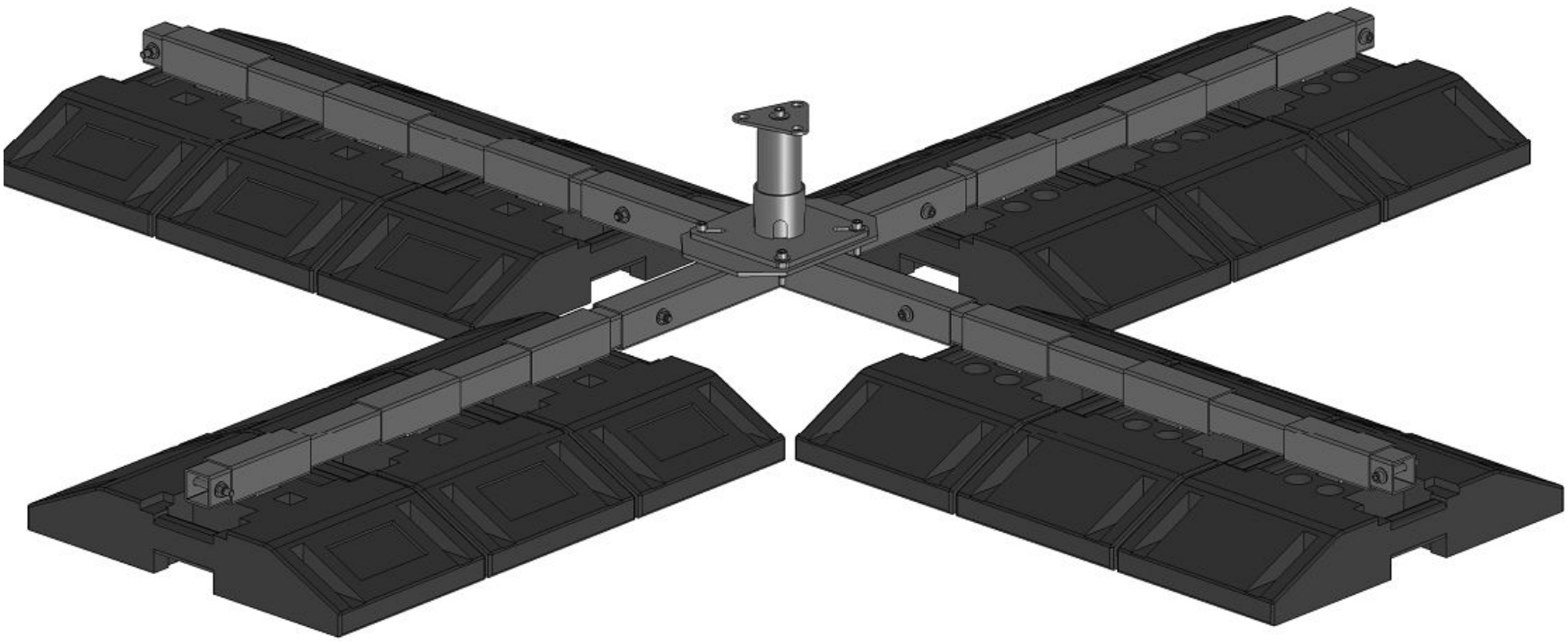


Table of contents:

1. Description of the Mobile Man Anchor 2
2. Construction of the Mobile Man Anchor 3
3. Technical data of the Mobile Man Anchor 3
4. Installation (mounting) of the Mobile Man Anchor 4
5. Description of the labelling of the Mobile Man Anchor 4
6. Main rules for using the Mobile Man Anchor 5
7. Operating Sheet of the Mobile Man Anchor 6

1. Description of the Mobile Man Anchor

The Mobile Man Anchor IM 200 was designed as a portable, collapsible anchorage point compliant with the EN 795 standard class E. This device helps protect employees working at heights, such as at the edge of a flat roof.

The Mobile Man Anchor allows you to quickly set up a safe and secure anchoring point for personal protective equipment for arresting falls from a height. After the completion of the planned works the Mobile Man Anchor can be disassembled and transferred to another location, or stored until its next use.

The modular design of the device allows it to be mounted and dismounted without the use of cranes, hoists, or any special equipment.

The weight of the individual components was chosen to make it compliant with the regulations (the weight of an individual item must not exceed 28 kg) and can be moved by man power.

The elements of the Mobile Man Anchor IM 200 are made of both rubber and steel. All steel components are made of stainless steel or are protected against adverse weather conditions using hot galvanising, which ensures their durability up to 50 years.

The Mobile Man Anchor IM 200 can be used on the following types of surface:
- roofing paper
- PVC membrane
- Concrete

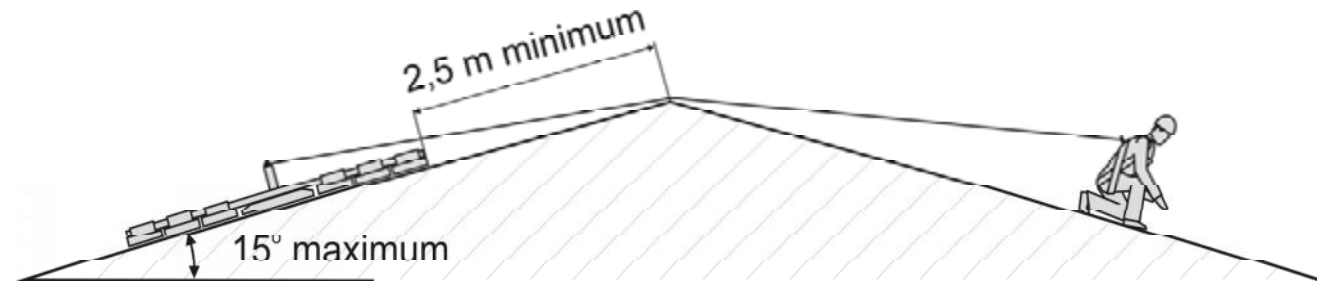
with inclination angle not exceeding **5°.**

Adequately large surface area taken up by the device can optimally distribute the load over the surface (e.g. a roof) to minimize the impact of the load on the structure.

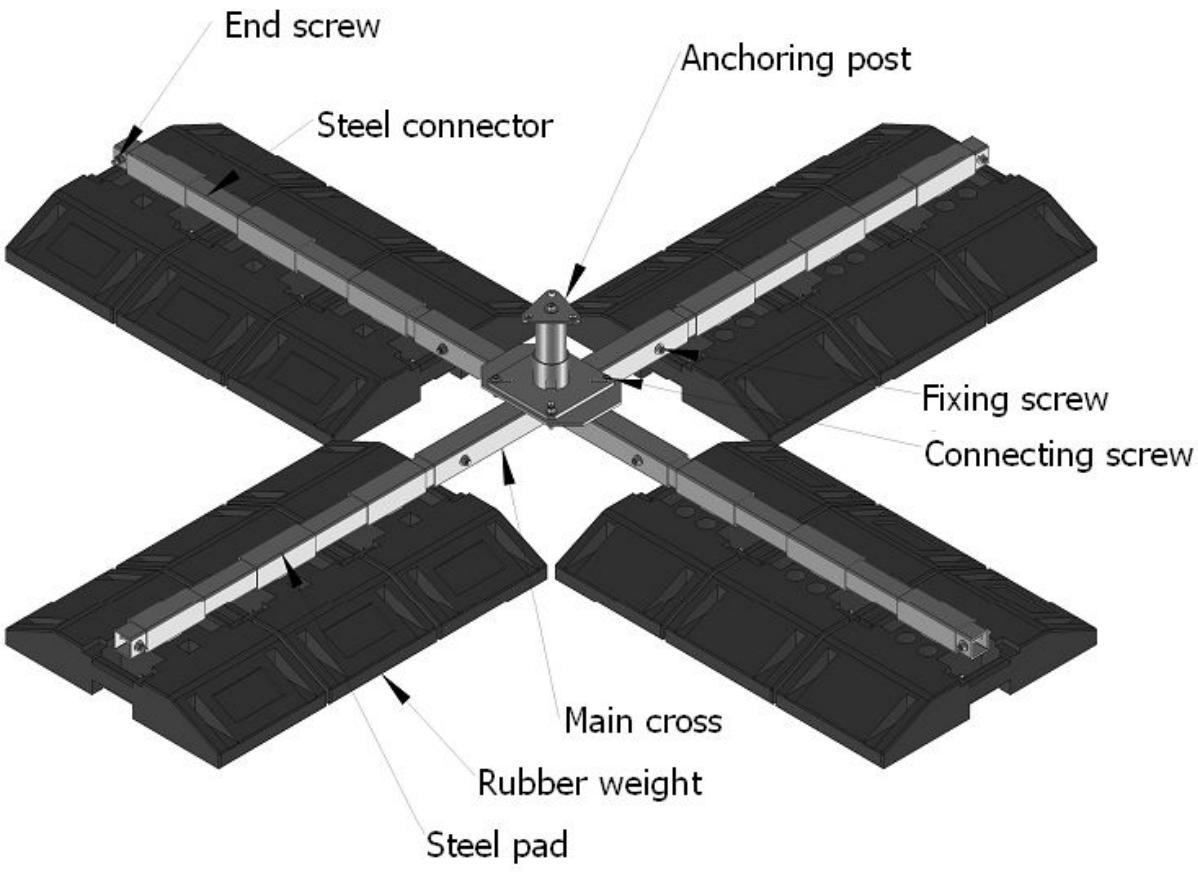
The Mobile Man Anchor shall not be used where there is a risk of frost, or in freezing conditions.

Remove any loose materials (e.g. lose stones) from the surface of the roof covering where the Mobile Man Anchor will be installed.
Do not use on icy, greasy or any slippery surfaces that may impair the Mobile Man Anchor's performance.
The IM200 should be positioned to avoid areas where water accumulates.

When used on steel cladded roofs up to 15° pitch always place the Mobile Man Anchor on the opposite pitch to the one you are working on. Always position the Mobile Man Anchor a minimum of 2.5m from the ridge on the opposite pitch. When working on the verge detail remember to position the Mobile Man Anchor at least 2.5m from the verge and only work opposite the Mobile Man Anchor order to avoid the pendulum effect down the facade of the building.



2. Construction of the Mobile Man Anchor.

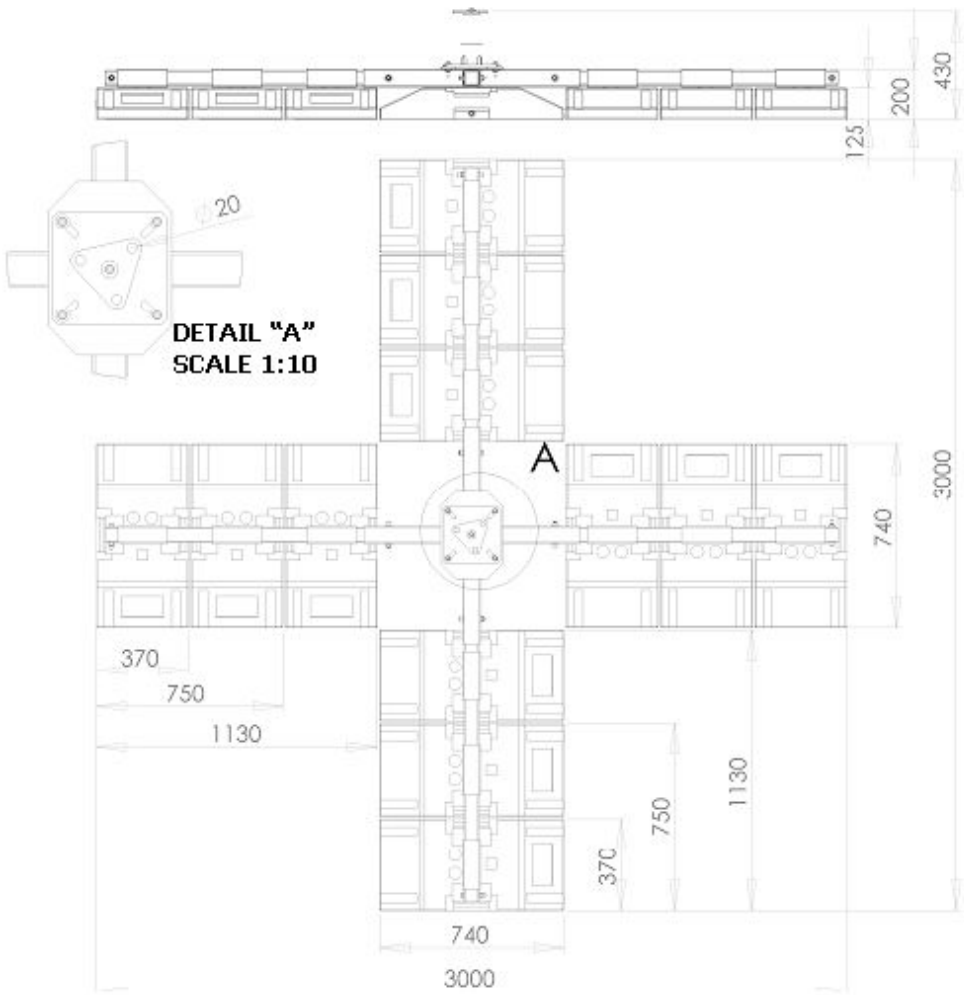


- **Anchoring post –** 1 piece, allows the connection of the individual equipment to the Mobile Man Anchor:
  a. harness compliant with EN 361
  b. connecting-absorbing component in the form:
     — Safety lanyard with a shock absorber compliant with EN 354/355
     — Self-locking device compliant with EN 353-2
     — Cable retractor compliant with EN 360
     — Connectors (snap hooks) compliant with EN 362

- **Rubber weight** – 12 pieces, single weight (1 of 12), permanently connected to the **steel pad**, positioned on the base.
- **Steel pad** –12 pieces, pad made of hot galvanized steel. It makes it possible to attach rubber weights together.
- **Main cross** – 1 piece, steel cross, hot galvanized, which is a base for the **anchoring post** (permanently fixed by screws), it is also a a base for connecting **(using a steel connector)** with **rubber weights**.
- **Steel connector** – 4 pieces, used for connecting **rubber weights** with **the main cross,** made of hot galvanized steel.
- **End screw** – 4 pieces, a screw that protects rubber weights from sliding off the steel connector.
- **Fixing screw** - 4 pieces, a screw that links **the main cross** with **steel connectors**.
- **Connecting screw** - 4 pieces, a screw that links **the main cross** with **the anchoring post**.

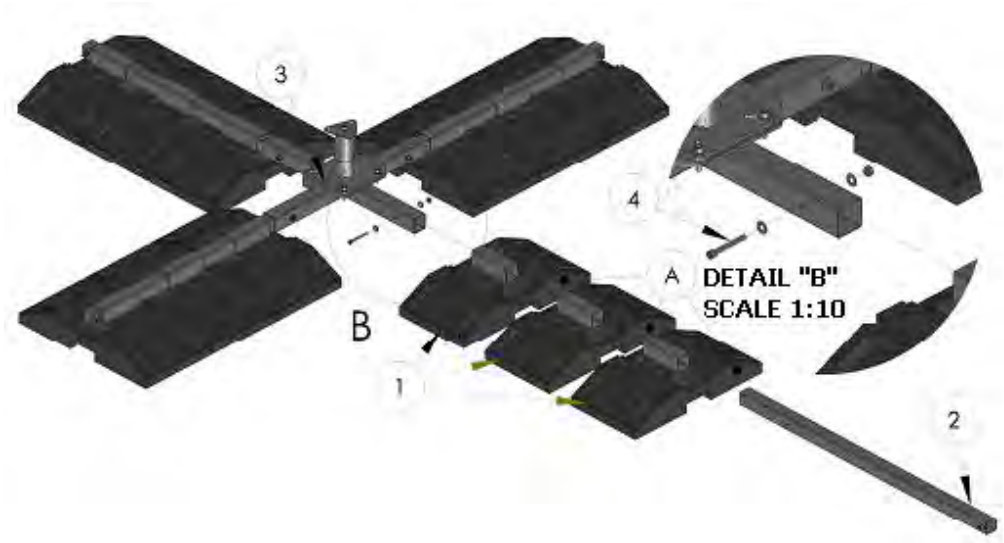
3. Technical data of the Mobile Man Anchor

- **measurements** – according to the drawing below



- **maximum number of people working simultaneously** - 2 people
- **total weight**- 374 kg +/- 2 kg
- **main structure** – hot galvanized steel
- **main weights** – rubber (rubber mixture resistant to UV rays)
- **connecting elements** – hot galvanized steel

4. Installation (mounting) of the Mobile Man Anchor



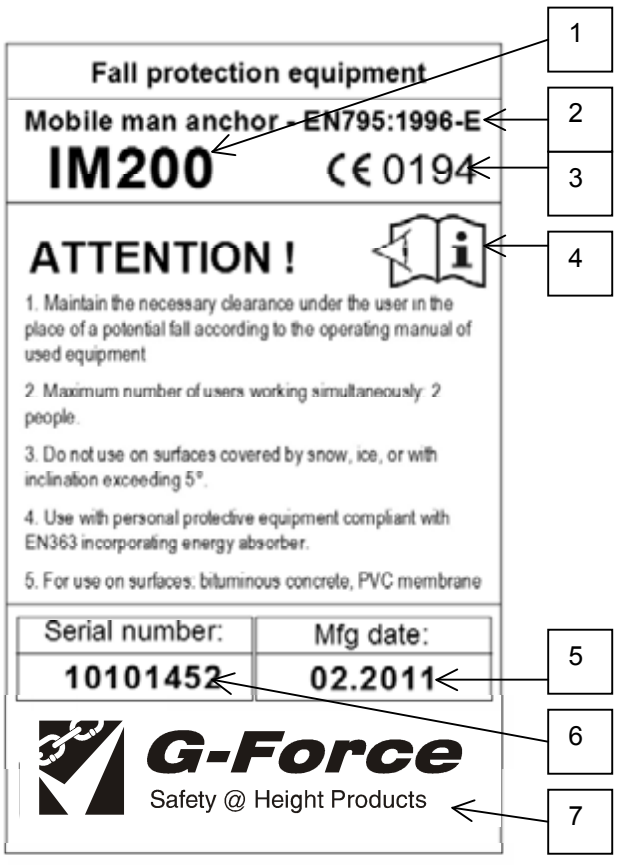
Prior to working with the Mobile Man Anchor 200 IM make sure that it is not damaged or unfit for use. To do this, perform a general visual inspection of the device.

In case of any doubts about the technical condition of the platform do not use it work at work!

To properly prepare the Mobile Man Anchor IM 200 for operation, follow the recommendations described below in the following sequence:

1. For installation you will need a #10 mm Allen key (1 pc) and a #19 mm wrench (1 pc).
2. Select an appropriate location for the Mobile Man Anchor 200 IM, so that the user's range of movements (resulting from the applied connecting and absorbing unit) covers the working area. Bear in mind that the deviation from the level surface cannot exceed 5°.
3. Position the rubber weights (1) in line, so that their surfaces (A) contact.
4. Push steel pads of the rubber weights (1) through using a steel connector (2).
5. Slide the main cross (3) over the steel connector (2) and lock its position by twisting the fixing screw (4) using mounting holes made in the steel connector (2). The end screw mounted permanently in the steel connector (2) is designed to prevent the mounting of the steel connector (2) in the wrong position.
6. Position another group of rubber weights (1) so their surfaces (A) contact and their steel pads make it possible to connect them using the steel connector (2) with the main cross (3).
7. Tighten the remaining fixing screws (4).
8. Check that all screws, including fixing screws (4), are tightened.
9. Check that the rotary plate on the anchoring post rotates.
10. Visually check the presence of all elements of the Mobile Man Anchor IM 200 and their technical condition.
11. Dismantling of the unit should be carried out in reverse order, follow points 6, 5, 4, 3, 2.
12. When dismantling, unscrew the fixing screws (4). Keep the remaining screws tightened.
13. The individual elements of the Mobile Man Anchor 200 IM must be transferred individually.
14. After dismantling the device should be stored in a cool, dry place.

5. Description of the labelling of the Mobile Man Anchor



1. Reference number of the device
2. European standard number, year and class to which the device conformed
3. CE sign and the number of notified body controlling manufacturing the device
4. Month and year of manufacture
5. Serial number
6. Attention: read the instructions
7. Designation of the manufacturer or distributor of the device

6. Main rules for using of the Mobile Man Anchor IM 200

1. The Mobile Man Anchor IM 200 is designed for attaching an personal protective equipment for arresting falls from height.
2. Every user of the Mobile Man Anchor should be familiar with this operating manual. The use of the device contrary to the manual poses a threat to life. This manual should always be available for inspection. Only persons trained in the use of the fall arrest equipment can operate the device.
3. The Mobile Man Anchor IM 200 cannot be used by people whose health condition may affect the safety during normal use and during rescue operations. Prepare a rescue plan, which will be used if necessary.
4. The Mobile Man Anchor can only be used to arrest falls from heights, in accordance with the instructions set out in this manual. In particular, the system cannot be used at work in suspension.
5. Before use ensure about the compatibility of items of equipment assembled into a fall arrest system. It is forbidden to use combinations of items of equipment in which the safe function of any one item is affected by or interferes with the safe function of another.
6. The Operating Sheet is an integral part of this manual. It is used for recording periodic inspections and repairs. The card should be completed and kept with this manual and shall be submitted to the manufacturer or a service technician authorized by the manufacturer at every request. An institution, which utilizes the device is responsible for updating the records in the Operating Sheet. The institution should require that the technicians servicing or repairing the system make the relevant entries in the Operating Sheet.
7. Follow the operating manual of the equipment used along with the Mobile Man Anchor, as referred to in this manual. In addition, follow all general occupational health and safety rules, particularly those, which apply to working at height.
8. After each 12 months of use the IM 200 must be withdrawn from use to carry out periodic inspection. If there are some factors which influe on condition of the device like hard conditions of use, or very often use of the device periodic inspection should be carried out more often. The periodic inspection must be carried out by a qualified person responsible for safety equipment in user’s company in accordance with the manufacturer’s periodic examination procedures. The periodic inspection can be also carried out by or the manufacturer or his certified representative.
9. The Mobile Man Anchor can be used for 5 years. After 5 years of use the IM 200 must be a subject to detailed manufacturer's inspection.The inspection can be carried out by the device manufacturer or his certified representative only.
10. During this inspection will be established admissible time of the beam clamp use till next manufacturer's inspection.
11. The results of inspections must be recorded in the operational sheet.
12. Before each use, check that the date of the next technical inspection of the system has not expired. After that date, the system cannot be used. Before and after each use, visually check the completeness and the correct technical condition of the device. In case of any defects or shortcomings in the system do not use it. In order to resolve doubts, please contact the manufacturer’s or authorized manufacturer's service department.
13. Periodic inspection details:
    - Ensure the system has not been modified/tampered with by unauthorised persons.
    - Check the legibility of the product markings
    - Visually inspect the complete system installation.
    - Check all components for distortion or dents. Ensure that this does not affect the fitting of the weight or steel connector.
    - Check metal plate for distortion or cracks.
    - Look for signs of cracks in metal.
    - Check all the bolts and nuts. Ensure that they are properly tighten.
    - Check for any general corrosion.
    - Check the weights for distortion, cracks or any mechanical damage. Check fixing of steel pad of the weight.
14. It is essential for safety that the Mobile Man Anchor IM 200 should be withdrawn from use immediately if any doubt arise about its conditions for safe use or it have been used to arrest to fall. The device should not be used again until confirmed in writing by a competent person that it is acceptable to do so .
15. Modifying, repairing by unauthorised person or replacing the original components of the system with other parts is forbidden.
16. The IM 200 can be used as a fall arrest system with retractable type fall arresters (EN360), energy absorbers with lanyards (EN355) and guided type fall arresters (EN353-2) G-Force branded.
17. Users intend to combine the IM 200 with retractable type fall arresters or energy absorbing lanyards coming from a different manufacturer must check all potential dangers because these devices haven’t been tested together as a complete fall arrest system.
18. Combining any fall arrest personal protective equipment (PPE) with the IM200 requires from a user checking all requirements and guidances coming from fall arrest PPE manufacturer.
19. It is mandatory to check the clearance under the work place, if there is a risk of a fall, to avoid hitting objects or a surface located below, before the protective equipment to arrests the fall.
20. While using the Mobile Man Anchor IM 200 pay special attention to the dangerous phenomena affecting the operation of protective equipment or safety of the user, in particular: looping and shifting of lanyards on sharp edges, pendular falls, electricity, extreme temperatures, damaging the equipment, adverse weather conditions, chemicals, pollution.
21. This device can not be used in an explosive environment.
22. The device must be transported in the package (e.g.: bag made of moisture-proof textile or cases made of steel or plastic) to protect it against damage or moisture.
23. The device must be cleaned and disinfected in order to avoid damaging the material (raw material) it is made of. It can be cleaned manually. Plastic and rubber elements can only be cleaned with water. Equipment which becomes wet during cleaning or while in operation must be carefully dried in natural conditions, away from heat sources. Metal parts and mechanisms (springs, hinges, catches etc.) can be periodically greased in order to improve their operation.
24. The device should be stored in loose packaging in well-ventilated dry rooms and protected against the impact of light, UV radiation, dust, sharp objects, extreme temperatures and caustic substances.
25. It is essential for the safety of the user that if the product is re-sold outside the original country of destination the reseller shall provide user’s instructions in the language of the country in which the product is to be used.

EC type examination carried out by INSPEC International Ltd, 56 Leslie Hough Way, Salford, Greater Manchester, M6 6AJ, United Kingdom No. 0194
Notified body controlling of manufacturing the device: INSPEC International Ltd, 56 Leslie Hough Way, Salford, Greater Manchester, M6 6AJ, United Kingdom No. 0194

O P E R A T I N G S H E E T					
Device name	**Mobile Man Anchor**			Type	**IM 200**
Serial number		Date of manufacture		Purchase date	
Date first put into use		User's name			

INSPECTION AND REPAIR RECORD SHEET

	Date	Reason for inspection or repair	Identified damage, repair, etc.	Next due date of periodic inspection	Inspector's name and signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Tacklestore Ltd, Unit 23 Atlantic Road, Avonbridge Trading Estate, Avonmouth, Bristol, BS11 9QD, England
tel. 0044 1179 381600, fax 0044 1179 381 602, www.fall-protection.uk.com

CAREY LIFTING GEAR LIMITED, City Hall Quay, Cork.

FORM: GA1 **(FORM CR.4A)**

SAFETY, HEALTH AND WELFARE AT WORK (GENERAL APPLICATION) REGULATIONS 2007

Report of result of thorough examination of :

Lifting Appliances

(Approved by the National Authority for Occupational Safety & Health in accordance with Regulation 97(6))

Owners Name and Address : CAREY TOOLS

Identification	**Date of Thorough Examination**	**Defects noted and alterations or repairs required to the lifting appliance**
Make & Type G FORCE 2 MAN ROOF ANCHOR SYSTEM IM200 SWL 2 MAN	21.1.15	NONE

Makers Number 11515762

Owners Name CAREY TOOLS

Owners number 3001

Signature--- ---A CAREY--

Date----------21.1.15----------

CAREY LIFTING GEAR LIMITED
CITY HALL QUAY
CORK

Appendix D

Risk Assessments

Draft

D1 Risk Assessments

Please see Risk Assessments overleaf.

Draft

HS1
Rev 11

ARUP

Hazard Identification and Risk Assessment
(Including Particular Risks & Other Significant Risks)

Job Number	235946-00
Page Number	1 of 3

Project	Haulbowline Steelworks Site Assessment		**Design Issue or Element**			Stage 3 Seawater Sampling by Arup and Minerex Staff		
Stage	**Seawater Sampling on Site**							
	Name	Date						
Risk Assessor	Padraig Coakley	20-01-15						
Project Manager	Olivia Holmes	20-01-15						

Hazard	**Mitigation Measures**	**Residual Risk Assessment following mitigation measures**		
		Likelihood	**Severity**	**Risk Rating**

General Notes: These risk assessments have been prepared for inclusion in the Method Statement for the work and are to be read in conjunction with the MS. These risk assessments will be previewed and understood by the whole Arup site team in a pre-visit safety meeting to be held in the Arup offices. The risk assessments will be communicated **again** to the site team in a Toolbox Talk on the morning of 26-01-15 prior to commencement of the work. These hazards and mitigation measures have prepared and documented based on the task-specific work to be carried out on the site.

The technical tasks to be carried out for this sampling project are described in the method statement previously issued. Key tasks include taking samples from the harbour (when standing on quay walls or by other methods described in the MS). The following site-specific elements/ are also noted:

- Jeeps/cars will be used to transport some of the sampling equipment to the sampling sites across the site. Travel is only allowed on the designated paths which have been shown on the drawing included in the method statement and are marked on the ground on site with yellow paint.
- The samples are to be stored on site temporarily and brought to Arup offices in cooler boxes for collection by courier. Final details of this will be arranged closer to the day of the works.
- The works taking place on 26-01-15 will cease at 5.15 pm with exit from the site by personnel at 5.30 pm due to sunset. This is to be reviewed on the day on site taking into account weather conditions.

Specific hazards arising from the work are identified below and suitable mitigation measures are noted.

Likelihood of Hazard occurring
L = Low (Seldom)
M = Medium (Reasonably Likely)
H = High (Certain/Nearly certain)

Severity of Harm
L = Minor Injury/Illness
M = Injury/Illness causing short term disability
H = Fatality or major injury/illness causing long term disability

Risk Assessment
L = Low Risk (No action)
M = Medium Risk (Site Mitigation Action required)
H = High Risk (Action required e.g. Design Change)

Risk Table	***Severity***		
Likelihood	**H**	**M**	**L**
H	H	H	M
M	H	M	L
L	M	L	L

	Hazard	Mitigation Measures	Residual Risk Assessment following mitigation measures		
			Likelihood	Severity	Risk Rating
1	**Accident caused by movement of jeeps/cars on site**				
	• Risk of car crashing into holes in ground, existing buildings, poor ground etc. or knocking down another worker on site	• Driving and walking only allowed on safe designated paths which are marked on site, as per the site drawing. • Turning to be carried out in a safe manner, on the paths (3-point turns where necessary to avoid wide sweeps). • Speed limit 15 km/hr, but safe speed to be to be determined by the driver due to condition of path, weather etc. – driver responsibility to drive with all due care and caution.. • All staff to wear high-vis jackets on site	L	H	M
	• Risk of ground collapsing under car/jeep	• Not considered likely given the passage of very heavy traffic along the designated routes previously. No evidence of imminent collapse noted on site inspection. Note: a detailed traffic management plan is not considered necessary based on the number and nature of the traffic movements on the site. High-levels of caution and awareness to be deployed by drivers on site at all times.	L	H	M
2	**Falls from a Height**	• Deep pits and unprotected holes are to be avoided by personnel by remaining on designated safe paths only as noted above.			
	• Risk of falling from a height into numerous unprotected deep pits and tanks around the site	• When carrying out sampling activities at each sampling point, worker to park car on the designated safe path at a point near to the sampling point which allows a safe walkable path to the sampling point. This is to be determined on site by the worker in a safe manner at each sampling point by careful cautious approach and "proving" of the safe walking route to the sampling point. Once this has been confirmed, the worker will use this path to access the sampling point each time, and also to return to the car.	L	H	M
	• Risk of falling through poorly protected or unprotected opes around the site i.e. manhole chambers and holes in concrete slabs etc.		L	H	M
	• Risk of falling over quay edges when taking samples there	• Approaches to quay walls are to be made with caution. All sampling points are unavoidably located near quay wall edges. Those sampling points near quay walls are to be approached from the land side and workers are not to walk near quay edges unnecessarily. • When sampling seawater from quay walls, the following mitigation will be put in place: o Two workers will be present o Life-vests will be worn by the workers A safety harness will be worn by the sampling worker, connected to a mobile anchor point with a lanyard length designed to prevent falls over the edge, i.e. shorter than the full distance to the wall edge. Refer to MS for further information.	L	L	L

Likelihood of Harm
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H = High (Certain/Nearly certain)

Severity of Harm
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	Hazard	Mitigation Measures	Residual Risk Assessment following mitigation measures		
			Likelihood	Severity	Risk Rating
3	**Chemical or Biological Substances**				
	• Risk of contact with contaminated water from the sampling activities	• Sampling workers to wear the following PPE: o Protective gloves o Protective eye-glasses o Long-sleeved clothing	L	H	M
	• Risk of contracting Leptospirosis (Weil's disease)	• Wash hands prior to eating. Discard gloves once used and removed. Eat in a safe area, away from possible sources infection.	L	M	L
4	**Drowning**	• Deep pits and unprotected holes are to be avoided by personnel by remaining on designated safe paths only as noted above.	L	H	M
	• Risk of drowning in the sea	• Approaches to quay walls are to be made with caution. All sampling points are unavoidably located near quay wall edges. Those sampling points near quay walls are to be approached from the land side and workers are not to walk near quay edges unnecessarily.	L	H	M
	• Risk of drowning in water filled pits & tanks	• When sampling seawater from quay walls, the following mitigation will be put in place: o Two workers will be present o Life-vests will be worn by the workers o A safety harness will be worn by the sampling worker, connected to a mobile anchor point with a lanyard length designed to prevent falls over the edge, i.e. shorter than the full distance to the wall edge. Refer to MS for further information.			
5	**Slips, Trips and Falls**				
	• On uneven ground conditions, on extruding rebar, on extruding structural steel members and steel plates, on damaged manhole covers, into inadequately protected manhole chambers, over small holes in slabs, on electrical cables, on hose pipes, over vegetation growing on the site	• When carrying out sampling activities at each sampling point, worker to park car on the designated safe path at a point near to the sampling point which allows a safe walkable path to the sampling point. This is to be determined on site by the worker in a safe manner at each sampling point by careful cautious approach and "proving" of the safe walking route to the sampling point. Once this has been confirmed, the worker will use this path to access the sampling point each time, and also to return to the car. • In the event of a minor accident, i.e. minor cuts or bruise, basic first aid will be carried out by the site supervisor using the first aid kits available. This will comprise cleaning and placing plasters on minor cuts only. For more serious injuries, the injured person will be taken for treatment to an appropriate centre, e.g. as noted in the Method Statement emergency plan section.	L	M	L
	• At sampling point SW2 at low tide, it is intended to take the sample at low and high tide from the				

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	Hazard	Mitigation Measures	Residual Risk Assessment following mitigation measures		
			Likelihood	Severity	Risk Rating
	sampling point at the top of the quay wall. However, due to the distance from the quay wall to the water at low tide, it may not be possible to reach the water from the quay wall to take a sample. In this event, another option will be for the sample taker to walk down to the waterline (at low tide) and to use the 5m sample taker to take the sample. All 4 site staff will be present for this operation. In this event, the hazards will be: o Falling while descending onto the shoreline o Slips, trips and falls while walking on the shore (seeweed area) o Falling into the water	o Use of ladder, placed on the sloping embankment down onto the shore, and held/tied at the top by Arup personnel, to allow safe access onto the shore o Sample taker to walk carefully and slowly to the sampling point, taking due care and attention. Wearing durable gloves during this operation. o The water at the edge is quite shallow and the risk is considered low. Life-jacket to be worn.	L L L	H M H	M L M
6	**Security** • Access by unauthorised vehicles onto the site	• Vehicular Gate to be close throughout the day	L	M	L
7	**Workers located at different sampling points on the site** • Risk of worker having an accident unseen by other personnel and going unnoticed for a long period of time.	• The personnel on site are operating as a team, with one central co-ordinator who mans the collection point for samples. Each sample taker returns to the collection point at most every half-hour, which ensures that there is frequent communications by all the team. • Each team member has fully charged mobile phone – phone calls are frequent during the day for technical queries and checking progress • In most cases, the workers are visible by another member of the team al almost all times • The team controller knows the sampling point location for each worker at all times.	L	H	M
8	**Risks from public traffic while working at SW1 and SW2** • Risk of worker being knocked down while taking samples at SW1 or SW2, which are located at the	• There are safe standing areas at SW1 (1.0 m wide footpath) and at SW2 (green verge) which will allow the sampling staff work without being on the live carriageway.			

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Risk Assessment
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H = High Risk (Action required e.g. Design Change)

	Hazard	Mitigation Measures	Residual Risk Assessment following mitigation measures		
			Likelihood	Severity	Risk Rating
	side of the public road	• Staff are to employ due caution when crossing the road or otherwise moving around this area • It is not considered necessary to deploy active traffic management measures in these areas – staff to employ due caution and to wear high-visibility clothing.			

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Project No. 235946.00 Stage 3 Sampling Fieldsheet Data
Location: Haulbowline Island, Co. Cork

** Sample was diluted to measure Conductivity (EC)

					Conductivity (EC)					Dissolved Oxygen (DO)								
BH ID	Date	Tidal Position (Harbour)	Weather	Static water level mAOD	Conductivity (EC) (diluted) (mS/cm)**	EC Dilution Factor	Total EC (undiluted by calculation) (mS/cm)	T (C°)	pH	DO (%)	DO (ppm) (mg/l)	Redox Potential (eH) (mv)	Clarity	Colour	Odour	Irridescence	Free Product	Field Comments
BH102	13/01/2015	HIGH	OVERCAST	0.41	N/A	N/A	3.95	12.40	7.40	30.80	4.25	-94.00	MODERATELY CLOUDY	BLACK	MINOR HC	YES	YES	
BH102	12/01/2015	LOW		0.48	N/A	N/A	2.58	10.80	7.73	65.90	9.83	-104.00						
BH105A	12/01/2015	HIGH	DRY	2.58	N/A	N/A	>20	11.50	8.19	43.10	4.30	-136.00						
BH105A	13/01/2015	LOW		2.34	N/A	N/A	18.46	9.60	7.69	54.30	5.29	67.00	CLEAR	COLOURLESS	NONE	NONE	NONE	
BH106	12/01/2015	HIGH	WINDY-CLEARING	0.43	N/A	N/A	3.21	11.90	7.80	43.30	5.67	-106.00	CLOUDY	MILK	NONE	NONE	NONE	
BH106	12/01/2015	LOW	CLEAR	-0.35	N/A	N/A	2.12	11.50	7.85	35.60	3.33	-76.00	SLIGHTLY CLOUDY	MILK	NONE			
BH107A	12/01/2015	HIGH	DRY	0.83	N/A	N/A	9.12	12.40	7.45	48.20	4.31	-45.00						
BH107A	13/01/2015	LOW		0.76	N/A	N/A	8.71	11.00	7.68	44.20	5.96	-15.00	SLIGHTLY CLOUDY	PALE GREY	NONE	NONE	NONE	
BH108	12/01/2015	HIGH	OVERCAST	0.36	1.801	30	54.03	n/a*	n/a*	58.10	5.55	-61.00	MODERATELY CLOUDY	BLACKISH-	NONE			Sample diluted with deionised water for
BH108	13/01/2015	LOW	OVERCAST	-0.66	N/A	N/A	5.21	n/a*	7.78	30.20	2.98	2.56	MODERATELY CLOUDY	BROWNISH	NONE			
BH109	12/01/2015	HIGH	DRY	0.79	N/A	N/A	15.47	13.40	6.74	38.10	3.64	-100.00						
BH109	12/01/2015	LOW		0.37	N/A	N/A	10.97	11.60	6.81	22.50	2.45	-106.00						
BH110A	12/01/2015	HIGH		0.56	N/A	N/A	19.80	12.40	8.00	50.70	6.63	-19.00	CLEAR					
BH110A	13/01/2015	LOW	OVERCAST	0.38	N/A	N/A	>20	8.50	8.55	56.70	5.28	2.00	SLIGHTLY CLOUDY	BROWNISH	NONE			
BH111	12/01/2015	HIGH	CLEAR	0.44	N/A	N/A	>20	10.90	8.40	67.70	9.36	17.00	CLEAR	CLEAR	NONE	NONE	NONE	
BH111	12/01/2015	LOW	CLEAR	-0.79	N/A	N/A	>20	10.10	8.07	60.20	7.37	-38.00	CLEAR	NONE	NONE	NONE	NONE	
BH112A	12/01/2015	HIGH	OVERCAST	1.20	N/A	N/A	1.04	12.40	7.63	49.30	6.04	8.00	SLIGHTLY TO	MILKY-GREY	NONE	NONE	NONE	
BH112A	12/01/2015	LOW	CLEAR	-0.26	N/A	N/A	0.88	11.00	7.91	68.40	9.40	-7.70	SLIGHTLY CLOUDY	GREYISH	NONE	NONE	NONE	
BH113	12/01/2015	HIGH	WINDY-CLEARING	0.80	N/A	N/A	>20	9.20	8.09	68.50	10.20	-54.00	CLEAR	CLEAR	NONE	NONE	NONE	
BH113	13/01/2015	LOW	STORMY/SNOW	-1.13	N/A	N/A	>20	7.90	8.51	59.10	6.85	-56.00	CLEAR	CLEAR	NONE	NONE	NONE	
BH114	12/01/2015	HIGH	CLEARING	0.96	N/A	N/A	6.72	11.60	7.82	30.60	3.35	-132.00	CLEAR		SLIGHT H2S	NONE	NONE	
BH114	13/01/2015	LOW	STORMY/SNOW	0.32	N/A	N/A	6.29	9.60	8.39	58.20	5.78	-77.00	CLEAR	CLEAR	SLIGHT H2S	NONE	NONE	
BH201R	12/01/2015	HIGH	DRY	0.68	N/A	N/A	>20	11.70	7.56	66.20	6.87	-8.00						
BH201R	13/01/2015	LOW	STORMY/SNOW	-0.25	N/A	N/A	>20	10.90	8.07	30.10	4.95	178.00	SLIGHTLY CLOUDY	BROWNISH	NONE	NONE	NONE	
BH202	12/01/2015	HIGH		0.80	N/A	N/A	2.49	11.20	7.87	46.90	5.74	-49.00	MODERATELY CLOUDY	GREY	H2S	SLIGHT	NONE	
BH202L	13/01/2015	LOW		0.73	N/A	N/A	2.72	8.40	8.30	46.10	4.25	7.00	MODERATELY CLOUDY	GREY	MILD H2S			
BH204R	12/01/2015	HIGH	DRY	3.02	N/A	N/A	>20	12.60	8.27	61.50	6.09	-37.00						
BH204R	12/01/2015	LOW		0.18	N/A	N/A	>20	9.90	7.47	29.03	3.43	-55.00						
BH206	12/01/2015	LOW	OVERCAST	1.12	N/A	N/A	12.65	10.50	8.32	58.00	5.54	-113.00	CLEAR	NONE	H2S SMELL			
BH206	12/01/2015	HIGH	OVERCAST	0.30	N/A	N/A	14.67	11.70	8.28	28.20	4.10	-167.00	SLIGHTLY CLOUDY	BLACKISH	MODERATE SMELL H2S	NONE	NONE	
BH207	12/01/2015	HIGH	OVERCAST	1.13	N/A	N/A	1.42	12.40	n/a*	40.20	2.87	-83.00	CLEAR	NONE	NONE	NONE	NONE	
BH207	12/01/2015	LOW	SUNNY	0.33	N/A	N/A	0.71	11.50	n/a*	34.20	4.45	-116.00	SLIGHTLY CLOUDY	BROWNISH	NONE	NONE	NONE	
BH208	12/01/2015	HIGH		2.12	N/A	N/A	N/A	11.40	7.18	39.70	3.75	-104	SLIGHTLY CLOUDY	YELLOW-	OILY			
BH208	13/01/2015	LOW	CLEAR/COLD	1.65	N/A	N/A	4.73	7.40	7.84	34.30	2.59	-74.00	CLEAR	CLEAR				
BH209R	12/01/2015	HIGH		0.77	N/A	N/A	7.64	12.60	7.62	40.90	4.37	-126.00	MODERATE CLARITY	GREY	OILY	YES	NONE	
BH209R	12/01/2015	LOW		0.47	N/A	N/A	7.21	11.30	7.79	68.80	7.10	-106.00	SLIGHTLY CLOUDY	GREY	NONE	YES	NONE	
BH211	12/01/2015	HIGH	OVERCAST	DRY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			Well dry. No water
BH211	12/01/2015	LOW	OVERCAST	DRY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			Well dry. No water
BH212A	12/01/2015	HIGH	OVERCAST	0.93	11.93	3	35.79	9.80	7.22	53.10	4.30	-25.00	MODERATELY CLOUDY	BLACK	NONE			Sample diluted with deionised water for
BH212A	12/01/2015	LOW	OVERCAST	-2.49	1.432	20	28.64	7.50	n/a*	52.80	6.80	-65.00	MODERATELY CLOUDY	BLACKISH	NONE	NONE	NONE	Sample diluted with deionised water for
BH213	12/01/2015	HIGH	DRY	0.94	N/A	N/A	6.67	13.30	7.17	36.20	5.05	-109.00						
BH213	13/01/2015	LOW		0.63	N/A	N/A	8.03	9.70	7.30	52.40	5.41	-107.00	SLIGHT CLOUDY	ORANGE BROWN	NONE	NONE	NONE	
BH214	12/01/2015	HIGH		1.21	N/A	N/A	2.98	13.20	7.37	22.10	3.50	-23.30						Initial smell of hydrocarbons/sulphur but
BH214	12/01/2014	LOW		0.33	N/A	N/A	2.92	11.80	7.48	40.60	3.09	-176.00						
BH215	12/01/2015	HIGH	OVERCAST	0.82	2.219	10	22.19	n/a*	n/a*	32.50	3.27	-110.00	SLIGHTLY CLOUDY	BLACKISH	MODERATE	NONE	NONE	Sample diluted with deionised water for
BH215	13/01/2015	LOW	OVERCAST	0.62	N/A	N/A	5.14	9.70	7.34	34.30	3.35	-127.00	MODERATELY CLOUDY	BLACKISH-	NONE	NONE	NONE	
BH216	12/01/2015	HIGH	CLEAR	0.36	N/A	N/A	1.08	12.50	7.43	33.90	4.54	-120.00	MODERATELY CLOUDY	BLACKISH	FAINT HYDROCARBON	SOME	NONE	
BH216	13/01/2015	LOW	CLEAR/COLD	0.31	N/A	N/A	1.84	9.40	7.36	34.40	4.70	-145.00	CLOUDY	BLACKISH	MODERATE	YES	YES	
BH217	12/01/2015	HIGH		0.66	N/A	N/A	18.41	12.70	6.59	56.40	7.76	-122.00	SLIGHTLY CLOUDY	GREY	HYDROCARBONS	YES	NONE	
BH217	13/01/2015	LOW	OVERCAST	0.60	3.9	10	39.00	n/a*	6.67	27.60	2.16	-117.00	MODERATELY CLOUDY	BROWNISH-	HYDROCARBONS	YES	YES	Sample diluted with deionised water for
BH218	12/01/2015	HIGH	FINE	-0.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			Only 5cm of water
BH218	12/01/2015	LOW	FINE	-0.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
BH218	13/01/2015	N/A	N/A	-1.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLEAR	HONEY	STRONG HYDROCARBONS			Only sampled free product. Water level 4.63mbGL, oil level 2.26mbGL
BH219	12/01/2015	HIGH	CLEAR	0.21	N/A	N/A	18.60	12.80	7.21	44.40	6.54	-119.00	CLOUDY	RED (IRON)	SOME	SLIGHT	NONE	No free product but sheen while purging
BH219	13/01/2015	LOW	SNOWY	0.51	N/A	N/A	15.90	9.90	7.01	30.40	5.19	-167.00	VERY CLOUDY	BROWNISH-ORANGE	NONE	NONE	NONE	

n/a* Data lost

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Arup
50 Ringsend Road
Dublin 4
Ireland

Attention :	Christopher Newton
Date :	30th January, 2015
Your reference :	
Our reference :	Test Report 15/2337 Batch 1
Location :	Haulbowline
Date samples received :	14th January, 2015
Status :	Final report
Issue :	1

Forty four samples were received for analysis on 14th January, 2015 of which forty three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-8	9-18	19-26	27-34	35-42	43-50	51-58	59-66	67-76	77-84	LOD/LOR	Units	Method No.
Sample ID	BH102L	BH105AH	BH105AL	BH110AH	BH202H	BH202L	BH209RH	BH209RL	BH215H	BH217H			
Depth				7.35			9.00	9.00		3.20			
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Dissolved Aluminium #	3.5	5.6	21.3	4.0	12.4	11.8	2.3	1.7	3.2	28.3	<1.5	ug/l	TM30/PM14
Dissolved Antimony #	3	<2	3	3	3	<2	14	6	<2	4	<2	ug/l	TM30/PM14
Dissolved Arsenic #	3.5	1.5	1.3	<0.9	4.3	1.7	<0.9	<0.9	<0.9	3.7	<0.9	ug/l	TM30/PM14
Dissolved Barium #	63.4	38.0	32.5	50.3	34.8	29.6	42.8	42.4	49.8	90.9	<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	ug/l	TM30/PM14
Dissolved Boron	557	2437	2354	3396	601	525	664	765	2776	2480	<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.11	<0.03	<0.03	0.08	<0.03	<0.03	<0.03	0.03	<0.03	2.06	<0.03	ug/l	TM30/PM14
Dissolved Calcium #	107.8	265.9$_A$	301.8$_A$	394.3$_A$	80.6	90.5	122.7	147.1	363.2$_A$	448.5$_A$	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	0.6	5.8	4.9	4.4	0.5	0.4	0.7	0.7	0.4	0.3	<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	<0.1	<0.1	<0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	4	<3	<3	<3	<3	<3	<3	<3	19	<3	ug/l	TM30/PM14
Total Dissolved Iron #	15.1	5.2	<4.7	<4.7	19.6	13.8	97.9	7.1	14.8	47690.0$_A$	<4.7	ug/l	TM30/PM14
Dissolved Lead #	4.4	<0.4	<0.4	<0.4	2.5	3.1	<0.4	3.2	1.3	1.8	<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	51.8	830.8$_E$	761.7$_E$	1114.0$_E$	25.2	30.5	146.3$_A$	166.7$_A$	863.4$_E$	883.9$_E$	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	269.3	<1.5	49.4	<1.5	502.6	494.1	503.7	571.0	832.1	264.5	<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	5.8	4.9	5.0	6.7	29.9	49.2	87.0	13.2	3.7	3.1	<0.2	ug/l	TM30/PM14
Dissolved Nickel #	2.0	0.3	0.5	0.5	2.9	2.1	6.1	1.6	1.0	0.7	<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	9.5	71.2	70.5	67.1	76.1	79.0	7.4	40.7	273.4	3.6	<0.7	ug/l	TM30/PM14
Dissolved Potassium #	41.8	228.2$_A$	246.8$_A$	349.1$_A$	106.9$_A$	113.6$_A$	75.0	84.9	285.3$_A$	287.8$_A$	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Sodium #	447.4$_A$	6525.0	6515.0$_G$	11120.0$_G$	519.3$_A$	604.9$_A$	1517.0$_D$	1818.0$_E$	7491.0$_G$	8520.0$_G$	<0.1	mg/l	TM30/PM14
Dissolved Thallium #	<0.9	3.0	<0.9	1.5	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Vanadium #	2.1	0.7	<0.6	<0.6	2.7	1.5	<0.6	0.7	<0.6	<0.6	<0.6	ug/l	TM30/PM14
Dissolved Zinc #	30.3	54.1	29.3	27.7	2.0	3.0	3.1	9.5	5.5	129.0	<1.5	ug/l	TM30/PM14
Total Boron	597	2479	2371	3011	611	508	667	719	2517	2336	<2	ug/l	TM30/PM14
Total Chromium	4.3	7.1	36.4	4.5	28.2	10.8	921.4	17.0	2.6	8.7	<0.2	ug/l	TM30/PM14
Total Copper	12	4	13	<3	59	27	671	13	8	81	<3	ug/l	TM30/PM14
Total Iron	1521.0	55.2	3317.0	138.6	28220.0$_A$	10760.0	86690.0$_D$	1540.0	3995.0	62790.0$_A$	<4.7	ug/l	TM30/PM14
Total Lead	22.6	<0.4	16.0	0.4	160.4	69.7	675.5	14.8	4.6	476.3	<0.4	ug/l	TM30/PM14
Total Manganese	260.6	1.7	606.7	82.5	1155.0	800.2	1381.0	538.5	883.0	273.4	<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	39.7	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Total Molybdenum	6.1	4.9	5.5	6.4	31.1	49.4	263.5	15.3	3.9	3.3	<0.2	ug/l	TM30/PM14
Total Nickel	1.9	0.3	2.3	0.5	36.3	15.2	56.7	2.0	3.6	4.5	<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	0.01	0.05	0.03	<0.01	<0.01	2.10	0.68	<0.01	0.29	<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	16.38	486.50$_F$	484.30$_F$	799.50$_F$	35.60	39.22	99.73$_D$	120.70$_D$	544.40$_F$	587.50$_F$	<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-8	9-18	19-26	27-34	35-42	43-50	51-58	59-66	67-76	77-84	LOD/LOR	Units	Method No.
Sample ID	BH102L	BH105AH	BH105AL	BH110AH	BH202H	BH202L	BH209RH	BH209RL	BH215H	BH217H			
Depth				7.35			9.00	9.00		3.20			
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
PAH MS													
Naphthalene	3.04	<0.01	<0.01	<0.01	0.23	0.14	<0.01	<0.01	<0.01	0.07	<0.01	ug/l	TM4/PM30
Acenaphthylene	0.01	<0.01	<0.01	<0.01	0.08	0.06	<0.01	0.01	0.02	0.02	<0.01	ug/l	TM4/PM30
Acenaphthene	0.98	<0.01	0.01	<0.01	0.26	0.19	0.01	0.01	0.02	0.03	<0.01	ug/l	TM4/PM30
Fluorene	0.03	0.01	0.01	0.01	0.39	0.28	0.01	0.02	0.02	0.05	<0.01	ug/l	TM4/PM30
Phenanthrene	0.02	0.01	0.02	0.01	0.61	0.40	0.01	0.02	0.02	0.10	<0.01	ug/l	TM4/PM30
Anthracene	0.01	<0.01	0.01	<0.01	0.18	0.11	<0.01	0.01	<0.01	0.05	<0.01	ug/l	TM4/PM30
Fluoranthene	0.01	<0.01	0.01	<0.01	0.04	0.03	0.01	0.05	0.02	1.79	<0.01	ug/l	TM4/PM30
Pyrene	0.01	<0.01	0.01	<0.01	0.04	0.03	0.02	0.04	0.03	1.36	<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	0.41	<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	<0.01	0.20	<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.55	<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.32	<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.15	<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.14	<0.01	ug/l	TM4/PM30
PAH 16 Total	4.1	<0.1	<0.1	<0.1	1.8	1.3	<0.1	0.2	0.1	5.3	<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.40	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.15	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	80	80	95	82	95	76	80	80	95	111	<0	%	TM4/PM30
VOC TICs	-	ND	-	-	-	-	-	-	ND	-		None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	<0.01	<0.01	<0.01	0.03	0.11	0.13	<0.01	<0.01	0.15	<0.01	<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01	0.39	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroform	<0.01	0.06	0.04	0.03	0.02	<0.01	<0.01	0.02	<0.01	0.02	<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.01	<0.01	<0.01	0.23	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Benzene	0.02	<0.01	0.06	<0.01	0.06	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-8	9-18	19-26	27-34	35-42	43-50	51-58	59-66	67-76	77-84	LOD/LOR	Units	Method No.
Sample ID	BH102L	BH105AH	BH105AL	BH110AH	BH202H	BH202L	BH209RH	BH209RL	BH215H	BH217H			
Depth				7.35			9.00	9.00		3.20			
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
1,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromomethane	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromodichloromethane	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Toluene	0.13	0.05	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Ethylbenzene	0.14	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
p/m-Xylene	0.23	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
o-Xylene	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromoform	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Isopropylbenzene	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Naphthalene	4.32	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	98	99	97	98	0	0	0	0	0	0	<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	90	88	85	86	0	0	0	0	0	0	<0	%	TM128/PM0
VOC TICs	See Attached	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-8	9-18	19-26	27-34	35-42	43-50	51-58	59-66	67-76	77-84	LOD/LOR	Units	Method No.
Sample ID	BH102L	BH105AH	BH105AL	BH110AH	BH202H	BH202L	BH209RH	BH209RL	BH215H	BH217H			
Depth				7.35			9.00	9.00		3.20			
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC TICs	ND	ND	ND	ND	See Attached	See Attached	ND	ND	ND	ND		None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	150	<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	210	<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	360	<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	70	<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	320	<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	180	<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	570	<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	930	<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM26/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-8	9-18	19-26	27-34	35-42	43-50	51-58	59-66	67-76	77-84	LOD/LOR	Units	Method No.
Sample ID	BH102L	BH105AH	BH105AL	BH110AH	BH202H	BH202L	BH209RH	BH209RL	BH215H	BH217H			
Depth				7.35			9.00	9.00		3.20			
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM27/PM0
Sulphate #	58.44	1350.05	1343.40	2174.72	114.54	108.82	244.14	282.67	1495.41	1611.21	<0.05	mg/l	TM38/PM0
Chloride #	612.6	9187.3	9400.4	15137.0$_D$	749.9	810.2	1941.0	2357.6	10663.1	10542.6	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	1.1	1.2	1.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM38/PM0
Free Cyanide #	0.007	<0.005	0.008	<0.005	<0.005	<0.005	0.009	0.013	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Total Cyanide	0.016	<0.005	0.015	<0.005	0.005	0.008	0.014	0.018	<0.005	0.006	<0.005	mg/l	TM89/PM0
Complex Cyanide	0.009	<0.005	0.007	<0.005	0.005	0.008	0.005	0.005	<0.005	0.006	<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.40	0.71	0.64	0.65	4.08	3.79	1.32	1.51	1.16	0.71	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	6	5	4	<2	<2	<2	<2	<2	<2	<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	45	<1	46	<1	<1	<1	<1	<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	mg/l	TM107/PM0
BOD (Settled) #	8	-	7	-	9	9	4	3	4	-	<1	mg/l	TM58/PM0
BOD (Settled)	-	<1	-	<1	-	-	-	-	-	42	<1	mg/l	TM121/PM0
COD (Settled) #	39	218$_E$	301$_D$	692$_E$	49	54	64	78	399	442$_D$	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	2671	26003	25585	40651	3045	2924	5996	7497	29428	29883	<2	uS/cm	TM76/PM0
pH #	7.42	8.06	8.07	8.34	8.19	8.46	7.67	7.79	7.53	6.60	<0.01	pH units	TM73/PM0
Salinity	<0.1	1.0	1.1	1.6	<0.1	<0.1	0.1	0.1	1.2	1.3	<0.1	%	TM64/PM0
Total Organic Carbon #	12	4	5	3	6	6	9	9	16	7	<2	mg/l	TM60/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	85-94	95-104	105-114	115-124	125-134	135-144	145-154	155-162	163-172	173-182	LOD/LOR	Units	Method No.
Sample ID	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109H	BH109L	BH111H			
Depth					10.40			3.10					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Dissolved Aluminium #	<1.5	2.6	9.4	2.6	2.2	4.6	6.5	7.8	3.2	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	1.4	2.3	<0.9	1.9	3.2	2.7	<0.9	<0.9	2.4	<0.9	ug/l	TM30/PM14
Dissolved Barium #	35.6	82.4	48.2	34.6	9.7	58.2	59.3	61.8	58.5	31.9	<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	1668	891	544	418	784	3427	3352	1638	1355	3464	<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.15	<0.03	0.04	0.05	0.11	0.06	0.22	0.35	0.97	<0.03	<0.03	ug/l	TM30/PM14
Dissolved Calcium #	408.7$_A$	120.3	146.9	99.3	171.4	401.7$_A$	401.6$_A$	276.7$_A$	162.0	457.4$_A$	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	0.3	0.3	0.7	0.4	0.7	2.9	2.6	0.4	0.2	1.2	<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.2	0.1	<0.1	<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	<3	7	5	<3	<3	3	5	4	<3	<3	ug/l	TM30/PM14
Total Dissolved Iron #	2988.0	15.1	68.5	<4.7	<4.7	<4.7	7.8	7624.0	9832.0	<4.7	<4.7	ug/l	TM30/PM14
Dissolved Lead #	3.1	2.8	1.8	1.6	0.5	<0.4	<0.4	3.9	6.3	0.6	<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	497.5$_A$	78.9	77.7	33.8	240.3$_A$	1251.0$_E$	1339.0$_E$	430.0$_A$	323.4$_E$	1220.0$_E$	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	441.2	624.4	276.9	90.1	8.5	<1.5	<1.5	1848.0	1029.0	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	1.2	2.9	1.2	1.8	3.5	6.9	6.8	3.0	2.5	5.4	<0.2	ug/l	TM30/PM14
Dissolved Nickel #	3.7	1.7	0.8	0.8	0.9	<0.2	0.3	4.0	1.3	0.3	<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	2.2	8.2	79.7	32.5	121.8	141.3	128.9	1.1	0.9	79.6	<0.7	ug/l	TM30/PM14
Dissolved Potassium #	159.3$_A$	55.8	48.1	30.5	69.6	358.8$_A$	357.8$_A$	146.9$_A$	84.0	406.2$_A$	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Sodium #	4072.0$_E$	709.4$_D$	649.3$_D$	343.7$_A$	2144.0$_E$	11780.0	10940.0	3995.0$_E$	2603.0$_E$	10660.0$_G$	<0.1	mg/l	TM30/PM14
Dissolved Thallium #	<0.9	<0.9	<0.9	<0.9	1.2	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Vanadium #	<0.6	2.5	2.5	1.9	1.3	<0.6	<0.6	0.8	1.4	<0.6	<0.6	ug/l	TM30/PM14
Dissolved Zinc #	174.9	6.4	33.8	12.6	4.9	12.3	12.0	10.5	18.4	156.0	<1.5	ug/l	TM30/PM14
Total Boron	1741	823	553	416	767	3485	3392	1679	1170	3203	<2	ug/l	TM30/PM14
Total Chromium	0.3	1.3	2.1	11.9	3.5	7.0	34.7	<0.2	1.5	2.2	<0.2	ug/l	TM30/PM14
Total Copper	20	4	9	35	5	23	149	13	14	5	<3	ug/l	TM30/PM14
Total Iron	12940.0	1310.0	924.7	8240.0	2080.0	3988.0	49650.0$_A$	24600.0$_A$	24890.0$_A$	26.7	<4.7	ug/l	TM30/PM14
Total Lead	49.0	6.8	4.3	26.1	5.0	35.6	180.9	4.1	4.4	<0.4	<0.4	ug/l	TM30/PM14
Total Manganese	423.3	582.0	277.4	1074.0	93.1	718.5	8152.0	1866.0	979.4	<1.5	<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Total Molybdenum	1.5	2.4	1.2	3.4	3.2	7.7	11.9	2.7	2.5	5.6	<0.2	ug/l	TM30/PM14
Total Nickel	3.6	1.5	0.9	9.2	1.7	7.4	48.8	3.9	1.3	<0.2	<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	0.21	0.02	<0.01	0.01	0.01	0.04	0.02	<0.01	<0.01	0.01	<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	482.00$_E$	6.69	61.47$_A$	31.11	189.00$_D$	815.70$_F$	835.00$_F$	345.30$_E$	248.50$_D$	821.40$_F$	<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	85-94	95-104	105-114	115-124	125-134	135-144	145-154	155-162	163-172	173-182	LOD/LOR	Units	Method No.
Sample ID	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109H	BH109L	BH111H			
Depth					10.40			3.10					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
PAH MS													
Naphthalene	0.01	3.30	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Acenaphthylene	0.01	0.01	<0.01	0.07	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Acenaphthene	0.01	1.76	0.01	0.08	<0.01	0.02	<0.01	0.01	0.01	<0.01	<0.01	ug/l	TM4/PM30
Fluorene	0.01	0.04	0.01	0.19	0.01	0.04	0.01	0.01	0.01	0.01	<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	0.02	0.01	0.20	0.01	0.03	0.01	0.01	0.02	0.01	<0.01	ug/l	TM4/PM30
Anthracene	0.01	0.01	<0.01	0.02	<0.01	0.01	<0.01	0.01	0.01	<0.01	<0.01	ug/l	TM4/PM30
Fluoranthene	0.02	0.01	<0.01	0.02	<0.01	0.01	<0.01	0.02	0.04	<0.01	<0.01	ug/l	TM4/PM30
Pyrene	0.05	0.01	<0.01	0.02	<0.01	0.01	<0.01	0.04	0.04	<0.01	<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH 16 Total	0.1	5.2	<0.1	0.6	<0.1	0.2	<0.1	0.1	0.1	<0.1	<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	88	85	82	99	81	102	88	85	82	82	<0	%	TM4/PM30
VOC TICs	ND	ND	ND	ND	ND	ND	ND	-	ND	ND		None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	0.18	<0.01	0.01	<0.01	<0.01	0.03	0.03	0.02	0.03	<0.01	<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroform	<0.01	<0.01	<0.01	<0.01	0.55	0.06	0.05	<0.01	0.01	0.15	<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	0.02	<0.01	<0.01	<0.01	<0.01	0.14	0.11	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	85-94	95-104	105-114	115-124	125-134	135-144	145-154	155-162	163-172	173-182	LOD/LOR	Units	Method No.
Sample ID	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109H	BH109L	BH111H			
Depth					10.40			3.10					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
1,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromodichloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Toluene	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	0.10	<0.01	0.05	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Ethylbenzene	<0.01	0.40	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
p/m-Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
o-Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromoform	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Isopropylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Naphthalene	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	0	0	0	0	0	0	0	0	0	0	<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	0	0	0	0	0	0	0	0	0	0	<0	%	TM128/PM0
VOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	85-94	95-104	105-114	115-124	125-134	135-144	145-154	155-162	163-172	173-182	LOD/LOR	Units	Method No.
Sample ID	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109H	BH109L	BH111H			
Depth					10.40			3.10					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM26/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	85-94	95-104	105-114	115-124	125-134	135-144	145-154	155-162	163-172	173-182	LOD/LOR	Units	Method No.
Sample ID	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109H	BH109L	BH111H			
Depth					10.40			3.10					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM27/PM0
Sulphate #	1168.15	15.86	160.24	93.54	474.89	2252.15	2275.04	839.84	576.02	2102.44	<0.05	mg/l	TM38/PM0
Chloride #	6119.9	1051.2	844.3	389.7	3247.2	15535.8$_D$	16023.1$_D$	5876.2	3871.6	14878.1$_D$	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	<0.2	0.3	0.7	14.7	1.1	1.0	<0.2	<0.2	0.9	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	0.010	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	0.016	0.017	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	0.006	0.008	0.009	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.82	1.65	0.63	0.19	0.03	0.50	0.31	1.08	0.81	0.61	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2	<2	<2	<2	2	2	<2	<2	<2	<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM107/PM0
BOD (Settled) #	4	17	4	3	<1	3	3	7	5	-	<1	mg/l	TM58/PM0
BOD (Settled)	-	-	-	-	-	-	-	-	-	<1	<1	mg/l	TM121/PM0
COD (Settled) #	394$_D$	57	50	37	60	453$_D$	497$_D$	183	96	657$_D$	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	18124	3873	3372	1863	9857	40178	40200	16021	11808	40105	<2	uS/cm	TM76/PM0
pH #	7.04	7.40	7.60	7.28	7.55	7.76	7.80	6.81	6.92	7.97	<0.01	pH units	TM73/PM0
Salinity	0.6	<0.1	<0.1	<0.1	0.3	2.1	1.6	0.6	0.4	1.7	<0.1	%	TM64/PM0
Total Organic Carbon #	7	13	9	9	3	3	3	10	8	3	<2	mg/l	TM60/PM0

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Client Name: Arup
Reference:
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Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	183-192	193-200	201-210	211-220	221-230	231-240	241-248	249-258	259-268	269-278	LOD/LOR	Units	Method No.
Sample ID	BH111L	BH112H	BH112AL	BH113H	BH114H	BH201RH	BH204H	BH204L	BH206H	BH206L			
Depth		6.45		6.00			5.50						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Dissolved Aluminium #	<1.5	<1.5	2.8	<1.5	<1.5	2.0	2.2	2.8	4.2	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	<0.9	2.3	<0.9	2.3	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Barium #	52.3	20.0	42.2	<1.8	17.3	15.9	33.4	35.6	45.7	38.6	<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	3383	189	200	2823	913	2810	2711	2306	1398	1392	<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.12	<0.03	<0.03	<0.03	<0.03	0.20	0.06	<0.03	<0.03	<0.03	<0.03	ug/l	TM30/PM14
Dissolved Calcium #	420.4_{A}	88.5	102.4	286.1_{A}	156.2	460.2_{A}	358.1_{A}	406.5_{A}	154.1	141.2	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	1.6	0.7	1.1	<0.2	0.3	1.1	1.7	1.1	0.9	0.6	<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM30/PM14
Dissolved Copper #	5	<3	4	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	<4.7	4.9	<4.7	8.5	6.0	<4.7	<4.7	7.1	5.5	<4.7	ug/l	TM30/PM14
Dissolved Lead #	0.6	4.9	5.4	0.8	3.4	<0.4	<0.4	<0.4	1.6	1.3	<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	1242.0_{E}	17.7	14.1	902.9_{E}	144.5_{A}	1024.0_{E}	981.1_{E}	867.0_{E}	373.2_{A}	336.5_{E}	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<1.5	2.5	2.5	<1.5	467.2	400.8	7.1	<1.5	773.8	743.3	<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	5.8	4.8	5.0	4.8	3.0	11.7	10.6	14.0	4.0	3.3	<0.2	ug/l	TM30/PM14
Dissolved Nickel #	0.8	0.8	1.5	<0.2	0.9	4.6	0.5	0.5	0.7	1.4	<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	105.3	70.0	66.3	30.1	423.2	43.6	30.0	23.4	237.8	274.0	<0.7	ug/l	TM30/PM14
Dissolved Potassium #	380.4_{A}	14.8	11.6	262.2_{A}	47.6	318.2_{A}	271.9_{A}	287.0_{A}	129.2_{A}	98.5	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Sodium #	12330.0_{G}	94.9	54.9	7005.0_{G}	1336.0_{D}	8184.0_{G}	7918.0_{G}	6920.0_{G}	3317.0_{E}	2702.0_{E}	<0.1	mg/l	TM30/PM14
Dissolved Thallium #	<0.9	<0.9	<0.9	<0.9	1.4	<0.9	1.4	1.0	1.2	1.1	<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Vanadium #	<0.6	2.2	1.7	<0.6	1.3	<0.6	<0.6	<0.6	0.6	0.8	<0.6	ug/l	TM30/PM14
Dissolved Zinc #	134.9	45.6	123.2	4.7	22.0	6.7	7.4	8.4	5.3	3.2	<1.5	ug/l	TM30/PM14
Total Boron	3108	193	186	2453	825	2702	2641	2207	1316	1215	<2	ug/l	TM30/PM14
Total Chromium	12.2	1.5	0.8	<0.2	0.6	4.5	1.4	0.4	<0.2	0.7	<0.2	ug/l	TM30/PM14
Total Copper	81	10	5	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Iron	6517.0	1075.0	53.0	14.3	662.8	127.7	54.4	166.1	38.0	77.6	<4.7	ug/l	TM30/PM14
Total Lead	104.6	11.4	5.1	<0.4	4.0	0.8	<0.4	<0.4	<0.4	<0.4	<0.4	ug/l	TM30/PM14
Total Manganese	232.3	223.8	4.3	<1.5	461.1	391.0	18.5	67.8	715.2	713.7	<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Total Molybdenum	5.6	4.9	5.0	4.8	2.2	12.1	10.2	13.3	3.9	3.0	<0.2	ug/l	TM30/PM14
Total Nickel	1.3	1.6	0.6	<0.2	0.3	8.9	<0.2	<0.2	<0.2	0.8	<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	1.31	0.02	0.03	<0.01	<0.01	0.01	<0.01	<0.01	0.01	0.01	<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	798.30_{F}	22.58	17.51	589.60_{F}	110.40_{D}	687.50_{F}	676.00_{F}	574.80_{F}	233.60_{D}	253.30_{D}	<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	183-192	193-200	201-210	211-220	221-230	231-240	241-248	249-258	259-268	269-278	LOD/LOR	Units	Method No.
Sample ID	BH111L	BH112H	BH112AL	BH113H	BH114H	BH201RH	BH204H	BH204L	BH206H	BH206L			
Depth		6.45		6.00			5.50						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
PAH MS													
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.27	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Acenaphthylene	0.04	<0.01	0.06	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Acenaphthene	0.04	<0.01	0.08	<0.01	<0.01	<0.01	0.06	0.13	0.01	<0.01	<0.01	ug/l	TM4/PM30
Fluorene	0.09	0.01	0.18	0.01	0.01	0.01	0.02	0.05	0.01	0.01	<0.01	ug/l	TM4/PM30
Phenanthrene	0.10	0.01	0.20	0.01	0.01	0.01	0.01	0.03	0.01	0.02	<0.01	ug/l	TM4/PM30
Anthracene	0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Fluoranthene	0.02	<0.01	0.03	<0.01	<0.01	<0.01	0.01	0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Pyrene	0.02	<0.01	0.03	<0.01	<0.01	0.01	0.01	0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH 16 Total	0.3	<0.1	0.6	<0.1	<0.1	<0.1	0.2	0.5	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	81	83	73	82	85	80	81	80	83	97	<0	%	TM4/PM30
VOC TICs	ND	-	ND	ND	ND	ND	-	ND	ND	ND		None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroform	0.11	0.02	0.11	7.21	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	183-192	193-200	201-210	211-220	221-230	231-240	241-248	249-258	259-268	269-278	LOD/LOR	Units	Method No.
Sample ID	BH111L	BH112H	BH112AL	BH113H	BH114H	BH201RH	BH204H	BH204L	BH206H	BH206L			
Depth		6.45		6.00			5.50						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
1,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromomethane	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromodichloromethane	0.06	<0.01	0.07	3.77	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Toluene	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	0.03	0.14	0.02	0.03	0.03	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.01	<0.01	0.03	1.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
p/m-Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
o-Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromoform	<0.01	<0.01	<0.01	0.32	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Isopropylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	0	0	0	0	0	0	0	0	0	0	<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	0	0	0	0	0	0	0	0	0	0	<0	%	TM128/PM0
VOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	183-192	193-200	201-210	211-220	221-230	231-240	241-248	249-258	259-268	269-278	LOD/LOR	Units	Method No.
Sample ID	BH111L	BH112H	BH112AL	BH113H	BH114H	BH201RH	BH204H	BH204L	BH206H	BH206L			
Depth		6.45		6.00			5.50						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	See Attached		None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM26/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	183-192	193-200	201-210	211-220	221-230	231-240	241-248	249-258	259-268	269-278	LOD/LOR	Units	Method No.
Sample ID	BH111L	BH112H	BH112AL	BH113H	BH114H	BH201RH	BH204H	BH204L	BH206H	BH206L			
Depth		6.45		6.00			5.50						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM27/PM0
Sulphate #	2017.58	64.96	51.47	1623.10	289.11	1831.54	1728.68	1618.81	654.99	567.92	<0.05	mg/l	TM38/PM0
Chloride #	15318.9$_D$	126.9	73.0	11494.0	1989.2	13435.8$_D$	12453.6$_D$	11622.4	5012.1	4324.0	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	1.4	0.6	0.7	3.6	0.3	1.2	2.2	0.9	<0.2	<0.2	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	0.06	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	<0.005	<0.005	0.006	<0.005	0.014	0.005	<0.005	0.005	<0.005	<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	<0.005	<0.005	0.006	<0.005	0.008	0.005	<0.005	0.005	<0.005	<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.65	<0.03	0.12	0.71	0.69	2.50	0.16	0.33	0.61	0.73	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM107/PM0
BOD (Settled) #	-	2	1	4	5	4	21	2	7	6	<1	mg/l	TM58/PM0
BOD (Settled)	<1	-	-	-	-	-	-	-	-	-	<1	mg/l	TM121/PM0
COD (Settled) #	604$_D$	17	21	381$_D$	65	457$_D$	472$_D$	495$_D$	173	128	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	40208	979	831	30611	6438	35526	33976	31125	14795	13174	<2	uS/cm	TM76/PM0
pH #	7.85	7.63	7.39	7.96	7.74	7.41	8.06	8.24	7.92	7.97	<0.01	pH units	TM73/PM0
Salinity	1.8	<0.1	<0.1	1.0	<0.1	1.4	1.4	1.3	0.5	0.3	<0.1	%	TM64/PM0
Total Organic Carbon #	5	6	6	3	6	4	3	3	9	10	<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	279-286	287-296	297-302	303-312	313-322	323-332	333-341	342-351	352-361	362-371	LOD/LOR	Units	Method No.
Sample ID	BH207H	BH207L	BH208H	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216H			
Depth			2.85				5.85	8.60					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Dissolved Aluminium #	<1.5	<1.5	6.9	<1.5	<1.5	<1.5	<1.5	4.8	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	<0.9	1.0	8.6	1.1	<0.9	1.4	2.8	8.6	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Barium #	28.5	16.7	209.1	269.6	24.5	14.9	62.8	<1.8	10.5	964.1	<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	378	191	1215	1247	2498	2239	1997	2717	2211	266	<2	ug/l	TM30/PM14
Dissolved Cadmium #	<0.03	<0.03	<0.03	0.07	<0.03	<0.03	<0.03	<0.03	0.11	0.14	<0.03	ug/l	TM30/PM14
Dissolved Calcium #	144.8	114.4	165.5	266.5$_A$	313.0$_A$	258.0$_A$	330.1$_A$	144.3	155.9	191.2	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	0.3	1.6	2.2	2.5	0.3	0.3	0.9	0.5	1.0	0.2	<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	0.1	3.1	2.2	<0.1	<0.1	2.2	1.6	<0.1	0.4	<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	13	<3	8	<3	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	6.1	19.1	17.8	37.2	<4.7	14.5	79.0	79.4	1463.0	<4.7	ug/l	TM30/PM14
Dissolved Lead #	3.3	4.2	6.9	5.9	<0.4	0.5	4.7	4.5	0.9	3.9	<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	41.8	15.4	64.2	81.0	924.0$_E$	731.1$_E$	209.9$_A$	72.2	57.3	15.1	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	371.2	113.6	6278.0	5624.0	310.9	<1.5	1552.0	572.6	564.1	302.9	<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	0.7	1.7	1.6	5.7	4.8	4.6	4.3	7.0	1.6	0.9	<0.2	ug/l	TM30/PM14
Dissolved Nickel #	<0.2	10.8	4.6	3.5	2.7	<0.2	2.4	1.6	0.4	2.5	<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	42.0	38.1	2.9	27.3	167.7	201.9	83.5	339.9	2239.0	2.8	<0.7	ug/l	TM30/PM14
Dissolved Potassium #	25.2	15.4	55.1	64.6	235.6$_A$	188.6$_A$	62.6	52.4	43.4	7.6	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Sodium #	349.9$_A$	85.1	674.5$_D$	734.1$_A$	6221.0$_G$	5267.0$_G$	1538.0$_D$	590.3$_D$	432.6$_A$	19.0	<0.1	mg/l	TM30/PM14
Dissolved Thallium #	1.3	<0.9	<0.9	<0.9	<0.9	1.4	<0.9	<0.9	<0.9	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Vanadium #	1.0	0.7	5.3	8.7	<0.6	<0.6	2.4	4.1	3.6	2.0	<0.6	ug/l	TM30/PM14
Dissolved Zinc #	4.6	2.9	3.8	8.7	5.0	2.2	2.0	2.9	<1.5	20.8	<1.5	ug/l	TM30/PM14
Total Boron	320	192	1041	1092	2199	1967	1739	2413	2154	217	<2	ug/l	TM30/PM14
Total Chromium	<0.2	4.7	96.2	2.9	1.3	2.6	13.3	4.9	2.3	3.0	<0.2	ug/l	TM30/PM14
Total Copper	<3	13	386	30	<3	16	35	23	<3	290	<3	ug/l	TM30/PM14
Total Iron	512.5	2972.0	105800.0$_D$	2272.0	2368.0	11750.0	29590.0$_A$	20650.0$_A$	2960.0	24070.0$_A$	<4.7	ug/l	TM30/PM14
Total Lead	1.6	3.5	96.4	10.1	<0.4	4.7	21.4	9.2	3.8	1952.0	<0.4	ug/l	TM30/PM14
Total Manganese	353.9	265.2	8568.0	5487.0	2103.0	13590.0	2063.0	644.3	561.8	318.4	<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1	<0.5	ug/l	TM30/PM14
Total Molybdenum	0.8	1.0	3.1	5.2	5.9	14.9	4.7	11.9	3.0	0.4	<0.2	ug/l	TM30/PM14
Total Nickel	0.5	11.6	67.0	3.6	1.0	11.3	18.0	8.5	1.6	5.6	<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	0.01	0.02	0.02	<0.01	0.02	<0.01	<0.01	<0.01	0.53	<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	45.13	26.08	5.90	7.61	603.50$_F$	464.20$_F$	89.95$_A$	97.39$_D$	98.10$_D$	3.82	<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	279-286	287-296	297-302	303-312	313-322	323-332	333-341	342-351	352-361	362-371	LOD/LOR	Units	Method No.
Sample ID	BH207H	BH207L	BH208H	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216H			
Depth			2.85				5.85	8.60					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
PAH MS													
Naphthalene	<0.01	0.03	-	0.03	<0.01	<0.01	<0.01	<0.01	0.01	-	<0.01	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	-	0.23	<0.01	<0.01	0.01	<0.01	0.02	-	<0.01	ug/l	TM4/PM30
Acenaphthene	0.01	0.02	-	0.28	<0.01	0.01	0.01	0.03	0.04	-	<0.01	ug/l	TM4/PM30
Fluorene	0.01	0.04	-	0.73	0.01	0.03	0.01	0.02	0.04	-	<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	0.05	-	0.33	0.02	0.05	0.02	0.03	0.07	-	<0.01	ug/l	TM4/PM30
Anthracene	<0.01	0.01	-	0.08	0.01	0.01	0.01	0.01	0.02	-	<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	0.03	-	0.40	0.01	0.02	0.01	0.02	0.04	-	<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.05	-	0.52	0.01	0.03	0.01	0.02	0.04	-	<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	0.01	-	0.17	0.01	0.01	0.01	<0.01	0.02	-	<0.01	ug/l	TM4/PM30
Chrysene	<0.01	0.01	-	0.40	<0.01	0.01	0.01	<0.01	0.01	-	<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	-	0.29	<0.01	0.01	0.01	<0.01	0.02	-	<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	0.01	-	0.11	<0.01	0.01	<0.01	<0.01	0.01	-	<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	-	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	-	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	0.3	-	3.7	<0.1	0.2	0.1	0.1	0.3	-	<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	-	0.21	<0.01	<0.01	<0.01	<0.01	0.01	-	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	-	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	77	94	-	102	96	101	101	90	98	-	<0	%	TM4/PM30
VOC TICs	-	ND	-	ND	ND	ND	ND	ND	ND	-		None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Chloroform	<0.01	0.02	-	0.17	0.05	0.04	<0.01	0.03	0.03	-	<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Benzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	279-286	287-296	297-302	303-312	313-322	323-332	333-341	342-351	352-361	362-371	LOD/LOR	Units	Method No.
Sample ID	BH207H	BH207L	BH208H	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216H			
Depth			2.85				5.85	8.60					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
1,2-Dichloropropane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Dibromomethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Bromodichloromethane	<0.01	<0.01	-	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Toluene	<0.01	<0.01	-	<0.01	0.03	<0.01	0.07	0.07	0.05	-	<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Ethylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
p/m-Xylene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
o-Xylene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Bromoform	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Isopropylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Naphthalene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	0	0	-	0	0	0	100	100	99	-	<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	0	0	-	0	0	0	84	84	84	-	<0	%	TM128/PM0
VOC TICs	ND	ND	-	ND	ND	ND	ND	ND	ND	-		None	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	279-286	287-296	297-302	303-312	313-322	323-332	333-341	342-351	352-361	362-371	LOD/LOR	Units	Method No.
Sample ID	BH207H	BH207L	BH208H	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216H			
Depth			2.85				5.85	8.60					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC TICs	ND	ND	-	ND	ND	ND	ND	ND	ND	-		None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	-	190	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	-	400	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	-	1540	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	-	2130	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	-	24	<5	<5	<5	<5	<5	-	<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	-	230	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	-	520	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	-	2210	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	-	2984	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	-	5114	<10	<10	<10	<10	<10	-	<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	-	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	-	<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM26/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	279-286	287-296	297-302	303-312	313-322	323-332	333-341	342-351	352-361	362-371	LOD/LOR	Units	Method No.
Sample ID	BH207H	BH207L	BH208H	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216H			
Depth			2.85				5.85	8.60					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
Fluoride	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3	mg/l	TM27/PM0
Sulphate #	124.14	72.18	8.54	13.97	1450.43	1229.21	224.75	241.86	224.04	10.07	<0.05	mg/l	TM38/PM0
Chloride #	540.2	114.3	847.1	1212.4	10350.2	8857.0	2144.4	507.1	305.5	47.5	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	0.4	<0.2	<0.2	1.3	1.8	3.1	<0.2	<0.2	<0.2	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	0.10	0.26	0.16	<0.02	<0.02	<0.02	<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	<0.005	<0.005	<0.005	0.007	0.007	<0.005	0.008	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	<0.005	<0.005	<0.005	0.007	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.57	0.23	3.11	3.14	0.91	1.15	7.51	13.21	12.10	0.57	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5	-	<5	<5	<5	<5	<5	<5	-	<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM107/PM0
BOD (Settled) #	4	2	9	10	-	4	4	14	18	-	<1	mg/l	TM58/PM0
BOD (Settled)	-	-	-	-	<1	-	-	-	-	69	<1	mg/l	TM121/PM0
COD (Settled) #	34	31	289	156	159_E	541_D	105	80	62	95	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	2499	1002	3790	4687	27820	24616	7706	3361	2744	1092	<2	uS/cm	TM76/PM0
pH #	7.43	7.27	7.25	7.30	7.37	7.44	7.36	7.53	7.49	6.85	<0.01	pH units	TM73/PM0
Salinity	<0.1	<0.1	<0.1	<0.1	1.2	0.9	0.2	<0.1	<0.1	<0.1	<0.1	%	TM64/PM0
Total Organic Carbon #	6	5	46	46	4	4	21	27	19	30	<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	374-383	384-393											
Sample ID	BH216L	BH217L											
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G											
Sample Date	13/01/2015	13/01/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1									LOD/LOR	Units	Method No.
Date of Receipt	14/01/2015	14/01/2015											
Dissolved Aluminium #	<1.5	43.3									<1.5	ug/l	TM30/PM14
Dissolved Antimony #	4	<2									<2	ug/l	TM30/PM14
Dissolved Arsenic #	5.9	10.0									<0.9	ug/l	TM30/PM14
Dissolved Barium #	801.2	74.4									<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Dissolved Boron	220	2102									<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.34	3.73									<0.03	ug/l	TM30/PM14
Dissolved Calcium #	179.9	371.9$_A$									<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	0.6									<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	0.4	<0.1									<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	<3									<3	ug/l	TM30/PM14
Total Dissolved Iron #	3344.0	43550.0$_D$									<4.7	ug/l	TM30/PM14
Dissolved Lead #	27.9	1.9									<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	16.2	639.6$_D$									<0.1	mg/l	TM30/PM14
Dissolved Manganese #	304.5	229.0									<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	0.3	1.9									<0.2	ug/l	TM30/PM14
Dissolved Nickel #	3.3	<0.2									<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	9.2	3.7									<0.7	ug/l	TM30/PM14
Dissolved Potassium #	7.5	244.4$_A$									<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2									<1.2	ug/l	TM30/PM14
Dissolved Sodium #	18.9	5962.0$_G$									<0.1	mg/l	TM30/PM14
Dissolved Thallium #	<0.9	<0.9									<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5									<5	ug/l	TM30/PM14
Dissolved Vanadium #	2.6	<0.6									<0.6	ug/l	TM30/PM14
Dissolved Zinc #	99.1	100.6									<1.5	ug/l	TM30/PM14
Total Boron	214	2112									<2	ug/l	TM30/PM14
Total Chromium	22.5	8.1									<0.2	ug/l	TM30/PM14
Total Copper	1982	136									<3	ug/l	TM30/PM14
Total Iron	46110.0$_A$	64070.0$_D$									<4.7	ug/l	TM30/PM14
Total Lead	17720.0$_A$	1241.0									<0.4	ug/l	TM30/PM14
Total Manganese	628.5	288.0									<1.5	ug/l	TM30/PM14
Total Mercury	8.3	2.6									<0.5	ug/l	TM30/PM14
Total Molybdenum	2.3	3.0									<0.2	ug/l	TM30/PM14
Total Nickel	31.7	3.4									<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	1.18	0.60									<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	2.83	555.70$_F$									<0.01	mg/l	TM30/PM14

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	374-383	384-393											
Sample ID	BH216L	BH217L											
Depth													
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G											
Sample Date	13/01/2015	13/01/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	14/01/2015	14/01/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
PAH MS													
Naphthalene	<2.00$_H$	<0.01									<0.01	ug/l	TM4/PM30
Acenaphthylene	63.88$_H$	0.02									<0.01	ug/l	TM4/PM30
Acenaphthene	60.32$_H$	0.02									<0.01	ug/l	TM4/PM30
Fluorene	197.40$_H$	0.05									<0.01	ug/l	TM4/PM30
Phenanthrene	447.22$_H$	0.07									<0.01	ug/l	TM4/PM30
Anthracene	46.23$_H$	0.05									<0.01	ug/l	TM4/PM30
Fluoranthene	255.52$_H$	1.08									<0.01	ug/l	TM4/PM30
Pyrene	267.98$_H$	0.86									<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	124.43$_H$	0.23									<0.01	ug/l	TM4/PM30
Chrysene	104.82$_H$	0.09									<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	152.56$_H$	0.24									<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	92.43$_H$	0.13									<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	40.11$_H$	0.06									<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	4.41$_H$	<0.01									<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	34.98$_H$	0.07									<0.01	ug/l	TM4/PM30
PAH 16 Total	1892.3$_H$	3.0									<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	109.84$_H$	0.17									<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	42.72$_H$	0.07									<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	116$_H$	100									<0	%	TM4/PM30
VOC TICs	See Attached	ND										None	TM15/PM10
Dichlorodifluoromethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Chloromethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Bromomethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Chloroethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	0.45$_D$	<0.01									<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	0.65$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Bromochloromethane	0.24$_D$	<0.01									<0.01	ug/l	TM128/PM0
Chloroform	0.31$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	0.56$_D$	<0.01									<0.01	ug/l	TM128/PM0
Carbon tetrachloride	0.21$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	0.20$_D$	<0.01									<0.01	ug/l	TM128/PM0
Benzene	0.54$_D$	<0.01									<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	0.70$_D$	<0.01									<0.01	ug/l	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	374-383	384-393											
Sample ID	BH216L	BH217L											
Depth													
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G											
Sample Date	13/01/2015	13/01/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	14/01/2015	14/01/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
1,2-Dichloropropane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Dibromomethane	0.37$_D$	<0.01									<0.01	ug/l	TM128/PM0
Bromodichloromethane	0.16$_D$	<0.01									<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Toluene	1.01$_D$	<0.01									<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	1.64$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Chlorobenzene	0.93$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	0.16$_D$	<0.01									<0.01	ug/l	TM128/PM0
Ethylbenzene	1.84$_D$	<0.01									<0.01	ug/l	TM128/PM0
p/m-Xylene	4.57$_D$	<0.01									<0.01	ug/l	TM128/PM0
o-Xylene	0.97$_D$	<0.01									<0.01	ug/l	TM128/PM0
Styrene	0.93$_D$	<0.01									<0.01	ug/l	TM128/PM0
Bromoform	0.22$_D$	<0.01									<0.01	ug/l	TM128/PM0
Isopropylbenzene	9.09$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Bromobenzene	0.60$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Propylbenzene	11.45$_D$	<0.01									<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	1.73$_D$	<0.01									<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
tert-Butylbenzene	13.38$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	2.84$_D$	<0.01									<0.01	ug/l	TM128/PM0
sec-Butylbenzene	43.87$_D$	<0.01									<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	2.73$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	1.32$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	1.77$_D$	<0.01									<0.01	ug/l	TM128/PM0
n-Butylbenzene	59.22$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	1.05$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	3.72$_D$	<0.01									<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	8.22$_D$	<0.01									<0.01	ug/l	TM128/PM0
Naphthalene	36.48$_D$	<0.01									<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.10$_D$	<0.01									<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	119$_D$	83									<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	106$_D$	97									<0	%	TM128/PM0
VOC TICs	See Attached$_D$	ND										None	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	374-383	384-393									LOD/LOR	Units	Method No.
Sample ID	BH216L	BH217L											
Depth													
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G											
Sample Date	13/01/2015	13/01/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	14/01/2015	14/01/2015											
SVOC TICs	See Attached	ND										None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5									<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5									<5	ug/l	TM36/PM12
>C8-C10 #	64	<5									<5	ug/l	TM36/PM12
>C10-C12 #	9035	<5									<5	ug/l	TM5/PM30
>C12-C16 #	34640	170									<10	ug/l	TM5/PM30
>C16-C21 #	47040	140									<10	ug/l	TM5/PM30
>C21-C35 #	17880	<10									<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	108659	310									<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5									<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5									<5	ug/l	TM36/PM12
>EC8-EC10 #	10	<5									<5	ug/l	TM36/PM12
>EC10-EC12 #	2135	<5									<5	ug/l	TM5/PM30
>EC12-EC16 #	19450	60									<10	ug/l	TM5/PM30
>EC16-EC21 #	39000	300									<10	ug/l	TM5/PM30
>EC21-EC35 #	17840	120									<10	ug/l	TM5/PM30
Total aromatics C5-35 #	78435	480									<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	187094	790									<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1									<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7									<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
o-cresol	<0.5	1.1									<0.5	ug/l	TM26/PM0
Total cresols	<0.5	1.1									<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5									<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5									<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5									<5	ug/l	TM26/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	374-383	384-393											
Sample ID	BH216L	BH217L											
Depth													
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G											
Sample Date	13/01/2015	13/01/2015											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	14/01/2015	14/01/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Fluoride	<0.3	<0.3									<0.3	mg/l	TM27/PM0
Sulphate #	2.43	1492.56									<0.05	mg/l	TM38/PM0
Chloride #	32.0	10315.1									<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	<0.2									<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02									<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	0.007									<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	0.007									<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	<0.005									<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.75	0.70									<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2									<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1									<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5									<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3									<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	0.03									<0.02	mg/l	TM107/PM0
BOD (Settled) #	35	-									<1	mg/l	TM58/PM0
BOD (Settled)	-	53									<1	mg/l	TM121/PM0
COD (Settled) #	481	586									<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	1018	28501									<2	uS/cm	TM76/PM0
pH #	6.82	6.53									<0.01	pH units	TM73/PM0
Salinity	<0.1	1.1									<0.1	%	TM64/PM0
Total Organic Carbon #	29	8									<2	mg/l	TM60/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Product

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	297-302	362-371	394-399										
Sample ID	BH208H	BH216H	BH218L - FREE PRODUCT										
Depth	2.85										Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V										
Sample Date	12/01/2015	12/01/2015	13/01/2015										
Sample Type	Ground Water	Ground Water	Product										
Batch Number	1	1	1								LOD/LOR	Units	Method No.
Date of Receipt	14/01/2015	14/01/2015	14/01/2015										
Whole Oil Trace	See Attached	See Attached	See Attached									None	TM1/PM0
Carbon Range	8-40+	8-28	8-40+									None	TM1/PM0
Boiling Point Range	126-525	126-432	126-525+								<50	Degrees C	TM1/PM0
Interpretation	See Attached	See Attached	See Attached									None	TM1/PM0
Pristane/Phytane Ratio	0.615	1.083	N/A									None	TM1/PM0
nC17/Pristane Ratio	<0.1	<0.1	N/A									None	TM1/PM0
Age (± 2years) (Christensen & Larsen 1993)	>20	>20	N/A									Years	TM1/PM0

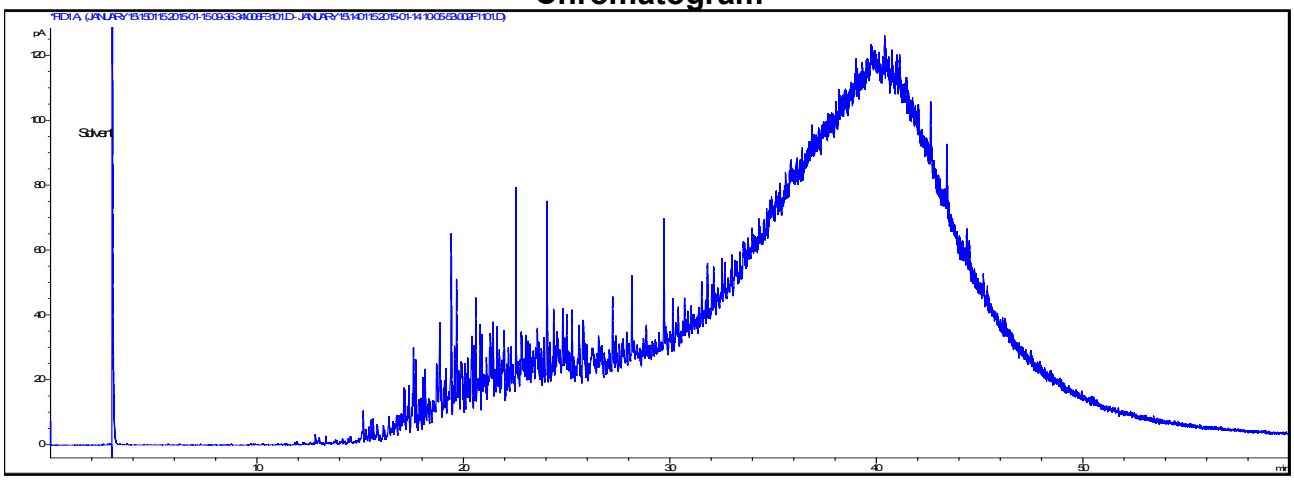
Jones Environmental Forensics Ltd

Whole Oil Analysis by GC-FID

No.4225

Job Number:	15/2337-297		
Client ID:	BH208H		
Description:	Brown Oil on Water		
Carbon Range:	nC8	to	nC40+
Boiling Point Range:	126°C	to	525°C+
Pristane/Phytane Ratio:	0.615		
nC_{17}/Pristane Ratio:	<0.1		
Age(+/-2 years)*	> 20 Years		
	Diesel Portion Only		
Interpretation:	Degraded Diesel and Lube Oil		

Chromatogram



Analyst: M. A. Cully BSc MRSC **Date:** 15/01/2015

*The age of release estimated in this report is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996). Age estimation should be treated with caution as it can be influenced by site specific factors that the laboratory are not aware of.

Bibliography

Christensen, L. B., and Larsen, T. H. (1993) Method for Determining the Age of Diesel Oil Spills in the Soil. ***Groundwater Monitoring Review pp.142 - 149.***

Kaplan, I. R., and Galperin, Y. (1996a) How to Recognize a Hydrocarbon Fuel in the Environment and Estimate its Age of Release. In: Bois, T. J., and Luther, B. J. (Ed.) ***Groundwater and Soil Contamination: Technical Preparation and Litigation Management. New York, Wiley Law Publishers, pp.145 - 199.***

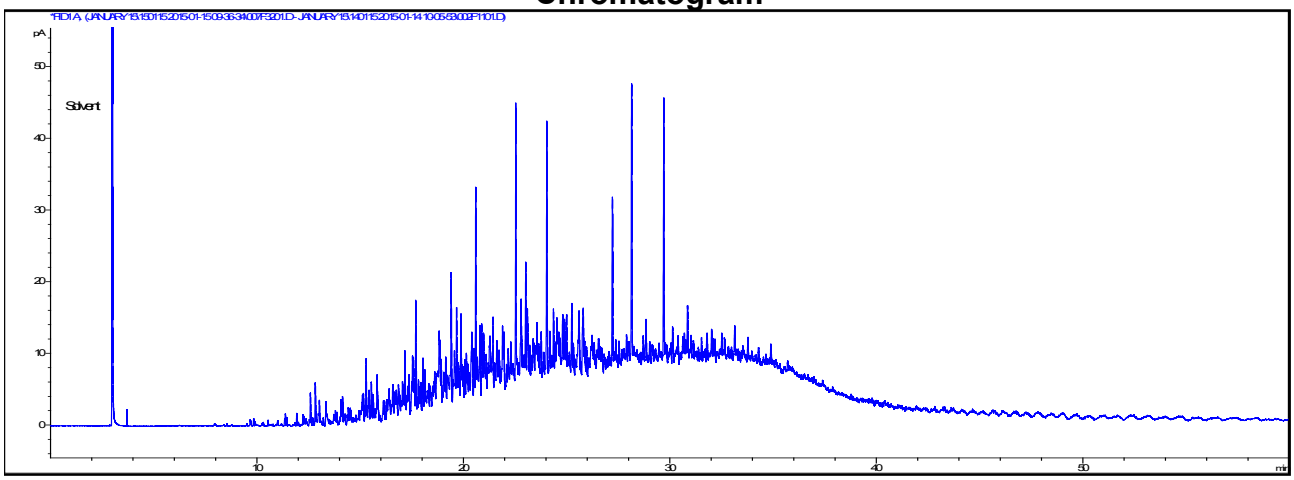
Jones Environmental Forensics Ltd

Whole Oil Analysis by GC-FID

No.4225

Job Number:	2337-364		
Client ID:	BH216H		
Description:	Thin Oil Layer on water		
Carbon Range:	nC8	to	nC28
Boiling Point Range:	126°C	to	432°C
Pristane/Phytane Ratio:	1.083		
nC_{17}/Pristane Ratio:	<0.1		
Age(+/-2 years)*	> 20 Years		
Interpretation:	Degraded Diesel		

Chromatogram



Analyst: M. A. Cully BSc MRSC **Date:**

*The age of release estimated in this report is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996). Age estimation should be treated with caution as it can be influenced by site specific factors that the laboratory are not aware of.

Bibliography

Christensen, L. B., and Larsen, T. H. (1993) Method for Determining the Age of Diesel Oil Spills in the Soil. ***Groundwater Monitoring Review pp.142 - 149.***

Kaplan, I. R., and Galperin, Y. (1996a) How to Recognize a Hydrocarbon Fuel in the Environment and Estimate its Age of Release. In: Bois, T. J., and Luther, B. J. (Ed.) ***Groundwater and Soil Contamination: Technical Preparation and Litigation Management. New York, Wiley Law Publishers, pp.145 - 199.***

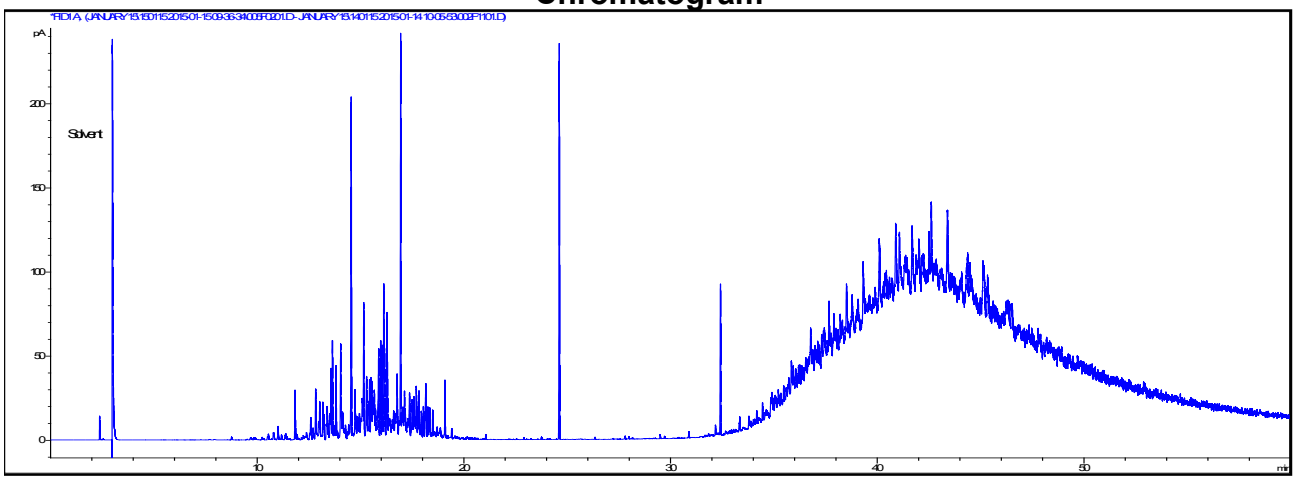
Jones Environmental Forensics Ltd

Whole Oil Analysis by GC-FID

No.4225

Job Number:	15/2337-394		
Client ID:	BH218L - FREE PRODUCT		
Description:	Yellow Oil		
Carbon Range:	nC8	to	nC40+
Boiling Point Range:	126°C	to	525°C+
Pristane/Phytane Ratio:	N/A		
nC_{17}/Pristane Ratio:	N/A		
Age(+/-2 years)	N/A		
Interpretation:	Hydrocarbon Solvent Blend and Heavy Lube Oil		

Chromatogram



Analyst: M. A. Cully BSc MRSC **Date:** 15/01/2015

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

SVOC Report : **Liquid**

J E Sample No.	1-8	9-18	19-26	27-34	35-42	43-50	51-58	59-66	67-76	77-84	LOD/LOR	Units	Method No.
Sample ID	BH102L	BH105AH	BH105AL	BH110AH	BH202H	BH202L	BH209RH	BH209RL	BH215H	BH217H			
Depth				7.35			9.00	9.00		3.20			
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

SVOC Report : **Liquid**

J E Sample No.	85-94	95-104	105-114	115-124	125-134	135-144	145-154	155-162	163-172	173-182	LOD/LOR	Units	Method No.
Sample ID	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109H	BH109L	BH111H			
Depth					10.40			3.10					
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Arup **SVOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	183-192	193-200	201-210	211-220	221-230	231-240	241-248	249-258	259-268	269-278	LOD/LOR	Units	Method No.
Sample ID	BH111L	BH112H	BH112AL	BH113H	BH114H	BH201RH	BH204H	BH204L	BH206H	BH206L			
Depth		6.45		6.00			5.50						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Arup **SVOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	279-286	287-296	303-312	313-322	323-332	333-341	342-351	352-361	374-383	384-393			
Sample ID	BH207H	BH207L	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216L	BH217L			
Depth						5.85	8.60				Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	13/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	30	<1	<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8.2	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Client Name: Arup **VOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	9-18	67-76	85-94	95-104	105-114	115-124	125-134	135-144	145-154	163-172	LOD/LOR	Units	Method No.
Sample ID	BH105AH	BH215H	BH219H	BH102H	BH106H	BH106L	BH107AH	BH108H	BH108L	BH109L			
Depth							10.40						
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015			
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	81	83	83	82	83	83	82	80	82	81	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	88	89	91	87	85	89	90	90	90	88	<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Client Name: Arup **VOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	173-182	183-192	201-210	211-220	221-230	231-240	249-258	259-268	269-278	287-296			
Sample ID	BH111H	BH111L	BH112AL	BH113H	BH114H	BH201RH	BH204L	BH206H	BH206L	BH207L			
Depth				6.00							Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G			
Sample Date	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	7	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	81	81	82	81	82	81	79	82	82	84	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	89	90	89	89	86	87	88	90	90	90	<0	%	TM15/PM10

Client Name: Arup **VOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	303-312	313-322	323-332	333-341	342-351	352-361	374-383	384-393			LOD/LOR	Units	Method No.
Sample ID	BH208L	BH212AH	BH212AL	BH213H	BH214H	BH214L	BH216L	BH217L					
Depth				5.85	8.60								
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V Z P BOD G	V N Z P BOD G	V N Z P BOD G					
Sample Date	13/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	12/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015	14/01/2015					
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4			<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3	4	<3			<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2			<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	82	82	83	85	84	83	83	81			<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	89	91	89	91	87	90	89	89			<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Job number: 15/2337 **Method:** VOC
Sample number: 2 **Matrix:** Liquid
Sample identity: BH102L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
496-11-7	Indane	12.145	80	2.8
766-97-2	Benzene, 1-ethynyl-4-methyl-	12.354	91	0.4
824-90-8	1-Phenyl-1-butene	12.725	80	0.3

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Job number: 15/2337 **Method:** VOC
Sample number: 375 **Matrix:** Liquid
Sample identity: BH216L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
583-57-3	Cyclohexane, 1,2-dimethyl- (cis/trans)	8.405	90	1.5
1072-05-5	Heptane, 2,6-dimethyl-	8.805	80	2.2
1678-91-7	Cyclohexane, ethyl-	9.007	83	2.8
3073-66-3	Cyclohexane, 1,1,3-trimethyl-	9.067	90	4.6
3074-71-3	Heptane, 2,3-dimethyl-	9.271	80	2.1
2234-75-5	Cyclohexane, 1,2,4-trimethyl-	9.301	94	2.9
2216-33-3	Octane, 3-methyl-	9.481	80	2.5
19489-10-2	cis-1-Ethyl-3-methyl-cyclohexane	9.833 - 9.875	90,91	10.3
15869-94-0	Octane, 3,6-dimethyl-	10.371	93	26.8
1678-92-8	Cyclohexane, propyl-	10.452	80	26.0
14676-29-0	Heptane, 3-ethyl-2-methyl-	10.499	90	14.3
5881-17-4	Octane, 3-ethyl-	10.826	81	3.5
13990-93-7	Trans-1,4-diethylcyclohexane	11.316	80	7.7
2425-77-6	1-Decanol, 2-hexyl-	11.403	86	31.6
2456-28-2	Decane, 1,1'-oxybis-	11.462	80	14.4
1678-93-9	Cyclohexane, butyl-	11.778	83	44.5
91-17-8	Naphthalene, decahydro-	12.230	96	32.2
1000351-74-9	Octacosyl trifluoroacetate	12.599	91	57.8
17312-54-8	Decane, 3,7-dimethyl-	12.729	80	43.1
4920-99-4	Benzene, 1-ethyl-3-(1-methylethyl)-	12.765	80	20.8
1000152-47-3	trans-Decalin, 2-methyl-	12.876	95	60.2
95-93-2	Benzene, 1,2,4,5-tetramethyl-	13.011 - 13.486	80,83	144.8
4832-17-1	2-Decalone,c&t	13.082	86	57.0
1595-16-0	Benzene, 1-methyl-4-(1-methylpropyl)-	13.451	91	37.6
4489-84-3	Benzene, (3-methyl-2-butenyl)-	13.812	80	32.1
2050-24-0	Benzene, 1,3-diethyl-5-methyl-	13.903 - 13.999	86,86	55.3
4175-53-5	1H-Indene, 2,3-dihydro-1,3-dimethyl-	13.969	80	26.8
5557-93-7	Benzene, 1-(1-methylethenyl)-2-(1-methylethyl)-	14.899	83	42.8
5617-41-4	Heptylcyclohexane	15.102	81	22.0
3891-98-3	Dodecane, 2,6,10-trimethyl-	15.247	87	70.1

Job number: 15/2337
Sample number: 375
Sample identity: BH216L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Method: **VOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
2613-76-5	1H-Indene, 2,3-dihydro-1,1,3-trimethyl-	15.292 - 15.937	83,84	62.6
91-57-6	Naphthalene, 2-methyl-	15.409	96	43.0

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Job number: 15/2337
Sample number: 376
Sample identity: BH216L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Method: **VOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
934-80-5	Benzene, 4-ethyl-1,2-dimethyl-	7.402	90	128

Job number: 15/2337
Sample number: 42
Sample identity: BH202H
Sample depth:
Sample Type: Ground Water
Units: ug/l

Method: **SVOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
10544-50-0	Cyclic octaatomic sulfur	19.159	95	973

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Job number: 15/2337
Sample number: 50
Sample identity: BH202L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Method: **SVOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
10544-50-0	Cyclic octaatomic sulfur	19.149	92	515

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Job number: 15/2337
Sample number: 278
Sample identity: BH206L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Method: **SVOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
10544-50-0	Cyclic octaatomic sulfur	19.138	95	304

Job number: 15/2337 **Method:** **SVOC**
Sample number: 383 **Matrix:** **Liquid**
Sample identity: BH216L
Sample depth:
Sample Type: Ground Water
Units: ug/l

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
629-92-5	Nonadecane	14.723	83	423
2131-42-2	Naphthalene, 1,4,6-trimethyl-	15.417	98	117
3892-00-0	Pentadecane, 2,6,10-trimethyl-	16.773	90	249
504-44-9	Hexadecane, 2,6,11,15-tetramethyl-	17.296	91	350
3891-98-3	Dodecane, 2,6,10-trimethyl-	18.082	92	334

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/2337						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/2337

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range
A	x5 Dilution
D	x10 Dilution
E	x20 Dilution
F	x50 Dilution
G	x100 Dilution
H	x200 Dilution

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM1	Modified USEPA 8015B method for the determination of carbon banding in oil and product samples by GC-FID.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			
TM105	Modified USEPA 8260. Determination of Fuel Oxygenates by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM121	Determination of BOD by Manometric (pressure) analysis using Velp BOD meters	PM0	No preparation is required.				

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM128	Modified USEPA 8260 and 524.2. Quantitative Determination of Volatile Organic Compounds (VOCs) by Purge and Trap GCMS	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
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Arup
50 Ringsend Road
Dublin 4
Ireland

Attention :	Christopher Newton
Date :	29th January, 2015
Your reference :	
Our reference :	Test Report 15/2337 Batch 2
Location :	Haulbowline
Date samples received :	15th January, 2015
Status :	Final report
Issue :	1

Eight samples were received for analysis on 15th January, 2015 of which eight were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	400-407	408-415	416-425	426-435	436-445	446-455	456-465	466-475			LOD/LOR	Units	Method No.
Sample ID	BH107AL	BH213L	BH215L	BH110AL	BH219L	BH114L	BH113L	BH201RL					
Depth	10.40	5.85											
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G					
Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	2	2	2	2	2	2	2	2					
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015					
Dissolved Aluminium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	2.4	<1.5			<1.5	ug/l	TM30/PM14
Dissolved Antimony #	2	2	<2	<2	<2	2	<2	<2			<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	7.8	12.2	<0.9	3.2	<0.9	<0.9	2.4			<0.9	ug/l	TM30/PM14
Dissolved Barium #	9.3	54.8	44.7	49.4	30.9	21.6	<1.8	19.3			<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM30/PM14
Dissolved Boron	844	1944	1608	3007	1480	766	3161	2371			<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.08	<0.03	0.40	<0.03	<0.03	<0.03	<0.03	<0.03			<0.03	ug/l	TM30/PM14
Dissolved Calcium #	163.5	370.6$_A$	201.1	422.3$_A$	463.3$_A$	155.7	363.9$_A$	521.1$_A$			<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	0.7	<0.2	<0.2	2.5	<0.2	<0.2	<0.2	<0.2			<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	0.5	0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	<3	<3	<3	<3	<3	<3	<3			<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	17.0	7.7	<4.7	441.7	<4.7	<4.7	<4.7			<4.7	ug/l	TM30/PM14
Dissolved Lead #	1.2	0.8	1.2	<0.4	2.1	0.9	0.9	<0.4			<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	228.1$_A$	238.2$_A$	561.0$_G$	1185.0$_E$	541.5$_G$	173.3$_A$	1173.0$_E$	915.9$_E$			<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<1.5	988.0	810.1	<1.5	422.7	301.3	<1.5	620.9			<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	2.7	3.0	13.1	6.6	0.5	2.7	5.6	9.3			<0.2	ug/l	TM30/PM14
Dissolved Nickel #	0.3	<0.2	5.7	<0.2	0.4	<0.2	0.3	1.0			<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	142.2	52.0	68.4	58.1	3.4	342.0	27.2	53.6			<0.7	ug/l	TM30/PM14
Dissolved Potassium #	64.7	79.0	165.2$_A$	365.8$_A$	172.2$_A$	47.2	336.3$_A$	346.9$_A$			<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2			<1.2	ug/l	TM30/PM14
Dissolved Sodium #	2071.0$_E$	1785.0$_F$	4253.0$_G$	8899.0$_G$	3977.0$_G$	1225.0$_F$	8187.0$_G$	8497.0$_G$			<0.1	mg/l	TM30/PM14
Dissolved Thallium #	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	2.9	<0.9			<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	6	<5	<5	<5	<5	<5	<5			<5	ug/l	TM30/PM14
Dissolved Vanadium #	1.7	<0.6	<0.6	<0.6	<0.6	0.9	<0.6	<0.6			<0.6	ug/l	TM30/PM14
Dissolved Zinc #	5.8	2.4	61.4	<1.5	92.6	1.9	4.9	2.6			<1.5	ug/l	TM30/PM14
Total Boron	830	1950	1601	2864	1481	756	3123	2459			<2	ug/l	TM30/PM14
Total Chromium	1.1	18.4	9.5	14.1	0.9	<0.2	<0.2	0.3			<0.2	ug/l	TM30/PM14
Total Copper	<3	61	60	12	74	<3	<3	<3			<3	ug/l	TM30/PM14
Total Iron	671.8	53420.0$_D$	12430.0	2778.0	35310.0$_D$	494.9	15.6	310.0			<4.7	ug/l	TM30/PM14
Total Lead	1.1	24.8	66.6	15.4	156.5	11.6	0.8	<0.4			<0.4	ug/l	TM30/PM14
Total Manganese	26.0	1691.0	1011.0	816.1	439.8	329.4	<1.5	723.3			<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5			<0.5	ug/l	TM30/PM14
Total Molybdenum	2.5	3.6	15.2	6.3	0.4	3.1	5.8	10.3			<0.2	ug/l	TM30/PM14
Total Nickel	0.7	20.1	17.9	5.0	1.3	<0.2	0.3	0.9			<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	0.02	0.01	0.02	0.04	0.53	<0.01	<0.01	0.01			<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	167.70$_D$	83.13$_A$	356.00$_E$	734.40$_F$	451.30$_E$	111.80$_D$	773.40$_F$	715.20$_F$			<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	400-407	408-415	416-425	426-435	436-445	446-455	456-465	466-475			LOD/LOR	Units	Method No.
Sample ID	BH107AL	BH213L	BH215L	BH110AL	BH219L	BH114L	BH113L	BH201RL					
Depth	10.40	5.85											
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G					
Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	2	2	2	2	2	2	2	2					
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015					
PAH MS													
Naphthalene	<0.01	0.02	0.04	0.02	0.04	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	0.02	<0.01	0.01	0.02	0.01	0.01			<0.01	ug/l	TM4/PM30
Acenaphthene	0.01	<0.01	0.06	0.02	0.02	0.02	0.01	0.01			<0.01	ug/l	TM4/PM30
Fluorene	0.01	0.01	<0.01	0.01	0.01	0.04	0.02	0.03			<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	0.01	<0.01	0.01	0.03	0.07	0.03	0.04			<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	0.01	0.05	0.01	0.04	0.02	0.01	0.01			<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.01	0.07	0.01	0.07	0.02	0.01	0.01			<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.01	0.01	0.02	0.01	0.02	0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Chrysene	<0.01	0.01	0.01	0.01	0.02	0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	0.3	0.1	0.3	0.2	<0.1	0.1			<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	78	85	85	80	87	84	76	75			<0	%	TM4/PM30
VOC TICs	-	-	ND	ND	ND	ND	ND	ND				None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	<0.01	<0.01	0.10	0.03	0.16	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Chloroform	0.62	0.05	<0.01	<0.01	<0.01	<0.01	3.44	<0.01			<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.01	<0.01	<0.01	0.17	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
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Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	2	2	2	2	2	2	2	2					
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015					
1,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Dibromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Bromodichloromethane	0.06	0.03	<0.01	<0.01	<0.01	<0.01	1.70	<0.01			<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Toluene	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	<0.01	<0.01	<0.01	<0.01	<0.01	0.07	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Dibromochloromethane	0.03	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Ethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
p/m-Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
o-Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Bromoform	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Isopropylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Naphthalene	<0.01	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	86	86	86	86	87	86	86	88			<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	87	87	86	87	87	87	89	88			<0	%	TM128/PM0
VOC TICs	ND	ND	ND	ND	ND	ND	ND	ND				None	TM128/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	400-407	408-415	416-425	426-435	436-445	446-455	456-465	466-475			LOD/LOR	Units	Method No.
Sample ID	BH107AL	BH213L	BH215L	BH110AL	BH219L	BH114L	BH113L	BH201RL					
Depth	10.40	5.85											
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G					
Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	2	2	2	2	2	2	2	2					
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015					
SVOC TICs	ND	ND	ND	ND	ND	ND	ND	ND				None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7			<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM26/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	400-407	408-415	416-425	426-435	436-445	446-455	456-465	466-475			LOD/LOR	Units	Method No.
Sample ID	BH107AL	BH213L	BH215L	BH110AL	BH219L	BH114L	BH113L	BH201RL					
Depth	10.40	5.85											
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G					
Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	2	2	2	2	2	2	2	2					
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015					
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			<0.3	mg/l	TM27/PM0
Sulphate #	431.25	203.68	884.48	2088.58	1198.47	288.12	1948.30	1846.98			<0.05	mg/l	TM38/PM0
Chloride #	3042.9	2691.1	6379.5	15205.6 D	6558.4	1934.9	14151.8 D	13296.8 D			<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	15.0	2.1	<0.2	1.2	<0.2	3.0	2.7	<0.2			<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	0.02			<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.016			<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.017			<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.03	11.35	0.98	0.72	0.96	0.47	0.38	3.19			<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2	<2	2	<2	<2	<2	<2			<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	52	<1	<1	<1	<1			<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			<0.02	mg/l	TM107/PM0
BOD (Settled) #	2	3	2	14	4	2	16	3			<1	mg/l	TM58/PM0
COD (Settled) #	58	87	166	995	193	52	600 D	185 D			<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	9483	8826	18489	39472	18445	6331	36928	34994			<2	uS/cm	TM76/PM0
pH #	7.51	7.38	7.33	8.41	6.89	7.55	7.76	7.37			<0.01	pH units	TM73/PM0
Salinity	0.3	0.3	0.8	1.7	0.8	0.1	1.6	1.6			<0.1	%	TM64/PM0
Total Organic Carbon #	2	13	22	2	7	5	3	4			<2	mg/l	TM60/PM0

Client Name: Arup **SVOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	400-407	408-415	416-425	426-435	436-445	446-455	456-465	466-475					
Sample ID	BH107AL	BH213L	BH215L	BH110AL	BH219L	BH114L	BH113L	BH201RL					
Depth	10.40	5.85									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G					
Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015					
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water					
Batch Number	2	2	2	2	2	2	2	2			LOD/LOR	Units	Method No.
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015					
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5			<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5			<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1			<1	ug/l	TM16/PM30

Client Name: Arup **VOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	416-425	426-435	436-445	446-455	456-465	466-475						
Sample ID	BH215L	BH110AL	BH219L	BH114L	BH113L	BH201RL						
Depth												
COC No / misc												
Containers	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G	V N Z P BOD G						
Sample Date	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015	13/01/2015						
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water						
Batch Number	2	2	2	2	2	2						
Date of Receipt	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015	15/01/2015						
VOC MS												
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	2	<2					<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4					<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	83	82	83	83	81	80					<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	89	88	90	90	87	89					<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/2337						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/2337

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range
A	x5 Dilution
D	x10 Dilution
E	x20 Dilution
F	x50 Dilution
G	x100 Dilution

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			
TM105	Modified USEPA 8260. Determination of Fuel Oxygenates by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM128	Modified USEPA 8260 and 524.2. Quantitative Determination of Volatile Organic Compounds (VOCs) by Purge and Trap GCMS	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Arup
50 Ringsend Road
Dublin 4
Ireland

Attention :	Christopher Newton
Date :	5th February, 2015
Your reference :	
Our reference :	Test Report 15/2337 Batch 3
Location :	Haulbowline
Date samples received :	28th January, 2015
Status :	Final report
Issue :	1

Twelve samples were received for analysis on 28th January, 2015 of which twelve were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
Dissolved Aluminium #	<1.5	<1.5	<1.5	2.7	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	2.3	<0.9	2.0	1.8	2.2	1.7	3.2	1.3	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Barium #	2.2	2.3	2.3	5.3	2.0	2.0	2.1	1.9	<1.8	<1.8	<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Boron	2908	2667	3008	2634	2813	3217	3171	3007	3008	3270	<2	ug/l	TM30/PM14
Dissolved Cadmium #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	ug/l	TM30/PM14
Dissolved Calcium #	335.2_A	313.2_A	321.0_A	303.4_A	302.5_A	344.4_A	329.9_A	331.1_A	331.0_A	368.6_A	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	<4.7	ug/l	TM30/PM14
Dissolved Lead #	<0.4	0.8	1.7	<0.4	<0.4	1.3	1.0	1.2	<0.4	2.0	<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	1135.0_E	959.3_E	1118.0_E	977.4_E	972.1_E	1166.0_F	1036.0_E	1108.0_E	1027.0_E	1282.0_F	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<1.5	7.1	3.1	7.3	5.1	2.4	4.3	2.8	5.3	1.6	<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	4.7	4.5	4.9	4.9	4.7	5.1	4.3	5.0	4.9	5.8	<0.2	ug/l	TM30/PM14
Dissolved Nickel #	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	11.0	28.5	24.9	29.5	26.0	24.4	26.6	26.1	26.1	24.3	<0.7	ug/l	TM30/PM14
Dissolved Potassium #	334.9_A	308.0_A	317.4_A	300.2_A	299.5_A	344.4_A	322.7_A	329.2_A	326.6_A	367.7_A	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	1.8	<1.2	<1.2	<1.2	ug/l	TM30/PM14
Dissolved Sodium #	9381.0_G	7756.0_G	9277.0_G	7989.0_G	8060.0_G	9071.0_G	8244.0_G	9034.0_G	10270.0_G	9603.0_G	<0.1	mg/l	TM30/PM14
Dissolved Thallium #	<0.9	<0.9	<0.9	<0.9	<0.9	1.5	1.7	1.0	<0.9	<0.9	<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Vanadium #	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	ug/l	TM30/PM14
Dissolved Zinc #	<1.5	<1.5	<1.5	2.8	1.7	2.7	1.5	1.9	<1.5	1.5	<1.5	ug/l	TM30/PM14
Total Boron	2822	2717	2913	2450	2836	3210	3173	2835	2843	3371	<2	ug/l	TM30/PM14
Total Chromium	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	ug/l	TM30/PM14
Total Copper	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Iron	68.1	88.0	95.4	21.2	18.1	103.2	75.2	48.1	41.8	82.3	<4.7	ug/l	TM30/PM14
Total Lead	<0.4	<0.4	1.6	<0.4	<0.4	1.3	0.9	1.1	1.0	1.9	<0.4	ug/l	TM30/PM14
Total Manganese	2.1	10.4	6.6	8.2	6.2	5.7	4.1	6.9	6.9	4.3	<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5	<0.5	0.5	<0.5	1.8	<0.5	0.5	<0.5	0.7	<0.5	ug/l	TM30/PM14
Total Molybdenum	4.8	4.3	5.1	4.7	4.8	5.0	5.1	4.9	4.7	5.9	<0.2	ug/l	TM30/PM14
Total Nickel	<0.2	0.6	0.5	0.5	0.4	0.2	0.5	0.3	0.3	<0.2	<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	322.40	857.00_F	326.60	312.40	879.00_F	335.10	304.40	916.00_F	317.30	342.50	<0.01	mg/l	TM30/PM14

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
PAH MS													
Naphthalene	0.05	0.01	0.01	<0.01	0.02	0.01	<0.01	0.01	0.01	0.01	<0.01	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01	0.01	<0.01	0.01	<0.01	0.01	0.01	0.01	0.01	0.01	<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.01	<0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	92	94	96	91	99	97	91	97	92	92	<0	%	TM4/PM30
VOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	0.08	0.11	0.11	0.09	0.10	0.09	0.11	0.10	0.10	0.09	<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chloroform	<0.01	0.07	<0.01	0.10	0.05	0.04	0.05	0.04	0.05	<0.01	<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Benzene	0.04	0.03	0.03	0.03	0.11	0.14	0.08	0.14	0.11	0.06	<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
1,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromomethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromodichloromethane	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Toluene	0.24	0.10	0.12	0.17	0.63	0.36	0.43	0.38	0.57	0.19	<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Ethylbenzene	0.04	<0.01	0.02	0.02	0.09	0.04	0.06	0.04	0.07	0.02	<0.01	ug/l	TM128/PM0
p/m-Xylene	0.13	<0.01	0.06	0.06	0.29	0.09	0.20	0.09	0.24	0.06	<0.01	ug/l	TM128/PM0
o-Xylene	0.05	<0.01	0.03	0.05	0.13	0.06	0.09	0.06	0.11	0.03	<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromoform	0.16	0.05	0.07	0.05	0.10	0.05	0.06	0.05	0.04	0.05	<0.01	ug/l	TM128/PM0
Isopropylbenzene	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	<0.01	<0.01	0.01	0.02	<0.01	0.01	<0.01	0.01	<0.01	<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	0.01	<0.01	<0.01	0.03	0.03	<0.01	0.03	0.01	0.02	<0.01	<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	0.03	0.02	0.02	0.06	0.06	0.02	0.07	0.02	0.05	0.02	<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Naphthalene	0.03	0.03	0.06	0.04	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	88	87	86	86	85	85	86	85	86	86	<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	86	84	85	84	85	84	83	83	84	84	<0	%	TM128/PM0
VOC TICs	ND	ND	ND	ND	ND	ND	See Attached	ND	ND	ND		None	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
SVOC TICs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/TM36/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM26/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM27/PM0
Sulphate #	2275.07	1912.54	2159.12	1895.43	2035.23	2253.52	2067.13	2389.94	2028.99	2430.42	<0.05	mg/l	TM38/PM0
Chloride #	16565.8_D	14506.9_D	15640.9_D	14464.7_D	14518.2_D	16401.3_D	14782.0_D	16308.6_D	15060.0_D	17812.7_D	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	1.9	3.5	2.3	3.4	2.8	1.9	3.1	2.0	2.6	1.6	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.70	0.06	0.69	0.17	0.16	0.71	0.16	0.75	0.16	0.12	<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/l	TM107/PM0
BOD (Settled)	10	10	10	20	<1	10	20	32	10	10	<1	mg/l	TM121/PM0
COD (Settled) #	282_A	251_A	292_A	331_A	271_A	327_A	301_A	393_A	271_A	332_A	<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	42384	37676	41840	37900	39163	43182	38614	41770	39754	46735	<2	uS/cm	TM76/PM0
pH #	7.96	7.94	7.96	8.11	7.93	7.96	7.94	7.96	7.94	7.97	<0.01	pH units	TM73/PM0
Salinity	1.9	1.6	1.6	1.3	1.4	1.5	1.8	1.9	1.7	1.6	<0.1	%	TM64/PM0
Total Organic Carbon #	<2	<2	<2	2	<2	<2	2	<2	<2	<2	<2	mg/l	TM60/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	586-596	597-607									LOD/LOR	Units	Method No.
Sample ID	SW6 HIGH	SW6 LOW											
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											
Dissolved Aluminium #	<1.5	<1.5									<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2									<2	ug/l	TM30/PM14
Dissolved Arsenic #	1.7	<0.9									<0.9	ug/l	TM30/PM14
Dissolved Barium #	<1.8	<1.8									<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Dissolved Boron	3500	3234									<2	ug/l	TM30/PM14
Dissolved Cadmium #	<0.03	<0.03									<0.03	ug/l	TM30/PM14
Dissolved Calcium #	351.6$_A$	338.6$_A$									<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2									<0.2	ug/l	TM30/PM14
Dissolved Cobalt #	<0.1	<0.1									<0.1	ug/l	TM30/PM14
Dissolved Copper #	<3	<3									<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	<4.7									<4.7	ug/l	TM30/PM14
Dissolved Lead #	1.4	1.3									<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	1241.0$_F$	1055.0$_E$									<0.1	mg/l	TM30/PM14
Dissolved Manganese #	1.6	<1.5									<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	4.9	4.6									<0.2	ug/l	TM30/PM14
Dissolved Nickel #	<0.2	<0.2									<0.2	ug/l	TM30/PM14
Dissolved Phosphorus #	25.5	22.3									<0.7	ug/l	TM30/PM14
Dissolved Potassium #	349.4$_A$	335.1$_A$									<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2									<1.2	ug/l	TM30/PM14
Dissolved Sodium #	9071.0$_G$	8761.0$_G$									<0.1	mg/l	TM30/PM14
Dissolved Thallium #	1.0	<0.9									<0.9	ug/l	TM30/PM14
Dissolved Tin	<5	<5									<5	ug/l	TM30/PM14
Dissolved Vanadium #	<0.6	<0.6									<0.6	ug/l	TM30/PM14
Dissolved Zinc #	<1.5	<1.5									<1.5	ug/l	TM30/PM14
Total Boron	3193	3051									<2	ug/l	TM30/PM14
Total Chromium	<0.2	1.2									<0.2	ug/l	TM30/PM14
Total Copper	<3	<3									<3	ug/l	TM30/PM14
Total Iron	58.3	59.7									<4.7	ug/l	TM30/PM14
Total Lead	1.4	1.1									<0.4	ug/l	TM30/PM14
Total Manganese	3.9	3.7									<1.5	ug/l	TM30/PM14
Total Mercury	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Total Molybdenum	4.7	5.3									<0.2	ug/l	TM30/PM14
Total Nickel	0.9	0.5									<0.2	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01									<0.01	ug/l	TM61/PM38
Total Dissolved Sulphur	986.80$_F$	957.60$_F$									<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	586-596	597-607											
Sample ID	SW6 HIGH	SW6 LOW											
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
PAH MS													
Naphthalene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.01									<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1									<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01									<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	92	91									<0	%	TM4/PM30
VOC TICs	ND	ND										None	TM15/PM10
Dichlorodifluoromethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Methyl Tertiary Butyl Ether	0.09	0.08									<0.01	ug/l	TM128/PM0
Chloromethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Vinyl Chloride	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Bromomethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Chloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Trichlorofluoromethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,1-Dichloroethene (1,1 DCE)	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Dichloromethane (DCM)	<0.01	<0.01									<0.01	ug/l	TM128/PM0
trans-1-2-Dichloroethene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,1-Dichloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
cis-1-2-Dichloroethene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
2,2-Dichloropropane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Bromochloromethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Chloroform	<0.01	0.12									<0.01	ug/l	TM128/PM0
1,1,1-Trichloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,1-Dichloropropene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Carbon tetrachloride	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dichloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Benzene	0.05	0.02									<0.01	ug/l	TM128/PM0
Trichloroethene (TCE)	<0.01	<0.01									<0.01	ug/l	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	586-596	597-607											
Sample ID	SW6 HIGH	SW6 LOW											
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
1,2-Dichloropropane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Dibromomethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Bromodichloromethane	<0.01	0.07									<0.01	ug/l	TM128/PM0
cis-1-3-Dichloropropene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Toluene	0.28	0.13									<0.01	ug/l	TM128/PM0
trans-1-3-Dichloropropene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,1,2-Trichloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Tetrachloroethene (PCE)	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,3-Dichloropropane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Dibromochloromethane	<0.01	0.04									<0.01	ug/l	TM128/PM0
1,2-Dibromoethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Chlorobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,1,1,2-Tetrachloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Ethylbenzene	0.04	0.02									<0.01	ug/l	TM128/PM0
p/m-Xylene	0.14	0.06									<0.01	ug/l	TM128/PM0
o-Xylene	0.06	0.07									<0.01	ug/l	TM128/PM0
Styrene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Bromoform	0.06	0.05									<0.01	ug/l	TM128/PM0
Isopropylbenzene	<0.01	0.01									<0.01	ug/l	TM128/PM0
1,1,2,2-Tetrachloroethane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Bromobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,2,3-Trichloropropane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Propylbenzene	<0.01	0.01									<0.01	ug/l	TM128/PM0
2-Chlorotoluene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,3,5-Trimethylbenzene	0.01	0.03									<0.01	ug/l	TM128/PM0
4-Chlorotoluene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
tert-Butylbenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,2,4-Trimethylbenzene	0.03	0.06									<0.01	ug/l	TM128/PM0
sec-Butylbenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
4-Isopropyltoluene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,3-Dichlorobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,4-Dichlorobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
n-Butylbenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dichlorobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,2-Dibromo-3-chloropropane	<0.01	<0.01									<0.01	ug/l	TM128/PM0
1,2,4-Trichlorobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Hexachlorobutadiene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Naphthalene	0.02	0.03									<0.01	ug/l	TM128/PM0
1,2,3-Trichlorobenzene	<0.01	<0.01									<0.01	ug/l	TM128/PM0
Surrogate Recovery Toluene D8	86	85									<0	%	TM128/PM0
Surrogate Recovery 4-Bromofluorobenzene	84	84									<0	%	TM128/PM0
VOC TICs	ND	ND										None	TM128/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	586-596	597-607											
Sample ID	SW6 HIGH	SW6 LOW											
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											

Please see attached notes for all abbreviations and acronyms

			LOD/LOR	Units	Method No.
SVOC TICs	ND	ND		None	TM16/PM30
TPH CWG					
Aliphatics					
>C5-C6 #	<5	<5	<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	ug/l	TM5/TM36/PM30
Aromatics					
>C5-EC7 #	<5	<5	<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Catechol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Phenol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
o-cresol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total cresols	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Xylenols	<0.5	<0.5	<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	<0.5	<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	<5	<5	ug/l	TM26/PM0

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	586-596	597-607											
Sample ID	SW6 HIGH	SW6 LOW											
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Fluoride	<0.3	<0.3									<0.3	mg/l	TM27/PM0
Sulphate #	2352.31	2226.81									<0.05	mg/l	TM38/PM0
Chloride #	17051.9_D	16404.7_D									<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	1.6	1.9									<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02									<0.02	mg/l	TM38/PM0
Free Cyanide #	<0.005	<0.005									<0.005	mg/l	TM89/PM0
Total Cyanide	<0.005	<0.005									<0.005	mg/l	TM89/PM0
Complex Cyanide	<0.005	<0.005									<0.005	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.70	0.75									<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<2	<2									<2	ug/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1									<1	mg/l	TM75/PM0
Tert Amyl Methyl Ether (TAME)	<5	<5									<5	ug/l	TM105/PM10
Sulphide	<0.3	<0.3									<0.3	mg/l	TM106/PM0
Thiocyanate	<0.02	<0.02									<0.02	mg/l	TM107/PM0
BOD (Settled)	<1	20									<1	mg/l	TM121/PM0
COD (Settled) #	326_A	338_A									<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	43437	42199									<2	uS/cm	TM76/PM0
pH #	7.97	7.98									<0.01	pH units	TM73/PM0
Salinity	2.1	1.8									<0.1	%	TM64/PM0
Total Organic Carbon #	<2	<2									<2	mg/l	TM60/PM0

Client Name: Arup **SVOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
SVOC MS													
Phenols													
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

SVOC Report : **Liquid**

J E Sample No.	586-596	597-607											
Sample ID	SW6 HIGH	SW6 LOW											
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											
SVOC MS											LOD/LOR	Units	Method No.
Phenols													
2-Chlorophenol #	<1	<1									<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1									<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1									<1	ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1									<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10									<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1									<1	ug/l	TM16/PM30
Phenol	<1	<1									<1	ug/l	TM16/PM30
PAHs													
2-Chloronaphthalene #	<1	<1									<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1									<1	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5									<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1									<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5									<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1									<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1									<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1									<1	ug/l	TM16/PM30
Other SVOCs													
1,2-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1									<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1									<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1									<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1									<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1									<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1									<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1									<1	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1									<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1									<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1									<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1									<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5									<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1									<1	ug/l	TM16/PM30

Client Name: Arup **VOC Report :** **Liquid**
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

J E Sample No.	476-486	487-497	498-508	509-519	520-530	531-541	542-552	553-563	564-574	575-585	LOD/LOR	Units	Method No.
Sample ID	SW1 HIGH	SW1 LOW	SW2 HIGH	SW2 LOW	SW3 HIGH	SW3 LOW	SW4 HIGH	SW4 LOW	SW5 HIGH	SW5 LOW			
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G	V H N Z P BOD G			
Sample Date	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015	26/01/2015			
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	3	3	3	3	3	3	3	3	3	3			
Date of Receipt	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015	28/01/2015			
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	1.2	2.4	<0.5	2.6	1.1	<0.5	<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	1	2	<1	2	<1	<1	<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	98	101	101	95	96	99	99	98	97	104	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	104	109	106	105	103	111	105	106	103	114	<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Client Name: Arup
Reference:
Location: Haulbowline
Contact: Christopher Newton
JE Job No.: 15/2337

VOC Report : **Liquid**

J E Sample No.	586-596	597-607									LOD/LOR	Units	Method No.
Sample ID	SW6 HIGH	SW6 LOW											
Depth													
COC No / misc													
Containers	V H N Z P BOD G	V H N Z P BOD G											
Sample Date	26/01/2015	26/01/2015											
Sample Type	Surface Water	Surface Water											
Batch Number	3	3											
Date of Receipt	28/01/2015	28/01/2015											
VOC MS													
Dichlorodifluoromethane	<2	<2									<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1									<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3									<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1									<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1									<1	ug/l	TM15/PM10
Chloroethane #	<3	<3									<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3									<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3									<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3									<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3									<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3									<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3									<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1									<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2									<2	ug/l	TM15/PM10
Chloroform #	<2	<2									<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2									<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3									<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2									<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2									<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3									<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2									<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3									<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2									<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2									<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2									<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2									<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3									<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2									<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2									<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2									<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2									<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2									<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1									<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
Styrene	<2	<2									<2	ug/l	TM15/PM10
Bromoform #	<2	<2									<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3									<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4									<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2									<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3									<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3									<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3									<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3									<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3									<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3									<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3									<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3									<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3									<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3									<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3									<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3									<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3									<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2									<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3									<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3									<3	ug/l	TM15/PM10
Naphthalene	<2	<2									<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3									<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	101	97									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	109	107									<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Job number: 15/2337
Sample number: 544
Sample identity: SW4 HIGH
Sample depth:
Sample Type: Surface Water
Units: ug/l

Method: **VOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
67-64-1	Acetone	2.545	80	0.5

Client Name: Arup

Matrix : Liquid

Reference:

Location: Haulbowline

Contact: Christopher Newton

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/2337	3	SW1 HIGH		476-486	Nitrate	Sample holding time exceeded
15/2337	3	SW1 LOW		487-497	Nitrate	Sample holding time exceeded
15/2337	3	SW2 HIGH		498-508	Nitrate	Sample holding time exceeded
15/2337	3	SW2 LOW		509-519	Nitrate	Sample holding time exceeded
15/2337	3	SW3 HIGH		520-530	Nitrate	Sample holding time exceeded
15/2337	3	SW3 LOW		531-541	Nitrate	Sample holding time exceeded
15/2337	3	SW4 HIGH		542-552	Nitrate	Sample holding time exceeded
15/2337	3	SW4 LOW		553-563	Nitrate	Sample holding time exceeded
15/2337	3	SW5 HIGH		564-574	Nitrate	Sample holding time exceeded
15/2337	3	SW5 LOW		575-585	Nitrate	Sample holding time exceeded
15/2337	3	SW6 HIGH		586-596	Nitrate	Sample holding time exceeded
15/2337	3	SW6 LOW		597-607	Nitrate	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/2337

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range
A	x5 Dilution
D	x10 Dilution
E	x20 Dilution
F	x50 Dilution
G	x100 Dilution

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM64	Determination of the salinity of liquid samples using a salinity meter.	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 15/2337

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			
TM105	Modified USEPA 8260. Determination of Fuel Oxygenates by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM121	Determination of BOD by Manometric (pressure) analysis using Velp BOD meters	PM0	No preparation is required.				
TM128	Modified USEPA 8260 and 524.2. Quantitative Determination of Volatile Organic Compounds (VOCs) by Purge and Trap GCMS	PM0	No preparation is required.				

Project No. 235946.00 Stage 3 Sampling Fieldsheet Data
Location: Haulbowline Island, Co. Cork

** Sample was diluted to measure Conductivity (EC)

					Conductivity (EC)					Dissolved Oxygen (DO)								
BH ID	Date	Tidal Position (Harbour)	Weather	Static water level mAOD	Conductivity (EC) (diluted) (mS/cm)**	EC Dilution Factor	Total EC (undiluted by calculation) (mS/cm)	T (C°)	pH	DO (%)	DO (ppm) (mg/l)	Redox Potential (eH) (mv)	Clarity	Colour	Odour	Irridescence	Free Product	Field Comments
BH102	13/01/2015	HIGH	OVERCAST	0.41	N/A	N/A	3.95	12.40	7.40	30.80	4.25	-94.00	MODERATELY CLOUDY	BLACK	MINOR HC	YES	YES	
BH102	12/01/2015	LOW		0.48	N/A	N/A	2.58	10.80	7.73	65.90	9.83	-104.00						
BH105A	12/01/2015	HIGH	DRY	2.58	N/A	N/A	>20	11.50	8.19	43.10	4.30	-136.00						
BH105A	13/01/2015	LOW		2.34	N/A	N/A	18.46	9.60	7.69	54.30	5.29	67.00	CLEAR	COLOURLESS	NONE	NONE	NONE	
BH106	12/01/2015	HIGH	WINDY-CLEARING	0.43	N/A	N/A	3.21	11.90	7.80	43.30	5.67	-106.00	CLOUDY	MILK	NONE	NONE	NONE	
BH106	12/01/2015	LOW	CLEAR	-0.35	N/A	N/A	2.12	11.50	7.85	35.60	3.33	-76.00	SLIGHTLY CLOUDY	MILK	NONE			
BH107A	12/01/2015	HIGH	DRY	0.83	N/A	N/A	9.12	12.40	7.45	48.20	4.31	-45.00						
BH107A	13/01/2015	LOW		0.76	N/A	N/A	8.71	11.00	7.68	44.20	5.96	-15.00	SLIGHTLY CLOUDY	PALE GREY	NONE	NONE	NONE	
BH108	12/01/2015	HIGH	OVERCAST	0.36	1.801	30	54.03	n/a*	n/a*	58.10	5.55	-61.00	MODERATELY CLOUDY	BLACKISH-	NONE			Sample diluted with deionised water for
BH108	13/01/2015	LOW	OVERCAST	-0.66	N/A	N/A	5.21	n/a*	7.78	30.20	2.98	2.56	MODERATELY CLOUDY	BROWNISH	NONE			
BH109	12/01/2015	HIGH	DRY	0.79	N/A	N/A	15.47	13.40	6.74	38.10	3.64	-100.00						
BH109	12/01/2015	LOW		0.37	N/A	N/A	10.97	11.60	6.81	22.50	2.45	-106.00						
BH110A	12/01/2015	HIGH		0.56	N/A	N/A	19.80	12.40	8.00	50.70	6.63	-19.00	CLEAR					
BH110A	13/01/2015	LOW	OVERCAST	0.38	N/A	N/A	>20	8.50	8.55	56.70	5.28	2.00	SLIGHTLY CLOUDY	BROWNISH	NONE			
BH111	12/01/2015	HIGH	CLEAR	0.44	N/A	N/A	>20	10.90	8.40	67.70	9.36	17.00	CLEAR	CLEAR	NONE	NONE	NONE	
BH111	12/01/2015	LOW	CLEAR	-0.79	N/A	N/A	>20	10.10	8.07	60.20	7.37	-38.00	CLEAR	NONE	NONE	NONE	NONE	
BH112A	12/01/2015	HIGH	OVERCAST	1.20	N/A	N/A	1.04	12.40	7.63	49.30	6.04	8.00	SLIGHTLY TO	MILKY-GREY	NONE	NONE	NONE	
BH112A	12/01/2015	LOW	CLEAR	-0.26	N/A	N/A	0.88	11.00	7.91	68.40	9.40	-7.70	SLIGHTLY CLOUDY	GREYISH	NONE	NONE	NONE	
BH113	12/01/2015	HIGH	WINDY-CLEARING	0.80	N/A	N/A	>20	9.20	8.09	68.50	10.20	-54.00	CLEAR	CLEAR	NONE	NONE	NONE	
BH113	13/01/2015	LOW	STORMY/SNOW	-1.13	N/A	N/A	>20	7.90	8.51	59.10	6.85	-56.00	CLEAR	CLEAR	NONE	NONE	NONE	
BH114	12/01/2015	HIGH	CLEARING	0.96	N/A	N/A	6.72	11.60	7.82	30.60	3.35	-132.00	CLEAR		SLIGHT H2S	NONE	NONE	
BH114	13/01/2015	LOW	STORMY/SNOW	0.32	N/A	N/A	6.29	9.60	8.39	58.20	5.78	-77.00	CLEAR	CLEAR	SLIGHT H2S	NONE	NONE	
BH201R	12/01/2015	HIGH	DRY	0.68	N/A	N/A	>20	11.70	7.56	66.20	6.87	-8.00						
BH201R	13/01/2015	LOW	STORMY/SNOW	-0.25	N/A	N/A	>20	10.90	8.07	30.10	4.95	178.00	SLIGHTLY CLOUDY	BROWNISH	NONE	NONE	NONE	
BH202	12/01/2015	HIGH		0.80	N/A	N/A	2.49	11.20	7.87	46.90	5.74	-49.00	MODERATELY CLOUDY	GREY	H2S	SLIGHT	NONE	
BH202L	13/01/2015	LOW		0.73	N/A	N/A	2.72	8.40	8.30	46.10	4.25	7.00	MODERATELY CLOUDY	GREY	MILD H2S			
BH204R	12/01/2015	HIGH	DRY	3.02	N/A	N/A	>20	12.60	8.27	61.50	6.09	-37.00						
BH204R	12/01/2015	LOW		0.18	N/A	N/A	>20	9.90	7.47	29.03	3.43	-55.00						
BH206	12/01/2015	LOW	OVERCAST	1.12	N/A	N/A	12.65	10.50	8.32	58.00	5.54	-113.00	CLEAR	NONE	H2S SMELL			
BH206	12/01/2015	HIGH	OVERCAST	0.30	N/A	N/A	14.67	11.70	8.28	28.20	4.10	-167.00	SLIGHTLY CLOUDY	BLACKISH	MODERATE SMELL H2S	NONE	NONE	
BH207	12/01/2015	HIGH	OVERCAST	1.13	N/A	N/A	1.42	12.40	n/a*	40.20	2.87	-83.00	CLEAR	NONE	NONE	NONE	NONE	
BH207	12/01/2015	LOW	SUNNY	0.33	N/A	N/A	0.71	11.50	n/a*	34.20	4.45	-116.00	SLIGHTLY CLOUDY	BROWNISH	NONE	NONE	NONE	
BH208	12/01/2015	HIGH		2.12	N/A	N/A	N/A	11.40	7.18	39.70	3.75	-104	SLIGHTLY CLOUDY	YELLOW-	OILY			
BH208	13/01/2015	LOW	CLEAR/COLD	1.65	N/A	N/A	4.73	7.40	7.84	34.30	2.59	-74.00	CLEAR	CLEAR				
BH209R	12/01/2015	HIGH		0.77	N/A	N/A	7.64	12.60	7.62	40.90	4.37	-126.00	MODERATE CLARITY	GREY	OILY	YES	NONE	
BH209R	12/01/2015	LOW		0.47	N/A	N/A	7.21	11.30	7.79	68.80	7.10	-106.00	SLIGHTLY CLOUDY	GREY	NONE	YES	NONE	
BH211	12/01/2015	HIGH	OVERCAST	DRY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			Well dry. No water
BH211	12/01/2015	LOW	OVERCAST	DRY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			Well dry. No water
BH212A	12/01/2015	HIGH	OVERCAST	0.93	11.93	3	35.79	9.80	7.22	53.10	4.30	-25.00	MODERATELY CLOUDY	BLACK	NONE			Sample diluted with deionised water for
BH212A	12/01/2015	LOW	OVERCAST	-2.49	1.432	20	28.64	7.50	n/a*	52.80	6.80	-65.00	MODERATELY CLOUDY	BLACKISH	NONE	NONE	NONE	Sample diluted with deionised water for
BH213	12/01/2015	HIGH	DRY	0.94	N/A	N/A	6.67	13.30	7.17	36.20	5.05	-109.00						
BH213	13/01/2015	LOW		0.63	N/A	N/A	8.03	9.70	7.30	52.40	5.41	-107.00	SLIGHT CLOUDY	ORANGE BROWN	NONE	NONE	NONE	
BH214	12/01/2015	HIGH		1.21	N/A	N/A	2.98	13.20	7.37	22.10	3.50	-23.30						Initial smell of hydrocarbons/sulphur but
BH214	12/01/2014	LOW		0.33	N/A	N/A	2.92	11.80	7.48	40.60	3.09	-176.00						
BH215	12/01/2015	HIGH	OVERCAST	0.82	2.219	10	22.19	n/a*	n/a*	32.50	3.27	-110.00	SLIGHTLY CLOUDY	BLACKISH	MODERATE	NONE	NONE	Sample diluted with deionised water for
BH215	13/01/2015	LOW	OVERCAST	0.62	N/A	N/A	5.14	9.70	7.34	34.30	3.35	-127.00	MODERATELY CLOUDY	BLACKISH-	NONE	NONE	NONE	
BH216	12/01/2015	HIGH	CLEAR	0.36	N/A	N/A	1.08	12.50	7.43	33.90	4.54	-120.00	MODERATELY CLOUDY	BLACKISH	FAINT HYDROCARBON	SOME	NONE	
BH216	13/01/2015	LOW	CLEAR/COLD	0.31	N/A	N/A	1.84	9.40	7.36	34.40	4.70	-145.00	CLOUDY	BLACKISH	MODERATE	YES	YES	
BH217	12/01/2015	HIGH		0.66	N/A	N/A	18.41	12.70	6.59	56.40	7.76	-122.00	SLIGHTLY CLOUDY	GREY	HYDROCARBONS	YES	NONE	
BH217	13/01/2015	LOW	OVERCAST	0.60	3.9	10	39.00	n/a*	6.67	27.60	2.16	-117.00	MODERATELY CLOUDY	BROWNISH-	HYDROCARBONS	YES	YES	Sample diluted with deionised water for
BH218	12/01/2015	HIGH	FINE	-0.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			Only 5cm of water
BH218	12/01/2015	LOW	FINE	-0.96	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
BH218	13/01/2015	N/A	N/A	-1.31	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	CLEAR	HONEY	STRONG HYDROCARBONS			Only sampled free product. Water level 4.63mbGL, oil level 2.26mbGL
BH219	12/01/2015	HIGH	CLEAR	0.21	N/A	N/A	18.60	12.80	7.21	44.40	6.54	-119.00	CLOUDY	RED (IRON)	SOME	SLIGHT	NONE	No free product but sheen while purging
BH219	13/01/2015	LOW	SNOWY	0.51	N/A	N/A	15.90	9.90	7.01	30.40	5.19	-167.00	VERY CLOUDY	BROWNISH-ORANGE	NONE	NONE	NONE	

n/a* Data lost

Haulbowline Factory Site

Low Flow Groundwater Purging and Sampling Methodology. October 2015

Sampling requirements

- All water samples to be representative of groundwater conditions (i.e. the medium from which they are being taken).
- Groundwater samples to be taken as specified using low flow purging and sampling techniques (also know as micro purging), at specified borehole locations and depths (see attached excel), low and high tide samples.
- Sampling methodology to ensure as little change in water chemistry as possible once water sample taken from the ground.

PPE

Appropriate PPE to be worn at all times in accordance with consultants site specific risk assessments and CCC requirements. Including but not necessarily limited to suitable footwear, hard hat, safety glasses and high visibility clothing. Nitrile Gloves

Sampling equipment

- In the case of the boreholes, groundwater samples to be taken using a low flow purging and sampling techniques (micro purging), as appropriate.
- All equipment to be thoroughly cleaned and calibrated prior to arrival onsite.
- All other materials involved in sampling activities to be clean and inert.
- Sample bottles/containers, preservatives, cool boxes, freezer packs and associated packing to be provided by the laboratory.
- Containers to be suited to a pre-specified list of laboratory analyses.

Sampling method (borehole)

- Low flow purging and sampling (micro purging)
- Suitable continuous discharge pump to be employed, suggested peristaltic to provide low pumping rates of 0.5l/min or less (typically 0.1-0.5l/min, so that drawdown of the water level in the borehole is minimised. Drawdown should not exceed 10cm.
- Interface meter to be used before each sampling to check for presence of free product.
- Water levels taken prior to pumping and during at regular intervals. Also be cognisant of tidal variations within each borehole
- Water quality indicators monitored continuous during pumping with the use of a flow cell and sample taken when parameters have stabilised (3 consecutive readings). Stabilised parameters include:
    - pH: +/- 0.2 pH units
    - conductivity: +/- 3% of reading
    - DO: +/- 10% reading or 0.2mg/l, whichever is greater
    - ORP: +/- 20mV
    - Turbidity: +/- 10% of the reading or +/- 1.0 NTU, whichever is greater (not always required)

  The measurement frequency of the above will be based on the pumping rate and the time required to completely evacuate one volume of the flow cell, associated tubing and pump volume
- Sampled water to be dispensed into appropriate sample containers from the tube outlet of hte flow cell.
- Sampler to ensure no headspace in sample bottles.
- Sample containers to be handled using disposable gloves (gloves to be replaced as appropriate and as a minimum between each sample).

Prevention of cross contamination

- New tubing to be use at each sample location.

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creative minds safe hands

- Disposable nitrile gloves to be worn and changed between each new sample.
- All material, clothing, PPE etc. to be kept clean and free from potential contaminants at all times.

Sample numbering/referencing
- All samples to be given a unique reference number.
- Reference to provide an indication of: sample type (groundwater / seep, outlet on dock wall, etc.), location, sample hole identifier and sample depth
- Additional details relating to each sample to be contained on the sample register.

Sample storage and handling
- All samples to be placed immediately into cool boxes, as provided by the laboratory.
- Cool boxes to be chilled using appropriate number of freezer packs before use.
- Cool box temperature to be regulated at circa 4oC using freezer packs as provided by the laboratory
- Cool box temperature to be monitored routinely during sampling activities;
- Efforts should be made to minimise storage times wherever possible.
- All samples to be dispatched to the laboratory daily.
- All sample containers to be handled with care to avoid breakage.
- Sample containers to be protected by bubble wrap within cool boxes, as provided by laboratory

Chain of custody
- Appropriate chain of custody forms to be completed by field supervisor.
- Separate forms to be completed for each cool box of samples.
- Relevant forms to be placed securely inside each respective cool box.
- Form copies retained by the sampling consultant and provided to CCC and WYG. WYG will use this record to schedule the samples for laboratory analysis

Sample records
- Field map to be drawn for each sampling location, including details of local landmarks, distances to and from reference points, location references etc.
- Digital photographs to be taken of sampling activities as appropriate. All photographs to include date stamp

Field Sampling Reporting Requirements:
- Equipment calibration report
- Site specific data (project name, site, well number, well depth, well diameter, screen length, pump type, tubing type)
- Initial water level (m from top of casing (mTOC), also length of casing to ground level to be provided.
- Depths of free product
- Pump placement / type (relative to well screen and water level)
- Final pumping rate
- Final stabilised drawdown
- Water quality measurements (data, time, temperature, pH, ORP, conductivity, DO, turbidity, visual olfactory evidence of contamination - odours, colour, sheens)
- In the absence of automated water level monitoring equipment, manual dips will be taken at an agreed frequency (i.e., every 10 seconds for the first minute; every 30 seconds for the first 10 minutes and every minute thereafter).
- All monitoring records to be carefully noted, including details of date, time, location, weather conditions etc.

Health and Safety
- The consultant is required to comply with relevant health and safety legislation as appropriate and to provide site specific risk assessments for the sampling activities.

Sampling Staff

- All site works to be supervised and undertaken by suitably qualified and experienced personnel
- Fieldwork engineer to be fully familiar with agreed working methods, emergency procedures, health and safety plans etc.
- Fieldwork engineer to enforce all agreed working methods as necessary onsite.
- Fieldwork engineer to ensure consistency of approach between sampling locations.
- Any deviations from agreed methods of working to be agreed with WYG and Cork County Council.

Waste management

- Any waste material generated during activities to be temporarily stored in appropriate storage containers and to be removed from working areas at end of each day
- Waste materials to be handled, stored and disposed of by the sampling consultant to current and approved site management practices.

East Tip Remediation Project, Haulbowline Island (Lot 1)

Steelworks Site: Method Statement for Groundwater and Sea-wall Seepage Sampling

Document Control Sheet

Client:	Cork County Council
Project Title:	Lot 1 Consultancy Services for Site Preparation at the East Tip, Haulbowline Island
Document Title:	Method Statement for Groundwater and Sea-wall Seepage Sampling
Document No:	MCC0800D Rp0001 D01

Text Pages:	5	Appendices:	2

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
D01	Draft	30th October 2015	MS		GB/AF		CP	

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EXECUTIVE SUMMARY

RPS was appointed by Cork County Council as consultants under a Single Operator Framework for the provision of Multi-Disciplinary consulting engineering and design services to deliver the sub-cap site profile in preparation for landfill cap and PES construction, at the East Tip, Haulbowline Island, Ringaskiddy, Co. Cork. (Lot 1)

As part of a call-off contract under the Lot 1 Framework, RPS was commissioned to undertake groundwater sampling at 5 locations at the Steelworks site. In addition, water samples (sea-wall seepage) are to be taken from a number of outlets on the dock walls.

1 GENERAL

This method statement sets out the approach for the completion of sampling of groundwater and sea-wall seepage at the Haulbowline Steelworks Site on Haulbowline Island Cork. The proposal is prepared based on the sampling requirements set out in the *Groundwater Sampling Specification* document (12/10/2015).

1.1 EXPERIENCE OF SAMPLING STAFF

Groundwater sampling will be completed by RPS Senior Hydrogeologist Gerry Baker. Gerry has 14 years' experience working in the field of Irish Hydrogeology and has extensive experience in groundwater sampling methodologies and monitoring programme management. Dara Chadwick will act as field assistant to Gerry Baker. Dara is a Junior Environmental Scientist with experience in sampling on a number of licenced and permitted sites around the country. CV's are available on request.

2 PROGRAMME

Gerry Baker will attend site on Monday the 2nd of November 2015 to commence the groundwater sampling. Table 1 outlines our proposed programme to complete the groundwater sampling over the course of 3 days. Note these may not be consecutive days. Samples will be collected within 2 hours of the low tide and high tide. The time taken for parameter stabilisation prior to sampling is difficult to predict and can be anywhere from 10 minutes to one hour.

The actual sampling time will be kept as close to the tide as possible. RPS has reviewed the hours of daylight and the tide times for Cobh over the sampling period and we consider the sampling regime can be completed within daylight hours for the proposed days. The number of samples on the last day of sampling is limited to two as this has the greatest limitation in terms of daylight hours in relation to the tides.

Sampling from BH207 will be completed first as this is considered the least contaminated borehole and therefore by sampling this site first mitigates the potential of cross contamination from other more contaminated boreholes.

The seepage sample will be collected on Thursday the 5th of November 2015 by Dara Chadwick at the locations agreed during the earlier survey.

Table 2.1: Proposed Sampling Programme

Date	02/11/2015	04/11/2015	05/11/2015
Samples Collected	BH207s BH207d BH105	BH215s BH215d BH204R	BH216s BH216d
-2Hrs	*01:13*	*03:06*	04:19
Low	**03:13**	**05:06**	**06:19**
+2hrs	*05:13*	*07:06*	08:19
-2Hrs	*07:14*	*09:18*	*10:32*
High	**09:14**	**11:18**	**12:32**
+2hrs	*11:14*	*13:18*	*14:32*
-2Hrs	*13:41*	*15:47*	*17:00*
Low	**15:41**	**17:47**	**19:00**
+2hrs	*17:41*	*19:47*	*21:00*
-2Hrs	*19:40*	*22:00*	*11:06*
High	**21:40**	**00:00**	**01:06**
+2hrs	*23:40*	*02:00*	*03:06*
Sunrise	07:30	07:33	07:35
Sunset	17:05	17:01	16:59

3 SAMPLING METHODOLOGY

3.1 GROUNDWATER SAMPLING

The groundwater sampling methodology will be in accordance with the methodology outlined by WYG. RPS will rent the appropriate equipment from InSitu including the following:

- smarTROLL Low Flow monitoring package including the YSI ProPlus multi meter and handheld device to monitor parameter stabilisation.
- EL2 Peristaltic Pump
- Rugged Inteface TAPE 200
- 45µm inline filters

The rental equipment will be checked and cleaned by InSitu prior to dispatch and RPS will also check the equipment and its functionality upon receipt, prior to attendance on site. Gerry Baker has previous experience of using the smarTROLL system under the direct supervision of an InSitu technician (Tom Stone) on a site in the UK in 2015. All other equipment and consumables will be supplied by RPS.

Appropriate PPE will be worn at all times by the samplers including nitrile gloves during sampling, hard hat, high visibility vest, steel toe cap and steel mid sole footwear. RPS staff will us eye

protection and face masks to prevent contamination from splashes of purged water and fumes that can build up in boreholes. Upon arrival at each monitoring site the borehole will be opened and the interface meter will be used to record the depth to water and any free product. A PID meter will be used to check for the presence of volatiles. The appropriate length of tubing will be connected to the pump based on the target sample depth. The defined stabilisation parameters will be entered into the smarTroll device prior to purging. The peristaltic pump will then be activated and the water from the outlet pipe will be discharged directly onto a 25L plastic drum for subsequent appropriate disposal. The purging will continue until the stabilisation parameters are achieved. The pumping rate will be adjusted if there is excessive drawdown observed in the borehole (>9cm).

Upon achievement of parameter stabilisation the monitoring equipment will be detached from the pumping equipment and the sample will be collected directly from the pump outlet pipe. VOC samples will be collected first and samples bottles will be filled to the brim with no headspace present, unless specified by the laboratory.

Where samples are required at shallow and deep sections within the same borehole the shallow samples will be collected first followed by the deeper sample. A new length of drop tubing will be used for each sample, including deeper samples collected subsequent to the shallow samples in a borehole, to ensure there is no cross-contamination across the boreholes.

3.2 SEEPAGE SAMPLING

The seepage samples are to be taken from a boat which will be accessed from a pontoon in the Navy dockyard. This boat will be navigated by Navy personnel.

The seepage sampling will be completed by using a telescopic rod with a sampling beaker on the end to ensure the sampler does not over-reach across the side of the boat when sampling. The beaker will be cleaned with Decon90 between each sampling location. Where a sample can be safely collected directly at the seepage this can be done using the sampling beaker. A field sample syringe with a 45µm filter will be used to filter the samples from the beaker and to inject the filtered sample into the appropriate bottles e.g. for metals analysis where a preservative is required.

Field notes on all samples will be taken to record the sample colour, cloudiness and smell during purging and at the time of sample collection.

We understand provision of the appropriate containers and sample collection is being organised by White Young Green and Cork County Council.

4 HEALTH, SAFETY, WELFARE & SECURITY

The Cork County Council Health and Safety Risk Assessment Report for the Steelworks site set out a number of the key hazards which are outlined below:

- Unprotected edges at deep pits.
- Presence of poorly protected or unprotected opes i.e. manhole chambers etc. It was noted that a sheet of plywood and a wooden pallet had been used to cover two chambers and these are now in a poor condition.
- Undulating ground conditions where structures were removed resulting in residual hazards of slips, trips and falls.
- Holes in slabs into which persons could walk.
- The presence of steel reinforcing bars, jagged steel beams and fittings protruding from the ground at various locations around the site.
- The presence of derelict buildings on the site. Access is available to the majority of these buildings and the buildings are in a poor state of repair.
- The presence of damaged portacabins and temporary offices on the site, including where cladding had been blown off the offices and was strewn on the ground around the site.
- Vegetation has grown up around the site and impedes visibility.
- Broken glass is present around the site.
- Some pits and tanks are present which are filled with water.
- Lack of signage in relation to site safety, site hazards or access routes around the site.
- Exposed electrical cables at various locations around the site
- High voltage overhead powerlines run from north to south along the western side of the site. These powerlines are supported by pylons, one of which is situated within the boundaries of the site Some windows in buildings have been broken and have shards of glass present which could possibly be loose and come free
- Possibility of contaminated water being present in tanks, pits and buildings around the site.
- Access to boreholes for sampling is impeded with vegetation in places and one sampling point is located in a deep pit with no safe access.

4.1 RPS SYSTEMS

RPS recognises that there are a number of hazards present on site and associated with undertaking the sampling activates. A risk assessment has been undertaken in respect of the groundwater sampling and seepage sampling works (See **Appendix B**). The key hazards that are considered applicable at this stage to the sampling activities are identified in the attached Risk Assessment. All RPS personnel will have reviewed the Cork County Council Health and Safety Risk Assessment Report for the Steelworks site in addition to the site Safety Protocol.

RPS staff will undergo an induction from Cork County Council staff prior to commencing any sampling.

Prior to undertaking sampling the RPS staff and a representative of Cork County Council will undertake a walkover of the site. This walkover will occur on the designated pathways that have been mapped out by Cork County Council in line with the recommendations of the Site Health and Safety Risk Assessment Report (Arup, 2014). The purpose of this walkover is to confirm that safe access can be gained to all sampling points prior to commencement of work. Due to the changing nature of sites in marine environment and given the presence of a number of known risks on site the

walkover survey will also assist the project team to identify any further unknown risks that may have emerged in recent times.

RPS has a number of Safe Systems of Work (SSW) relating to the various activates that staff are engaged in. Based on the risks identified the sampling team will familiarise themselves with the relevant SSWs in advance of the visit to site. The adherence to these SSW represents the main mitigation to the hazards identified. In addition, lone working will not be permitted; all RPS staff will be working closely with another member of the project team. In the event of an accident or emergency, the appropriate measures should be undertaken or emergency contacts as outlined below called if applicable.

All team members are competent to undertake the sampling works that they are scheduled to complete.

Should new risks be identified or changes to the procedure for sampling occur when on site, a revised Risk Assessment will be prepared by the RPS employee and a member of the RPS Health and Safety team.

5 EMERGENCY CONTACTS

As part of the site induction provided by Cork County Council Emergency Procedures will be communicated to RPS site staff.

The emergency contacts for the site are provided below. All RPS staff will carry a mobile phone with the contacts details below included in their phonebook/contact list.

Cork County Council site representative will be informed by RPS staff as soon as there is any incident/accident. RPS staff will ensure they have a first aid kit in the event that minor first aid is required on site.

Cork County Council:

Padraig Barrett: 087 286 3066

Navy Base:

Jim Langford: 087 2877122

EMERGENCY CONTACT NUMBERS

Carrigaline Garda Station:	021-4919370
Carrigaline Fire Station:	021-4374147
Emergency Services:	999 or 112
Cork County Council Safety Dept:	021-4275770
Doctor O'Sullivan (Naval Base):	021-4864915
Medical admin office (Naval Base):	021-4864899
Duty medic (Naval Base)	021-4864899 (up to 16.20)
Duty medic (Naval Base)	021 4864920 (after 16.20)

APPENDIX A

Site Maps

(Taken from Arup Reports)

A3

\\crknts04\Cork_Jobs\235000\235946-00\4. Internal\4-03 Design\4-03-03 Infrastructure\GIS\02_Maps\MXD\140424_Haubowline.mxd

Legend

- Existing_Buildings_140430
- DRAFT_Site_Boundary_dwg_Polyline
- Monitoring Well

02/05/2014 10:31:05

Issue	Date	By	Chkd	Appd
P0	2014-04-30	JO	JO	JO

Metres
0 25 50 100

ARUP

15 Oliver Plunkett Street
Cork
Tel 021 427 7670
www.arup.com

Client

Cork County Council

Job Title

Former Irish Steel Plant Haulbowline

HEALTH AND SAFETY RISK ASSESMENT REPORT - SITE LAYOUT

Scale at A3

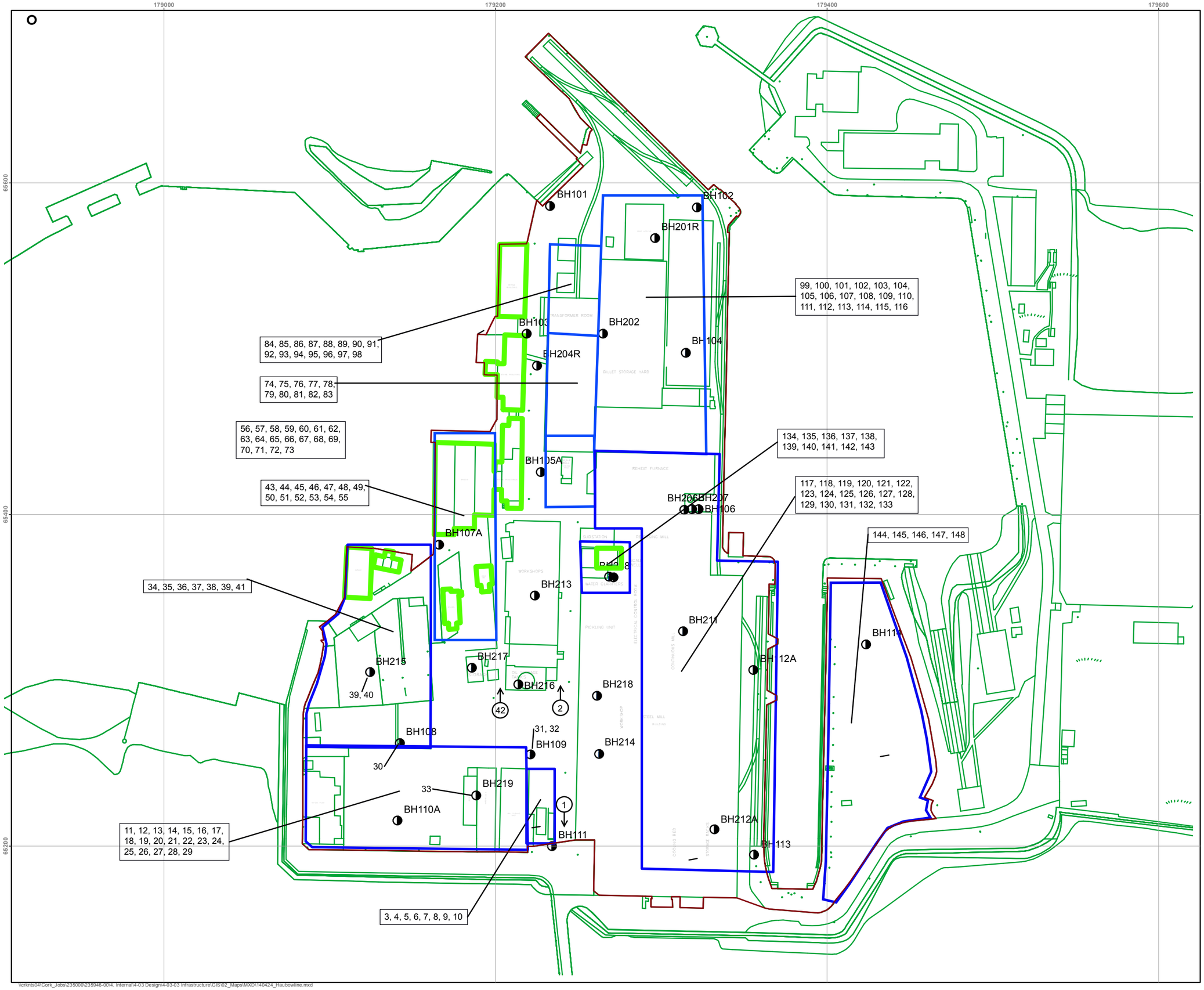
1:2,147

Job No	Drawing Status
235946	**Preliminary**

Drawing No	Issue
SK-HSRA-001	**P0**

© Arup

A3



Legend

- Existing Buildings 140430
- DRAFT Site Boundary dwg Polyline
- Monitoring Well
- Approximate Locations of photographs taken during Site Audit on 29th April '14. (Numbers shown refer to photograph numbers in Appendix B2 of the Health and Safely Risk Assessment Report)

02/05/2014 10:31:05

Issue	Date	By	Chkd	Appd
P0	2014-04-30	JO	JO	JO

Metres
0 25 50 100

ARUP

15 Oliver Plunkett Street
Cork
Tel 021 427 7670
www.arup.com

Client

Cork County Council

Job Title

Former Irish Steel Plant Haulbowline

HEALTH AND SAFETY RISK ASSESEMENT REPORT - INDICATIVE PHOTOGRAPH LOCATIONS

Scale at A3

1:2,147

Job No	Drawing Status
235946	**FOR INFORMATION**

Sketch No	Issue
SK-HSRA-002	**P0**

\\crknts04\Cork_Jobs\235000\235946-00\4. Internal\4-03 Design\4-03-03 Infrastructure\GIS\02_Maps\MXD\140424_Haubowline.mxd

© Arup

A3

Legend

Existing_Buildings_140430

DRAFT_Site_Boundary_deg_Polyline

Monitoring Well

MR1

MR2

MR3

MR4

MR5

ARUP

Cork County Council

Former Irish Steel Plant Haulbowline

HEALTH AND SAFETY RISK ASSESMENT REPORT - SITE LAYOUT

1:2,147

238948

Preliminary

SK-HSRA-001

P0

Appendix B

Risk Assessment for Sampling

Risk Assessment (RA)
RA Title: Groundwater & Seepage Sampling at Steelworks Site, Haulbowline (Lot 1)

Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Falling overboard while sampling from the boat	6	3	6x3	M	SSW5.7_Working in or near Water. Sampling methodology includes use of an extendable pole with a container attached to the end. Staff explicitly instructed in method statement not to lean over the side of the boat in obtaining the sample. Appropriate PPE including lifejacket to be worn. Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	6	1	6x1	L
Slips or trips, leading to a fall into water, while accessing the boat	6	3	6x3	M	SSW5.7_Working in or near Water. Appropriate Appropriate PPE including lifejacket to be worn. Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol. Site induction to indentify safe pathways.	6	2	6x2	M

Created By: Micheál Spillane
Approved By:

Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Entering water due to a problem with the boat	6	3	6x3	M	SSW5.7_Working in or near Water. Appropriate Appropriate PPE including lifejacket to be worn. RPS to check the boat is certified prior to the sampling works. Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	6	1	6x1	L
Biological or other health hazards from sampling of potentially contaminated effluents	4	3	4x3	M	SSW5.9 Working in or near a Landfill / Contaminated Land Appropriate hygiene procedures, PPE and use of welfare facilities on site.	4	1	4x1	L
Working at night or in darkness	5	4	5x4	M	SSW5.6 Work at Night Avoidance of Lone Working Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	5	2	5x2	L

Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Falling from a height ▪ Risk of falling from a height into numerous unprotected deep pits around the site ▪ Risk of falling through poorly protected or unprotected opes around the site i.e. manhole chambers and holes in concrete slabs etc. ▪ Risk of falling from a height into open tanks on the site ▪ Risk of falling from a height into Cork Harbour ▪ Risk of falling from a height when accessing borehole sampling areas i.e. BH202 ▪ Risk of being struck by building materials falling from a height i.e. glass shards from windows and electrical cable ladder partially removed from the Scale Well building	6	3	6x3	M	RPS staff to be escorted around site by Cork County Council staff initially to identify hazards and safe walkways Avoidance of Lone Working SSW5.7_Working in or near Water. Appropriate SSW5.5_Working at height Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	6	1	6x1	L

Created By: Micheál Spillane
Approved By:

Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Chemical of Biological Substances ▪ Risk of contact with contaminated soil ▪ Risk of inhaling hazardous dust particles on the site ▪ Risk of contact with contaminated water on the site i.e. in pits and tanks ▪ Risk of contact with asbestos containing materials (ACMs) on the site ▪ Risk of contracting Leptospirosis (Weil's disease)	6	2	6x2	M	RPS staff to be escorted around site by Cork County Council staff initially to identify hazards SSW5.3_Lone Working SSW5.7_Working in or near Water. Appropriate SSW5.16_Hydrogeology Activities SSW5.9 Work In or Near a Landfill/Contaminated Land SSW5.5_Working at height Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	6	1	6x1	L
Drowning ▪ Risk of drowning in the sea ▪ Risk of drowning in water filled pits ▪ Risk of drowning in water filled tanks ▪ Risk of drowning in flooded former scale well building	6	3	6x3	M	RPS staff to be escorted around site by Cork County Council staff initially to identify hazards SSW5.3_Lone Working SSW5.7_Working in or near Water. Appropriate SSW5.16_Hydrogeology Activities SSW5.9 Work In or Near a Landfill/Contaminated Land SSW5.5_Working at height	6	1	6x1	L

Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Slips, trips & falls: ▪ On uneven ground conditions ▪ On extruding rebar ▪ On extruding structural steel members and steel plates ▪ On damaged manhole covers ▪ Into inadequately protected manhole Chambers ▪ Over small holes in slabs ▪ On electrical cables ▪ On hose pipes ▪ Over vegetation growing on the site	4	3	4x3	M	RPS staff to be escorted around site by Cork County Council staff initially to identify safe walkways and hazards SSW5.3_Lone Working SSW5.16_Hydrogeology Activities SSW5.9 Work In or Near a Landfill/Contaminated Land SSW3_Visiting Construction Sites/Short Term Working on Sites Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	4	1	4x1	L
Derelict Buildings ▪ Building collapse ▪ Unsafe floors possible risk of collapse ▪ Lack of lighting ▪ Presence of vermin, Weils disease etc. ▪ Presence of broken glass ▪ Slips, trips and falls	5	2	5x2	L	RPS staff to be escorted around site by Cork County Council staff initially to identify hazards SSW5.3_Lone Working SSW5.16_Hydrogeology Activities SSW3_Visiting Construction Sites/Short Term Working on Sites Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	5	1	5x1	L

Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Existing Buried Services ▪ Contact with uncharted buried services on the site during excavation works resulting in injury	5	2	5x2	L	RPS staff to be escorted around site by Cork County Council staff initially to identify hazards SSW5.3_Lone Working SSW5.16_Hydrogeology Activities SSW3_Visiting Construction Sites/Short Term Working on Sites Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	5	1	5x1	L
Electrocution ▪ Due to contact with exposed electrical cables on the site	6	2	6x2	M	RPS staff to be escorted around site by Cork County Council staff initially to identify hazards SSW5.3_Lone Working SSW5.16_Hydrogeology Activities SSW3_Visiting Construction Sites/Short Term Working on Sites Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol. Adherence to no smoking policy.	6	1	6x1	L

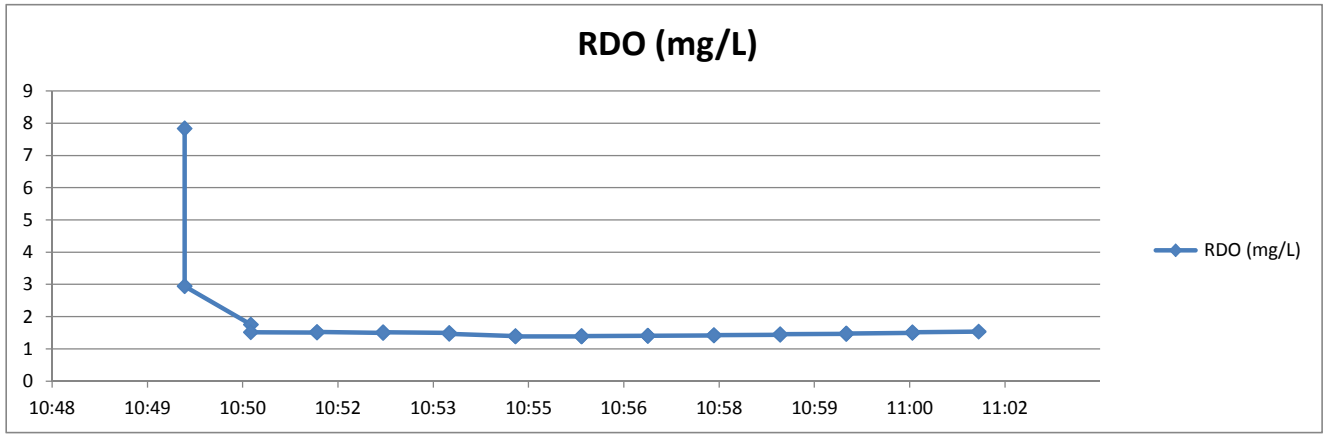
Hazards Physical, Chemical, Biological, Psychological	Risk Evaluation				Control Measures Elimination, Substitution, Engineering, Signage etc., PPE	Revised Risk Rating			
	S	L	S x L	Rating		S	L	S x L	Rating
Other Hazards ▪ Risk of contamination from splashes off purged water and fumes that can build up in boreholes ▪ Injury due to contact with broken glass present around the site ▪ Injury while accessing borehole sampling locations i.e. some sampling locations are: impeded by vegetation, close to edge of quay wall, in a deep pit etc. ▪ Injury due to lack of lighting on the site ▪ Lone working on the site ▪ Presence of small animals on the site resulting in personnel becoming startled thus causing an accident, i.e. dogs, rats, birds, other small animals, etc. ▪ Weather i.e. sun burn, high winds etc. ▪ Lack of first aid equipment and first aiders on the site	5	2	5x2	L	Appropriate PPE – including use of eye protection and face masks RPS staff to be escorted around site by Cork County Council staff initially to identify hazards SSW5.3_Lone Working SSW5.16_Hydrogeology Activities SSW3_Visiting Construction Sites/Short Term Working on Sites Adherence to Haulbowline Steelworks Site Assessment Project Site Safety Protocol.	5	1	5x1	L

Note: RPS have not been to the site as part of this risk assessment. The hazards in blue have been taken from the Health and Safety Risk Assessment Report prepared by Arup for Cork County Council.

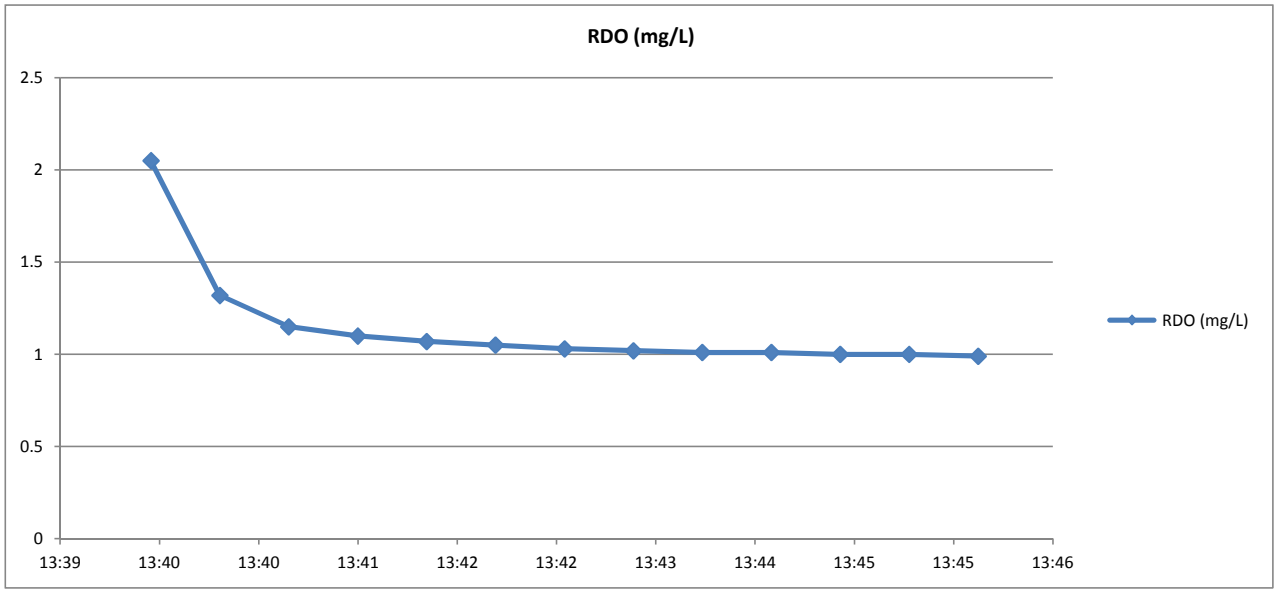
Note: Following the site walkover undertaken on the 2nd of November the Risk Assessment will be updated by RPS to include any new risks that were not foreseen or accounted for prior to the RPS site visit.

Date	Sample ID	Time	Tide	PID (ppm)	Product Level (mbtoc)		Water Level (ml	Colour	Odour	Sheen	pH	EC (uS/cm)	DO (mg/l)	ORP (mV)	Temp (oC)
02/11/2015	BH105		10:50	High	0.2	None		2.64	No	No	No	8.26	29608	1.54	30.4	14.76
02/11/2015	BH105		13:28	Low	1.6	None		2.65				8.40	29852	0.99	17.3	15.17
02/11/2015	BH216s		14:40	Low	1.9		2.895	2.905	Clear with black flecks	No	No	7.29	1121	0.26	-140.3	15.64
02/11/2015	BH216d		15:20	Low	-	-	-		Black, clearing slightly during purge	Hydrocarbon	No	6.77	1205	3.94	-102.8	16
04/11/2015	BH207s		09:55	High	0.6	None		3.33				6.58	757	6.49	69.8	13.75
04/11/2015	BH207d		10:35	High	-	-	-		No	No	No	6.77	846	1.72	37	13.26
04/11/2015	BH215s		11:10	High	0.3	None		1.7	No	No	No	6.80	7589	0.09	-95.4	13.42
04/11/2015	BH215d		11:50	High	-	-	-		No	No	No	7.25	27834	0.09	-114.7	13.38
04/11/2015	BH204R		12:35	High	0.8	None		2.15	Black flecks in suspension but mostly cle	No	No	7.87	34265	2.47	28.5	14.11
04/11/2015	BH207s		15:20	Low	0.4	None		3.58	No	No	No	8.57	748	5.5	33.3	13.93
04/11/2015	BH207d		16:00	Low	-	-	-		No	No	No	7.29	751	4.19	35.6	13.53
04/11/2015	BH215s		16:40	Low	0.4	None		1.99	No	No	No	6.98	7501	0.14	-88.4	13.29
04/11/2015	BH215d		17:00	Low	-	-	-		No	No	No	7.32	28739	0.11	-109.4	13.25
05/11/2015	BH218		12:00	High	6.8 peak, 5.6 sta		2.6	4.9 (base of bor	Not Sampled			-	-	-	-	-	
05/11/2015	BH216s		12:20	High	26.9		3.07	3.09	Initially some dirt but cleared upond pur	Hydrocarbon	yes	6.59	1003	0.09	-114.1	15.37
05/11/2015	BH216d		14:00	High	-	-	-		Water extremely black, based of borehole at	~4.5mbtoc.	Sampling c	6.59	1015	1.43	-71.1	15.95
05/11/2015	BH204R		17:00	Low	0.4	None		2.65	Occasional Light brown/black flecks	mild hydrocarb	possibly	8.34	30646	1.36	-25.6	14.02

Log:	Haulbowline- 1 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-02 10:50:15															
Number Readings:		32														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/	RDO Sat (%	pH (pH)	ORP (mV)	Act Cond (	Sp Cond (µ	Salinity (p:	Resist (Oh	Density (g	TDS (ppt)	Depth (ft)	Pressure (	Air Temp (
02/11/2015 10:50		1020.9	15.87	7.84	89.9	6.28	161.4	28826.1	34918.2	22.1	35	1.016	23	0.06	0.028	16.1
02/11/2015 10:50		1020.9	15.37	2.95	33.8	6.79	121.4	29832.8	36555.2	23.2	34	1.017	24	0.04	0.017	16.1
02/11/2015 10:51		1020.9	15.06	1.76	20	7.15	99.4	29747.1	36721.7	23.3	34	1.017	24	0.04	0.016	16.1
02/11/2015 10:51		1020.8	14.87	1.52	17.2	7.41	84.5	29718.9	36846.9	23.4	34	1.017	24	0.05	0.022	16.1
02/11/2015 10:52		1020.9	14.74	1.51	17.1	7.6	74.3	29722.2	36965.9	23.4	34	1.017	24	0.05	0.022	16.1
02/11/2015 10:52		1020.9	14.65	1.53	17.2	7.74	66.5	29650	36955.3	23.4	34	1.017	24	0.03	0.015	16.1
02/11/2015 10:53		1020.9	14.6	1.5	17	7.86	60.5	29658.8	37006.8	23.5	34	1.017	24	0.05	0.022	16.1
02/11/2015 10:53		1020.8	14.56	1.52	17.1	7.95	56	29607.9	36982.3	23.4	34	1.017	24	0.06	0.028	16.1
02/11/2015 10:54		1020.8	14.52	1.5	16.9	8.02	52.3	29597.5	37001.7	23.4	34	1.017	24	0.03	0.013	16.2
02/11/2015 10:54		1020.8	14.52	1.47	16.6	8.07	49.1	29591.4	37000.8	23.4	34	1.017	24	0.07	0.032	16.2
02/11/2015 10:55		1020.9	14.51	1.4	15.8	8.12	48.1	29578.3	36985.4	23.4	34	1.017	24	0.08	0.035	16.2
02/11/2015 10:55		1020.9	14.56	1.39	15.6	8.15	45.1	29613.3	37004.9	23.4	34	1.017	24	0.07	0.031	16.2
02/11/2015 10:56		1020.9	14.56	1.39	15.7	8.16	43	29586.5	36955.2	23.4	34	1.017	24	0.04	0.018	16.2
02/11/2015 10:56		1020.9	14.6	1.4	15.8	8.17	41.2	29610.2	36959.5	23.4	34	1.017	24	0.08	0.035	16.3
02/11/2015 10:57		1020.9	14.63	1.41	15.9	8.17	42.1	29640.8	36973.8	23.4	34	1.017	24	0.07	0.03	16.3
02/11/2015 10:57		1020.8	14.67	1.41	15.9	8.17	39.6	29645.9	36948.6	23.4	34	1.017	24	0.09	0.037	16.3
02/11/2015 10:58		1020.8	14.71	1.42	16	8.18	37.9	29695.4	36970.5	23.4	34	1.017	24	0.04	0.018	16.4
02/11/2015 10:58		1020.8	14.75	1.43	16.1	8.18	36.6	29701.9	36940.5	23.4	34	1.017	24	0.07	0.031	16.4
02/11/2015 10:59		1020.8	14.81	1.44	16.3	8.19	35.5	29712.3	36910.9	23.4	34	1.017	24	0.07	0.031	16.5
02/11/2015 10:59		1020.8	14.85	1.46	16.5	8.19	34.5	29755	36926.4	23.4	34	1.017	24	0.09	0.039	16.6
02/11/2015 11:00		1020.8	14.89	1.47	16.7	8.19	33.6	29752.5	36882.3	23.4	34	1.017	24	0.07	0.032	16.7
02/11/2015 11:00		1020.8	14.92	1.48	16.8	8.2	33.1	29798.8	36902.6	23.4	34	1.017	24	0.07	0.03	16.8
02/11/2015 11:01		1020.8	14.92	1.5	17	8.22	32.4	29695.4	36768.9	23.3	34	1.017	24	0.08	0.036	16.8
02/11/2015 11:01		1020.8	14.86	1.52	17.2	8.25	31.4	29585.6	36678.3	23.2	34	1.017	24	0.06	0.024	16.9
02/11/2015 11:02		1020.7	14.76	1.54	17.4	8.26	30.4	29608.2	36784.3	23.3	34	1.017	24	0.04	0.019	17.1

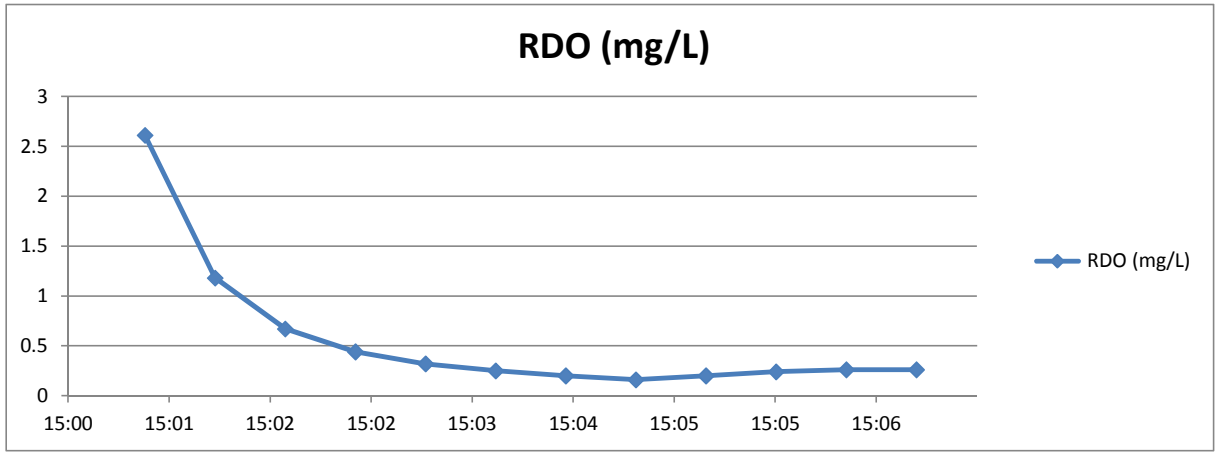

RDO (mg/L)
9
8
7
6
5
4
3
2
1
0
10:48
10:49
10:50
10:52
10:53
10:55
10:56
10:58
10:59
11:00
11:02
RDO (mg/L)

Log:	Haulbowline- 2 of 13														
Report Created:	2015-11-05 09:59:58														
Site:	Haulbowline														
GPS:	0	0	0	0	0	0									
Log Created:	2015-11-02 13:40:01														
Number Readings:	13														
Battery Type:	SmarTROLLâ„¢ Battery Pack														
Battery SN:	402055														
Device Type:	SmarTROLLâ„¢ MP														
Device SN:	365938														
Created	Baro (mba	Temp (C)	RDO (mg/	RDO Sat (%	pH (pH)	ORP (mV)	Act Cond (	Sp Cond (µ	Salinity (p	Resist (Oh	Density (g	TDS (ppt)	Depth (ft)	Pressure (	Air Temp (
02/11/2015 13:40	1019	19.15	2.05	25	8.03	42.8	30206.8	34005.3	21.5	33	1.015	22	-0.05	-0.005	17.4
02/11/2015 13:40	1019	17.97	1.32	15.9	8.12	35.4	30037.3	34697.4	22	33	1.015	23	-0.02	-0.016	17.4
02/11/2015 13:41	1019	17.08	1.15	13.6	8.19	30.2	30010.6	35359.1	22.4	33	1.016	23	-0.03	-0.007	17.4
02/11/2015 13:41	1019	16.46	1.1	12.8	8.24	26.6	29969.3	35813.2	22.7	33	1.016	23	-0.03	-0.014	17.4
02/11/2015 13:42	1018.9	16.04	1.07	12.4	8.28	24	29925.8	36100.7	22.9	33	1.016	23	-0.06	-0.019	17.4
02/11/2015 13:42	1019	15.76	1.05	12.1	8.31	22.1	29911.7	36322.8	23	33	1.017	24	-0.08	-0.04	17.4
02/11/2015 13:43	1019	15.58	1.03	11.9	8.33	20.8	29917.1	36483.5	23.1	33	1.017	24	-0.09	-0.037	17.4
02/11/2015 13:43	1018.9	15.45	1.02	11.7	8.35	19.8	29922.5	36600.3	23.2	33	1.017	24	-0.08	-0.026	17.4
02/11/2015 13:44	1019	15.36	1.01	11.6	8.37	19.1	29909.1	36661.7	23.3	33	1.017	24	-0.1	-0.033	17.4
02/11/2015 13:44	1019	15.28	1.01	11.5	8.38	18.5	29909.4	36726.3	23.3	33	1.017	24	-0.11	-0.058	17.4
02/11/2015 13:45	1019	15.24	1	11.4	8.39	18	29930.5	36791.1	23.3	33	1.017	24	-0.1	-0.035	17.3
02/11/2015 13:45	1019	15.19	1	11.4	8.4	17.6	29888.7	36777.9	23.3	33	1.017	24	-0.16	-0.042	17.4
02/11/2015 13:46	1019	15.17	0.99	11.4	8.4	17.3	29851.8	36753.4	23.3	33	1.017	24	-0.13	-0.056	17.3

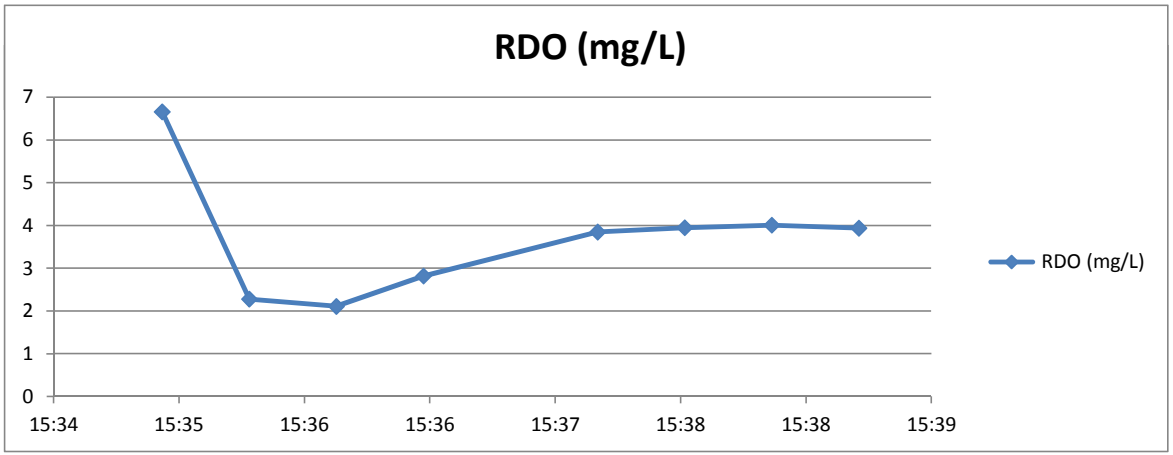

RDO (mg/L)
2.5
2
1.5
1
0.5
0
13:39
13:40
13:40
13:41
13:42
13:42
13:43
13:44
13:45
13:45
13:46
RDO (mg/L)

Log:	Haulbowline- 3 of 13
Report Created:	2015-11-05 09:59:58
Site:	Haulbowline
GPS:	0 0 0 0 0 0
Log Created:	2015-11-02 15:01:16
Number Readings:	12
Battery Type:	SmarTROLLâ„¢ Battery Pack
Battery SN:	402055
Device Type:	SmarTROLLâ„¢ MP
Device SN:	365938

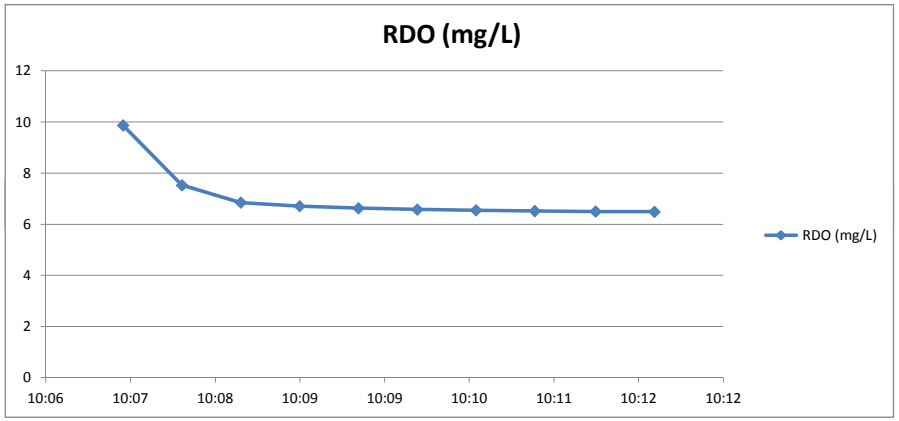
Created	Baro (mba	Temp (C)	RDO (mg/	RDO Sat (%	pH (pH)	ORP (mV)	Act Cond (	Sp Cond (µ	Salinity (p	Resist (Oh	Density (g	TDS (ppt)	Depth (ft)	Pressure (	Air Temp (
02/11/2015 15:01	1018.1	19.51	2.61	28.5	8.9	-164.1	1163.5	1291.7	0.7	859	0.999	1	-0.1	-0.041	17.8
02/11/2015 15:01	1018.1	18.37	1.18	12.6	8.52	-162.5	1143.2	1303.3	0.7	875	0.999	1	-0.09	-0.039	17.8
02/11/2015 15:02	1018.2	17.54	0.67	7	8.28	-158.1	1134.3	1318.9	0.7	882	0.999	1	-0.08	-0.035	17.8
02/11/2015 15:02	1018.1	16.99	0.44	4.5	8.07	-152.2	1132.3	1334.2	0.7	883	0.999	1	-0.13	-0.058	17.8
02/11/2015 15:03	1018.2	16.59	0.32	3.3	7.9	-147.9	1123.2	1335.9	0.7	890	0.999	1	-0.1	-0.043	17.8
02/11/2015 15:03	1018.1	16.31	0.25	2.5	7.77	-145.7	1120.7	1342.2	0.7	892	0.999	1	-0.12	-0.053	17.9
02/11/2015 15:04	1018.2	16.1	0.2	2	7.64	-144.4	1121.5	1350	0.7	892	0.999	1	-0.13	-0.058	17.9
02/11/2015 15:04	1018.1	15.93	0.16	1.6	7.56	-143.8	1121.3	1356	0.7	892	0.999	1	-0.1	-0.043	17.9
02/11/2015 15:05	1018.1	15.82	0.2	2	7.47	-142.6	1119.7	1357	0.7	893	0.999	1	-0.15	-0.066	17.9
02/11/2015 15:05	1018.1	15.73	0.24	2.4	7.41	-141.7	1121.2	1362	0.7	892	1	1	-0.14	-0.063	17.9
02/11/2015 15:06	1018.1	15.66	0.26	2.6	7.34	-140.7	1119	1361.4	0.7	894	1	1	-0.17	-0.074	17.9
02/11/2015 15:06	1018.1	15.64	0.26	2.6	7.29	-140.3	1120.8	1364.7	0.7	892	1	1	-0.15	-0.064	17.9



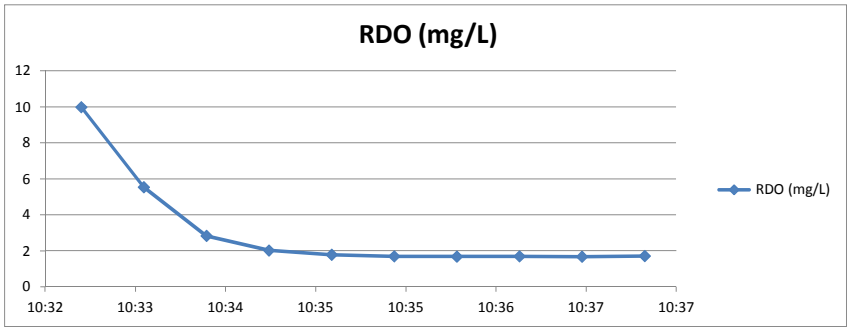
Log:	Haulbowline- 4 of 13														
Report Created:	2015-11-05 09:59:58														
Site:	Haulbowline														
GPS:	0	0	0	0	0	0									
Log Created:	2015-11-02 15:35:11														
Number Readings:	18														
Battery Type:	SmarTROLLâ„¢ Battery Pack														
Battery SN:	402055														
Device Type:	SmarTROLLâ„¢ MP														
Device SN:	365938														
Created	Baro (mba	Temp (C)	RDO (mg/l	RDO Sat (%	pH (pH)	ORP (mV)	Act Cond (	Sp Cond (µ	Salinity (p	Resist (Oh	Density (g	TDS (ppt)	Depth (ft)	Pressure (	Air Temp (
02/11/2015 15:35	1017.7	17.17	6.66	69.2	7.39	-47.8	1175.1	1381.9	0.7	851	0.999	1	-0.07	-0.032	18.9
02/11/2015 15:35	1017.6	16.36	2.28	23.3	7.07	-90.9	1176.1	1408.6	0.7	850	0.999	1	-0.03	-0.012	18.9
02/11/2015 15:36	1017.6	16.01	2.11	21.4	6.94	-92.9	1183.1	1428.4	0.7	845	1	1	-0.06	-0.027	18.9
02/11/2015 15:36	1017.6	15.91	2.82	28.5	6.89	-94.9	1191	1441.1	0.7	840	1	1	-0.07	-0.032	19
02/11/2015 15:37	1017.7	15.82	3.85	38.8	6.78	-96.8	1197.8	1452.4	0.7	835	1	1	-0.09	-0.039	19
02/11/2015 15:38	1017.7	15.83	3.95	39.9	6.86	-103.6	1199.5	1454.4	0.7	834	1	1	-0.07	-0.03	19
02/11/2015 15:38	1017.6	15.86	4.01	40.5	6.91	-107.4	1206.6	1462.2	0.7	829	1	1	-0.06	-0.025	19
02/11/2015 15:39	1017.6	16	3.94	39.8	6.77	-102.8	1205.2	1458.1	0.7	830	1	1	-0.07	-0.03	19



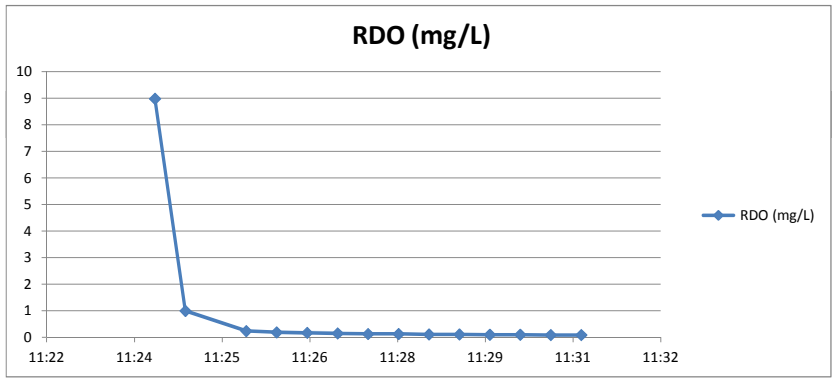
Log:	Haulbowline- 5 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 10:07:37															
Number Readings:		10														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 10:07		1012.5	15.01	9.87	98.1	7.47	69.9	353	436.2	0.2	2833	0.999	0	0.01	0.003	15.7
04/11/2015 10:08		1012.5	14.12	7.53	73.5	7.3	127.1	740.2	934.4	0.5	1351	1	1	0.04	0.016	15.7
04/11/2015 10:08		1012.4	13.99	6.85	66.7	6.82	114.1	752.4	952.7	0.5	1329	1	1	0	0.002	15.7
04/11/2015 10:09		1012.4	13.93	6.71	65.2	6.74	96.4	756.1	958.9	0.5	1323	1	1	-0.03	-0.012	15.6
04/11/2015 10:09		1012.4	13.88	6.63	64.4	6.65	87.5	757.3	961.5	0.5	1321	1	1	0	0.001	15.6
04/11/2015 10:10		1012.3	13.83	6.58	63.9	6.65	79.4	757.1	962.3	0.5	1321	1	1	0.02	0.009	15.6
04/11/2015 10:10		1012.5	13.79	6.55	63.5	6.6	76.7	758.2	964.7	0.5	1319	1	1	-0.01	-0.003	15.6
04/11/2015 10:11		1012.4	13.78	6.52	63.2	6.6	72.9	758.3	965.1	0.5	1319	1	1	-0.02	-0.007	15.5
04/11/2015 10:11		1012.5	13.77	6.5	63	6.58	70.9	757.1	963.8	0.5	1321	1	1	-0.02	-0.01	15.5
04/11/2015 10:12		1012.4	13.75	6.49	62.8	6.58	69.8	757	964.2	0.5	1321	1	1	0.03	0.012	15.5



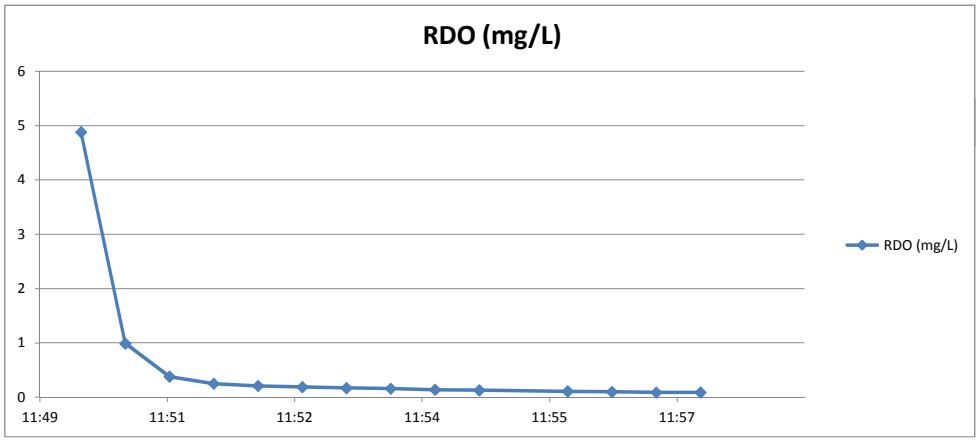
Log:	Haulbowline- 6 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 10:33:10															
Number Readings:		10														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 10:33		1012.5	13.42	9.99	96.3	6.88	81.9	741.8	949.1	0.5	1348	1	1	0.36	0.154	13.4
04/11/2015 10:33		1012.5	13.38	5.54	53.2	6.82	65.4	802.1	1030.9	0.5	1247	1	1	0.41	0.178	13.4
04/11/2015 10:34		1012.5	13.38	2.84	27.3	6.76	56.5	837	1075.8	0.5	1195	1	1	0.43	0.187	13.5
04/11/2015 10:34		1012.5	13.35	2.03	19.5	6.73	50.4	849.4	1092.1	0.5	1177	1	1	0.43	0.186	13.5
04/11/2015 10:35		1012.5	13.34	1.79	17.2	6.73	45.9	850	1093.6	0.5	1176	1	1	0.43	0.185	13.5
04/11/2015 10:35		1012.5	13.31	1.7	16.3	6.77	41.5	851.4	1096	0.5	1174	1	1	0.45	0.194	13.5
04/11/2015 10:36		1012.5	13.29	1.69	16.2	6.76	40.2	849.7	1094.4	0.5	1177	1	1	0.47	0.203	13.5
04/11/2015 10:36		1012.5	13.29	1.7	16.3	6.79	37.1	849.4	1094.1	0.5	1177	1	1	0.5	0.217	13.5
04/11/2015 10:37		1012.6	13.28	1.68	16.1	6.8	36	845.2	1088.9	0.5	1183	1	1	0.5	0.215	13.5
04/11/2015 10:37		1012.6	13.26	1.72	16.5	6.77	37	846	1090.4	0.5	1182	1	1	0.53	0.229	13.5



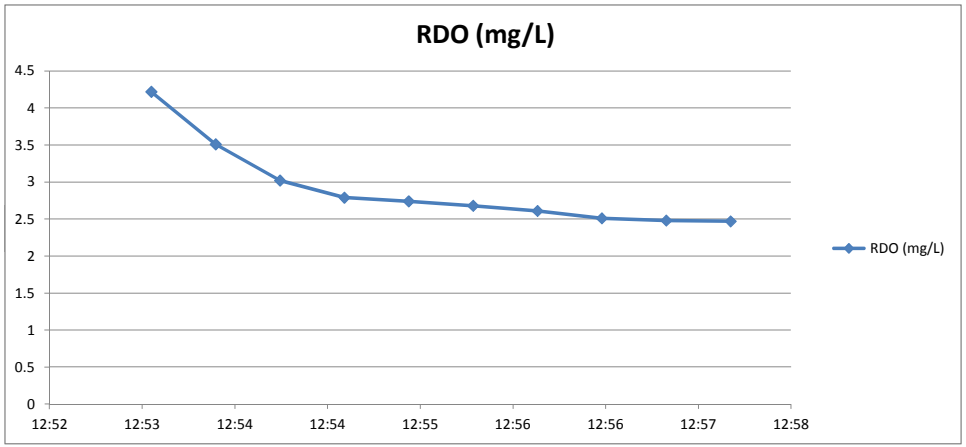
Log:	Haulbowline- 7 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 11:24:20															
Number Readings:		14														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 11:24		1012.7	13.71	8.98	89.4	6.56	17.4	6884.8	8765.3	4.9	145	1.003	6	0.01	0.003	14.6
04/11/2015 11:24		1012.6	13.65	1	10	6.67	-41.7	6957.8	8882.8	5	144	1.003	6	0.01	0.006	14.7
04/11/2015 11:25		1012.6	13.5	0.24	2.4	6.7	-72.7	7168.8	9183.7	5.2	139	1.003	6	0	-0.002	14.8
04/11/2015 11:26		1012.6	13.47	0.19	1.9	6.72	-79.7	7257.3	9306.7	5.2	138	1.003	6	-0.02	-0.009	14.8
04/11/2015 11:26		1012.6	13.42	0.17	1.7	6.73	-83.7	7358.1	9446.5	5.3	136	1.003	6	0	-0.002	14.9
04/11/2015 11:27		1012.6	13.38	0.15	1.5	6.75	-86.8	7439.2	9557.6	5.4	134	1.003	6	0.01	0.006	14.9
04/11/2015 11:27		1012.7	13.38	0.13	1.3	6.76	-89.7	7498.6	9637.4	5.4	133	1.004	6	0.01	0.006	14.9
04/11/2015 11:28		1012.7	13.38	0.13	1.3	6.77	-90.9	7528.2	9675.5	5.5	133	1.004	6	0.01	0.004	15
04/11/2015 11:28		1012.6	13.38	0.11	1.1	6.78	-92.3	7548.8	9701.9	5.5	132	1.004	6	0.02	0.01	15
04/11/2015 11:29		1012.6	13.38	0.11	1.1	6.79	-93	7563.2	9720.4	5.5	132	1.004	6	0.01	0.006	15
04/11/2015 11:29		1012.6	13.39	0.1	1	6.79	-93.4	7572.8	9731.4	5.5	132	1.004	6	0.01	0.004	15
04/11/2015 11:30		1012.6	13.4	0.1	0.9	6.79	-94.1	7577.8	9734.1	5.5	132	1.004	6	-0.01	-0.006	15
04/11/2015 11:30		1012.6	13.4	0.09	0.9	6.8	-94.5	7583.5	9740.8	5.5	132	1.004	6	-0.01	-0.004	15
04/11/2015 11:31		1012.6	13.42	0.09	0.9	6.8	-95.4	7588.9	9745.1	5.5	132	1.004	6	0.01	0.002	15



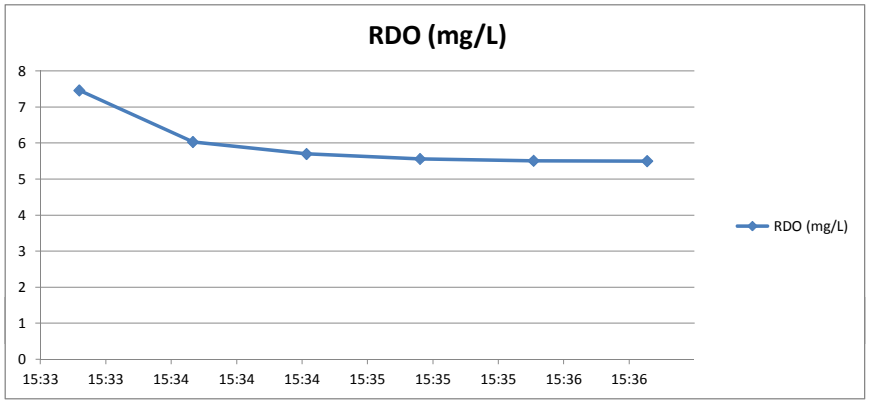
Log:	Haulbowline- 8 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 11:50:23															
Number Readings:		14														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 11:50		1012.4	13.97	4.88	52.7	6.61	-39.5	22481.7	18803.8	11.2	67	1.008	12	0.05	0.023	15.2
04/11/2015 11:50		1012.5	13.84	0.99	10.9	6.72	-72.5	26405	33559.3	20.6	39	1.015	21	0.01	0.002	15.3
04/11/2015 11:51		1012.4	13.7	0.38	4.2	6.86	-84.5	27319.2	34834.3	21.7	37	1.016	22	0.01	0.005	15.4
04/11/2015 11:51		1012.4	13.61	0.25	2.8	6.94	-91.4	27609.2	35286.9	22.1	36	1.016	23	0.03	0.012	15.6
04/11/2015 11:52		1012.5	13.56	0.21	2.3	7.01	-96.2	27702.5	35450.1	22.3	36	1.016	23	-0.03	-0.011	15.7
04/11/2015 11:52		1012.4	13.51	0.19	2.1	7.05	-99.7	27713.2	35506.9	22.3	36	1.017	23	-0.02	-0.009	15.8
04/11/2015 11:53		1012.4	13.47	0.17	1.9	7.1	-102.7	27673	35486.9	22.3	36	1.017	23	-0.04	-0.015	15.9
04/11/2015 11:53		1012.4	13.46	0.16	1.7	7.13	-105.1	27691.1	35523.7	22.4	36	1.017	23	-0.02	-0.008	16
04/11/2015 11:54		1012.4	13.43	0.14	1.5	7.15	-107	27782.9	35668	22.4	36	1.017	23	0.01	0.005	16.1
04/11/2015 11:54		1012.4	13.42	0.13	1.4	7.18	-108.6	27769.1	35654	22.4	36	1.017	23	0	0.002	16.2
04/11/2015 11:55		1012.4	13.39	0.11	1.2	7.21	-112.2	27769.5	35677.9	22.5	36	1.017	23	0.01	0.004	16.3
04/11/2015 11:56		1012.4	13.38	0.1	1.1	7.23	-113	27771.3	35691.1	22.5	36	1.017	23	0.01	0.002	16.4
04/11/2015 11:56		1012.4	13.38	0.09	1	7.24	-113.8	27780.6	35703.6	22.5	36	1.017	23	-0.01	-0.006	16.4
04/11/2015 11:57		1012.4	13.38	0.09	1	7.25	-114.7	27834.3	35773.9	22.5	36	1.017	23	0.01	0.006	16.4



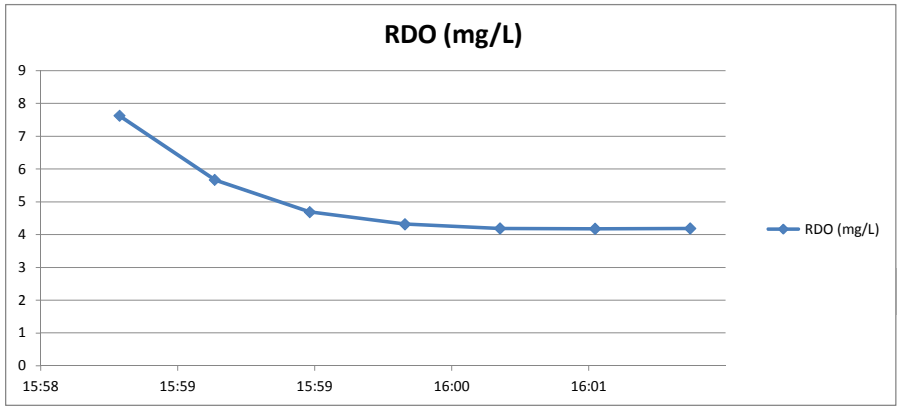
Log:	Haulbowline- 9 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 12:53:21															
Number Readings:		10														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 12:53		1011.9	14.42	4.22	49	7.33	20.2	33956.2	42551.5	27.4	29	1.02	28	-0.04	-0.016	15.5
04/11/2015 12:53		1011.9	14.31	3.51	40.8	7.43	16	34194.8	42971	27.6	29	1.02	28	-0.01	-0.004	15.6
04/11/2015 12:54		1011.9	14.24	3.02	35	7.52	13.2	34253	43115.2	27.7	29	1.021	28	-0.01	-0.006	15.6
04/11/2015 12:54		1011.8	14.2	2.79	32.4	7.6	11.5	34274.9	43185.1	27.8	29	1.021	28	-0.01	-0.006	15.6
04/11/2015 12:55		1011.9	14.15	2.74	31.7	7.66	10.6	34293.9	43255.3	27.8	29	1.021	28	-0.02	-0.01	15.7
04/11/2015 12:55		1011.8	14.15	2.68	31	7.71	10	34310.2	43277.2	27.9	29	1.021	28	0	-0.002	15.7
04/11/2015 12:56		1011.8	14.13	2.61	30.2	7.76	9.6	34240.3	43213.1	27.8	29	1.021	28	-0.03	-0.011	15.8
04/11/2015 12:56		1011.9	14.12	2.51	29	7.8	9.2	34251.1	43232.1	27.8	29	1.021	28	-0.03	-0.012	15.8
04/11/2015 12:57		1011.9	14.12	2.48	28.6	7.84	9	34235.4	43214.4	27.8	29	1.021	28	-0.03	-0.014	15.8
04/11/2015 12:57		1011.8	14.11	2.47	28.5	7.87	8.8	34264.9	43265.4	27.8	29	1.021	28	-0.01	-0.004	15.9



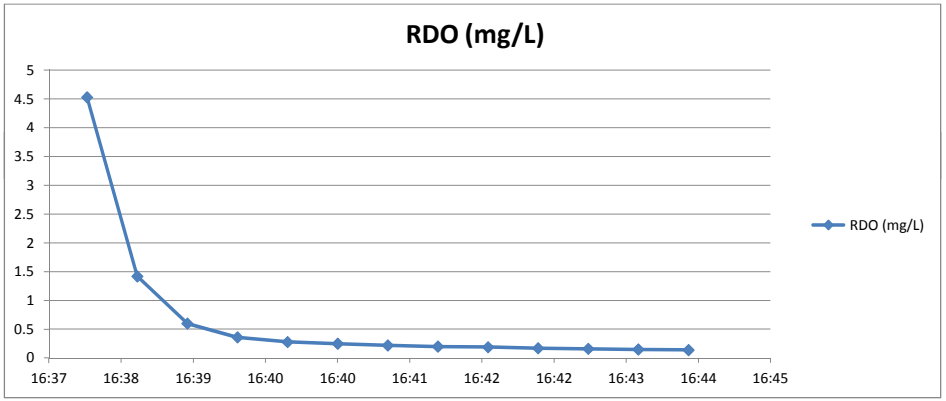
Log:	Haulbowline- 10 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 15:33:52															
Number Readings:		6														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 15:33		1010.8	14.14	7.46	73	10.29	21.4	781.7	986.2	0.5	1279	1	1	0.11	0.05	14.3
04/11/2015 15:34		1010.8	14.03	6.03	58.8	9.59	34.2	753.3	952.9	0.5	1328	1	1	0.12	0.051	14.3
04/11/2015 15:34		1010.8	14	5.7	55.6	9.19	34.8	749.9	949.2	0.5	1334	1	1	0.13	0.054	14.3
04/11/2015 15:35		1010.9	13.97	5.56	54.2	8.94	33.6	748.7	948.6	0.5	1336	1	1	0.15	0.063	14.4
04/11/2015 15:35		1010.9	13.94	5.51	53.7	8.73	33.3	748	948.4	0.5	1337	1	1	0.15	0.063	14.4
04/11/2015 15:36		1010.8	13.93	5.5	53.5	8.57	33.3	747.9	948.6	0.5	1337	1	1	0.14	0.059	14.4



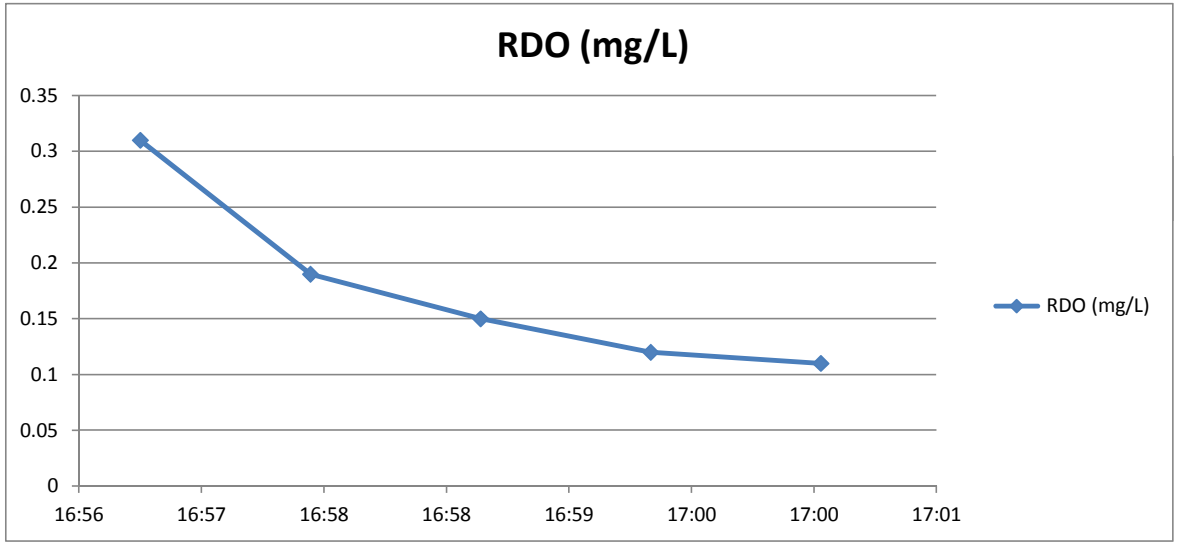
Log:	Haulbowline- 11 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 15:58:44															
Number Readings:		10														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 15:58		1010.9	13.65	7.63	73.9	7.96	38.3	769.1	981.9	0.5	1294	1	1	0.56	0.244	13.7
04/11/2015 15:59		1010.9	13.61	5.67	54.9	7.75	37.3	763.1	975.3	0.5	1310	1	1	0.54	0.235	13.7
04/11/2015 15:59		1010.8	13.6	4.69	45.4	7.59	36.7	761.4	973.3	0.5	1311	1	1	0.56	0.244	13.8
04/11/2015 16:00		1010.8	13.59	4.32	41.8	7.5	34.9	759.6	971.3	0.5	1315	1	1	0.56	0.242	13.8
04/11/2015 16:00		1010.9	13.56	4.19	40.5	7.42	35.2	756.4	967.8	0.5	1321	1	1	0.6	0.259	13.8
04/11/2015 16:01		1010.8	13.56	4.18	40.4	7.35	34.6	752.7	963.2	0.5	1326	1	1	0.59	0.255	13.8
04/11/2015 16:01		1010.9	13.53	4.19	40.5	7.29	35.6	751.2	962	0.5	1330	1	1	0.56	0.241	13.8



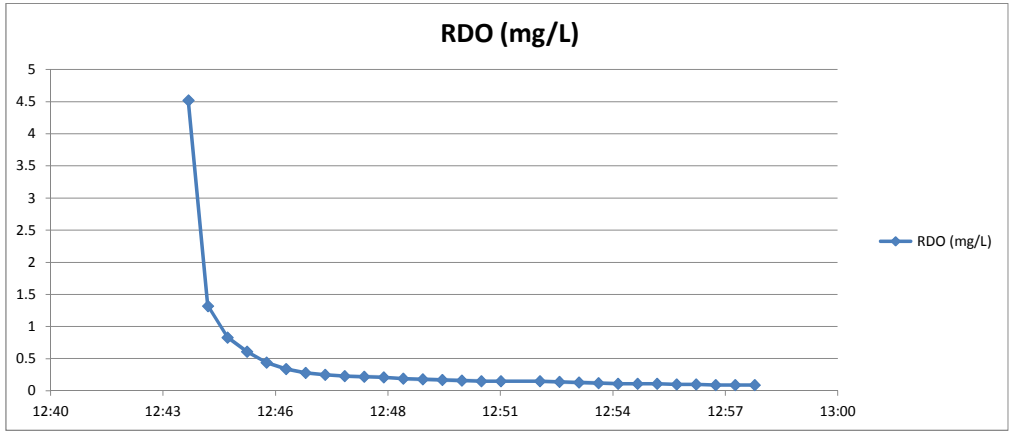
Log:	Haulbowline- 12 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-04 16:38:18															
Number Readings:		13														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
04/11/2015 16:38		1010.8	13.38	4.53	44.9	6.85	-10.9	6945.1	8925.3	5	144	1.003	6	0.32	0.137	13.8
04/11/2015 16:38		1010.8	13.4	1.42	14.1	7	-58.4	7022.5	9022.3	5.1	142	1.003	6	0.31	0.137	13.8
04/11/2015 16:39		1010.8	13.34	0.6	5.9	7.03	-73.4	7087.9	9118.1	5.1	141	1.003	6	0.33	0.145	13.8
04/11/2015 16:39		1010.9	13.31	0.36	3.6	7.04	-78.9	7161.9	9219.7	5.2	140	1.003	6	0.33	0.142	13.9
04/11/2015 16:40		1010.8	13.29	0.28	2.8	7.03	-82	7238.5	9323.9	5.2	138	1.003	6	0.36	0.156	13.9
04/11/2015 16:40		1010.8	13.29	0.25	2.4	7.03	-84.5	7322.1	9431.6	5.3	137	1.003	6	0.35	0.15	13.9
04/11/2015 16:41		1010.9	13.29	0.22	2.2	7.02	-85.6	7363.1	9484.6	5.3	136	1.003	6	0.38	0.164	13.9
04/11/2015 16:41		1010.8	13.29	0.2	2	7.01	-86.6	7402	9534.7	5.4	135	1.003	6	0.38	0.163	13.9
04/11/2015 16:42		1010.8	13.29	0.19	1.9	7.01	-87.1	7435.3	9577.8	5.4	134	1.004	6	0.41	0.177	13.9
04/11/2015 16:42		1010.9	13.29	0.17	1.6	7	-88.5	7460.2	9609.7	5.4	134	1.004	6	0.41	0.178	13.9
04/11/2015 16:43		1010.8	13.29	0.16	1.6	6.99	-88.2	7472.8	9625.9	5.4	134	1.004	6	0.42	0.181	13.9
04/11/2015 16:43		1010.8	13.29	0.15	1.4	6.99	-88.2	7493.1	9652	5.4	133	1.004	6	0.42	0.182	13.9
04/11/2015 16:44		1010.9	13.29	0.14	1.4	6.98	-88.4	7501	9662.3	5.4	133	1.004	6	0.42	0.184	13.9



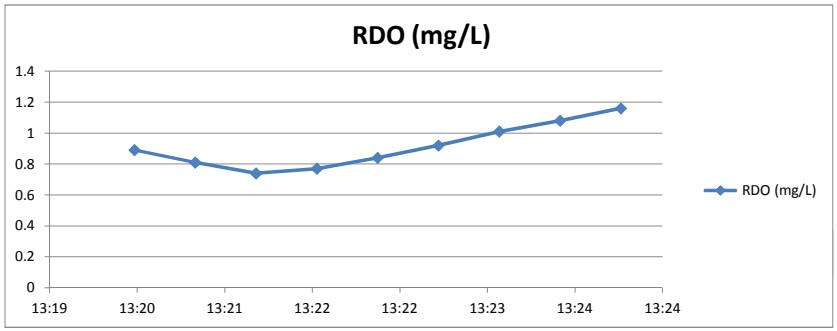
Log:	Haulbowline- 13 of 13															
Report Created:	2015-11-05 09:59:58															
Site:	Haulbowline															
GPS:	0	0	0	0	0	0										
Log Created:	2015-11-04 16:57:06															
Number Readings:	9															
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:	402055															
Device Type:	SmarTROLLâ„¢ MP															
Device SN:	365938															
Created	Baro (mba	Temp (C)	RDO (mg/	RDO Sat (%	pH (pH)	ORP (mV)	Act Cond (	Sp Cond (µ	Salinity (p	Resist (Oh	Density (g	TDS (ppt)	Depth (ft)	Pressure (	Air Temp (	
04/11/2015 16:57	1011	13.29	0.31	3.4	7.09	-86	28327.8	36489.9	23	35	1.017	24	0.64	0.277	13.1	
04/11/2015 16:58	1010.9	13.25	0.19	2.1	7.19	-96	28656.1	36943.6	23.3	35	1.017	24	0.67	0.289	13.2	
04/11/2015 16:59	1010.9	13.25	0.15	1.6	7.25	-102.1	28687.7	36995.7	23.4	35	1.017	24	0.67	0.289	13.3	
04/11/2015 17:00	1010.8	13.24	0.12	1.4	7.29	-106.3	28700.4	37010	23.4	35	1.017	24	0.72	0.31	13.4	
04/11/2015 17:01	1010.9	13.25	0.11	1.2	7.32	-109.4	28739.4	37058.8	23.4	35	1.017	24	0.67	0.291	13.4	



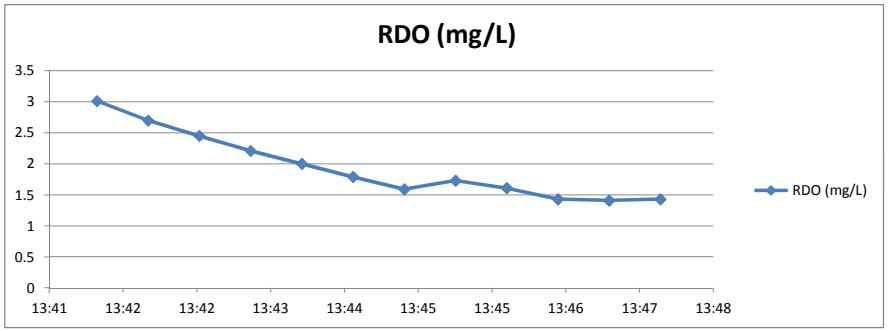
Log:	Haulbowline- 14 of 17															
Report Created:	2015-11-06 09:59:22															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-05 12:43:51															
Number Readings:		49														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
05/11/2015 12:43		1001.2	17.02	4.52	47.6	7.01	-29.4	1187.8	1398.8	0.7	842	0.999	1	-0.04	-0.018	19
05/11/2015 12:44		1001.1	16.45	1.32	13.7	6.49	-34.8	1058.5	1265.2	0.6	945	0.999	1	-0.02	-0.008	19
05/11/2015 12:44		1001	16.11	0.83	8.6	6.37	-46.6	1034.5	1244	0.6	967	0.999	1	-0.02	-0.01	19
05/11/2015 12:45		1001	15.88	0.61	6.3	6.31	-56.4	1031.7	1248.5	0.6	969	0.999	1	-0.02	-0.007	19
05/11/2015 12:45		1001	15.7	0.44	4.5	6.31	-64.7	1030.4	1252	0.6	971	0.999	1	-0.01	-0.003	19.1
05/11/2015 12:46		1000.9	15.59	0.34	3.4	6.34	-72.8	1023.8	1247.7	0.6	977	0.999	1	-0.05	-0.02	19.1
05/11/2015 12:46		1001	15.47	0.28	2.9	6.36	-78.9	1024.3	1251.5	0.6	976	1	1	-0.05	-0.021	19.2
05/11/2015 12:47		1001	15.41	0.25	2.6	6.38	-83	1017	1244.9	0.6	983	1	1	-0.04	-0.017	19.3
05/11/2015 12:47		1001	15.35	0.23	2.4	6.4	-87.6	1009.9	1237.6	0.6	990	1	1	-0.03	-0.011	19.3
05/11/2015 12:48		1000.9	15.31	0.22	2.2	6.43	-90.5	1009.5	1238.4	0.6	991	1	1	-0.03	-0.013	19.4
05/11/2015 12:48		1000.9	15.28	0.21	2.1	6.46	-94	1003.3	1231.9	0.6	997	1	1	-0.04	-0.016	19.5
05/11/2015 12:49		1000.9	15.28	0.19	2	6.46	-96	1004.2	1233.2	0.6	996	1	1	-0.04	-0.019	19.5
05/11/2015 12:49		1000.9	15.25	0.18	1.8	6.48	-98.1	1005	1234.7	0.6	995	1	1	-0.03	-0.014	19.6
05/11/2015 12:50		1000.9	15.25	0.17	1.7	6.49	-99.5	1006.9	1237.5	0.6	993	1	1	-0.02	-0.009	19.6
05/11/2015 12:50		1001	15.24	0.16	1.6	6.5	-101.4	1001.7	1231.3	0.6	998	1	1	-0.05	-0.023	19.6
05/11/2015 12:51		1000.9	15.24	0.15	1.5	6.5	-102.2	1000.1	1229.3	0.6	1000	1	1	-0.05	-0.023	19.7
05/11/2015 12:51		1001	15.24	0.15	1.5	6.51	-103.8	996.1	1224.5	0.6	1004	1	1	-0.06	-0.025	19.7
05/11/2015 12:52		1001.1	15.27	0.15	1.5	6.52	-106.6	1000.9	1229.4	0.6	999	1	1	-0.04	-0.018	19.9
05/11/2015 12:53		1001.1	15.28	0.14	1.4	6.54	-107.9	1004.1	1233	0.6	996	1	1	-0.04	-0.019	20.1
05/11/2015 12:53		1001	15.28	0.13	1.3	6.55	-108.1	1000	1227.9	0.6	1000	1	1	-0.04	-0.016	20.2
05/11/2015 12:54		1001.1	15.31	0.12	1.2	6.57	-110.3	999.3	1226.2	0.6	1001	1	1	-0.09	-0.039	20.4
05/11/2015 12:54		1001	15.33	0.11	1.1	6.58	-111.9	1001.6	1228.5	0.6	998	1	1	-0.03	-0.015	20.6
05/11/2015 12:55		1001	15.37	0.11	1.1	6.6	-112.6	1000.4	1225.8	0.6	1000	1	1	-0.02	-0.008	20.9
05/11/2015 12:55		1001.1	15.37	0.11	1.1	6.6	-113.5	1002.3	1228.1	0.6	998	1	1	-0.07	-0.03	21.1
05/11/2015 12:56		1001	15.39	0.1	1.1	6.61	-114.5	1004.2	1230	0.6	996	1	1	-0.06	-0.024	21.3
05/11/2015 12:56		1001	15.39	0.1	1	6.61	-114	1004	1229.6	0.6	996	1	1	-0.04	-0.016	21.5
05/11/2015 12:57		1001.1	15.39	0.09	0.9	6.59	-114	1004.1	1229.8	0.6	996	1	1	-0.03	-0.013	21.6
05/11/2015 12:57		1001	15.38	0.09	0.9	6.6	-114.6	1002.8	1228.6	0.6	997	1	1	-0.05	-0.022	21.7
05/11/2015 12:58		1001	15.37	0.09	0.9	6.59	-114.1	1003.1	1229.1	0.6	997	1	1	-0.06	-0.024	21.7


RDO (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
12:40
12:43
12:46
12:48
12:51
12:54
12:57
13:00
RDO (mg/L)

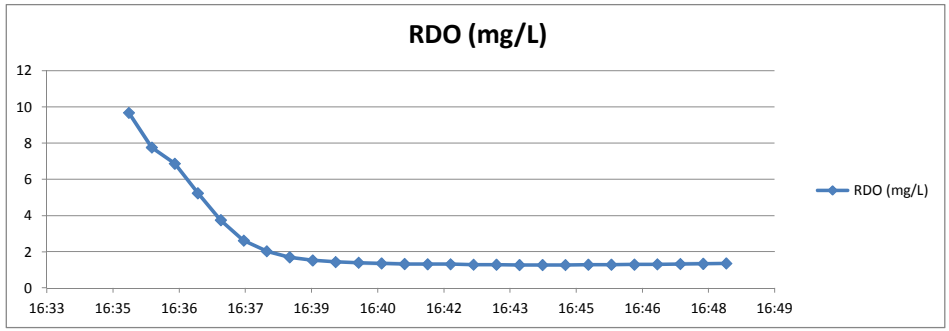
Log:	Haulbowline- 15 of 17															
Report Created:	2015-11-06 09:59:22															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-05 13:20:37															
Number Readings:		20														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
05/11/2015 13:20		1001.4	16.98	0.89	9.4	6.5	-68.4	1050.7	1240.7	0.6	952	0.999	1	-0.02	-0.007	20.1
05/11/2015 13:21		1001.4	16.93	0.81	8.5	6.59	-77.1	1054.7	1246.6	0.6	948	0.999	1	-0.04	-0.019	20.1
05/11/2015 13:21		1001.3	16.91	0.74	7.7	6.66	-84.3	1057.8	1250.9	0.6	945	0.999	1	-0.04	-0.017	20
05/11/2015 13:22		1001.4	16.91	0.77	8	6.73	-90.8	1060	1253.8	0.6	943	0.999	1	-0.03	-0.013	20
05/11/2015 13:22		1001.4	16.94	0.84	8.8	6.57	-84.8	1062.5	1256	0.6	941	0.999	1	-0.02	-0.009	20
05/11/2015 13:23		1001.4	16.97	0.92	9.7	6.59	-87.9	1064.4	1257.7	0.6	939	0.999	1	-0.04	-0.018	19.9
05/11/2015 13:23		1001.4	16.99	1.01	10.7	6.63	-91.5	1065.9	1258.6	0.6	938	0.999	1	-0.04	-0.015	19.8
05/11/2015 13:24		1001.5	17.03	1.08	11.4	6.65	-94.5	1068.5	1260.5	0.6	936	0.999	1	-0.04	-0.016	19.8
05/11/2015 13:24		1001.4	17.12	1.16	12.2	6.69	-77.4	1071.5	1262.6	0.6	933	0.999	1	-0.02	-0.009	19.7



Log:	Haulbowline- 16 of 17															
Report Created:	2015-11-06 09:59:22															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-05 13:41:59															
Number Readings:		12														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
05/11/2015 13:41		1001.7	16.9	3.01	31.6	6.89	-80.6	1030.2	1216.3	0.6	971	0.999	1	-0.08	-0.033	19.7
05/11/2015 13:42		1001.7	16.45	2.7	28.1	6.79	-77.5	1028.5	1227.2	0.6	972	0.999	1	-0.11	-0.047	19.8
05/11/2015 13:42		1001.7	16.15	2.45	25.3	6.73	-75.7	1025.7	1233.5	0.6	975	0.999	1	-0.14	-0.062	19.9
05/11/2015 13:43		1001.7	15.95	2.21	22.7	6.7	-75.1	1019.7	1231.4	0.6	981	0.999	1	-0.09	-0.039	20
05/11/2015 13:43		1001.6	15.81	2	20.5	6.69	-74.9	1015.1	1230.9	0.6	985	0.999	1	-0.07	-0.032	20.1
05/11/2015 13:44		1001.6	15.64	1.79	18.3	6.68	-75.5	1004.6	1222	0.6	995	0.999	1	-0.07	-0.031	20.1
05/11/2015 13:44		1001.6	15.55	1.59	16.3	6.68	-76	958.1	1169.1	0.6	1044	0.999	1	-0.08	-0.037	20.2
05/11/2015 13:45		1001.6	15.55	1.73	17.6	6.62	-71.6	1002.9	1223.7	0.6	997	0.999	1	-0.08	-0.033	20.2
05/11/2015 13:45		1001.6	15.64	1.61	16.4	6.3	-56.5	1006.3	1226.3	0.6	994	0.999	1	-0.07	-0.032	20.2
05/11/2015 13:46		1001.5	15.74	1.43	14.7	6.47	-65.3	1010.4	1227.8	0.6	990	0.999	1	-0.07	-0.031	20.2
05/11/2015 13:46		1001.4	15.84	1.41	14.5	6.43	-63.4	1012.8	1228.2	0.6	987	0.999	1	-0.09	-0.039	20.2
05/11/2015 13:47		1001.4	15.95	1.43	14.7	6.59	-71.1	1015.2	1228.3	0.6	985	0.999	1	-0.1	-0.041	20.2



Log:	Haulbowline- 17 of 17															
Report Created:	2015-11-06 09:59:22															
Site:	Haulbowline															
GPS:		0	0	0	0	0	0									
Log Created:	2015-11-05 16:35:23															
Number Readings:		27														
Battery Type:	SmarTROLLâ„¢ Battery Pack															
Battery SN:		402055														
Device Type:	SmarTROLLâ„¢ MP															
Device SN:		365938														
Created	Baro (mbar)		Temp (C)	RDO (mg/L)	RDO Sat (%)	pH (pH)	ORP (mV)	Act Cond (ÂµS/cm)	Sp Cond (ÂµS/cm)	Salinity (psu)	Resist (Ohm-cm)	Density (g/cm^3)	TDS (ppt)	Depth (ft)	Pressure (psi)	Air Temp (C)
05/11/2015 16:35		1005	16.58	9.68	103.4	8.78	24.5	8052.7	9595.1	5.4	124	1.003	6	0.08	0.035	16.4
05/11/2015 16:35		1004.9	16.03	7.76	82.2	8.55	-72.6	8424	10166.2	5.8	119	1.003	7	0.05	0.023	16.4
05/11/2015 16:36		1005	15.42	6.87	78.5	8.14	-74.8	26564.4	32515.2	20.4	38	1.015	21	0.06	0.028	16.4
05/11/2015 16:36		1005	15.06	5.24	60.2	8.19	-82.6	28670.3	35391.4	22.4	35	1.016	23	0.05	0.021	16.4
05/11/2015 16:37		1005	14.83	3.75	43.1	8.21	-81.3	29492.5	36602.4	23.2	34	1.017	24	0.06	0.025	16.4
05/11/2015 16:37		1004.9	14.65	2.62	30	8.23	-78.1	29872.4	37231.1	23.6	33	1.017	24	0.06	0.025	16.4
05/11/2015 16:38		1005	14.48	2.03	23.3	8.25	-74.3	30071.5	37630	23.9	33	1.018	24	0.06	0.026	16.4
05/11/2015 16:38		1005	14.41	1.7	19.5	8.26	-69.9	30153.2	37796.8	24	33	1.018	25	0.05	0.024	16.4
05/11/2015 16:39		1005	14.29	1.53	17.5	8.28	-65.5	30254.9	38036.7	24.2	33	1.018	25	0.08	0.034	16.3
05/11/2015 16:39		1005	14.22	1.44	16.5	8.29	-61.4	30289.8	38142.4	24.2	33	1.018	25	0.06	0.024	16.3
05/11/2015 16:40		1005.1	14.2	1.4	16	8.3	-57.4	30286.3	38160.9	24.2	33	1.018	25	0.08	0.034	16.3
05/11/2015 16:40		1005.1	14.15	1.36	15.5	8.31	-54.1	30325.1	38251.4	24.3	33	1.018	25	0.08	0.033	16.3
05/11/2015 16:41		1005.1	14.11	1.33	15.2	8.32	-51.1	30315.5	38277.1	24.3	33	1.018	25	0.11	0.048	16.3
05/11/2015 16:41		1005	14.11	1.32	15	8.32	-48.2	30328.4	38295.5	24.3	33	1.018	25	0.07	0.032	16.3
05/11/2015 16:42		1005.1	14.08	1.32	15	8.33	-45.7	30354.8	38352.1	24.4	33	1.018	25	0.08	0.035	16.2
05/11/2015 16:42		1005.1	14.06	1.29	14.7	8.33	-43.5	30380.8	38403	24.4	33	1.018	25	0.08	0.036	16.2
05/11/2015 16:43		1005.1	14.06	1.29	14.7	8.34	-41.5	30370.1	38390.4	24.4	33	1.018	25	0.08	0.033	16.2
05/11/2015 16:43		1005.1	14.06	1.27	14.5	8.34	-39.4	30406.4	38438.7	24.4	33	1.018	25	0.11	0.047	16.2
05/11/2015 16:44		1005.1	14.05	1.27	14.5	8.34	-39.6	30419	38466.7	24.4	33	1.018	25	0.1	0.043	16.2
05/11/2015 16:44		1005.1	14.03	1.27	14.5	8.34	-36.3	30452.6	38520.5	24.5	33	1.018	25	0.13	0.057	16.2
05/11/2015 16:45		1005.1	14.03	1.29	14.6	8.34	-34.2	30465.4	38546.5	24.5	33	1.018	25	0.12	0.052	16.2
05/11/2015 16:45		1005.1	14.02	1.29	14.7	8.34	-32.4	30495.6	38590.6	24.5	33	1.018	25	0.11	0.047	16.2
05/11/2015 16:46		1005.1	14.02	1.3	14.8	8.34	-30.8	30508.6	38605.4	24.5	33	1.018	25	0.1	0.043	16.1
05/11/2015 16:46		1005	14.02	1.31	14.9	8.34	-29.4	30559.9	38672.2	24.6	33	1.018	25	0.12	0.052	16.1
05/11/2015 16:47		1005	14.02	1.33	15.1	8.34	-28.1	30576.1	38693.3	24.6	33	1.018	25	0.11	0.049	16.1
05/11/2015 16:47		1005	14.02	1.34	15.3	8.34	-26.8	30596.1	38718.6	24.6	33	1.018	25	0.13	0.055	16.1
05/11/2015 16:48		1004.9	14.02	1.36	15.5	8.34	-25.6	30645.7	38781.2	24.7	33	1.018	25	0.12	0.054	16.1



Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

WYG
1 Locksley Business Park
Montgomery Park
Belfast
Northern Ireland
BT6 9UP

Attention :	Yvonne Buchanan
Date :	20th November, 2015
Your reference :	A091086
Our reference :	Test Report 15/15719 Batch 1
Location :	Haulbowline Factory
Date samples received :	4th November, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 4th November, 2015 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44							LOD/LOR	Units	Method No.
Sample ID	BH105-H	BH216S-L	BH216D-L	BH105-L									
Depth	2.6	3.5	4.5	2.6									
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	02/11/2015 11:00	02/11/2015 15:00	02/11/2015 16:00	02/11/2015 14:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	04/11/2015	04/11/2015	04/11/2015	04/11/2015									
Dissolved Aluminium #	<1.5	22.9	44.3	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Antimony #	3	4	3	<2							<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	<0.9	9.4	<0.9							<0.9	ug/l	TM30/PM14
Dissolved Barium #	74.0	1182.0	1079.0	79.1							<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Boron	2423	229	233	2399							<2	ug/l	TM30/PM14
Dissolved Cadmium #	1.17	0.30	0.48	0.89							<0.03	ug/l	TM30/PM14
Dissolved Calcium #	336.7 AB	186.3	187.2	332.6 AB							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	8.9	<0.2	0.3	8.9							<0.2	ug/l	TM30/PM14
Dissolved Copper #	<3	22	27	<3							<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	25950.0 AA	24100.0 AA	8.5							<4.7	ug/l	TM30/PM14
Dissolved Lead #	0.7	14.0	147.9	1.2							<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	855.2 AB	21.6	22.5	842.1 AB							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	<1.5	297.7	374.8	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	5.9	0.3	0.7	5.0							<0.2	ug/l	TM30/PM14
Dissolved Nickel #	<0.2	6.0	8.7	<0.2							<0.2	ug/l	TM30/PM14
Dissolved Potassium #	263.6 AB	10.5	11.2	258.9 AB							<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2							<1.2	ug/l	TM30/PM14
Dissolved Sodium #	8229.0 AD	56.2	63.5	7389.0 AD							<0.1	mg/l	TM30/PM14
Dissolved Vanadium #	<0.6	2.7	2.3	<0.6							<0.6	ug/l	TM30/PM14
Dissolved Zinc #	44.9	986.0	828.3	40.3							<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01	1.11	<0.01							<0.01	ug/l	TM61/PM38
Total Sulphur	598.90 AB	5.54	6.40	647.50 AB							<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-11	12-22	23-33	34-44							LOD/LOR	Units	Method No.
Sample ID	BH105-H	BH216S-L	BH216D-L	BH105-L									
Depth	2.6	3.5	4.5	2.6									
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	02/11/2015 11:00	02/11/2015 15:00	02/11/2015 16:00	02/11/2015 14:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	04/11/2015	04/11/2015	04/11/2015	04/11/2015									
PAH MS													
Naphthalene	0.2	<0.1	<1.0$_{AB}$	0.2							<0.1	ug/l	TM4/PM30
Acenaphthylene	0.01	0.61	23.51$_{AB}$	0.01							<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	0.90	20.50$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Fluorene	<0.01	2.29	67.30$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	1.96	116.46$_{AC}$	0.02							<0.01	ug/l	TM4/PM30
Anthracene	<0.01	0.14	19.27$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	0.47	81.13$_{AC}$	0.01							<0.01	ug/l	TM4/PM30
Pyrene	<0.01	0.39	78.34$_{AC}$	0.01							<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	0.07	36.88$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Chrysene	<0.01	0.08	32.01$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	0.09	54.97$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	0.05	38.34$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	0.02	21.19$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	3.67$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	0.02	16.75$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
PAH 16 Total	0.2	7.1	610.3$_{AB}$	0.3							<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	0.06	39.58$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	0.03	15.39$_{AB}$	<0.01							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	95	89	91$_{AB}$	95							<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	93	103	96	97							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	97	103	99							<0	%	TM15/PM10
SVOC TICs	ND	ND	See Attached	ND								None	TM16/PM30
de 2,3,4,6-tetrachlorophenol	<100	<100	<100	<100							<100	ug/l	TM16/PM30
2,6-dichlorophenol	<100	<100	<100	<100							<100	ug/l	TM16/PM30
2,3,5,6-tetrachlorophenol	<100	<100	<100	<100							<100	ug/l	TM16/PM30
2,4-Dinitrophenol	<100	<100	<100	<100							<100	ug/l	TM16/PM30
4-Chlorophenol	<100	<100	<100	<100							<100	ug/l	TM16/PM30
Dinoseb	<100	<100	<100	<100							<100	ug/l	TM16/PM30
DNOC	<100	<100	<100	<100							<100	ug/l	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	10	<5							<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	637	<5							<5	ug/l	TM36/PM12
>C10-C12 #	<5	136	6444	<5							<5	ug/l	TM5/PM30
>C12-C16 #	<10	590	22440	<10							<10	ug/l	TM5/PM30
>C16-C21 #	<10	720	27010	<10							<10	ug/l	TM5/PM30
>C21-C35 #	<10	200	9610	<10							<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	1646	66151	<10							<10	ug/l	TM5/TM36/PM30

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44							LOD/LOR	Units	Method No.
Sample ID	BH105-H	BH216S-L	BH216D-L	BH105-L									
Depth	2.6	3.5	4.5	2.6									
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	02/11/2015 11:00	02/11/2015 15:00	02/11/2015 16:00	02/11/2015 14:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	04/11/2015	04/11/2015	04/11/2015	04/11/2015									
TPH CWG													
Aromatics													
>C5-EC7 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	32	<5							<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	106	1473	<5							<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	430	11920	<10							<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	450	21370	<10							<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	110	9630	<10							<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	1096	44425	<10							<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	2742	110576	<10							<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<5.0 AD	<0.1							<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<35.0 AD	<0.7							<0.7	ug/l	TM17/PM30
Resorcinol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
Catechol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
Phenol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
m/p-cresol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
o-cresol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
Total cresols	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
Xylenols	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
1-naphthol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
2,3,5-trimethyl phenol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
2-isopropylphenol	<0.5	-	-	<0.5							<0.5	ug/l	TM26/PM0
Total Speciated Phenols HPLC	<5	-	-	<5							<5	ug/l	TM26/PM0
Fluoride	1.5	<0.3	<0.3	1.5							<0.3	mg/l	TM27/PM0
2-Chlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2-Nitrophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3,4,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3,5,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44							LOD/LOR	Units	Method No.
Sample ID	BH105-H	BH216S-L	BH216D-L	BH105-L									
Depth	2.6	3.5	4.5	2.6									
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	02/11/2015 11:00	02/11/2015 15:00	02/11/2015 16:00	02/11/2015 14:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									
Date of Receipt	04/11/2015	04/11/2015	04/11/2015	04/11/2015									
2,6-Dichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,6-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3,5-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Chloro-2-methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Nitrophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4,6-Dinitro-o-cresol (DNOC)	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Phenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Total Speciated Phenols MS	<2.1	<2.1	<2.1	<2.1							<2.1	ug/l	TM16/PM30
Sulphate #	1239.31	5.68	5.57	1245.22							<0.05	mg/l	TM38/PM0
Chloride #	13874.7	121.3	128.4	13997.8							<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	0.6	<0.2	<0.2	0.8							<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02							<0.02	mg/l	TM38/PM0
Free Cyanide	0.001	<0.001	<0.001	<0.001							<0.001	mg/l	TM89/PM0
Total Cyanide	0.003	0.002	0.005	0.002							<0.001	mg/l	TM89/PM0
Complex Cyanide	0.002	0.002	0.005	0.002							<0.001	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.64	1.21	0.47	0.52							<0.03	mg/l	TM38/PM0
Hexavalent Chromium	0.008	<0.002	<0.002	0.008							<0.002	mg/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1							<1	mg/l	TM75/PM0
Sulphide	<10	<10	<10	<10							<10	ug/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02							<0.02	mg/l	TM107/PM0
BOD (Settled) #	-	3	17	3							<1	mg/l	TM58/PM0
BOD (Settled) #	<1	-	-	-							<1	mg/l	TM58/PM0
COD (Settled) #	536$_{AB}$	46	237	365$_{AB}$							<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	38840	1256	1270	38368							<2	uS/cm	TM76/PM0
pH #	8.12	6.81	6.78	8.12							<0.01	pH units	TM73/PM0
Total Organic Carbon #	2	24	35	<2							<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

VOC Report : **Liquid**

J E Sample No.	1-11	12-22	23-33	34-44								
Sample ID	BH105-H	BH216S-L	BH216D-L	BH105-L								
Depth	2.6	3.5	4.5	2.6								
COC No / misc												
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	02/11/2015 11:00	02/11/2015 15:00	02/11/2015 16:00	02/11/2015 14:00								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	1	1	1	1								
Date of Receipt	04/11/2015	04/11/2015	04/11/2015	04/11/2015								
VOC MS												
Dichlorodifluoromethane	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1							<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1							<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4							<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	93	103	96	97							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	97	103	99							<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Job number: 15/15719
Sample number: 33
Sample identity: BH216D-L
Sample depth: 4.5
Sample Type: Ground Water
Units: ug/l

Method: **SVOC**
Matrix: **Liquid**

Note: Only samples with TICs (if requested) are reported. If TICs were requested but no compounds found they are not reported.

CAS No.	Tentative Compound Identification	Retention Time (minutes)	% Match	Concentration
1678-93-9	Cyclohexane, butyl-	6.929	90	138
1000152-47-3	trans-Decalin, 2-methyl-	8.323	96	119
2958-76-1	Naphthalene, decahydro-2-methyl-	8.608	95	186
488-23-3	Benzene, 1,2,3,4-tetramethyl-	8.883	95	103
1595-16-0	Benzene, 1-methyl-4-(1-methylpropyl)-	9.091	91	147
53172-84-2	Benzene, (1-methyl-1-butenyl)-	9.513	90	121
90-12-0	Naphthalene, 1-methyl-	11.483	95	145
475-03-6	Naphthalene, 1,2,3,4-tetrahydro-1,1,6-trimethyl-	12.410	90	157
31295-56-4	Dodecane, 2,6,11-trimethyl-	13.095	86	474
582-16-1	Naphthalene, 2,7-dimethyl-	13.295	97	206
2131-42-2	Naphthalene, 1,4,6-trimethyl-	14.579	86	128
2245-38-7	Naphthalene, 1,6,7-trimethyl-	15.109	98	171
941-81-1	Azulene, 4,6,8-trimethyl-	15.299	96	178
630-01-3	Hexacosane	16.511	83	293
1921-70-6	Pentadecane, 2,6,10,14-tetramethyl-	17.038	91	537
3891-98-3	Dodecane, 2,6,10-trimethyl-	17.843	95	457
67388-11-8	4-Methylnaphtho[1,2-b]thiophene	18.030	90	196
3386-33-2	Octadecane, 1-chloro-	18.382	89	164
31317-19-8	2,7-Dimethyldibenzothiophene	18.701	96	121
40750-71-8	Benzene, 1-chlorodifluoromethoxy-4-nitro-	19.404	94	181

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/15719

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution
AC	x20 Dilution
AD	x50 Dilution

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Zone 3
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Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

WYG
1 Locksley Business Park
Montgomery Park
Belfast
Northern Ireland
BT6 9UP

Attention :	Yvonne Buchanan
Date :	23rd November, 2015
Your reference :	A091086
Our reference :	Test Report 15/15719 Batch 2
Location :	Haulbowline Factory
Date samples received :	6th November, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 6th November, 2015 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	45-55	56-66	67-77	78-88							LOD/LOR	Units	Method No.
Sample ID	BH215 S-L	BH215 D-L	BH207 S-L	BH207 D-L									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	04/11/2015 16:30	04/11/2015 17:00	04/11/2015 15:47	04/11/2015 16:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	2	2	2	2									
Date of Receipt	06/11/2015	06/11/2015	06/11/2015	06/11/2015									
Dissolved Aluminium #	1.7	24.1	<1.5	13.1							<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	<2							<2	ug/l	TM30/PM14
Dissolved Arsenic #	6.8	1.5	<0.9	2.8							<0.9	ug/l	TM30/PM14
Dissolved Barium #	140.5	71.2	29.3	27.3							<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Boron	602	2558	125	130							<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.99	1.04	0.39	0.37							<0.03	ug/l	TM30/PM14
Dissolved Calcium #	241.9$_{AA}$	349.6$_{AA}$	112.1	108.1							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2	0.3	0.8							<0.2	ug/l	TM30/PM14
Dissolved Copper #	<3	<3	<3	<3							<3	ug/l	TM30/PM14
Total Dissolved Iron #	4051.0	1850.0	<4.7	10.6							<4.7	ug/l	TM30/PM14
Dissolved Lead #	7.1	3.6	5.0	3.1							<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	209.8$_{AA}$	819.1$_{AA}$	13.2	14.5							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	1228.0	682.2	<1.5	10.4							<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	12.0	3.4	2.3	2.1							<0.2	ug/l	TM30/PM14
Dissolved Nickel #	4.5	0.5	0.5	0.4							<0.2	ug/l	TM30/PM14
Dissolved Potassium #	49.7	244.4$_{AA}$	12.0	12.6							<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2							<1.2	ug/l	TM30/PM14
Dissolved Sodium #	1461.0$_{AB}$	5692.0$_{AC}$	44.5	48.3							<0.1	mg/l	TM30/PM14
Dissolved Vanadium #	1.5	1.8	1.0	0.7							<0.6	ug/l	TM30/PM14
Dissolved Zinc #	5.0	9.5	9.7	23.2							<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	0.14	<0.01	<0.01	<0.01							<0.01	ug/l	TM61/PM38
Total Sulphur	139.90$_{AB}$	544.40$_{AB}$	16.53	16.96							<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	45-55	56-66	67-77	78-88							LOD/LOR	Units	Method No.
Sample ID	BH215 S-L	BH215 D-L	BH207 S-L	BH207 D-L									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	04/11/2015 16:30	04/11/2015 17:00	04/11/2015 15:47	04/11/2015 16:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	2	2	2	2									
Date of Receipt	06/11/2015	06/11/2015	06/11/2015	06/11/2015									
PAH MS													
Naphthalene	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM4/PM30
Acenaphthylene	0.01	<0.01	0.01	<0.01							<0.01	ug/l	TM4/PM30
Acenaphthene	0.01	<0.01	<0.01	0.01							<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01	0.01	0.01							<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	0.01	0.02	0.01							<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Fluoranthene	0.01	0.01	0.01	0.01							<0.01	ug/l	TM4/PM30
Pyrene	0.04	0.02	0.01	0.01							<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	75	76	79	76							<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	103	106	104	103							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	105	104	105							<0	%	TM15/PM10
SVOC TICs	ND	ND	ND	ND								None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5							<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10							<10	ug/l	TM5/TM36/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	45-55	56-66	67-77	78-88							LOD/LOR	Units	Method No.
Sample ID	BH215 S-L	BH215 D-L	BH207 S-L	BH207 D-L									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	04/11/2015 16:30	04/11/2015 17:00	04/11/2015 15:47	04/11/2015 16:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	2	2	2	2									
Date of Receipt	06/11/2015	06/11/2015	06/11/2015	06/11/2015									
TPH CWG													
Aromatics													
>C5-EC7 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5							<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10							<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7							<0.7	ug/l	TM17/PM30
Fluoride	<0.3	<0.3	<0.3	0.3							<0.3	mg/l	TM27/PM0
2-Chlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2-Nitrophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3,4,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3,5,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,6-Dichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,6-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3,5-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Chloro-2-methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Nitrophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4,6-Dinitro-o-cresol (DNOC)	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Phenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	45-55	56-66	67-77	78-88							LOD/LOR	Units	Method No.
Sample ID	BH215 S-L	BH215 D-L	BH207 S-L	BH207 D-L									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	04/11/2015 16:30	04/11/2015 17:00	04/11/2015 15:47	04/11/2015 16:00									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	2	2	2	2									
Date of Receipt	06/11/2015	06/11/2015	06/11/2015	06/11/2015									
Total Speciated Phenols MS	<2.1	<2.1	<2.1	<2.1							<2.1	ug/l	TM16/PM30
Sulphate #	403.70	1622.80	72.42	60.28							<0.05	mg/l	TM38/PM0
Chloride #	2571.0	12170.3	75.2	58.1							<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	<0.2	<0.2	<0.2							<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02							<0.02	mg/l	TM38/PM0
Free Cyanide	0.001	0.003	0.001	0.001							<0.001	mg/l	TM89/PM0
Total Cyanide	0.002	0.003	0.002	0.002							<0.001	mg/l	TM89/PM0
Complex Cyanide	0.001	<0.001	0.001	0.001							<0.001	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.91	1.23	<0.03	0.04							<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.002	<0.002	<0.002	<0.002							<0.002	mg/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1							<1	mg/l	TM75/PM0
Sulphide	<10	<10	<10	<10							<10	ug/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02							<0.02	mg/l	TM107/PM0
BOD (Settled) #	2	-	<1	<1							<1	mg/l	TM58/PM0
BOD (Settled) #	-	<1	-	-							<1	mg/l	TM58/PM0
COD (Settled) #	107	422	12	13							<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	8835	35571	836	802							<2	uS/cm	TM76/PM0
pH #	7.19	7.50	7.20	7.21							<0.01	pH units	TM73/PM0
Total Organic Carbon #	23	7	2	2							<2	mg/l	TM60/PM0

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

VOC Report : **Liquid**

J E Sample No.	45-55	56-66	67-77	78-88								
Sample ID	BH215 S-L	BH215 D-L	BH207 S-L	BH207 D-L								
Depth											Please see attached notes for all abbreviations and acronyms	
COC No / misc												
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	04/11/2015 16:30	04/11/2015 17:00	04/11/2015 15:47	04/11/2015 16:00								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	2	2	2	2								
Date of Receipt	06/11/2015	06/11/2015	06/11/2015	06/11/2015								
VOC MS											LOD/LOR	Units	Method No.
Dichlorodifluoromethane	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1							<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1							<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4							<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	103	106	104	103							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	105	104	105							<0	%	TM15/PM10

Client Name: WYG

Matrix : Liquid

Reference: A091086

Location: Haulbowline Factory

Contact: Yvonne Buchanan

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/15719	2	BH215 S-L		45-55	BOD, Mercury, Nitrate	Sample holding time exceeded
15/15719	2	BH215 D-L		56-66	BOD, Mercury, Nitrate	Sample holding time exceeded
15/15719	2	BH207 S-L		67-77	BOD, Mercury, Nitrate	Sample holding time exceeded
15/15719	2	BH207 D-L		78-88	BOD, Mercury, Nitrate	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/15719

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution
AC	x100 Dilution

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
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WYG
1 Locksley Business Park
Montgomery Park
Belfast
Northern Ireland
BT6 9UP

Attention :	Yvonne Buchanan
Date :	24th November, 2015
Your reference :	A091086
Our reference :	Test Report 15/15719 Batch 3
Location :	Haulbowline Factory
Date samples received :	9th November, 2015
Status :	Final report
Issue :	1

Five samples were received for analysis on 9th November, 2015 of which five were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	89-99	100-110	111-121	122-132	133-143						LOD/LOR	Units	Method No.
Sample ID	BH215S-H	BH215D-H	BH207S-H	BH207D-H	BH204R-H								
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	04/11/2015	04/11/2015	04/11/2015	04/11/2015	04/11/2015								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	3	3	3	3	3								
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015	09/11/2015								
Dissolved Aluminium #	5.1	7.6	2.4	85.2	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	4	<2	2	<2						<2	ug/l	TM30/PM14
Dissolved Arsenic #	4.1	6.0	2.9	1.5	<0.9						<0.9	ug/l	TM30/PM14
Dissolved Barium #	146.3	61.6	30.7	28.0	30.9						<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM30/PM14
Dissolved Boron	634	2269	125	169	2293						<2	ug/l	TM30/PM14
Dissolved Cadmium #	1.11	1.01	0.43	0.50	1.07						<0.03	ug/l	TM30/PM14
Dissolved Calcium #	256.8 AA	351.4 AA	113.3	108.7	436.5 AA						<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	0.5	<0.2	0.5	0.3	2.0						<0.2	ug/l	TM30/PM14
Dissolved Copper #	7	<3	<3	<3	<3						<3	ug/l	TM30/PM14
Total Dissolved Iron #	4841.0	1769.0	9.0	299.2	<4.7						<4.7	ug/l	TM30/PM14
Dissolved Lead #	13.1	2.0	5.8	8.0	<0.4						<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	228.9 AA	895.8 AB	13.8	18.5	950.8 AB						<0.1	mg/l	TM30/PM14
Dissolved Manganese #	1332.0	677.4	2.6	93.9	<1.5						<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	13.4	3.5	2.0	1.3	9.3						<0.2	ug/l	TM30/PM14
Dissolved Nickel #	3.0	<0.2	<0.2	<0.2	<0.2						<0.2	ug/l	TM30/PM14
Dissolved Potassium #	50.4	262.3 AA	13.0	15.9	346.1 AA						<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2	<1.2						<1.2	ug/l	TM30/PM14
Dissolved Sodium #	1580.0 AB	6781.0 AD	50.3	72.0	8181.0 AD						<0.1	mg/l	TM30/PM14
Dissolved Vanadium #	<0.6	<0.6	<0.6	<0.6	<0.6						<0.6	ug/l	TM30/PM14
Dissolved Zinc #	5.1	4.7	7.9	14.8	8.4						<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM61/PM38
Total Sulphur	137.40 AC	528.10 AD	17.69	19.57	616.00 AD						<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	89-99	100-110	111-121	122-132	133-143						LOD/LOR	Units	Method No.
Sample ID	BH215S-H	BH215D-H	BH207S-H	BH207D-H	BH204R-H								
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	04/11/2015	04/11/2015	04/11/2015	04/11/2015	04/11/2015								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	3	3	3	3	3								
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015	09/11/2015								
PAH MS													
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Fluorene	0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	0.01	0.01	0.01	0.01						<0.01	ug/l	TM4/PM30
Anthracene	0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Pyrene	0.01	0.02	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01						<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	73	77	78	78	76						<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1						<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	104	105	104	103	105						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	106	106	104	103	106						<0	%	TM15/PM10
SVOC TICs	ND	ND	ND	ND	ND							None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5						<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/TM36/PM30

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	89-99	100-110	111-121	122-132	133-143						LOD/LOR	Units	Method No.
Sample ID	BH215S-H	BH215D-H	BH207S-H	BH207D-H	BH204R-H								
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	04/11/2015	04/11/2015	04/11/2015	04/11/2015	04/11/2015								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	3	3	3	3	3								
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015	09/11/2015								
TPH CWG													
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5						<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5						<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10						<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10						<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7						<0.7	ug/l	TM17/PM30
Resorcinol	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
Catechol	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
Phenol #	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
m/p-cresol	-	-	-	-	<0.02						<0.02	mg/l	TM26/PM0
o-cresol	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
Total cresols #	-	-	-	-	<0.03						<0.03	mg/l	TM26/PM0
Xylenols #	-	-	-	-	<0.06						<0.06	mg/l	TM26/PM0
1-naphthol	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
2,3,5-trimethyl phenol	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
2-isopropylphenol	-	-	-	-	<0.01						<0.01	mg/l	TM26/PM0
Total Speciated Phenols HPLC	-	-	-	-	<0.1						<0.1	mg/l	TM26/PM0
Fluoride	<0.3	<0.3	0.3	0.4	<0.3						<0.3	mg/l	TM27/PM0
2-Chlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2-Methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2-Nitrophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,3-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,3,4,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,3,5,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	89-99	100-110	111-121	122-132	133-143						LOD/LOR	Units	Method No.
Sample ID	BH215S-H	BH215D-H	BH207S-H	BH207D-H	BH204R-H								
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	04/11/2015	04/11/2015	04/11/2015	04/11/2015	04/11/2015								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	3	3	3	3	3								
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015	09/11/2015								
2,6-Dichlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
2,6-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
3-Methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
3,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
3,5-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
4-Chloro-2-methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
4-Methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
4-Nitrophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
4,6-Dinitro-o-cresol (DNOC)	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM16/PM30
Total Speciated Phenols MS	<2.1	<2.1	<2.1	<2.1	<2.1						<2.1	ug/l	TM16/PM30
Sulphate #	405.16	1572.48	73.68	66.41	1935.71						<0.05	mg/l	TM38/PM0
Chloride #	2650.3	11044.8	74.9	83.8	13561.7						<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	2.3	<0.2	<0.2	<0.2	0.8						<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/l	TM38/PM0
Free Cyanide	0.002	0.003	<0.001	<0.001	0.003						<0.001	mg/l	TM89/PM0
Total Cyanide	0.004	0.009	0.003	0.003	0.008						<0.001	mg/l	TM89/PM0
Complex Cyanide	0.002	0.006	0.003	0.003	0.005						<0.001	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.92	1.21	<0.03	0.12	0.73						<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.002	<0.002	<0.002	<0.002	<0.002						<0.002	mg/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1						<1	mg/l	TM75/PM0
Sulphide	<10	<10	<10	<10	<10						<10	ug/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02						<0.02	mg/l	TM107/PM0
BOD (Settled) #	1	<1	<1	<1	<1						<1	mg/l	TM58/PM0
COD (Settled) #	91	515	<7	<7	578						<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	8710	34663	871	937	41965						<2	uS/cm	TM76/PM0
pH #	7.07	7.37	7.16	7.21	7.95						<0.01	pH units	TM73/PM0
Total Organic Carbon #	24	8	3	3	<2						<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

VOC Report : **Liquid**

J E Sample No.	89-99	100-110	111-121	122-132	133-143							
Sample ID	BH215S-H	BH215D-H	BH207S-H	BH207D-H	BH204R-H							
Depth												
COC No / misc												
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G							
Sample Date	04/11/2015	04/11/2015	04/11/2015	04/11/2015	04/11/2015							
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water							
Batch Number	3	3	3	3	3							
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015	09/11/2015							

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1						<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1						<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1						<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4						<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	104	105	104	103	105						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	106	106	104	103	106						<0	%	TM15/PM10

Client Name: WYG

Matrix : Liquid

Reference: A091086

Location: Haulbowline Factory

Contact: Yvonne Buchanan

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/15719	3					Liquid Samples were received at a temperature above 9°C.
15/15719	3	BH215S-H		89-99	BOD	Sample holding time exceeded prior to receipt
15/15719	3	BH215D-H		100-110	BOD	Sample holding time exceeded prior to receipt
15/15719	3	BH207S-H		111-121	BOD	Sample holding time exceeded prior to receipt
15/15719	3	BH207D-H		122-132	BOD	Sample holding time exceeded prior to receipt
15/15719	3	BH204R-H		133-143	BOD	Sample holding time exceeded prior to receipt

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/15719

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution
AC	x20 Dilution
AD	x50 Dilution

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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WYG
1 Locksley Business Park
Montgomery Park
Belfast
Northern Ireland
BT6 9UP

Attention :	Yvonne Buchanan
Date :	24th November, 2015
Your reference :	A091086
Our reference :	Test Report 15/15719 Batch 4
Location :	Haulbowline Factory
Date samples received :	9th November, 2015
Status :	Final report
Issue :	1

Four samples were received for analysis on 9th November, 2015 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	144-152	153-161	162-170	171-179							LOD/LOR	Units	Method No.
Sample ID	OT07	OT08	SW03	SW11									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	05/11/2015	05/11/2015	05/11/2015	05/11/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	4	4	4	4									
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015									
Dissolved Aluminium #	1.7	5.8	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	<2	<2	3							<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	<0.9	<0.9	<0.9							<0.9	ug/l	TM30/PM14
Dissolved Barium #	<1.8	43.7	2.3	2.0							<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Dissolved Boron	2966	331	3231	3198							<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.69	0.53	0.59	0.71							<0.03	ug/l	TM30/PM14
Dissolved Calcium #	372.7$_{AA}$	70.2	406.0$_{AA}$	439.0$_{AA}$							<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2	<0.2	<0.2							<0.2	ug/l	TM30/PM14
Dissolved Copper #	<3	5	<3	<3							<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	116.5	<4.7	<4.7							<4.7	ug/l	TM30/PM14
Dissolved Lead #	4.8	3.7	1.4	<0.4							<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	1167.0$_{AC}$	52.2	1183.0$_{AC}$	1239.0$_{AC}$							<0.1	mg/l	TM30/PM14
Dissolved Manganese #	6.4	91.0	4.3	5.1							<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	4.1	2.6	4.3	4.0							<0.2	ug/l	TM30/PM14
Dissolved Nickel #	<0.2	2.4	<0.2	<0.2							<0.2	ug/l	TM30/PM14
Dissolved Potassium #	335.6$_{AA}$	24.8	378.9$_{AA}$	418.6$_{AA}$							<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	<1.2	<1.2							<1.2	ug/l	TM30/PM14
Dissolved Sodium #	9105.0$_{AC}$	541.6$_{AA}$	9303.0$_{AC}$	9808.0$_{AC}$							<0.1	mg/l	TM30/PM14
Dissolved Vanadium #	<0.6	0.8	<0.6	<0.6							<0.6	ug/l	TM30/PM14
Dissolved Zinc #	2.1	226.4	<1.5	2.3							<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM61/PM38
Total Sulphur	754.90$_{AB}$	37.65	699.70$_{AB}$	800.40$_{AB}$							<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	144-152	153-161	162-170	171-179							LOD/LOR	Units	Method No.
Sample ID	OT07	OT08	SW03	SW11									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	05/11/2015	05/11/2015	05/11/2015	05/11/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	4	4	4	4									
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015									
PAH MS													
Naphthalene	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Phenanthrene	0.01	<0.01	0.01	0.01							<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Pyrene	0.01	<0.01	0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	75	74	74	77							<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	104	103	106	106							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	104	106	106							<0	%	TM15/PM10
SVOC TICs	ND	ND	ND	ND								None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5							<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10							<10	ug/l	TM5/TM36/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	144-152	153-161	162-170	171-179							LOD/LOR	Units	Method No.
Sample ID	OT07	OT08	SW03	SW11									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	05/11/2015	05/11/2015	05/11/2015	05/11/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	4	4	4	4									
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015									
TPH CWG													
Aromatics													
>C5-EC7 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5							<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5							<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10							<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10							<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7							<0.7	ug/l	TM17/PM30
Resorcinol	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
Catechol	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
Phenol #	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
m/p-cresol	-	-	<0.02	-							<0.02	mg/l	TM26/PM0
o-cresol	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
Total cresols #	-	-	<0.03	-							<0.03	mg/l	TM26/PM0
Xylenols #	-	-	<0.06	-							<0.06	mg/l	TM26/PM0
1-naphthol	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
2,3,5-trimethyl phenol	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
2-isopropylphenol	-	-	<0.01	-							<0.01	mg/l	TM26/PM0
Total Speciated Phenols HPLC	-	-	<0.1	-							<0.1	mg/l	TM26/PM0
Fluoride	<0.3	<0.3	<0.3	<0.3							<0.3	mg/l	TM27/PM0
2-Chlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2-Methylphenol	<0.1	5.5	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2-Nitrophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3,4,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,3,5,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4-Dimethylphenol	<0.1	2.4	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	144-152	153-161	162-170	171-179							LOD/LOR	Units	Method No.
Sample ID	OT07	OT08	SW03	SW11									
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G									
Sample Date	05/11/2015	05/11/2015	05/11/2015	05/11/2015									
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water									
Batch Number	4	4	4	4									
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015									
2,6-Dichlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
2,6-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3-Methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
3,5-Dimethylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Chloro-2-methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Methylphenol	<0.1	6.8	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4-Nitrophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
4,6-Dinitro-o-cresol (DNOC)	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Phenol	<0.1	3.6	<0.1	<0.1							<0.1	ug/l	TM16/PM30
Total Speciated Phenols MS	<2.1	18.3	<2.1	<2.1							<2.1	ug/l	TM16/PM30
Sulphate #	2057.30	120.70	1338.30	2282.38							<0.05	mg/l	TM38/PM0
Chloride #	13802.9 AA	822.8	14032.9 AA	15610.2 AA							<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	1.0	0.7	0.9	0.8							<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	0.05	<0.02	0.04	0.05							<0.02	mg/l	TM38/PM0
Free Cyanide	<0.001	<0.001	<0.001	<0.001							<0.001	mg/l	TM89/PM0
Total Cyanide	<0.001	0.002	0.004	0.003							<0.001	mg/l	TM89/PM0
Complex Cyanide	<0.001	0.002	0.004	0.003							<0.001	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.75	0.11	0.75	0.72							<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.002	<0.002	<0.002	<0.002							<0.002	mg/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1							<1	mg/l	TM75/PM0
Sulphide	<10	<10	<10	<10							<10	ug/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02							<0.02	mg/l	TM107/PM0
BOD (Settled) #	-	2	-	-							<1	mg/l	TM58/PM0
BOD (Settled) #	<1	-	<1	<1							<1	mg/l	TM58/PM0
COD (Settled) #	897 AA	31	989	598 AA							<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	46811	2968	47974	48436							<2	uS/cm	TM76/PM0
pH #	7.85	7.46	7.87	7.87							<0.01	pH units	TM73/PM0
Total Organic Carbon #	3	7	<2	<2							<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

VOC Report : **Liquid**

J E Sample No.	144-152	153-161	162-170	171-179								
Sample ID	OT07	OT08	SW03	SW11								
Depth												
COC No / misc												
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G								
Sample Date	05/11/2015	05/11/2015	05/11/2015	05/11/2015								
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water								
Batch Number	4	4	4	4								
Date of Receipt	09/11/2015	09/11/2015	09/11/2015	09/11/2015								

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1							<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1							<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4							<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3							<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	104	103	106	106							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	104	106	106							<0	%	TM15/PM10

Client Name: WYG

Matrix : Liquid

Reference: A091086

Location: Haulbowline Factory

Contact: Yvonne Buchanan

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/15719	4	OT07		144-152	BOD	Sample holding time exceeded prior to receipt
15/15719	4	OT08		153-161	BOD	Sample holding time exceeded prior to receipt
15/15719	4	SW03		162-170	BOD	Sample holding time exceeded prior to receipt
15/15719	4	SW11		171-179	BOD	Sample holding time exceeded prior to receipt

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/15719

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution
AB	x50 Dilution
AC	x100 Dilution

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
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WYG
1 Locksley Business Park
Montgomery Park
Belfast
Northern Ireland
BT6 9UP

Attention :	Yvonne Buchanan
Date :	25th November, 2015
Your reference :	A091086
Our reference :	Test Report 15/15719 Batch 5
Location :	Haulbowline Factory
Date samples received :	9th November, 2015
Status :	Final report
Issue :	1

Three samples were received for analysis on 9th November, 2015 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	180-190	193-203											
Sample ID	BH216S-H	BH204R-L											
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G											
Sample Date	05/11/2015 12:00	05/11/2015 14:00											
Sample Type	Ground Water	Ground Water											
Batch Number	5	5											
Date of Receipt	09/11/2015	09/11/2015											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Dissolved Aluminium #	24.5	<1.5									<1.5	ug/l	TM30/PM14
Dissolved Antimony #	2	5									<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	<0.9									<0.9	ug/l	TM30/PM14
Dissolved Barium #	1258.0	28.1									<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5									<0.5	ug/l	TM30/PM14
Dissolved Boron	216	2509									<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.16	0.63									<0.03	ug/l	TM30/PM14
Dissolved Calcium #	195.6	400.9 AB									<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	1.5									<0.2	ug/l	TM30/PM14
Dissolved Copper #	9	<3									<3	ug/l	TM30/PM14
Total Dissolved Iron #	30550.0 AA	<4.7									<4.7	ug/l	TM30/PM14
Dissolved Lead #	15.6	<0.4									<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	20.2	937.2 AB									<0.1	mg/l	TM30/PM14
Dissolved Manganese #	270.1	<1.5									<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	<0.2	7.8									<0.2	ug/l	TM30/PM14
Dissolved Nickel #	1.0	<0.2									<0.2	ug/l	TM30/PM14
Dissolved Potassium #	10.2	327.5 AB									<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2									<1.2	ug/l	TM30/PM14
Dissolved Sodium #	41.7	8183.0 AD									<0.1	mg/l	TM30/PM14
Dissolved Vanadium #	1.8	<0.6									<0.6	ug/l	TM30/PM14
Dissolved Zinc #	53.9	3.5									<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	0.02	0.02									<0.01	ug/l	TM61/PM38
Total Sulphur	4.61	663.60 AC									<0.01	mg/l	TM30/PM14

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	180-190	193-203									LOD/LOR	Units	Method No.
Sample ID	BH216S-H	BH204R-L											
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G											
Sample Date	05/11/2015 12:00	05/11/2015 14:00											
Sample Type	Ground Water	Ground Water											
Batch Number	5	5											
Date of Receipt	09/11/2015	09/11/2015											
PAH MS													
Naphthalene	0.3	<0.1									<0.1	ug/l	TM4/PM30
Acenaphthylene	0.69	<0.01									<0.01	ug/l	TM4/PM30
Acenaphthene	0.90	<0.01									<0.01	ug/l	TM4/PM30
Fluorene	2.34	<0.01									<0.01	ug/l	TM4/PM30
Phenanthrene	2.61	0.01									<0.01	ug/l	TM4/PM30
Anthracene	0.28	<0.01									<0.01	ug/l	TM4/PM30
Fluoranthene	0.72	<0.01									<0.01	ug/l	TM4/PM30
Pyrene	0.65	<0.01									<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	0.18	<0.01									<0.01	ug/l	TM4/PM30
Chrysene	0.16	<0.01									<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	0.24	<0.01									<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	0.16	<0.01									<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	0.07	<0.01									<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	0.01	<0.01									<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	0.05	<0.01									<0.01	ug/l	TM4/PM30
PAH 16 Total	9.4	<0.1									<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	0.17	<0.01									<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	0.07	<0.01									<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	76	82									<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1									<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1									<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5									<0.5	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	104	105									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	105									<0	%	TM15/PM10
SVOC TICs	ND	ND										None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5									<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5									<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5									<5	ug/l	TM36/PM12
>C10-C12 #	28	<5									<5	ug/l	TM5/PM30
>C12-C16 #	220	<10									<10	ug/l	TM5/PM30
>C16-C21 #	260	<10									<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10									<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	508	<10									<10	ug/l	TM5/TM36/PM30

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	180-190	193-203									LOD/LOR	Units	Method No.
Sample ID	BH216S-H	BH204R-L											
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G											
Sample Date	05/11/2015 12:00	05/11/2015 14:00											
Sample Type	Ground Water	Ground Water											
Batch Number	5	5											
Date of Receipt	09/11/2015	09/11/2015											
TPH CWG													
Aromatics													
>C5-EC7 #	<5	<5									<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5									<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5									<5	ug/l	TM36/PM12
>EC10-EC12 #	93	<5									<5	ug/l	TM5/PM30
>EC12-EC16 #	350	<10									<10	ug/l	TM5/PM30
>EC16-EC21 #	250	<10									<10	ug/l	TM5/PM30
>EC21-EC35 #	40	<10									<10	ug/l	TM5/PM30
Total aromatics C5-35 #	733	<10									<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	1241	<10									<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1									<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1									<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7									<0.7	ug/l	TM17/PM30
Resorcinol	-	<0.01									<0.01	mg/l	TM26/PM0
Catechol	-	<0.01									<0.01	mg/l	TM26/PM0
Phenol #	-	<0.01									<0.01	mg/l	TM26/PM0
m/p-cresol	-	<0.02									<0.02	mg/l	TM26/PM0
o-cresol	-	<0.01									<0.01	mg/l	TM26/PM0
Total cresols #	-	<0.03									<0.03	mg/l	TM26/PM0
Xylenols #	-	<0.06									<0.06	mg/l	TM26/PM0
1-naphthol	-	<0.01									<0.01	mg/l	TM26/PM0
2,3,5-trimethyl phenol	-	<0.01									<0.01	mg/l	TM26/PM0
2-isopropylphenol	-	<0.01									<0.01	mg/l	TM26/PM0
Total Speciated Phenols HPLC	-	<0.1									<0.1	mg/l	TM26/PM0
Fluoride	<0.3	<0.3									<0.3	mg/l	TM27/PM0
2-Chlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2-Methylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2-Nitrophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,3-Dimethylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,3,4,6-Tetrachlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,3,5,6-Tetrachlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,4-Dimethylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	180-190	193-203									LOD/LOR	Units	Method No.
Sample ID	BH216S-H	BH204R-L											
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G											
Sample Date	05/11/2015 12:00	05/11/2015 14:00											
Sample Type	Ground Water	Ground Water											
Batch Number	5	5											
Date of Receipt	09/11/2015	09/11/2015											
2,6-Dichlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
2,6-Dimethylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
3-Methylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
3,4-Dimethylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
3,5-Dimethylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
4-Chloro-2-methylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
4-Methylphenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
4-Nitrophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
4,6-Dinitro-o-cresol (DNOC)	<0.1	<0.1									<0.1	ug/l	TM16/PM30
Pentachlorophenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
Phenol	<0.1	<0.1									<0.1	ug/l	TM16/PM30
Total Speciated Phenols MS	<2.1	<2.1									<2.1	ug/l	TM16/PM30
Sulphate #	5.46	1885.51									<0.05	mg/l	TM38/PM0
Chloride #	73.5	13347.1									<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	0.4	2.1									<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02									<0.02	mg/l	TM38/PM0
Free Cyanide	<0.001	<0.001									<0.001	mg/l	TM89/PM0
Total Cyanide	0.004	0.002									<0.001	mg/l	TM89/PM0
Complex Cyanide	0.004	0.002									<0.001	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	1.21	0.13									<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.002	<0.002									<0.002	mg/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1									<1	mg/l	TM75/PM0
Sulphide	<10	<10									<10	ug/l	TM106/PM0
Thiocyanate	<0.02	<0.02									<0.02	mg/l	TM107/PM0
BOD (Settled) #	1	<1									<1	mg/l	TM58/PM0
COD (Settled) #	51	780									<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	1153	42052									<2	uS/cm	TM76/PM0
pH #	6.89	7.90									<0.01	pH units	TM73/PM0
Total Organic Carbon #	26	<2									<2	mg/l	TM60/PM0

Client Name: WYG
Reference: A091086
Location: Haulbowline Factory
Contact: Yvonne Buchanan
JE Job No.: 15/15719

VOC Report : **Liquid**

J E Sample No.	180-190	191-192	193-203									
Sample ID	BH216S-H	BH216D-H	BH204R-L									
Depth										Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V H HN N Z P BOD G	V	V H HN N Z P BOD G									
Sample Date	05/11/2015 12:00	05/11/2015 14:00	05/11/2015 14:00									
Sample Type	Ground Water	Ground Water	Ground Water									
Batch Number	5	5	5									
Date of Receipt	09/11/2015	09/11/2015	09/11/2015									
VOC MS												
Dichlorodifluoromethane	<2	<2	<2							<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3							<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1							<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1							<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3							<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3							<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3							<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3							<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3							<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1							<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3							<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3							<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2							<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2							<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	116	<2							<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2							<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2							<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2							<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2							<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1							<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5							<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2							<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2							<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	4	<3							<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4							<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3							<3	ug/l	TM15/PM10
Propylbenzene #	<3	4	<3							<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3							<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	7	<3							<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	25	<3							<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	25	<3							<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3							<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3							<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3							<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2							<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3							<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	104	94	105							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	84	105							<0	%	TM15/PM10

Client Name: WYG

Matrix : Liquid

Reference: A091086

Location: Haulbowline Factory

Contact: Yvonne Buchanan

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/15719	5	BH216S-H		180-190	BOD	Sample holding time exceeded prior to receipt
15/15719	5	BH204R-L		193-203	BOD	Sample holding time exceeded prior to receipt

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

Please include all sections of this report if it is reproduced

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/15719

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x5 Dilution
AB	x10 Dilution
AC	x50 Dilution
AD	x100 Dilution

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 15/15719

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Zone 3
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Deeside
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Tel: +44 (0) 1244 833780
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WYG
1 Locksley Business Park
Montgomery Park
Belfast
Northern Ireland
BT6 9UP

Attention :	Yvonne Buchanan
Date :	9th December, 2015
Your reference :	A091086
Our reference :	Test Report 15/17095 Batch 1
Location :	HFS (Haulbowline Factory Site)
Date samples received :	30th November, 2015
Status :	Final report
Issue :	1

Six samples were received for analysis on 30th November, 2015 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: WYG
Reference: A091086
Location: HFS (Haulbowline Factory Site)
Contact: Yvonne Buchanan
JE Job No.: 15/17095

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56-66					LOD/LOR	Units	Method No.
Sample ID	HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6							
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G							
Sample Date	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015							
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015							
Dissolved Aluminium #	2.1	<1.5	2.7	6.3	5.8	23.2					<1.5	ug/l	TM30/PM14
Dissolved Antimony #	<2	2	<2	<2	<2	<2					<2	ug/l	TM30/PM14
Dissolved Arsenic #	<0.9	4.5	1.7	<0.9	3.8	3.2					<0.9	ug/l	TM30/PM14
Dissolved Barium #	2.8	3.9	2.6	2.2	3.1	2.8					<1.8	ug/l	TM30/PM14
Dissolved Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM30/PM14
Dissolved Boron	3077	3118	2913	2933	2845	2747					<2	ug/l	TM30/PM14
Dissolved Cadmium #	0.80	1.15	1.34	1.30	1.16	1.29					<0.03	ug/l	TM30/PM14
Dissolved Calcium #	388.9$_{AA}$	415.0$_{AA}$	344.7$_{AA}$	366.5$_{AA}$	372.4$_{AA}$	335.7$_{AA}$					<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					<0.2	ug/l	TM30/PM14
Dissolved Copper #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM30/PM14
Total Dissolved Iron #	<4.7	<4.7	<4.7	12.0	8.6	58.0					<4.7	ug/l	TM30/PM14
Dissolved Lead #	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4					<0.4	ug/l	TM30/PM14
Dissolved Magnesium #	1251.0$_{AC}$	1153.0$_{AC}$	997.2$_{AA}$	1098.0$_{AC}$	1036.0$_{AC}$	955.7$_{AA}$					<0.1	mg/l	TM30/PM14
Dissolved Manganese #	5.7	<1.5	7.2	7.7	10.0	11.8					<1.5	ug/l	TM30/PM14
Dissolved Molybdenum #	5.6	4.9	4.5	5.4	4.3	3.7					<0.2	ug/l	TM30/PM14
Dissolved Nickel #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					<0.2	ug/l	TM30/PM14
Dissolved Potassium #	391.7$_{AA}$	418.4$_{AA}$	349.1$_{AA}$	375.6$_{AA}$	366.3$_{AA}$	336.2$_{AA}$					<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<1.2	<1.2	3.7	3.7	<1.2	<1.2					<1.2	ug/l	TM30/PM14
Dissolved Sodium #	9593.0$_{AC}$	9111.0$_{AC}$	8950.0$_{AC}$	8585.0$_{AC}$	8350.0$_{AC}$	8218.0$_{AC}$					<0.1	mg/l	TM30/PM14
Dissolved Vanadium #	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6					<0.6	ug/l	TM30/PM14
Dissolved Zinc #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5					<1.5	ug/l	TM30/PM14
Mercury Dissolved by CVAF #	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM61/PM38
Total Sulphur	783.00$_{AB}$	723.00$_{AB}$	694.40$_{AB}$	725.50$_{AB}$	722.00$_{AB}$	760.50$_{AB}$					<0.01	mg/l	TM30/PM14

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: HFS (Haulbowline Factory Site)
Contact: Yvonne Buchanan
JE Job No.: 15/17095

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56-66							
Sample ID	HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6							
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G							
Sample Date	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015							
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015							

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
PAH MS													
Naphthalene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM4/PM30
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Phenanthrene	<0.01	<0.01	0.01	0.01	<0.01	0.01					<0.01	ug/l	TM4/PM30
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(bk)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Indeno(123cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Dibenzo(ah)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
PAH 16 Total	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	74	80	74	77	76	73					<0	%	TM4/PM30
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	100	97	96	96	96	95					<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	107	105	106	106	108	109					<0	%	TM15/PM10
SVOC TICs	ND	ND	ND	ND	ND	ND						None	TM16/PM30
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/TM36/PM30

Client Name: WYG
Reference: A091086
Location: HFS (Haulbowline Factory Site)
Contact: Yvonne Buchanan
JE Job No.: 15/17095

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56-66							
Sample ID	HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6							
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G							
Sample Date	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015							
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015							

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
TPH CWG													
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5					<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10					<10	ug/l	TM5/TM36/PM30
PCB 28	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
PCB 52	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
PCB 101	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
PCB 118	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
PCB 138	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
PCB 153	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
PCB 180	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM17/PM30
Total 7 PCBs	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7					<0.7	ug/l	TM17/PM30
Resorcinol	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
Catechol	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
Phenol #	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
m/p-cresol	<0.02	<0.02	<0.02	<0.02	-	-					<0.02	mg/l	TM26/PM0
o-cresol	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
Total cresols #	<0.03	<0.03	<0.03	<0.03	-	-					<0.03	mg/l	TM26/PM0
Xylenols #	<0.06	<0.06	<0.06	<0.06	-	-					<0.06	mg/l	TM26/PM0
1-naphthol	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
2,3,5-trimethyl phenol	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
2-isopropylphenol	<0.01	<0.01	<0.01	<0.01	-	-					<0.01	mg/l	TM26/PM0
Total Speciated Phenols HPLC	<0.1	<0.1	<0.1	<0.1	-	-					<0.1	mg/l	TM26/PM0
Fluoride	2.1	2.1	2.1	2.1	2.1	2.0					<0.3	mg/l	TM27/PM0
2-Chlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2-Methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2-Nitrophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,3-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,3,4,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,3,5,6-Tetrachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,4-Dichlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30

Client Name: WYG
Reference: A091086
Location: HFS (Haulbowline Factory Site)
Contact: Yvonne Buchanan
JE Job No.: 15/17095

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56-66					LOD/LOR	Units	Method No.
Sample ID	HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6							
Depth													
COC No / misc													
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G							
Sample Date	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015							
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water							
Batch Number	1	1	1	1	1	1							
Date of Receipt	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015							
2,6-Dichlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
2,6-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
3-Methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
3,4-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
3,5-Dimethylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
4-Chloro-2-methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
4-Chloro-3-methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
4-Methylphenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
4-Nitrophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
4,6-Dinitro-o-cresol (DNOC)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM16/PM30
Total Speciated Phenols MS	<2.1	<2.1	<2.1	<2.1	<2.1	<2.1					<2.1	ug/l	TM16/PM30
Sulphate #	2335.59	2398.21	2232.52	2215.54	2149.20	2113.04					<0.05	mg/l	TM38/PM0
Chloride #	16897.5	16671.0	16094.1	16017.9	15415.5	15249.2					<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	0.6	0.6	1.6	1.6	2.0	2.3					<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	mg/l	TM38/PM0
Free Cyanide	0.001	0.001	<0.001	<0.001	<0.001	<0.001					<0.001	mg/l	TM89/PM0
Total Cyanide	0.004	0.003	0.003	0.003	0.003	0.003					<0.001	mg/l	TM89/PM0
Complex Cyanide	0.003	0.002	0.003	0.003	0.003	0.003					<0.001	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.71	0.65	0.64	0.71	0.67	0.75					<0.03	mg/l	TM38/PM0
Hexavalent Chromium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002					<0.002	mg/l	TM38/PM0
Carbonate Alkalinity as CaCO3	<1	<1	<1	<1	<1	<1					<1	mg/l	TM75/PM0
Sulphide	<10	<10	<10	<10	<10	<10					<10	ug/l	TM106/PM0
Thiocyanate	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					<0.02	mg/l	TM107/PM0
BOD (Settled) #	7	13	78	<1	<1	<1					<1	mg/l	TM58/PM0
COD (Settled) #	536 AA	718 AA	442 AA	485 AA	596 AA	390 AA					<7	mg/l	TM57/PM0
Electrical Conductivity @25C #	49408	50988	47742	47054	45981	45973					<2	uS/cm	TM76/PM0
pH #	7.83	7.79	7.82	7.81	7.84	7.83					<0.01	pH units	TM73/PM0
Total Organic Carbon #	<2	<2	<2	<2	<2	<2					<2	mg/l	TM60/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: WYG
Reference: A091086
Location: HFS (Haulbowline Factory Site)
Contact: Yvonne Buchanan
JE Job No.: 15/17095

VOC Report : **Liquid**

J E Sample No.	1-11	12-22	23-33	34-44	45-55	56-66						
Sample ID	HF-S-1	HF-S-2	HF-S-3	HF-S-4	HF-S-5	HF-S-6						
Depth												
COC No / misc												
Containers	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G	V H HN N Z P BOD G						
Sample Date	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015	26/11/2015						
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water						
Batch Number	1	1	1	1	1	1						
Date of Receipt	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015	30/11/2015						

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1					<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4					<4	ug/l	TM15/PM10
Bromobenzene #	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2					<2	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3					<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	100	97	96	96	96	95					<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	107	105	106	106	108	109					<0	%	TM15/PM10

Client Name: WYG

Matrix : Liquid

Reference: A091086

Location: HFS (Haulbowline Factory Site)

Contact: Yvonne Buchanan

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
15/17095	1	HF-S-1		1-11	BOD	Sample holding time exceeded prior to receipt
15/17095	1	HF-S-2		12-22	BOD	Sample holding time exceeded prior to receipt
15/17095	1	HF-S-3		23-33	BOD	Sample holding time exceeded prior to receipt
15/17095	1	HF-S-4		34-44	BOD	Sample holding time exceeded prior to receipt
15/17095	1	HF-S-5		45-55	BOD	Sample holding time exceeded prior to receipt
15/17095	1	HF-S-6		56-66	BOD	Sample holding time exceeded prior to receipt

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/17095

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution
AB	x20 Dilution
AC	x50 Dilution

JE Job No: 15/17095

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.				

JE Job No: 15/17095

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is required.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand.	PM0	No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			

JE Job No: 15/17095

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.				
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.				
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Appendix K Geological Cross Sections (Arup, 2014)

DISTANCE ALONG BASELINE (m)

−50 0 50 100 150 200 250 300 350 400 450

A South

Rock Embankment

BH212A

BH211

BH206

TP106

BH104

BH102

A' North

Quay Wall

MHWS

MSL

MLWS

REDUCED LEVEL (mOD)

6 4 2 0 −2 −4 −6 −8 −10 −12 −14 −16

SCALE 1:200V 1:1389H @ A3L

LEGEND

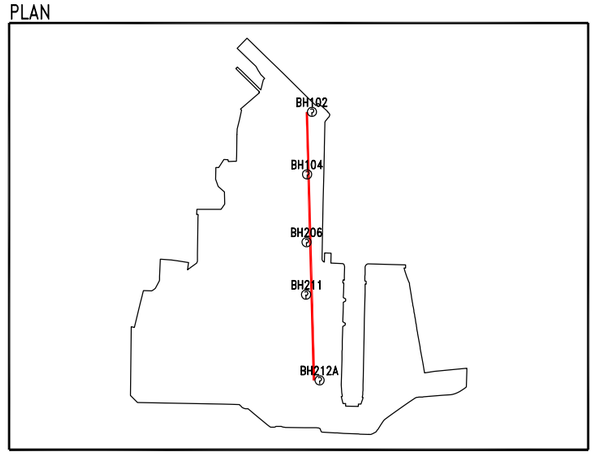
HoleID

Piezometer readings
Key to piezo types:

Range of water levels recorded

Piezo response zone

PLAN



Esturine/ Marine Deposit

- Made Ground [MG]
- Clay [Cl_EM]
- Sand [Sa_EM]
- Silt [Sl_EM]
- Gravel [GR_EM]

Glacial Till

- Boulder Clay [CT_GT]
- Sand [Sa_GT]
- Gravel [GR_GT]
- Weathered Limestone [WrR]
- Limestone [RCk]

Notes: (1) MHWS, MLWS and MLS are based on a 30 year average
(2) Strata and bedrock boundaries between site investigation locations are inferred
(3) Depth to sea bed at rock armour and quay walls unknown

MHWS: Mean High Water Spring
MSL: Mean Sea Level
MLWS: Mean Low Water Spring

Haulbowline Steelworks Site Assessment
INTERPRETIVE GEOLOGICAL CROSS SECTION A–A'

FIGURE 5.3a

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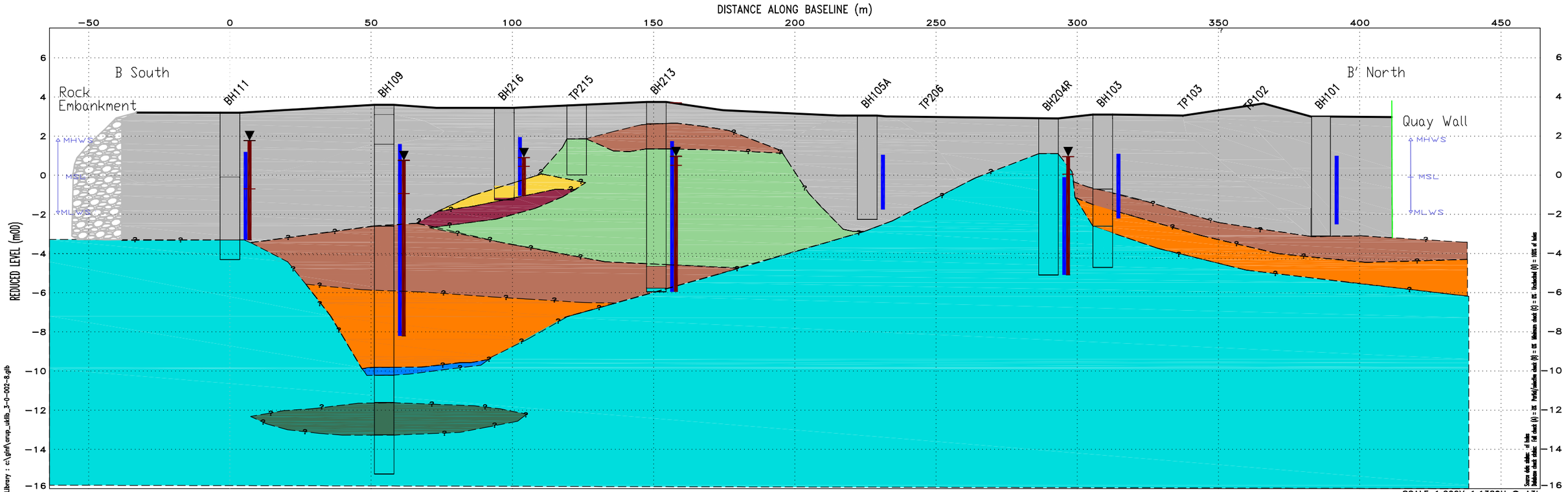

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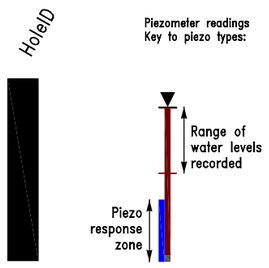

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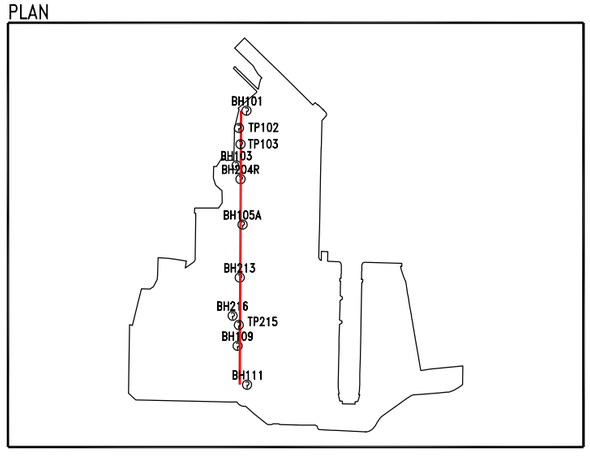

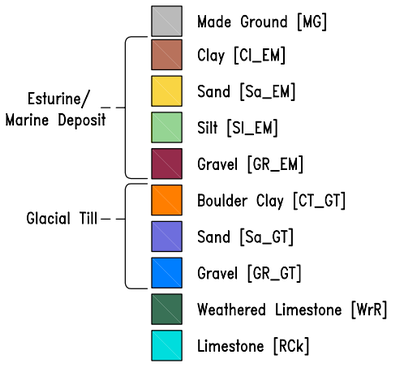

Notes: (1) No groundwater level data available for boreholes BH101, BH103 and BH105A
(2) MHWS, MHWS, MLS levels are based on a 30year average
(3) Strata and bedrock boundaries between site investigation locations are inferred
(4) Depth to sea bed at rock armour and quay walls unknown

MHWS: Mean High Water Spring
MSL: Mean Sea Level
MLWS: Mean Low Water Spring

Haulbowline Steelworks Site Assessment
INTERPRETIVE GEOLOGICAL CROSS SECTION B–B'

FIGURE 5.3b

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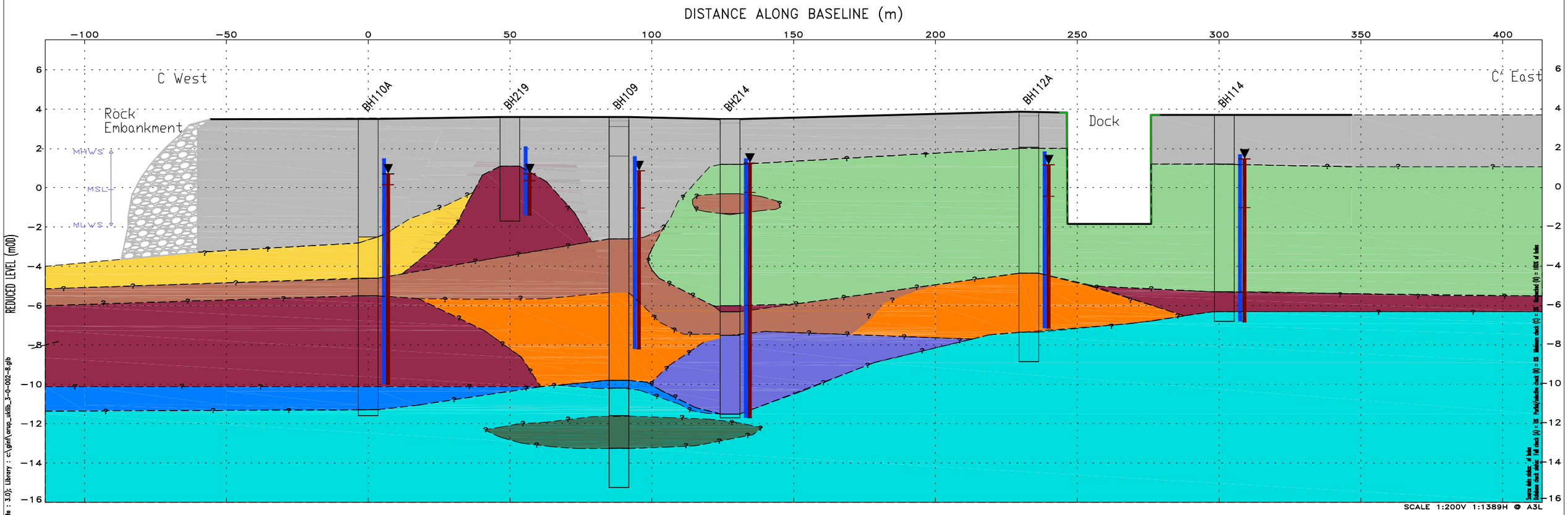

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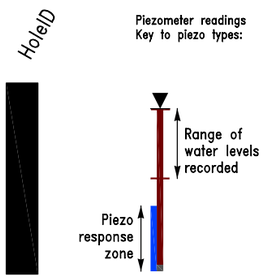
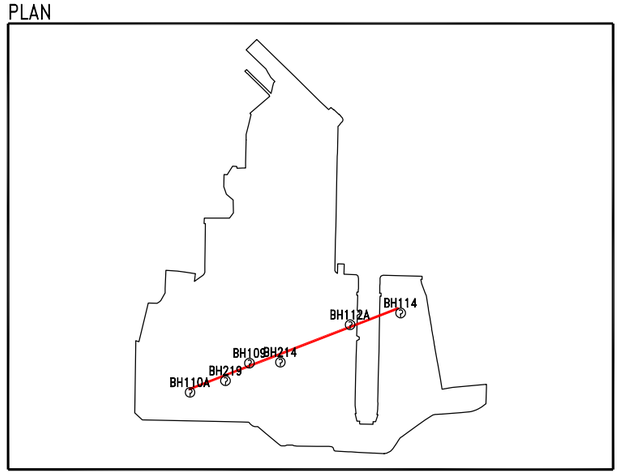
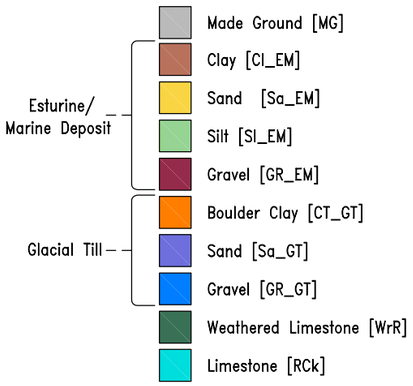


PLAN





Notes: (1) MHWS, MLWS and MLS are based on a 30 year average
(2) Strata and bedrock boundaries between site investigation locations are inferred
(3) Depth to sea bed at rock armour and quay walls unknown

MHWS: Mean High Water Spring
MSL: Mean Sea Level
MLWS: Mean Low Water Spring

Haulbowline Steelworks Site Assessment
INTERPRETIVE GEOLOGICAL CROSS SECTION C-C'

FIGURE 5.3c

<<DrawingFileSpec>>

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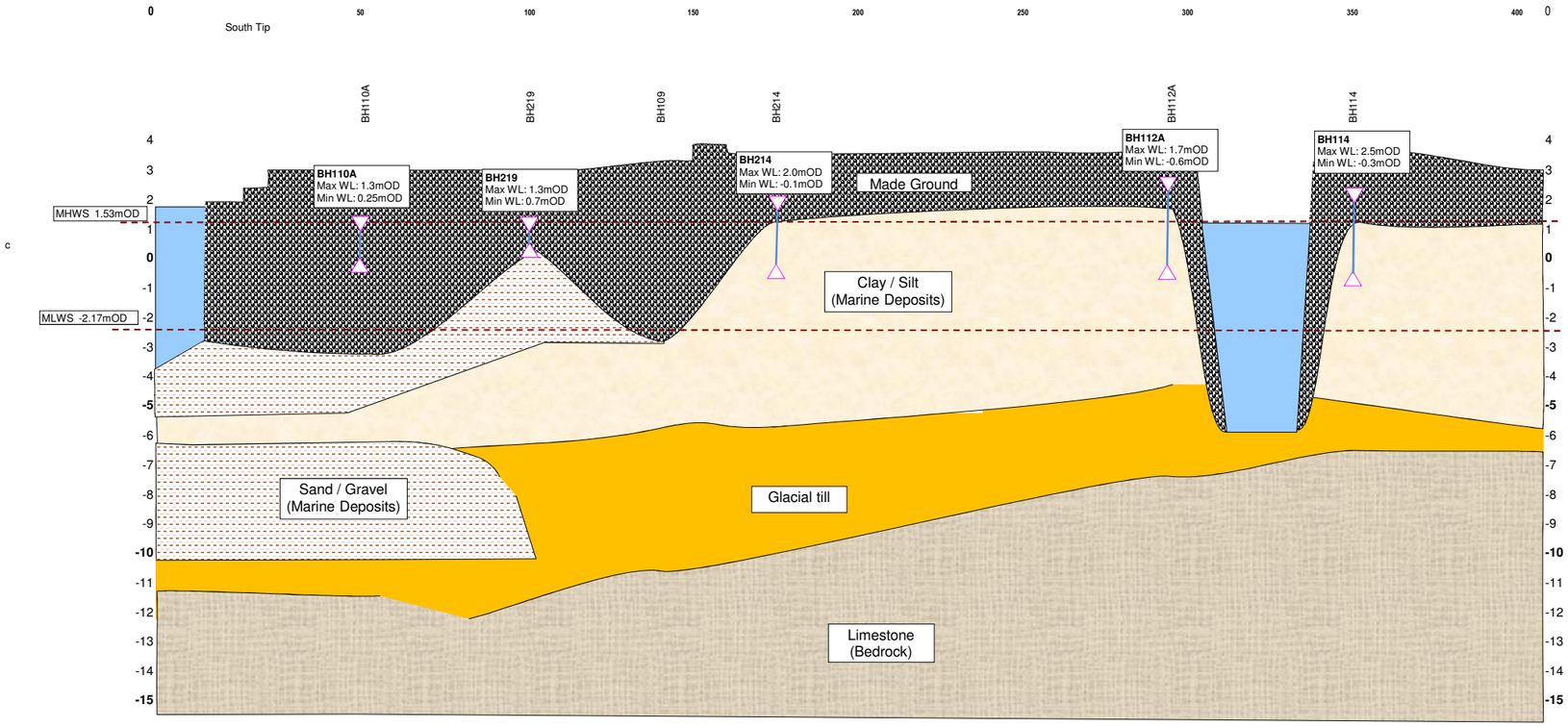
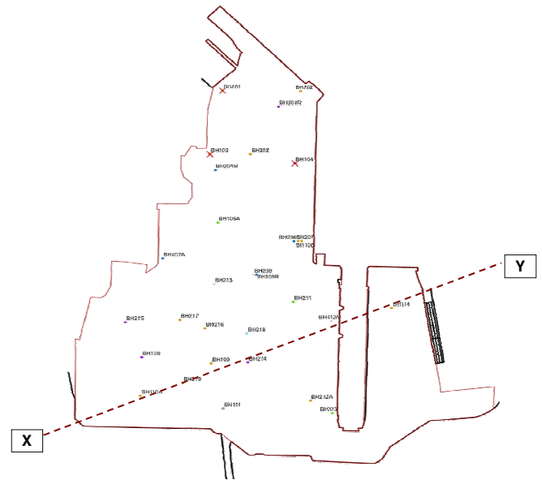
gINT output page 0 of 0. Made 15Aug14 10:15

Appendix L Factory Site Cross Section, Groundwater and Sea Level Data


South Tip
BH110A
BH219
BH109
BH214
BH112A
BH114
BH110A
Max WL: 1.3mOD
Min WL: 0.25mOD
BH219
Max WL: 1.3mOD
Min WL: 0.7mOD
BH214
Max WL: 2.0mOD
Min WL: -0.1mOD
BH112A
Max WL: 1.7mOD
Min WL: -0.6mOD
BH114
Max WL: 2.5mOD
Min WL: -0.3mOD
MHWS 1.53mOD
MLWS -2.17mOD
Made Ground
Clay / Silt
(Marine Deposits)
Sand / Gravel
(Marine Deposits)
Glacial till
Limestone
(Bedrock)


X
Y

Appendix M Report on Groundwater Level Monitoring at Haulbowline Former Steelworks Site, 2015

Cork County Council
Haulbowline Island groundwater level monitoring

Report on Groundwater Level Monitoring at Haulbowline Island former steelworks site

Minerex Doc. Ref.:2702-036 (Report on Groundwater Level Monitoring for Cork Co Co in Haulbowline Cork) FINAL

Date: Thursday, 15th January 2015

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Prepared by :	**Approved by :**
Conor Quinlan Ph.D. EurGeol. PGeo. Hydrogeologist	**Cecil Shine** EurGeol. PGeo. Managing Director

Minerex
Environmental Limited

WORK AND REPORT LIMITATIONS

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, interpretations, conclusions or recommendations in the following report.

1. Minerex Environmental Limited (MEL) has prepared this report for the sole use of its client in accordance with the work authorised.
2. No warranty, expressed or implied, is made as to the professional advice included in this report or any other services provided by MEL.
3. This report may not be relied upon by any other party without the prior and express written permission from MEL.
4. Interpretations contained in this report are derived from available information of the site conditions, the likely environmental responses and the experience of the company.
5. MEL has prepared this report in line with best current practice and with all reasonable skill, care and diligence in consideration of the limits imposed by materials, equipment or methodologies used, and the resources devoted to it as agreed with the client.
6. The interpretative basis of the conclusions contained in this report should be taken into account in any future use of this report. If the scope of the works includes drilling, pitting, sampling, or interpretation of such information, the client's attention is drawn to the fact that special risks occur whenever hydrogeological and related disciplines are applied to identify subsurface conditions.
7. Even a comprehensive sampling and testing programme (for example drilling, pitting, sampling, or interpretation of such information,), implemented in accordance with a professional Standard of Care, may fail to detect certain conditions.
8. The environmental, geological, geotechnical, geochemical, hydrological and hydrogeological conditions that MEL interprets to exist between sampling points may differ from those that actually exist.
9. Also, the passage of time, natural occurrences, and activities near the site may substantially alter discovered conditions.
10. Changes in the legislation, industry standards and guidance may cause opinion, advice, conclusions and recommendations set out in MEL reports to be inappropriate or incorrect. Once a report has been issued to a Client, MEL will have no obligation to advise the Client of any such changes, or their repercussions.
11. While MEL endeavours to take reasonable effort to assess data in hand at the time of writing and give the best advice possible, MEL will accept no responsibility for how the information within this report is interpreted and used. Where elements of this report are based upon information provided by others, it is assumed that all the relevant information has been supplied to MEL in full and is reliable, accurate and representative.
12. It should be assumed that MEL has not independently verified any information provided by others. MEL, its agents, directors, owners, employees, and contractors will not be held responsible for any loss (reputation, financial, technical or otherwise) occurring from the use of this report, howsoever caused.

DRAFT

DOCUMENT TO	DOCUMENT BY
Cork County Council	Minerex Environmental Limited
Report on Groundwater Level Monitoring at Haulbowline Island former steelworks site	Doc Ref.: 2702-036 (Report on Groundwater Level Monitoring for Cork Co Co in Haulbowline Cork) FINAL

Contents

1. **Introduction** 1

2. **Health and safety planning / including Risk Assessment** 1

3. **Methodology** 2

4. **Results** 2

Appendices

Appendix	*Title*	*Pages*	*Location*
A	**Monitoring point location map**	1xA3	Attached
B	**Hydrometric and hydrochemical graphs**	23xA4	Attached
C	**Slug test result graphs and reports**	56xA4	Attached
D	**Hydrometric and hydrochemical results**	n/a	On CD
E	**Hydrometric and hydrochemical graphs**	n/a	On CD
F	**Slug test data**	n/a	On CD

DRAFT

1. Introduction

Minerex Environmental Limited (MEL) has been appointed by Cork County Council (The client) to carry out the following at the former steelworks site on Haulbowline Island as per the specification contained in the document 'Cork County Council, Haulbowline Steelworks Site Assessment, Data Logger Installation and Permeability Test Specification. REP/1, Issue 1 | 13 November 2014':

1. Installation of 17 'diver' type data loggers in boreholes across the site
2. Installation of one diver data logger in Cork Harbour adjacent to the site
3. Installation of one barometric logger at the site
4. Installation of two telemetric 'Impress' data loggers and probes at the site
5. Installation of one pH probe and Electrical Conductivity probe in BH206 at the site
6. Installation of one automatic telemetric rainfall gauge at the site
7. The above were to be installed for a period covering one complete tidal cycle to determine water levels during spring and neap tidal ranges.
8. Carry out slug tests in 10 wells as per the Specification to determine aquifer permeability at the site.
9. Collate and provide data obtained.

2. Health and safety planning / including Risk Assessment

Health and safety, and labour regulations were adhered to. The environment was protected during the course of the work.

The potential health and safety hazards were identified and assessed by site personnel and the project manager according to internal protocol and a site specific method statement was produced and approved before any site works took place.

All personnel visiting the site were provided with the H&S Site Protocol document and safety inducted prior to accessing the site.

3. Methodology

The methodology employed during this project is described in detail in the method statement document 2702-036 (Report on Groundwater Level Monitoring for Cork Co Co in Haulbowline Cork)_draft3.docx.

4. Results

Works completed on site are detailed below:

4.1 Water level monitoring results

4.1.1 Boreholes monitored with diver type loggers

The diver loggers were installed on Friday 14th November in 17 boreholes at the site. Locations are show in in Appendix A. The loggers were downloaded on Monday 24th November (interim download) and were removed and downloaded on Tuesday 9th December. The interim logger data was made available to Arup for review. On completion of the review, Arup confirmed that the data logging continue as agreed for the remainder of the monitoring period. A full spring-neap tidal range cycle was thus captured. All data sets were compensated for barometric variations using data obtained from the onsite barometric logger. The results are presented graphically in Appendix B and the data is contained in Appendix D and E.

4.1.2 Boreholes monitored with Impress telemetric probes

The Impress telemetric probes were installed on Friday 14th November in 2 boreholes (BH206 and BH106) at the site. The solar panel powering the probes malfunctioned during the 23rd of November and was repaired on 26th of November resulting in the loss of 2.5 days of data. Notwithstanding the breakdown issue a full spring-neap tidal range cycle was captured in these two monitoring points. The results are presented graphically in Appendix B and the data is contained in Appendix D and E.

4.1.3 Cork Harbour water level monitoring

The Cork Harbour diver logger was installed adjacent to the quay wall at the eastern side of the site (Location indicated on drawing contained in Appendix A) on Friday 14th November. The logger was downloaded on Monday 24th November (interim download) and was removed and downloaded on Tuesday 9th December. A full spring-neap tidal range cycle was thus captured. There were no issues with logger breakdown and full data set was recorded. The data set was compensated for barometric variation using data obtained from the onsite barometric logger. The results are presented graphically in Appendix B and the data is contained in Appendix D and E.

4.2 Hydrochemistry monitoring results

4.2.1 pH

pH was monitored in BH206 from 14th November until the 9th December 2014. The solar panel powering the probe malfunctioned during the 23rd of November and was repaired on 26th of November resulting in the loss of 2.5 days of data. Notwithstanding the breakdown issue a full spring-neap tidal range cycle was captured. The results show a slight but consistent variation in pH between low and high tide of approximately 0.05 pH units. The average pH appears to have risen from 7.05 to 7.25 over the monitoring period. The probe is within its calibration certification. The results are presented graphically in Appendix B and the data is contained in Appendix D and E.

4.2.2 Electric Conductivity

Electrical Conductivity was monitored in BH206 from 14th November until the 9th December 2014. The solar panel powering the probe malfunctioned during the 23rd of November and was repaired on 26th of November resulting in the loss of 2.5 days of data. Notwithstanding the breakdown issue a full spring-neap tidal range cycle was captured. The results show a slight but consistent variation in Electrical Conductivity between low and high tide of approximately 20-40 µS/cm. The average Electrical Conductivity appears to have fallen from 3560 µS/cm to 3530 µS/cm over the monitoring period. The probe is within its calibration certification. The results are presented graphically in Appendix B and the data is contained in Appendix D and E.

4.2.3 Contamination

During the monitoring oil sheen was observed on the surface water immediately adjacent to the Cork Harbour data logger at the east of the site. Free product was measured in two of the monitored boreholes (BH208 and BH218). The dates and thicknesses of the free product in BH208 were: 24th/12/14=0.14m, 9th/12/14=0.14m . The dates and thicknesses of the free product in BH218 were: 24th/12/14=2.37m, 9th/12/14=2.4m.

4.3 Rainfall

The automatic rain gauge installed onsite recorded rainfall volumes throughout the monitoring period. The results show rainfall events occurring mainly during the first 10 days of the monitoring period. It should be noted that the rain gauge was not operating for a 2.5 day period (23rd-26th November) due to the solar panel malfunction and as a result no rainfall data exists for that period.

4.4 Slug Test Results

Slug tests were carried out in the following monitoring points: BH105A, BH113, BH107A, BH204R, BH206, BH108, BH111, BH,114, BH216 on 9th December 2014.

Borehole ID	Time	Water level (mbTOC)
BH105A	10:25	2.56
BH113	11:34	4.31
BH107A	10:00	2.66
BH204R	10:50	2.51
BH206	11:05	3.86
BH108	9:25	3.35
BH111	14:42	3.91
BH114	12:01	4.69
BH216	13:00	3.75
BH218	14:23	4.75 (2.35 to top of free product)

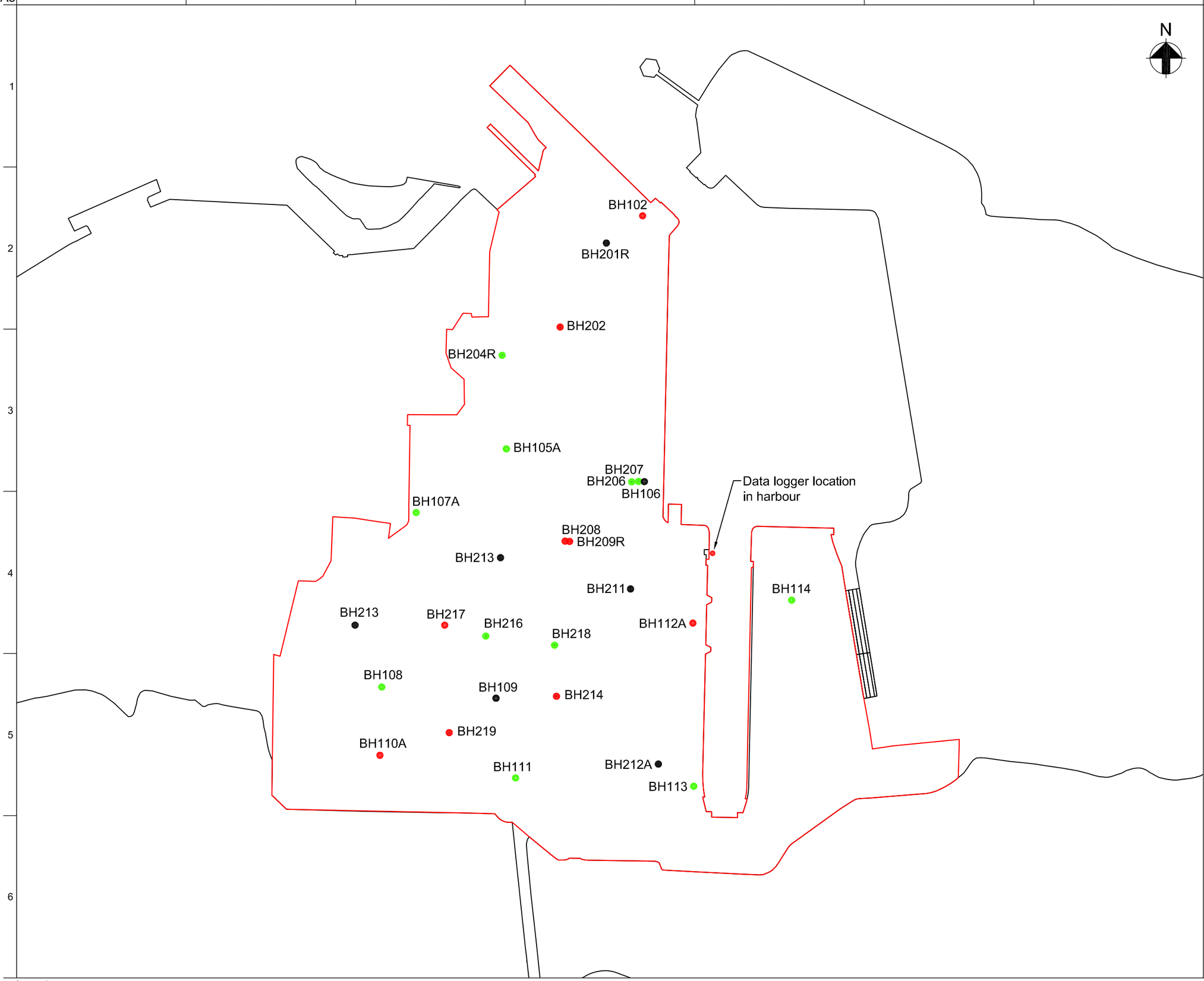
Permeability values were calculated for all tested wells except for BH105A and BH113. The results are contained in Appendix C and the raw data in Appendix F. These two wells are installed in formations with permeabilities that are too high to permit accurate slug testing. No change in water level was recorded during either rising or falling head tests in these wells with a diver set to record every 0.5 seconds.
No slug test was carried out in BH218 as there was insufficient water in the well (<0.3m). An additional well will be identified in the new year by Arup and CCC in which a slug test will be carried out by Minerex.

4.5 Incidents

The only incident that occurred during the monitoring period or the slug testing was the malfunction of the solar panel. As soon as Minerex became aware of the issue a staff member was sent to site to replace the solar panel and check all telemetric kit onsite.

APPENDIX A

A3



Legend:

- Site Boundary
- Automatic Data logger
- Automatic Data logger and permeability test
- Existing Groundwater wells not requiring Data loggers or Permeability tests

Rev	Date	By	Chkd	Appd
P1	xx/12/14			

Issued for Information

ARUP

15 Oliver Plunkett Street
Cork, Ireland
Tel +353 (0)21 427 7670 Fax +353 (0)21 427 2345
www.arup.com

Client
Cork County Council

Project Title
Haulbowline Steelworks
Site Assessment

Drawing Title
Figure 1:
Proposed Data Logger and Permeability Test Locations

Scale at A3
1:2500 at A3

Role
Civil

Suitability
Information

Arup Job No
235946-00

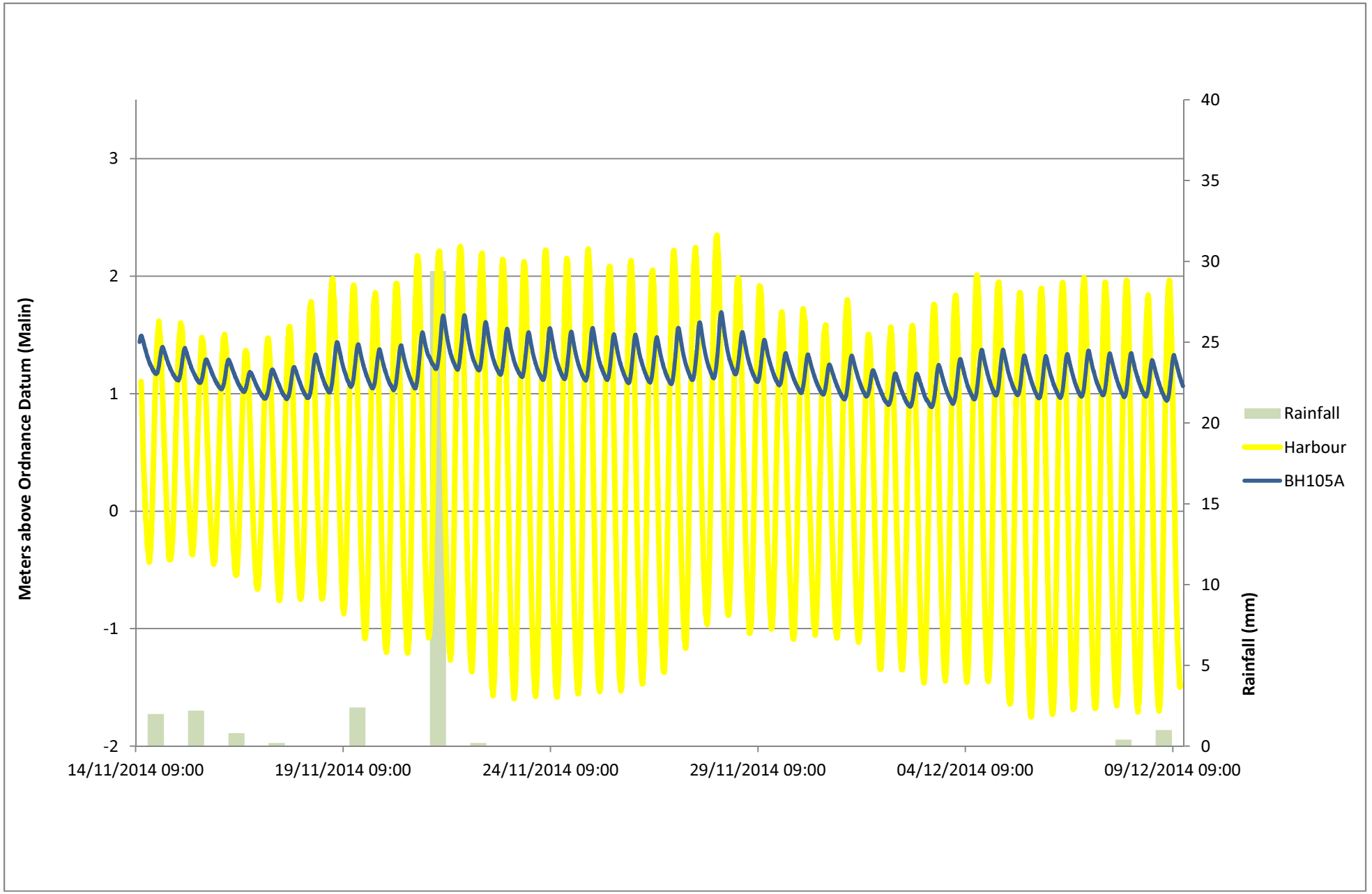
Rev

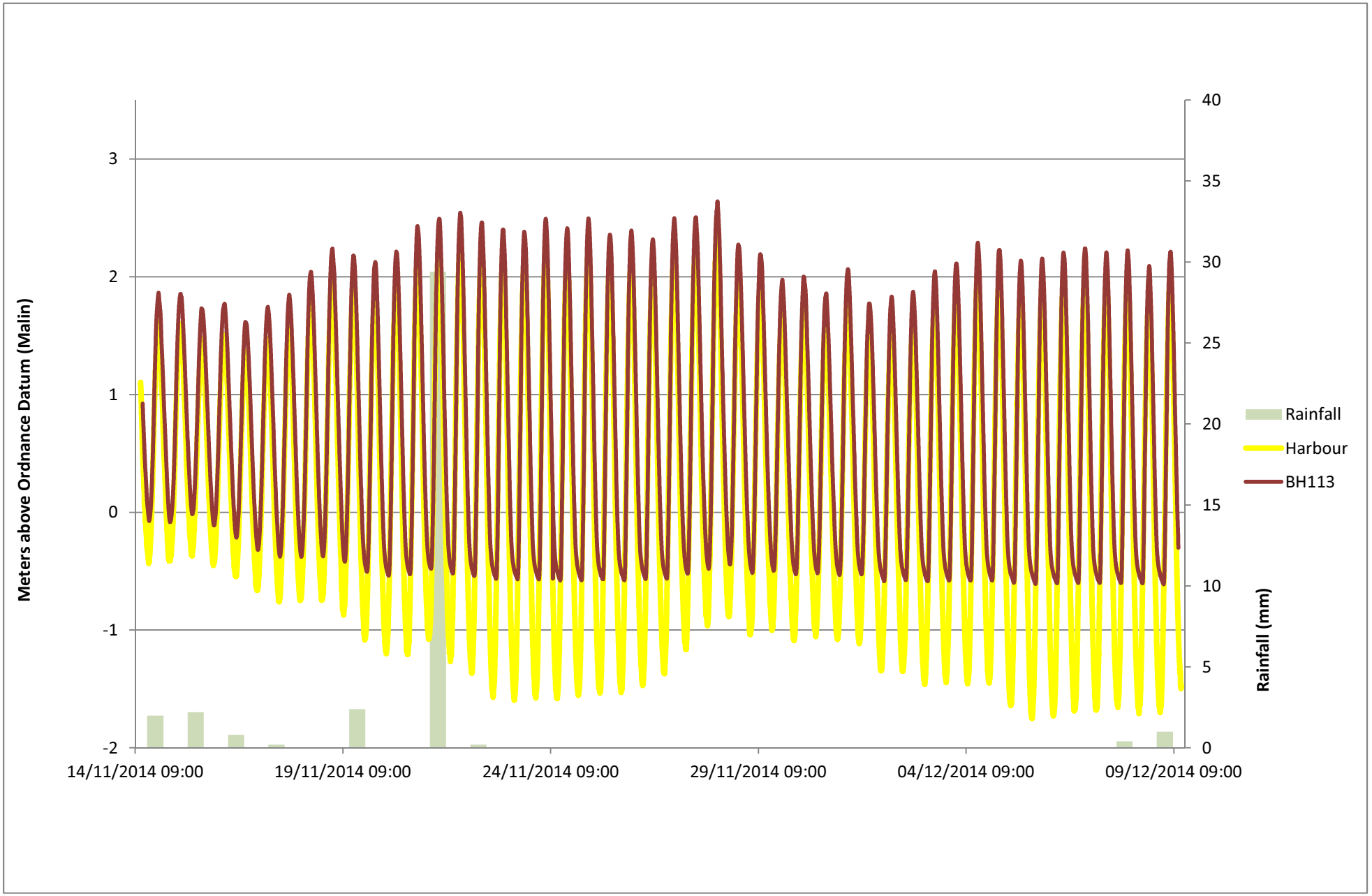
Name
G-001

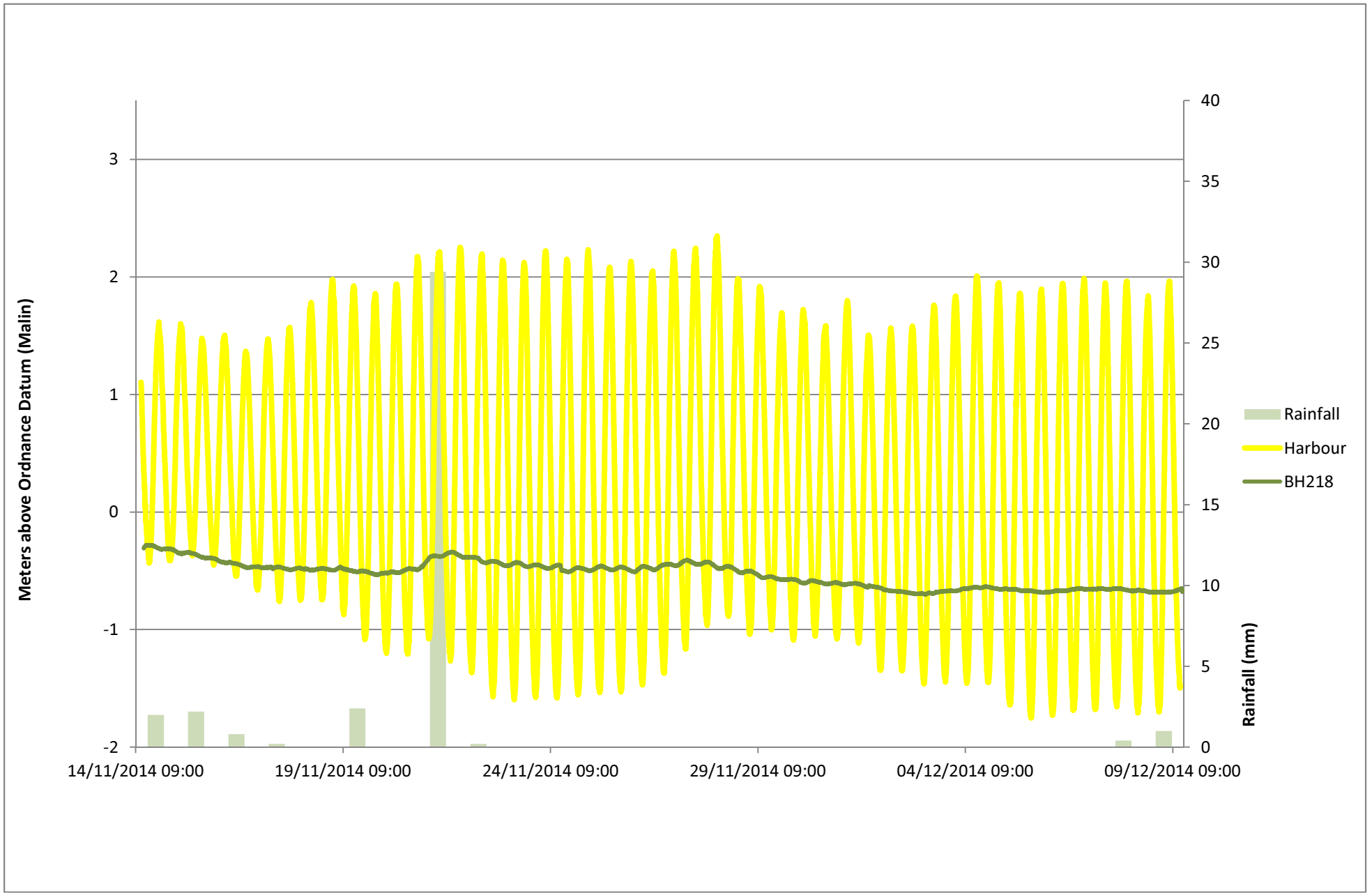
Do not scale

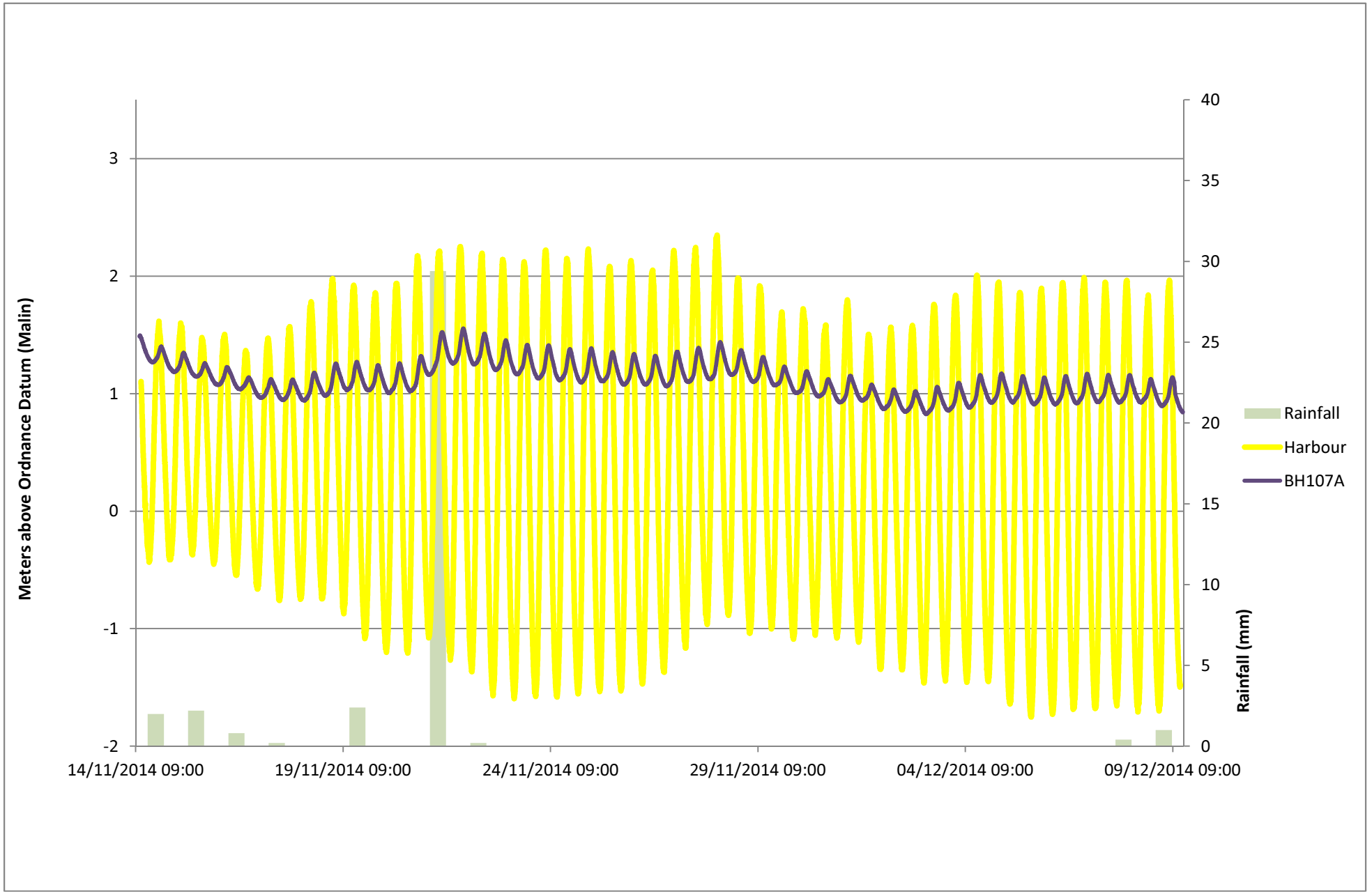
© Arup

APPENDIX B

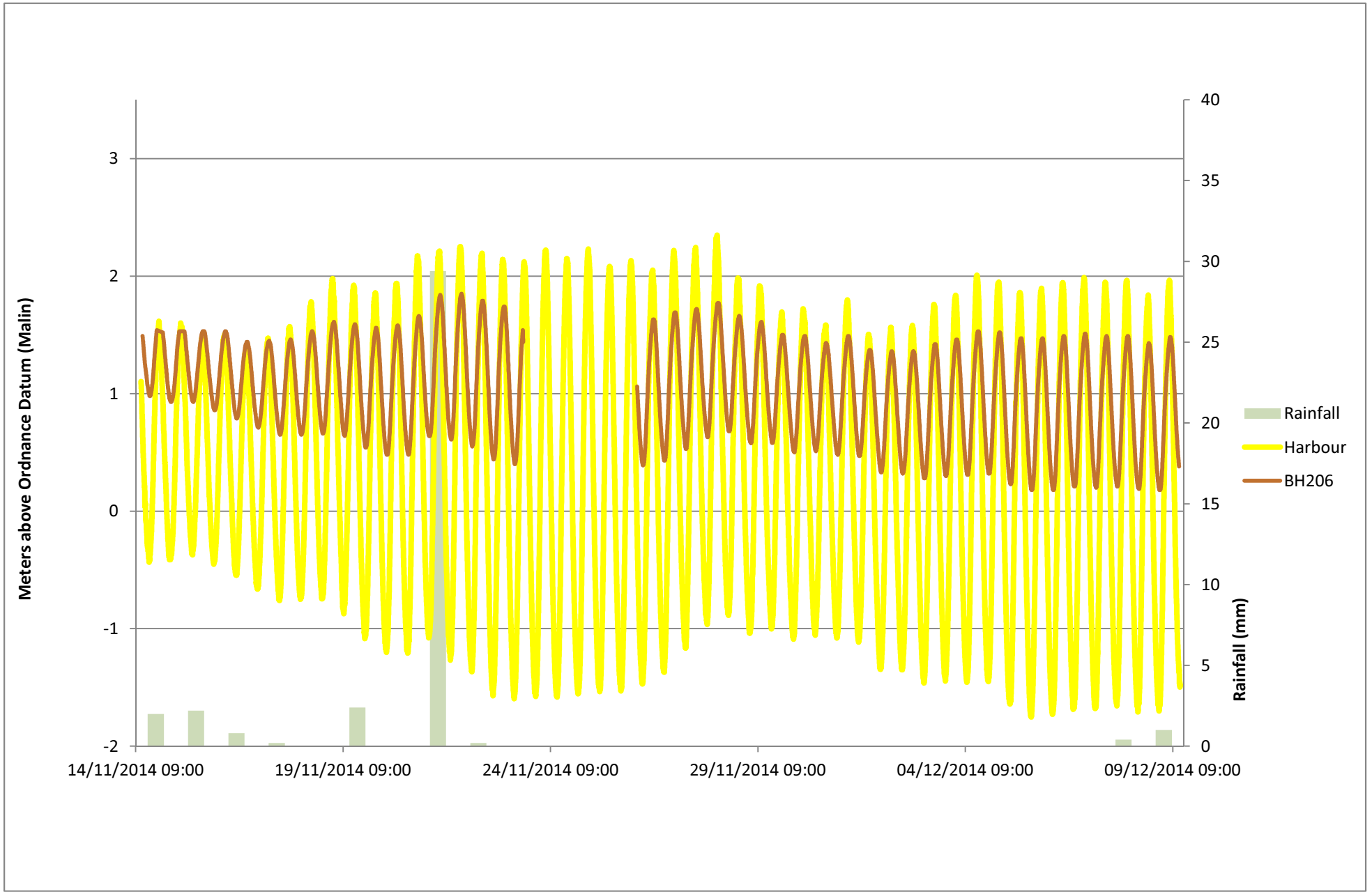

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH105A

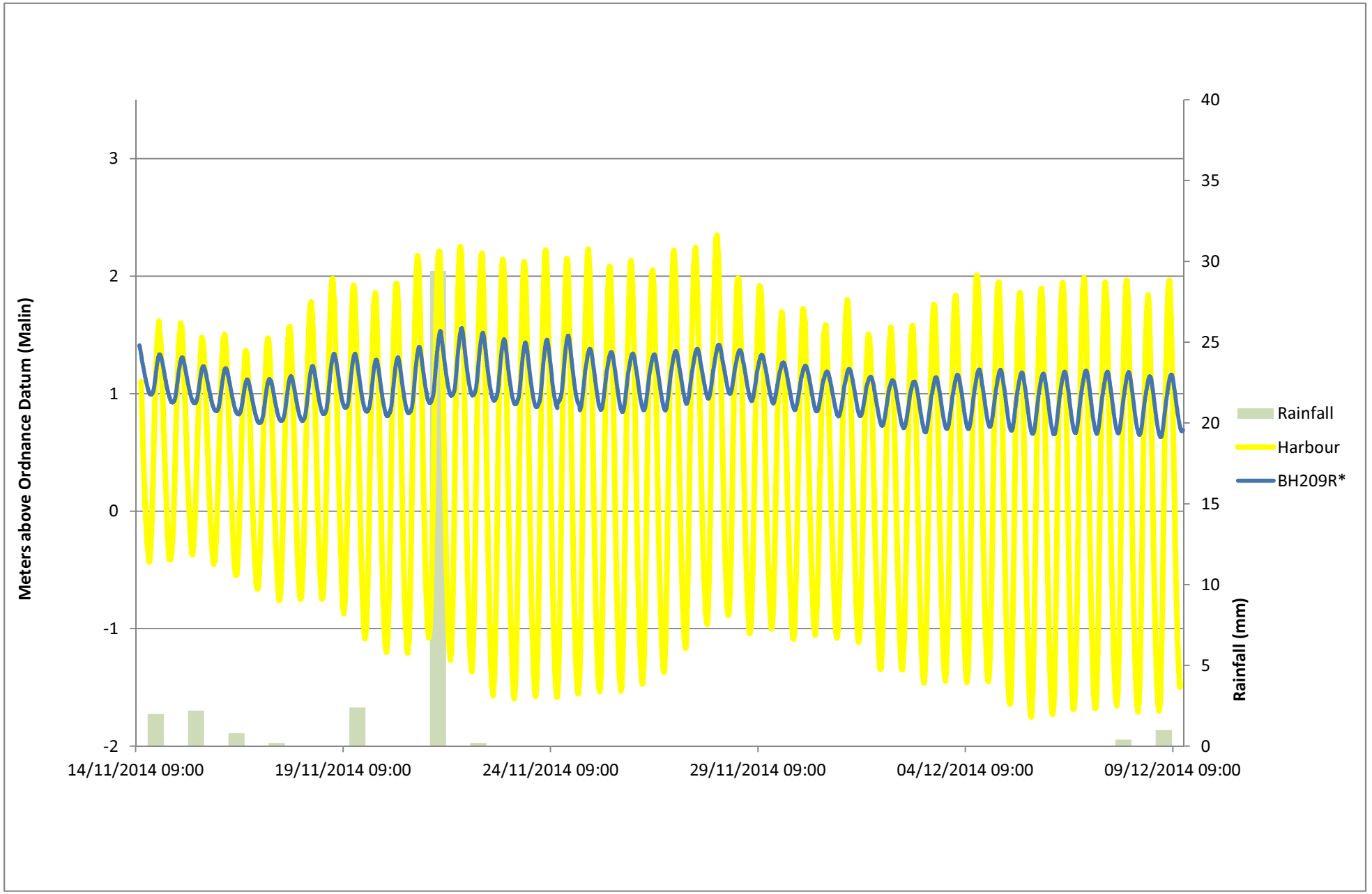

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH113

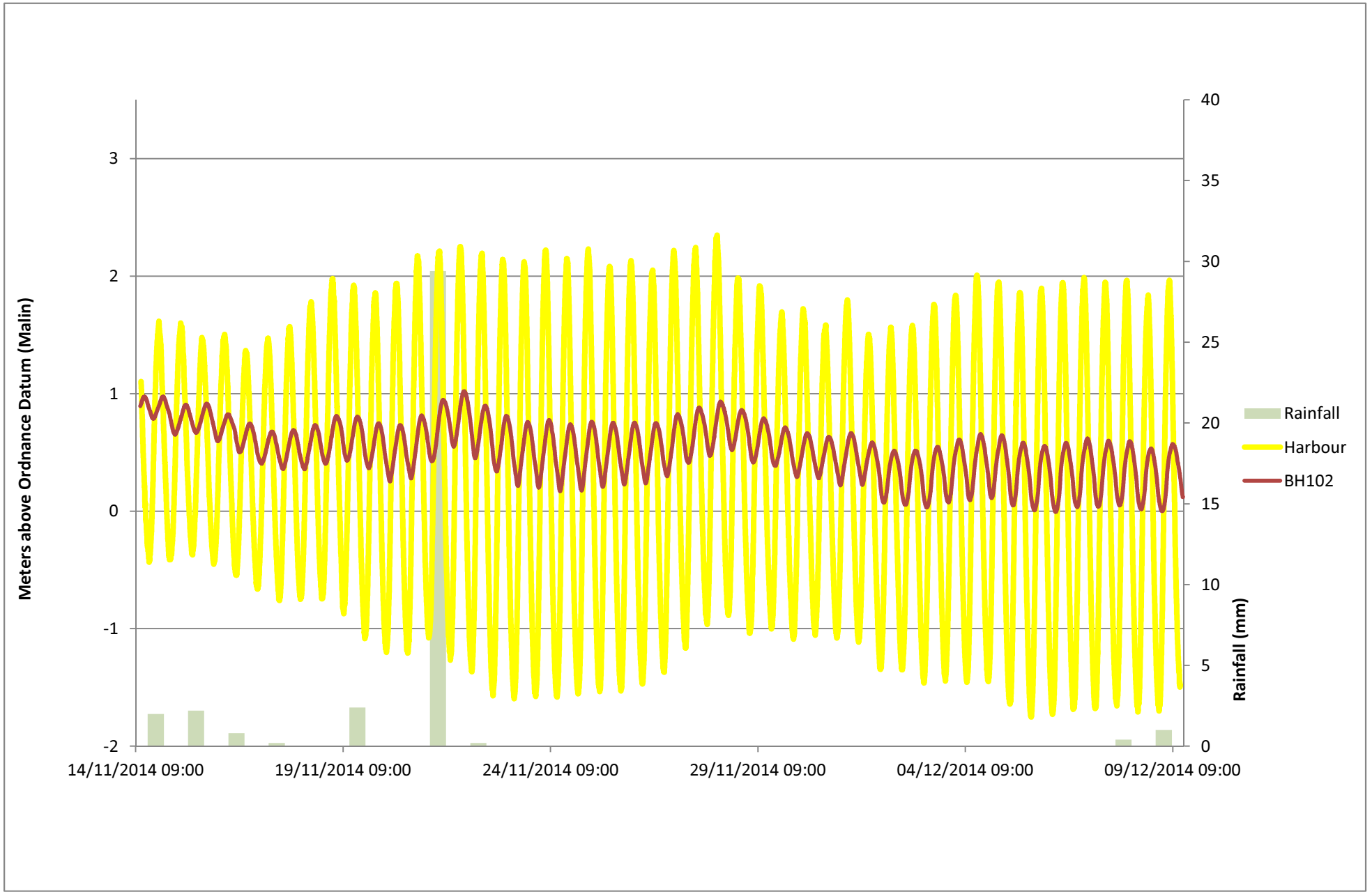

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH218

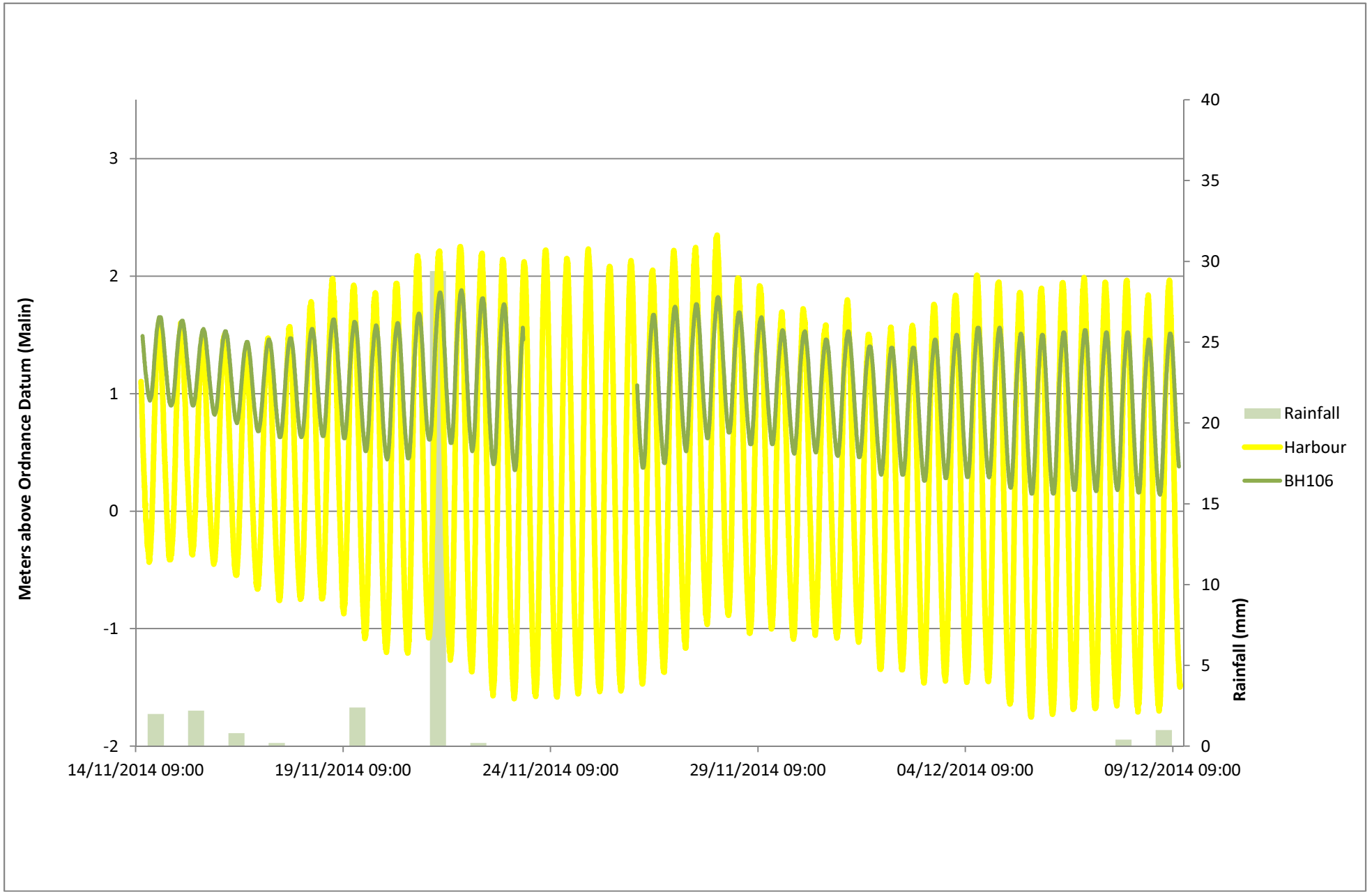

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH107A

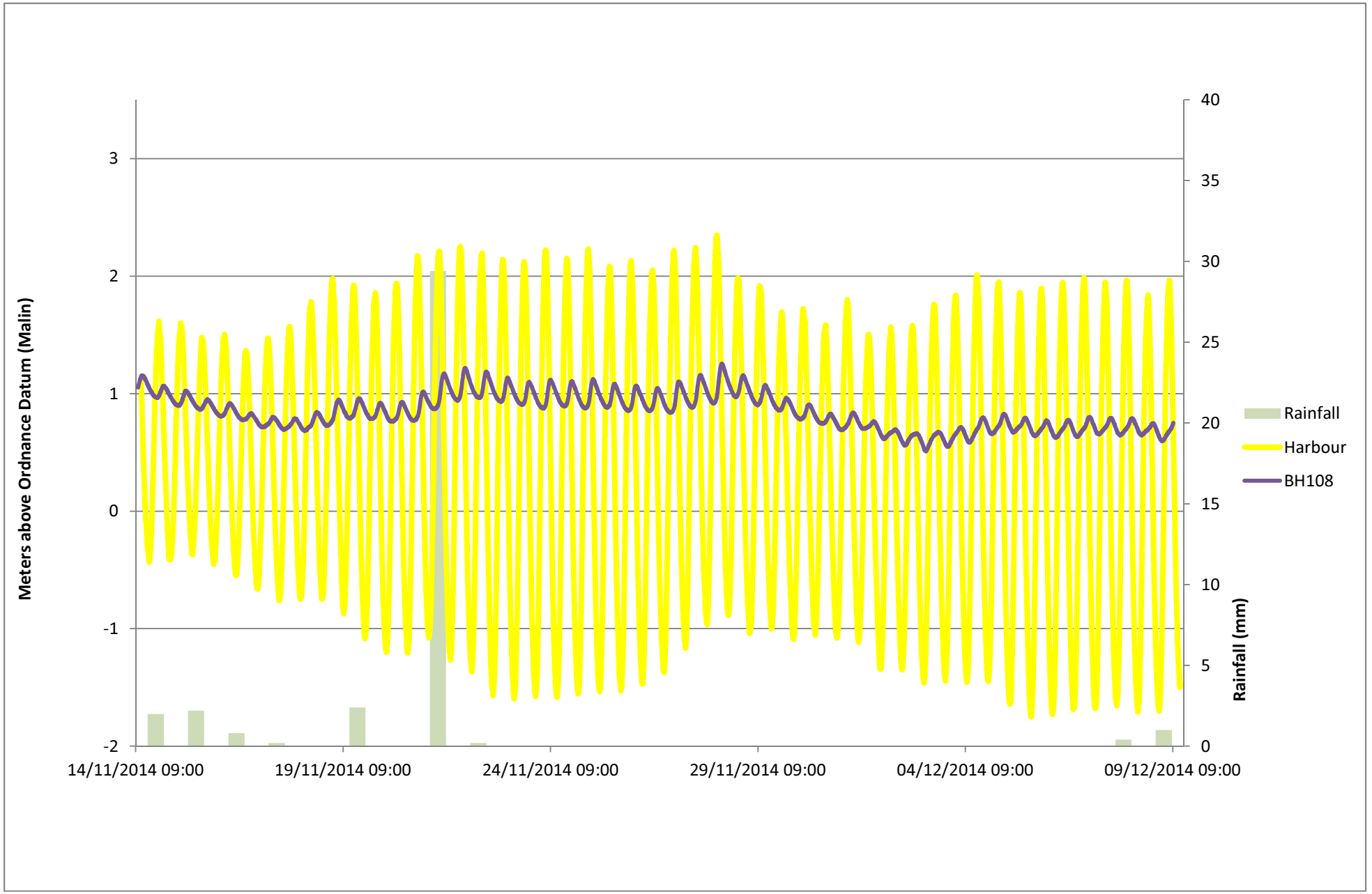
Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH204R

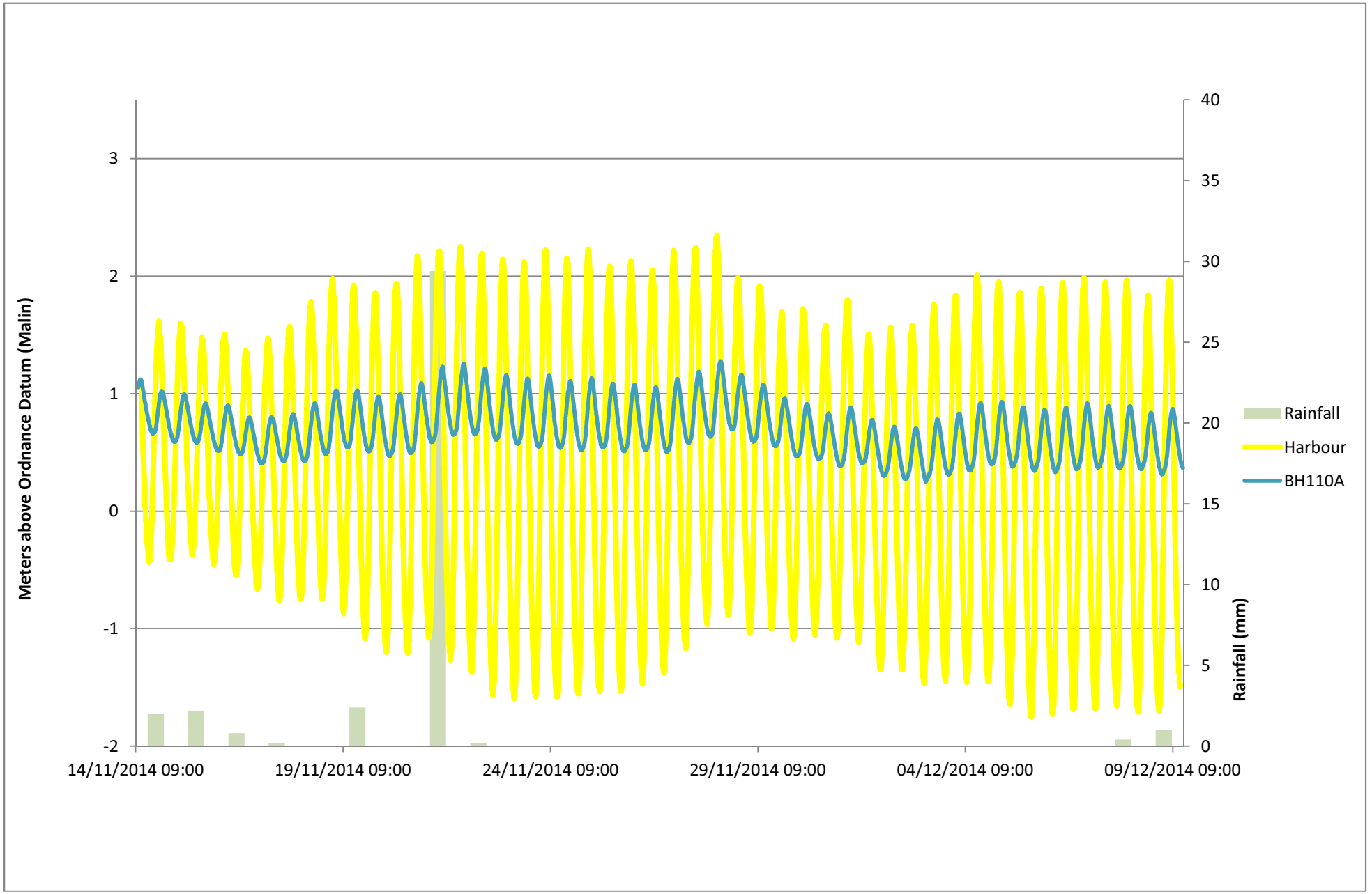

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH206

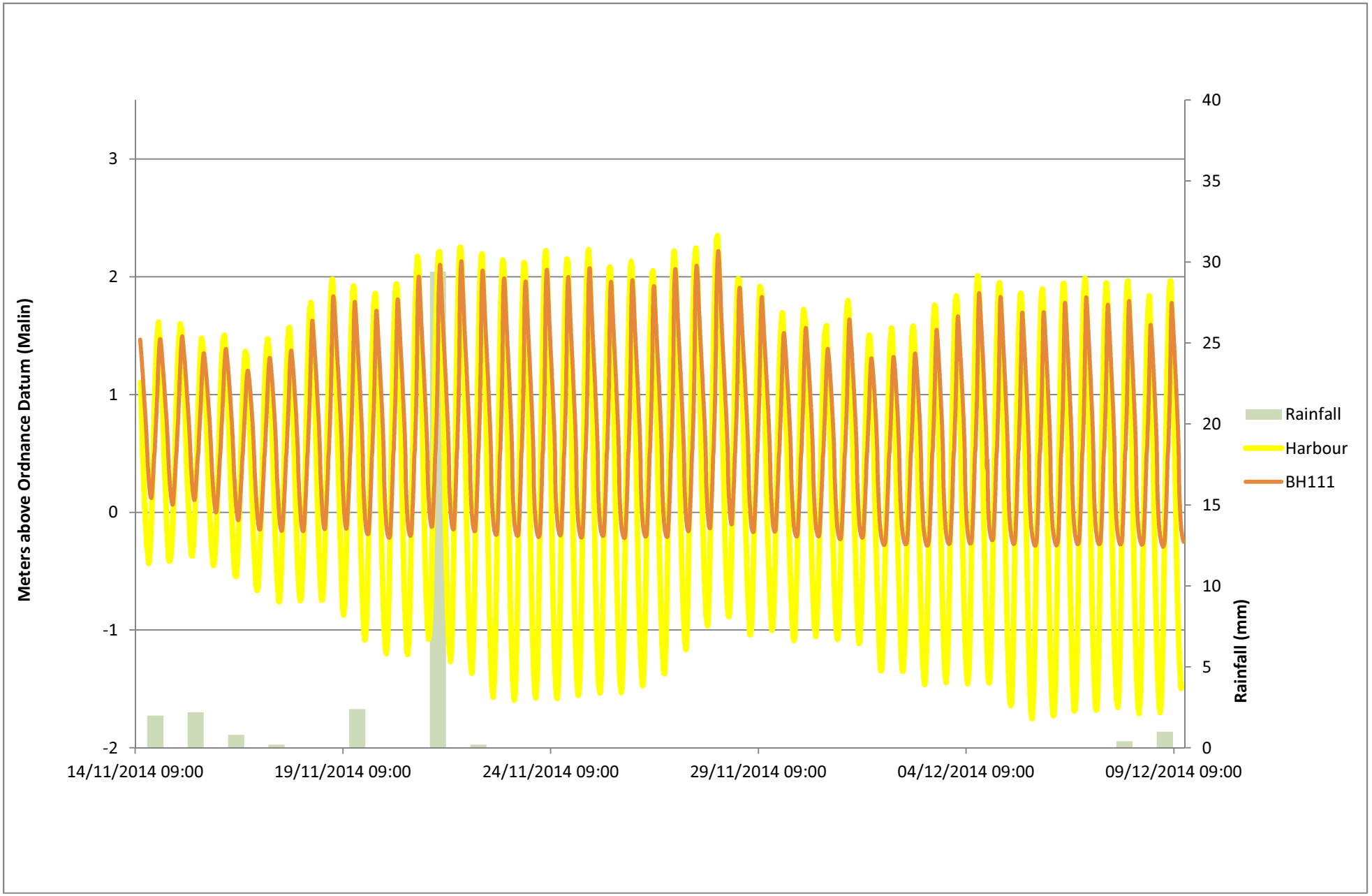

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH209R*

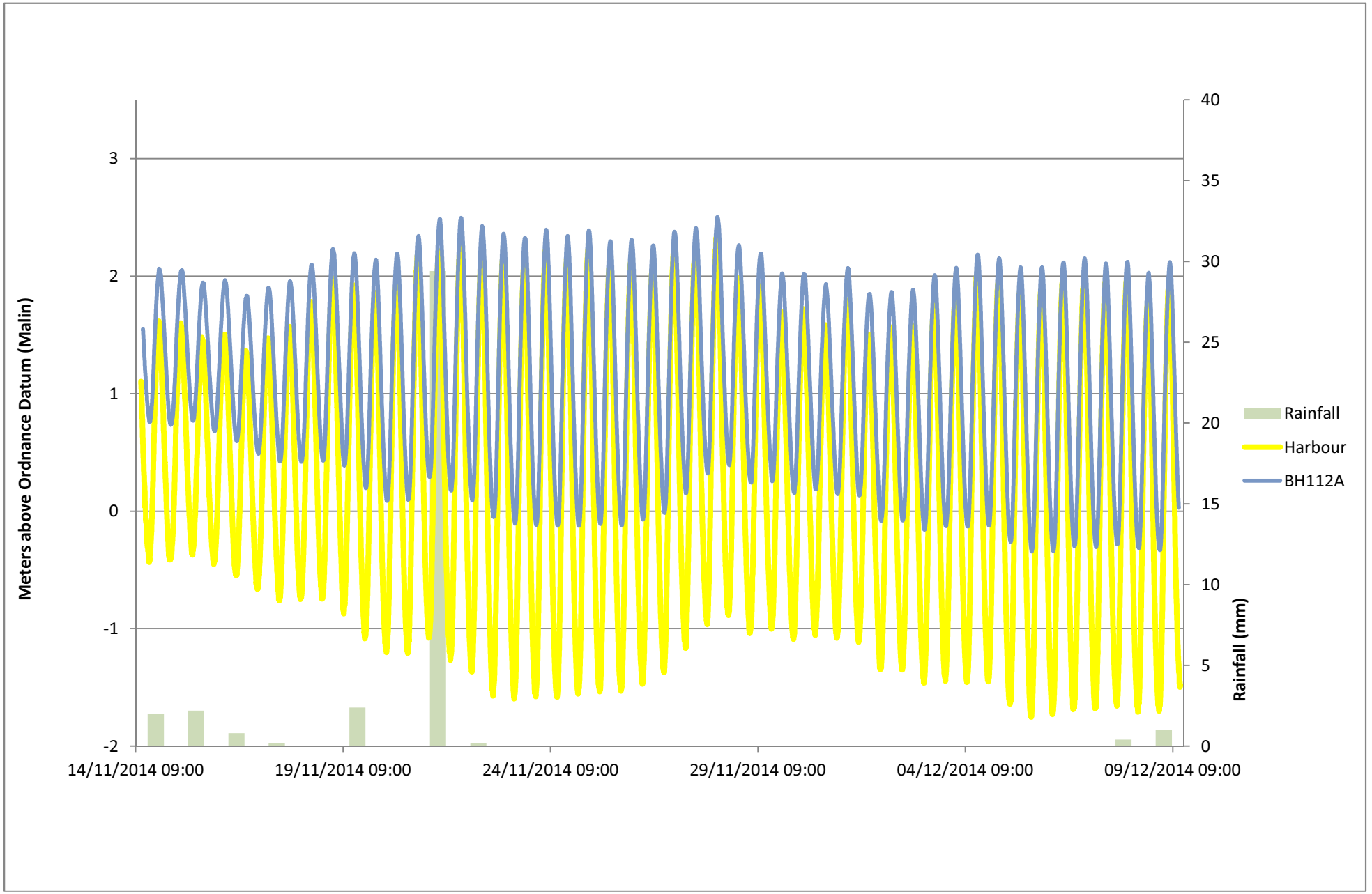

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH102


Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH106


Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH108

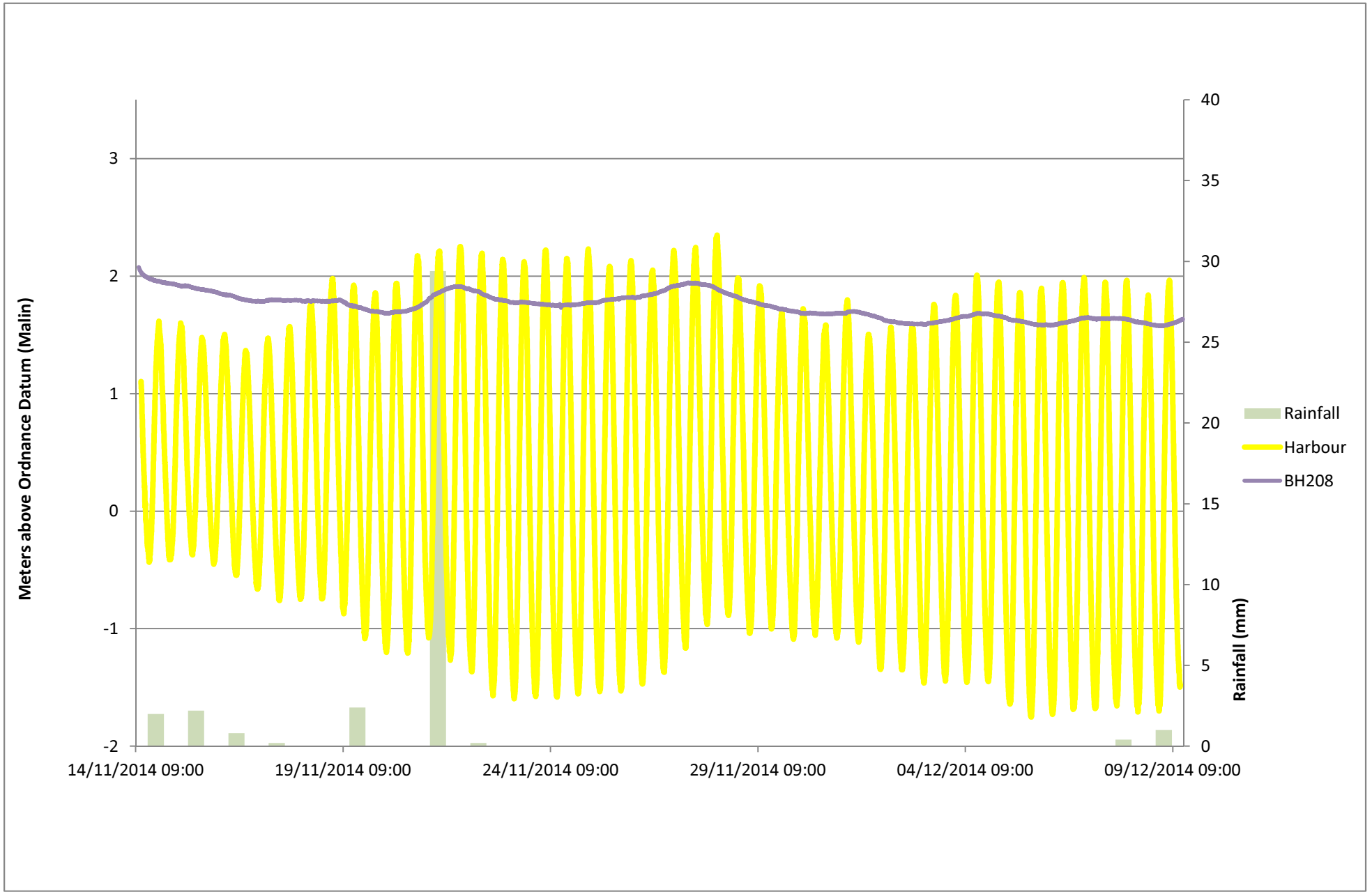

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH110A


Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH111

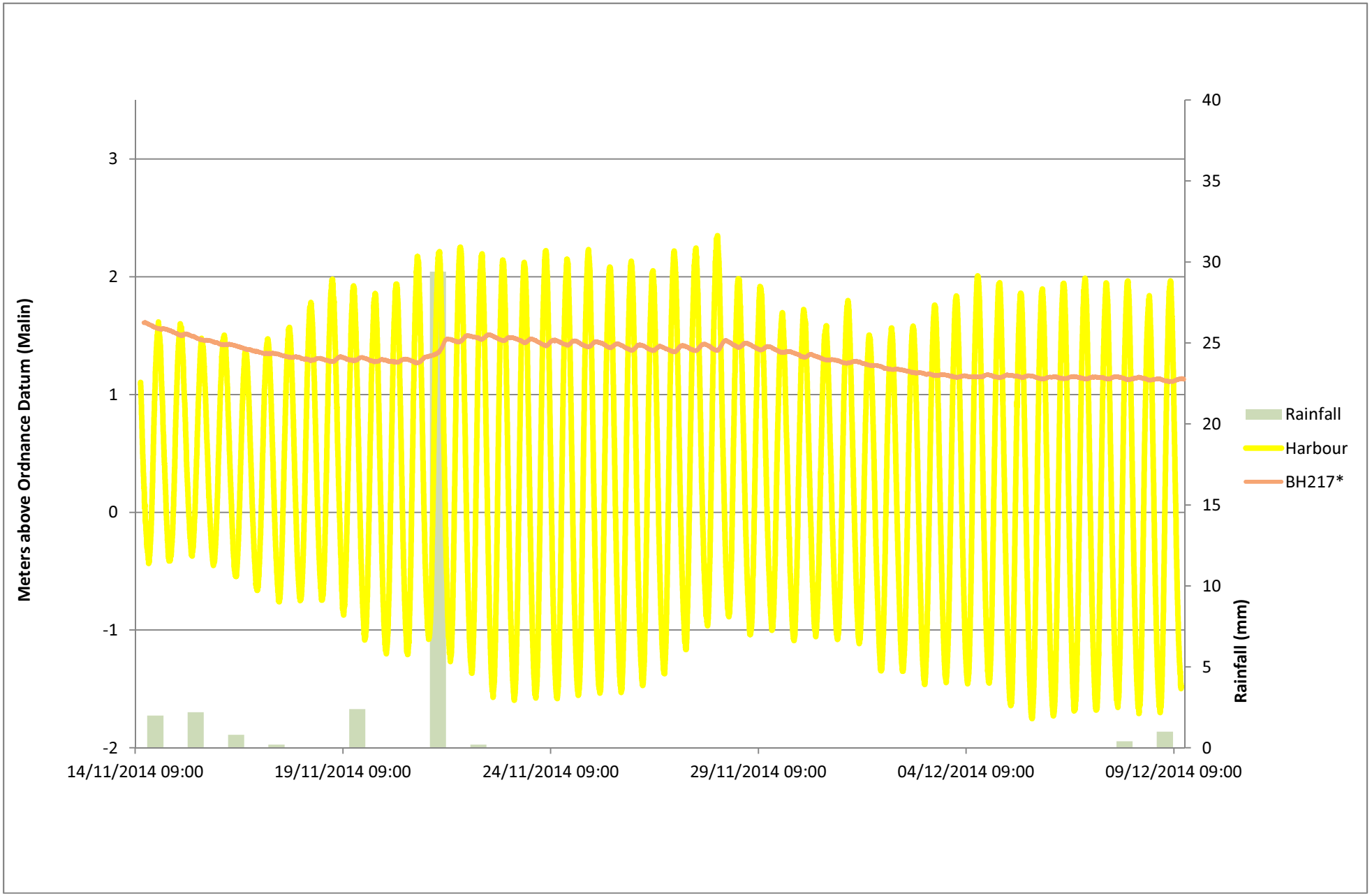

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH112A

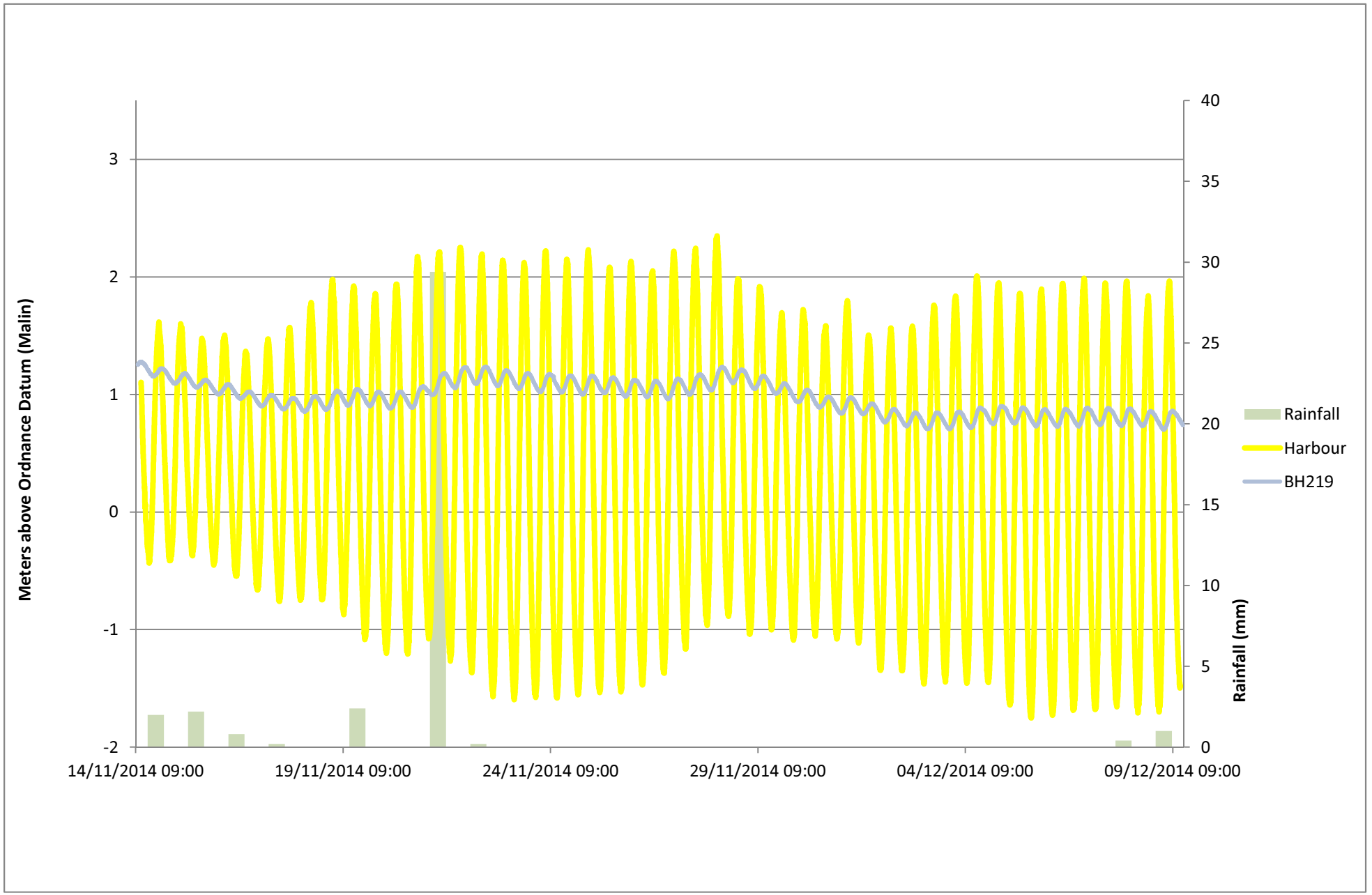
Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH114

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH202

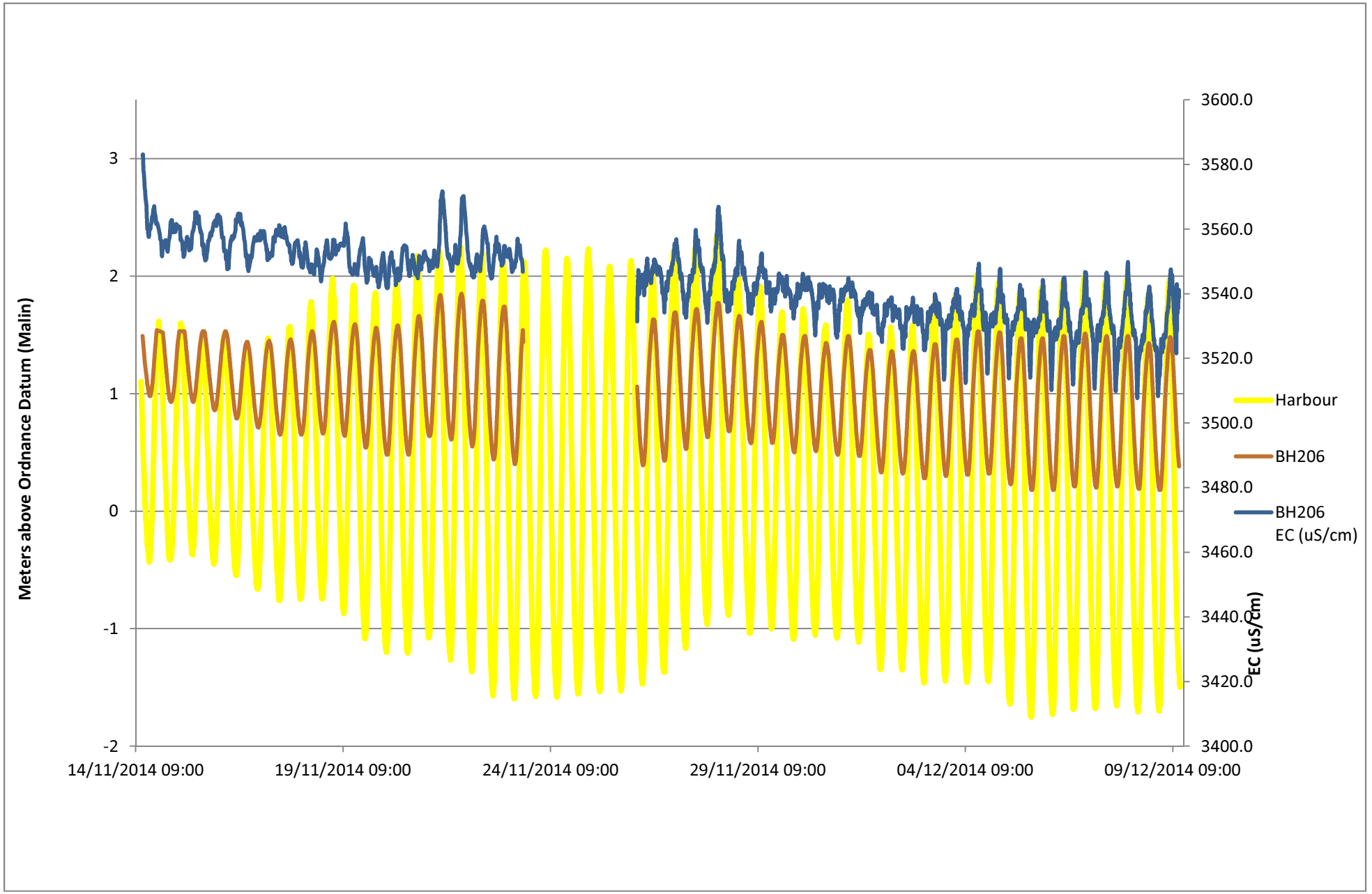

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH208

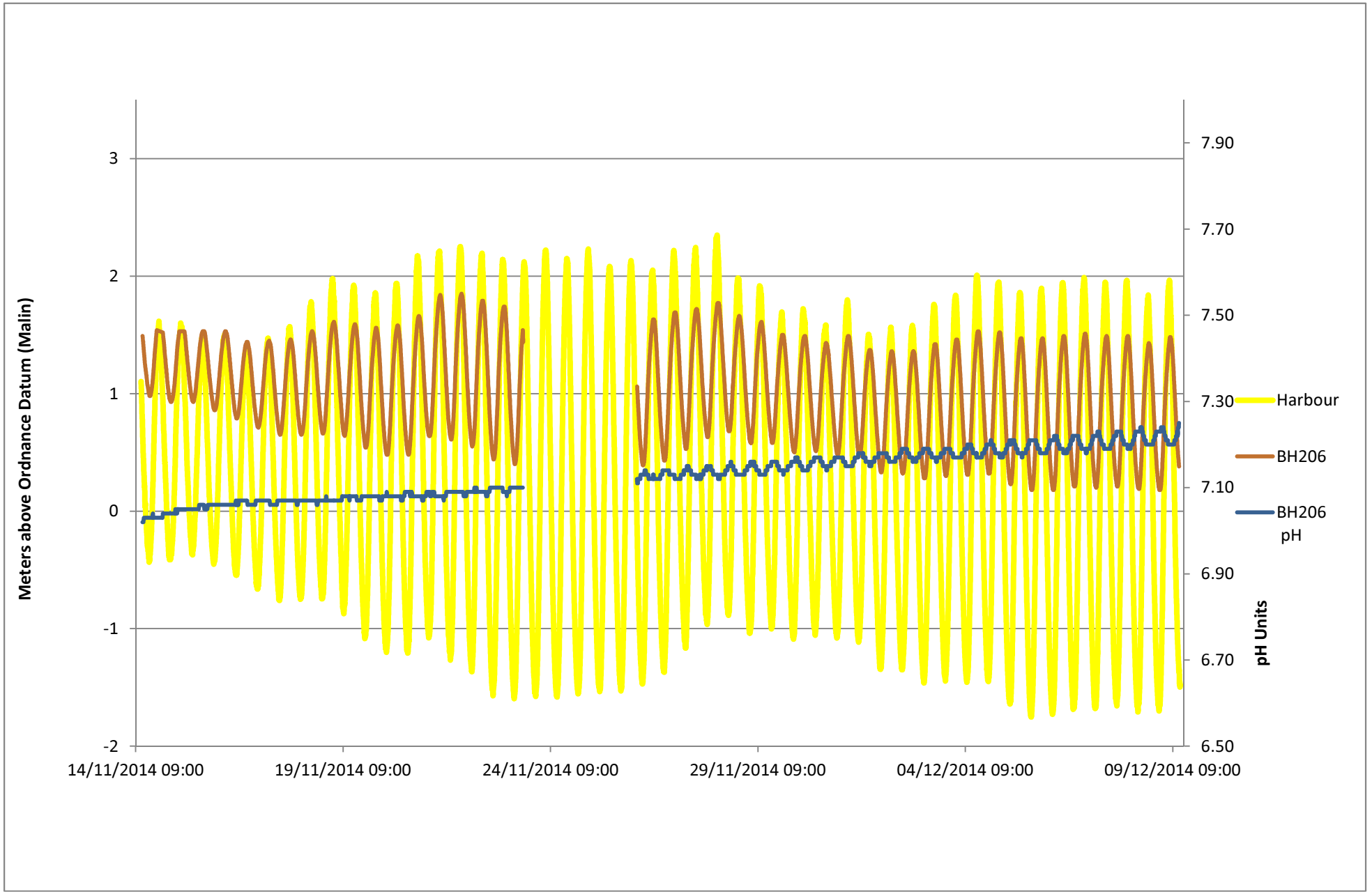
Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH214**

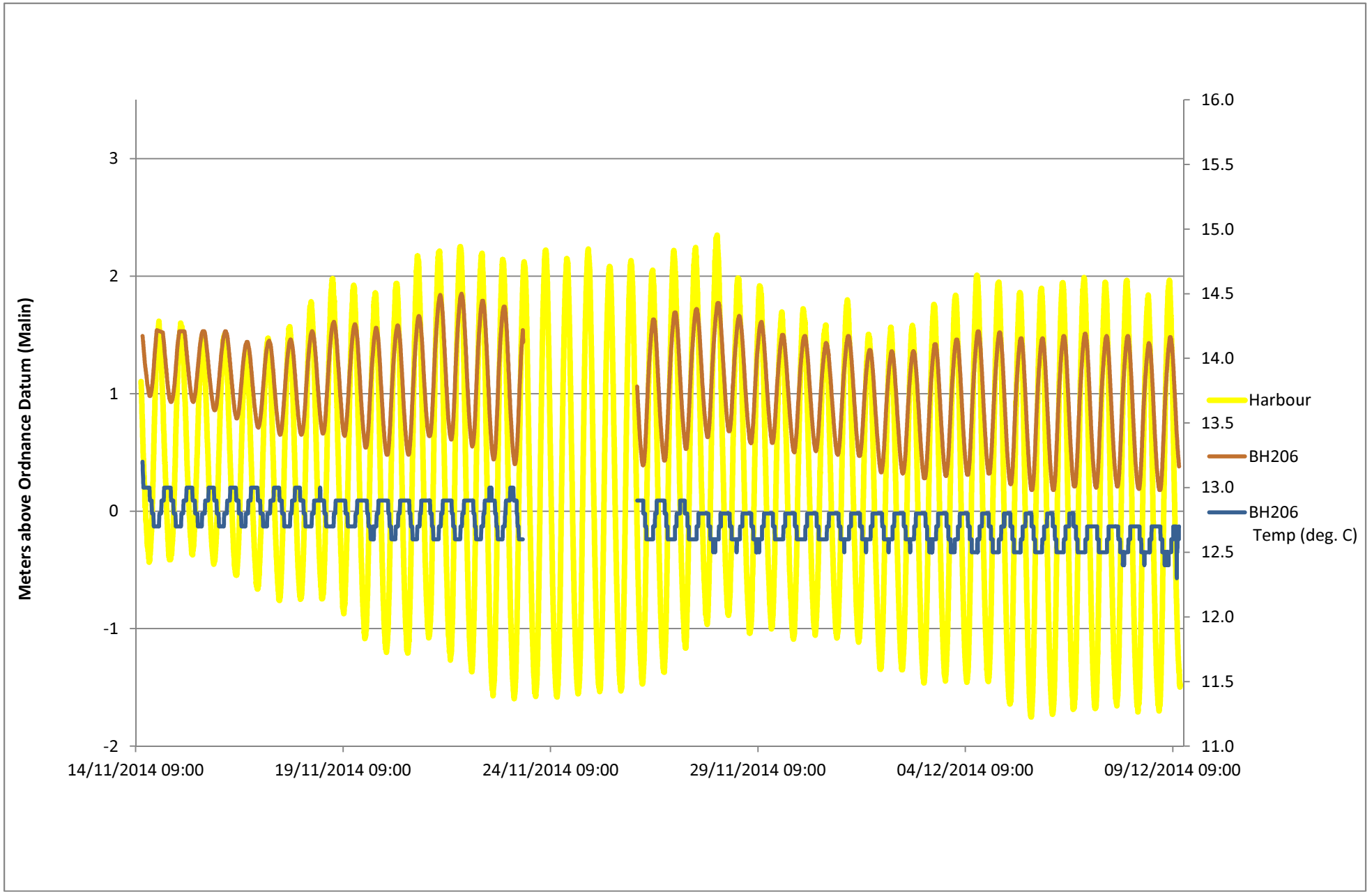

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH217*


Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Rainfall
Harbour
BH219

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
40
35
30
25
20
15
10
5
0
Rainfall (mm)
Rainfall
Harbour
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00

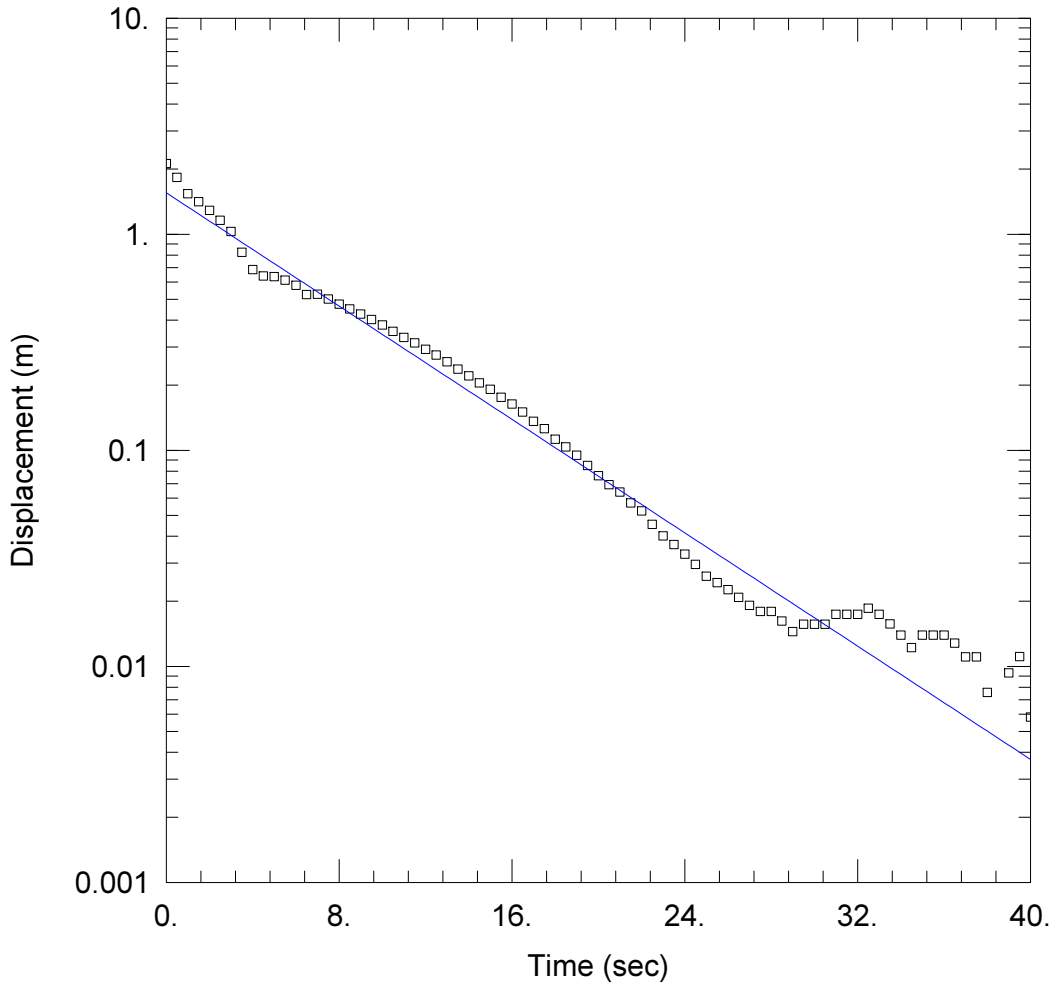

Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
3600.0
3580.0
3560.0
3540.0
3520.0
3500.0
3480.0
3460.0
3440.0
3420.0
3400.0
EC (uS/cm)
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Harbour
BH206
BH206 EC (uS/cm)


Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
7.90
7.70
7.50
7.30
7.10
6.90
6.70
6.50
pH Units
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Harbour
BH206
BH206 pH


Meters above Ordnance Datum (Malin)
3
2
1
0
-1
-2
16.0
15.5
15.0
14.5
14.0
13.5
13.0
12.5
12.0
11.5
11.0
14/11/2014 09:00
19/11/2014 09:00
24/11/2014 09:00
29/11/2014 09:00
04/12/2014 09:00
09/12/2014 09:00
Harbour
BH206
BH206
Temp (deg. C)

APPENDIX C

BH107A Falling Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 09:47:42

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH107A
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH107A)

Initial Displacement: 2.12 m
Total Well Penetration Depth: 9.34 m
Casing Radius: 0.025 m
Static Water Column Height: 9.34 m
Screen Length: 2.8 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 6.866 m/day
y0 = 1.554 m

Data Set:
Date: 12/17/14
Time: 12:22:28

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH107A

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH107A

X Location: 0. m
Y Location: 0. m

Initial Displacement: 2.12 m
Static Water Column Height: 9.34 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 2.8 m
Total Well Penetration Depth: 9.34 m

No. of Observations: 80

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	2.119	20.	0.07623
0.5	1.829	20.5	0.06924
1.	1.539	21.	0.06399
1.5	1.414	21.5	0.05699
2.	1.288	22.	0.05233
2.5	1.159	22.5	0.04534
3.	1.03	23.	0.04009
3.5	0.8233	23.5	0.0366
4.	0.6857	24.	0.0331
4.5	0.6408	24.5	0.02961
5.	0.6355	25.	0.02611
5.5	0.6128	25.5	0.02436
6.	0.5801	26.	0.02262
6.5	0.5253	26.5	0.02087
7.	0.527	27.	0.01913
7.5	0.5008	27.5	0.01797
8.	0.4751	28.	0.01797
8.5	0.4512	28.5	0.01623
9.	0.4267	29.	0.01448
9.5	0.4028	29.5	0.01565
10.	0.3806	30.	0.01566
10.5	0.355	30.5	0.01566
11.	0.3328	31.	0.01741
11.5	0.3136	31.5	0.01742
12.	0.2932	32.	0.01742
12.5	0.2757	32.5	0.0186
13.	0.257	33.	0.01743
13.5	0.2377	33.5	0.01569
14.	0.2208	34.	0.01394
14.5	0.2051	34.5	0.0122
15.	0.1917	35.	0.01395

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	0.1759	35.5	0.01396
16.	0.1637	36.	0.01396
16.5	0.1503	36.5	0.0128
17.	0.1363	37.	0.01105
17.5	0.1258	37.5	0.01106
18.	0.1124	38.	0.00756
18.5	0.1036	39.	0.00932
19.	0.09489	39.5	0.01108
19.5	0.08498	40.	0.00583

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.2119

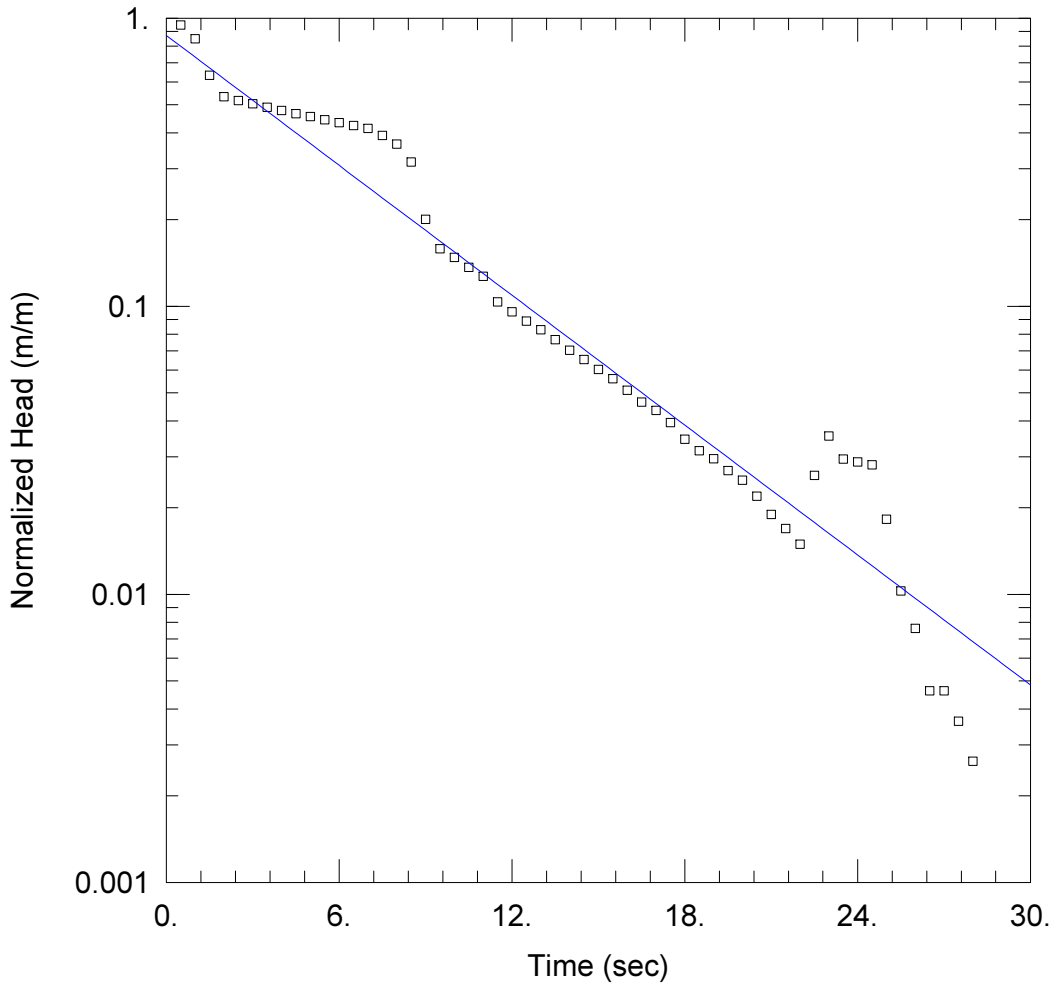
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.866	m/day
y0	1.554	m

K = 0.007946 cm/sec
T = K*b = 206. m²/day (23.84 sq. cm/sec)

BH107A Rising Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 15:41:27

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH107A
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH107A)

Initial Displacement: -1.76 m
Total Well Penetration Depth: 2.8 m
Casing Radius: 0.025 m
Static Water Column Height: 9.34 m
Screen Length: 2.8 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.873 m/day
y0 = -1.533 m

Data Set:
Date: 12/17/14
Time: 15:41:46

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH107A

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH107A

X Location: 0. m
Y Location: 0. m

Initial Displacement: -1.76 m
Static Water Column Height: 9.34 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 2.8 m
Total Well Penetration Depth: 2.8 m

No. of Observations: 57

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-1.76	14.5	-0.115
0.5	-1.665	15.	-0.1063
1.	-1.493	15.5	-0.09866
1.5	-1.116	16.	-0.08991
2.	-0.9382	16.5	-0.08173
2.5	-0.9108	17.	-0.07648
3.	-0.8869	17.5	-0.06948
3.5	-0.8641	18.	-0.06072
4.	-0.8419	18.5	-0.05547
4.5	-0.8209	19.	-0.05196
5.	-0.8023	19.5	-0.04729
5.5	-0.7818	20.	-0.04379
6.	-0.7643	20.5	-0.03853
6.5	-0.7468	21.	-0.03328
7.	-0.7282	21.5	-0.02977
7.5	-0.6885	22.	-0.02627
8.	-0.6436	22.5	-0.04551
8.5	-0.5578	23.	-0.06242
9.	-0.3525	23.5	-0.05192
9.5	-0.2784	24.	-0.05075
10.	-0.2597	24.5	-0.04958
10.5	-0.2405	25.	-0.03207
11.	-0.2235	25.5	-0.01807
11.5	-0.1821	26.	-0.0134
12.	-0.1681	26.5	-0.00814
12.5	-0.1564	27.	-0.00814
13.	-0.1459	27.5	-0.00638
13.5	-0.1349	28.	-0.00463
14.	-0.1238		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.2119

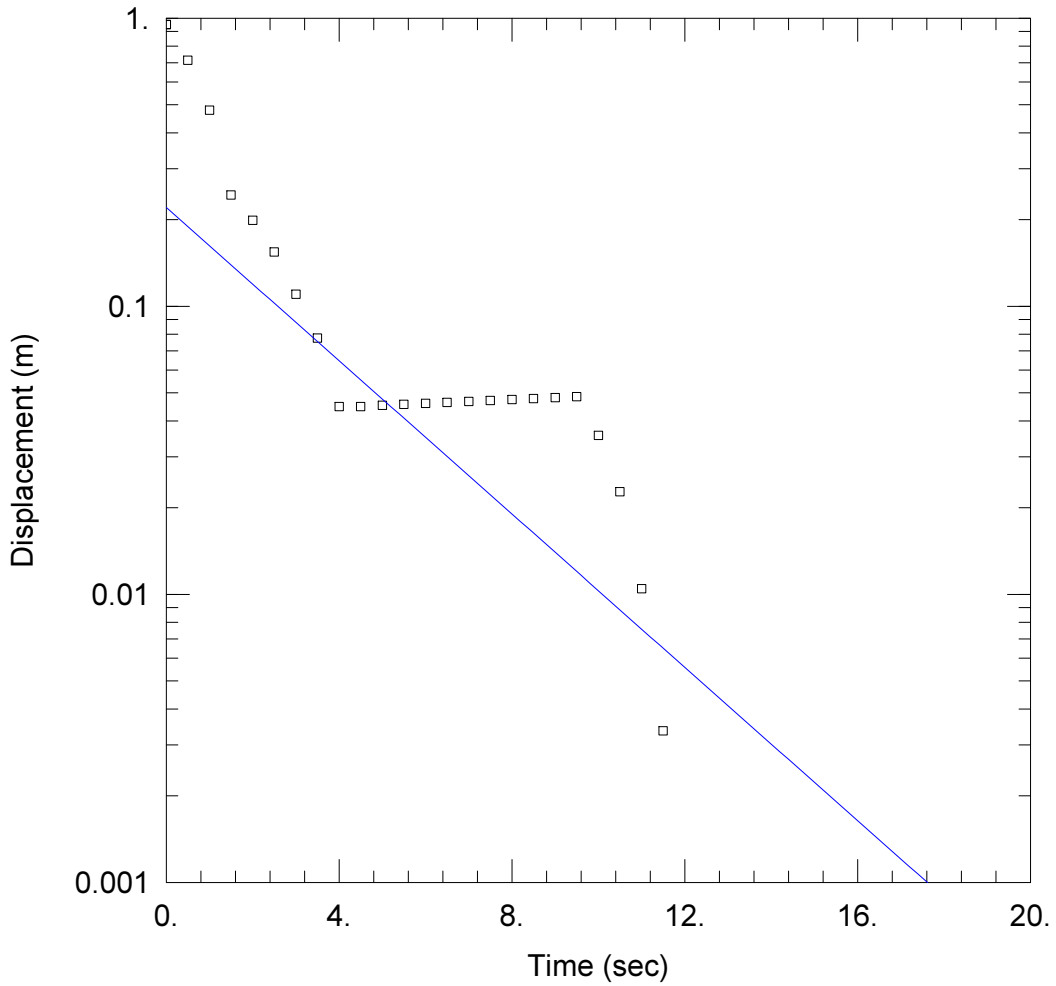
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	7.873	m/day
y0	-1.533	m

K = 0.009113 cm/sec
T = K*b = 236.2 m²/day (27.34 sq. cm/sec)

BH108 Falling Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 12:06:14

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH108
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH108)

Initial Displacement: 0.95 m
Total Well Penetration Depth: 6.9 m
Casing Radius: 0.025 m
Static Water Column Height: 5.55 m
Screen Length: 6.9 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 6.733 m/day
y0 = 0.22 m

Data Set:
Date: 12/17/14
Time: 12:11:23

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH108

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH108

X Location: 0. m
Y Location: 0. m

Initial Displacement: 0.95 m
Static Water Column Height: 5.55 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 6.9 m
Total Well Penetration Depth: 6.9 m

No. of Observations: 24

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	0.9508	6.	0.04597
0.5	0.715	6.5	0.04633
1.	0.4791	7.	0.04669
1.5	0.2432	7.5	0.04705
2.	0.1988	8.	0.04741
2.5	0.1544	8.5	0.04777
3.	0.11	9.	0.04814
3.5	0.07745	9.5	0.0485
4.	0.04489	10.	0.0356
4.5	0.04489	10.5	0.02271
5.	0.04525	11.	0.01046
5.5	0.04561	11.5	0.00336

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1779

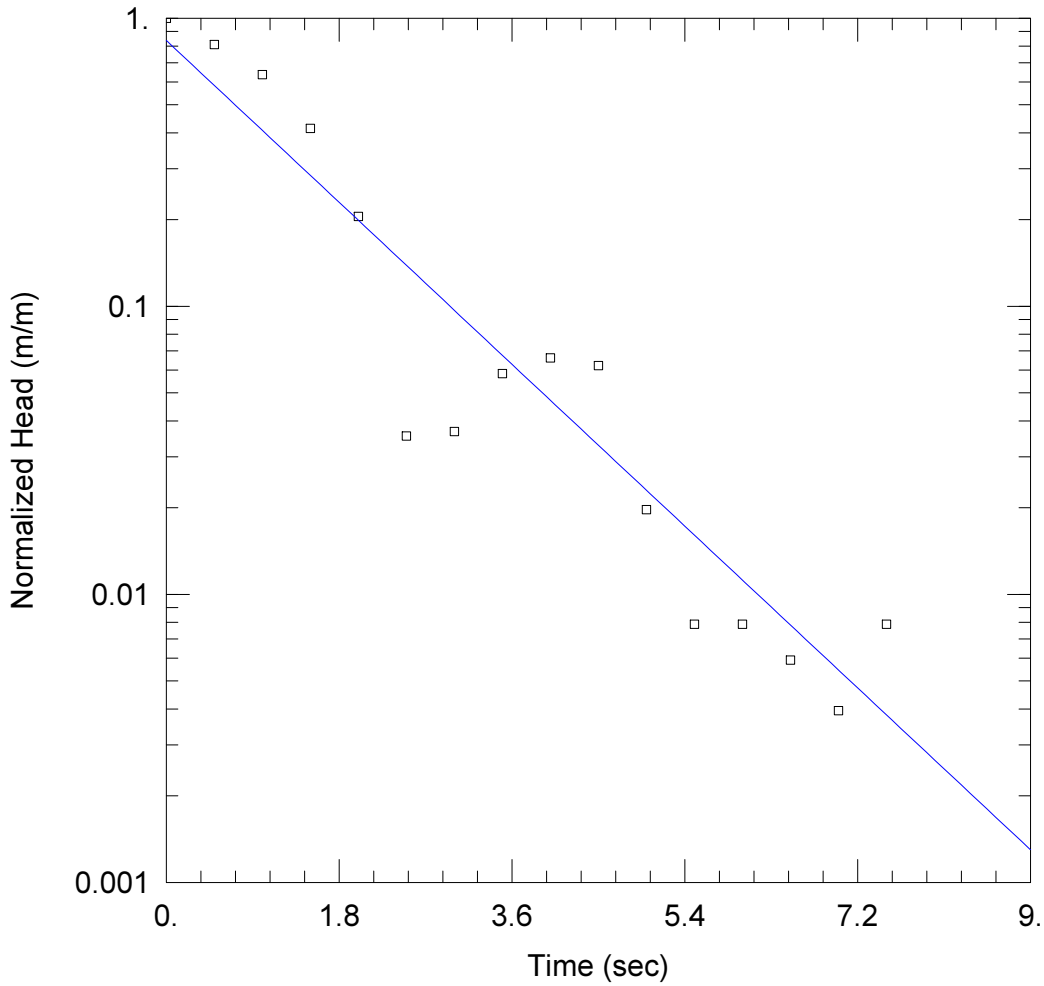
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	6.733	m/day
y0	0.22	m

K = 0.007793 cm/sec
T = K*b = 202. m²/day (23.38 sq. cm/sec)

BH108 Rising Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 15:15:40

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH108
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH 108)

Initial Displacement: -0.89 m Static Water Column Height: 5.55 m
Total Well Penetration Depth: 6.9 m Screen Length: 6.9 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev
K = 15.8 m/day y0 = -0.7442 m

Data Set:
Date: 12/17/14
Time: 15:15:58

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH108

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH 108

X Location: 0. m
Y Location: 0. m

Initial Displacement: -0.89 m
Static Water Column Height: 5.55 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 6.9 m
Total Well Penetration Depth: 6.9 m

No. of Observations: 19

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-0.8896	5.	-0.01751
0.5	-0.7209	5.5	-0.00701
1.	-0.5664	6.	-0.00701
1.5	-0.3687	6.5	-0.00526
2.	-0.1826	7.	-0.00351
2.5	-0.03152	7.5	-0.00701
3.	-0.03269	8.	-1.0E-5
3.5	-0.05193	8.5	0.00174
4.	-0.05893	9.	0.
4.5	-0.05543		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1779

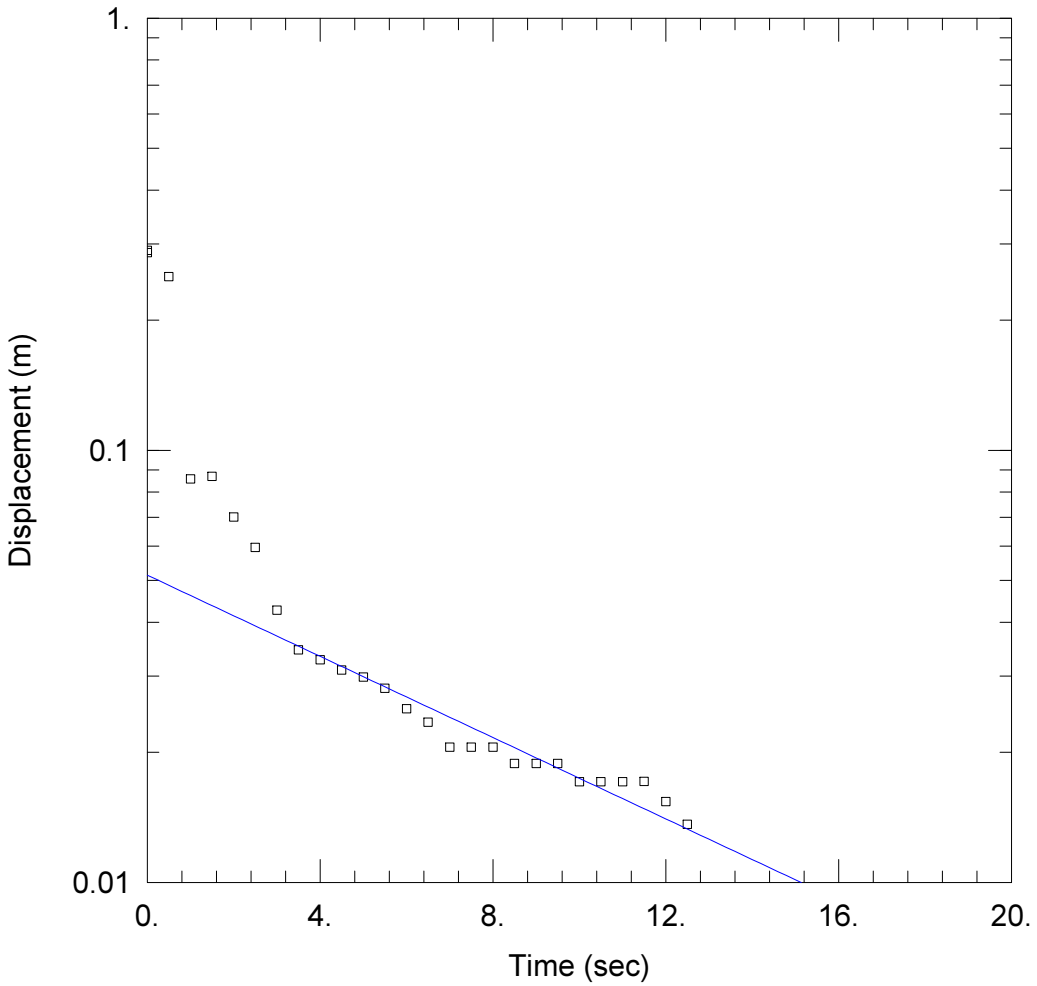
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	15.8	m/day
y0	-0.7442	m

K = 0.01829 cm/sec
T = K*b = 474. m²/day (54.86 sq. cm/sec)

BH111 Falling Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\111 FH.aqt
Date: 12/18/14 Time: 16:22:23

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH111
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 0.29 m
Total Well Penetration Depth: 4.5 m
Casing Radius: 0.025 m
Static Water Column Height: 2.59 m
Screen Length: 4.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.37 m/day
y0 = 0.05139 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\111 FH.aqt
Date: 12/18/14
Time: 16:23:00

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH111

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: New Well

X Location: 0. m
Y Location: 0. m

Initial Displacement: 0.29 m
Static Water Column Height: 2.59 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 4.5 m
Total Well Penetration Depth: 4.5 m

No. of Observations: 26

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	0.2865	6.5	0.02347
0.5	0.2521	7.	0.02056
1.	0.0858	7.5	0.02056
1.5	0.08698	8.	0.02057
2.	0.07007	8.5	0.01883
2.5	0.05958	9.	0.01883
3.	0.04267	9.5	0.01884
3.5	0.03451	10.	0.0171
4.	0.03276	10.5	0.01711
4.5	0.03102	11.	0.01711
5.	0.02986	11.5	0.01712
5.5	0.02812	12.	0.01538
6.	0.02521	12.5	0.01363

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1926

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.37	m/day
y0	0.05139	m

K = 0.003901 cm/sec
T = K*b = 101.1 m²/day (11.7 sq. cm/sec)

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	20.64	2.311	+/- 4.769	8.933	m/day
y0	0.2859	0.0192	+/- 0.03964	14.89	m

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = 0.02389 cm/sec
T = K*b = 619.3 m²/day (71.67 sq. cm/sec)

Parameter Correlations

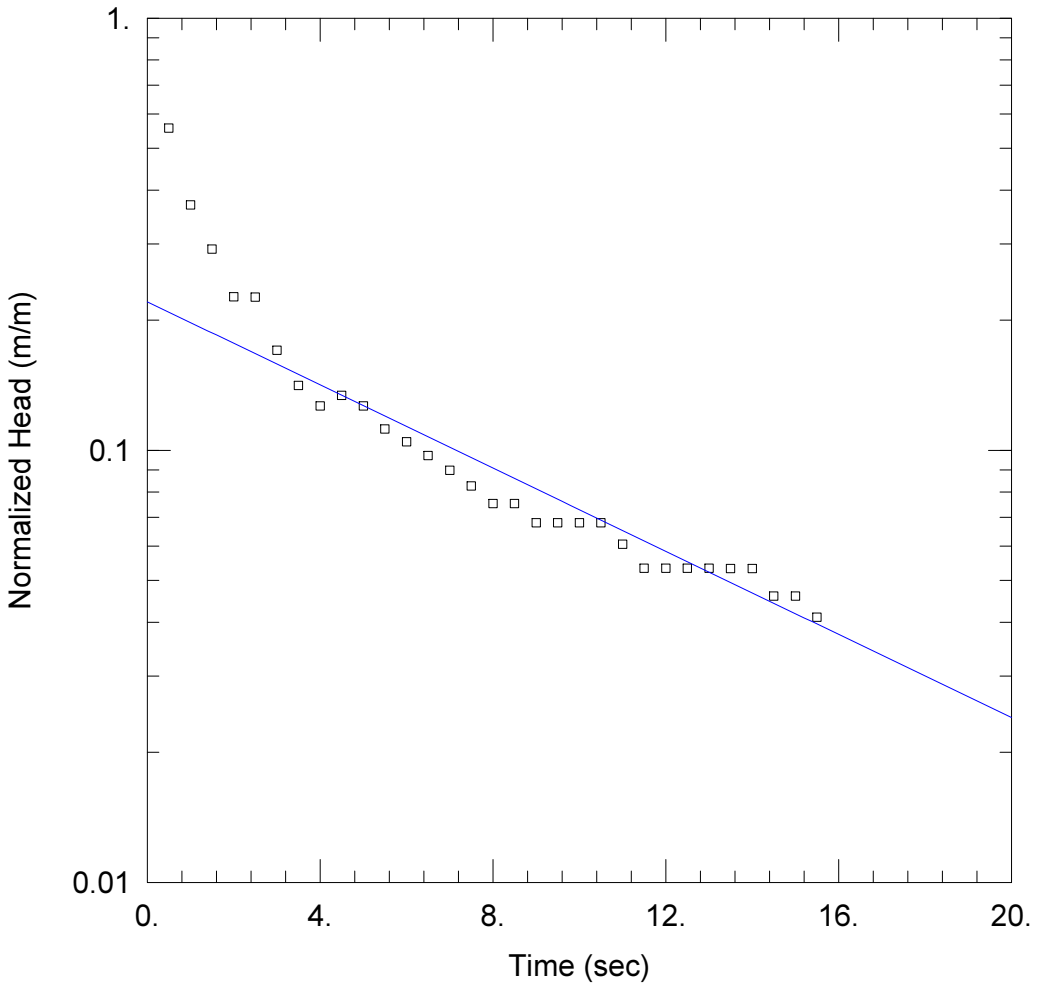
	K	y0
K	1.00	0.58
y0	0.58	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . . 0.01203 m^2
Variance. . . . . 0.0005011 m^2
Std. Deviation . . . . . 0.02239 m
Mean . . . . . 0.01116 m
No. of Residuals 26
No. of Estimates 2

BH111 Rising Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\111 RH.aqt
Date: 12/18/14 Time: 16:24:55

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH111
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH111)

Initial Displacement: -0.24 m
Total Well Penetration Depth: 4.5 m
Casing Radius: 0.025 m
Static Water Column Height: 2.59 m
Screen Length: 4.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.45 m/day
y0 = -0.05295 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\111 RH.aqt
Date: 12/18/14
Time: 16:25:14

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH111

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH111

X Location: 0. m
Y Location: 0. m

Initial Displacement: -0.24 m
Static Water Column Height: 2.59 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 4.5 m
Total Well Penetration Depth: 4.5 m

No. of Observations: 32

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-0.2434	8.	-0.01808
0.5	-0.1337	8.5	-0.01808
1.	-0.08876	9.	-0.01632
1.5	-0.07009	9.5	-0.01632
2.	-0.05433	10.	-0.01632
2.5	-0.05432	10.5	-0.01631
3.	-0.0409	11.	-0.01456
3.5	-0.03389	11.5	-0.01281
4.	-0.03038	12.	-0.0128
4.5	-0.03213	12.5	-0.0128
5.	-0.03037	13.	-0.0128
5.5	-0.02686	13.5	-0.01279
6.	-0.0251	14.	-0.01279
6.5	-0.02335	14.5	-0.01104
7.	-0.02159	15.	-0.01103
7.5	-0.01983	15.5	-0.00986

SOLUTION

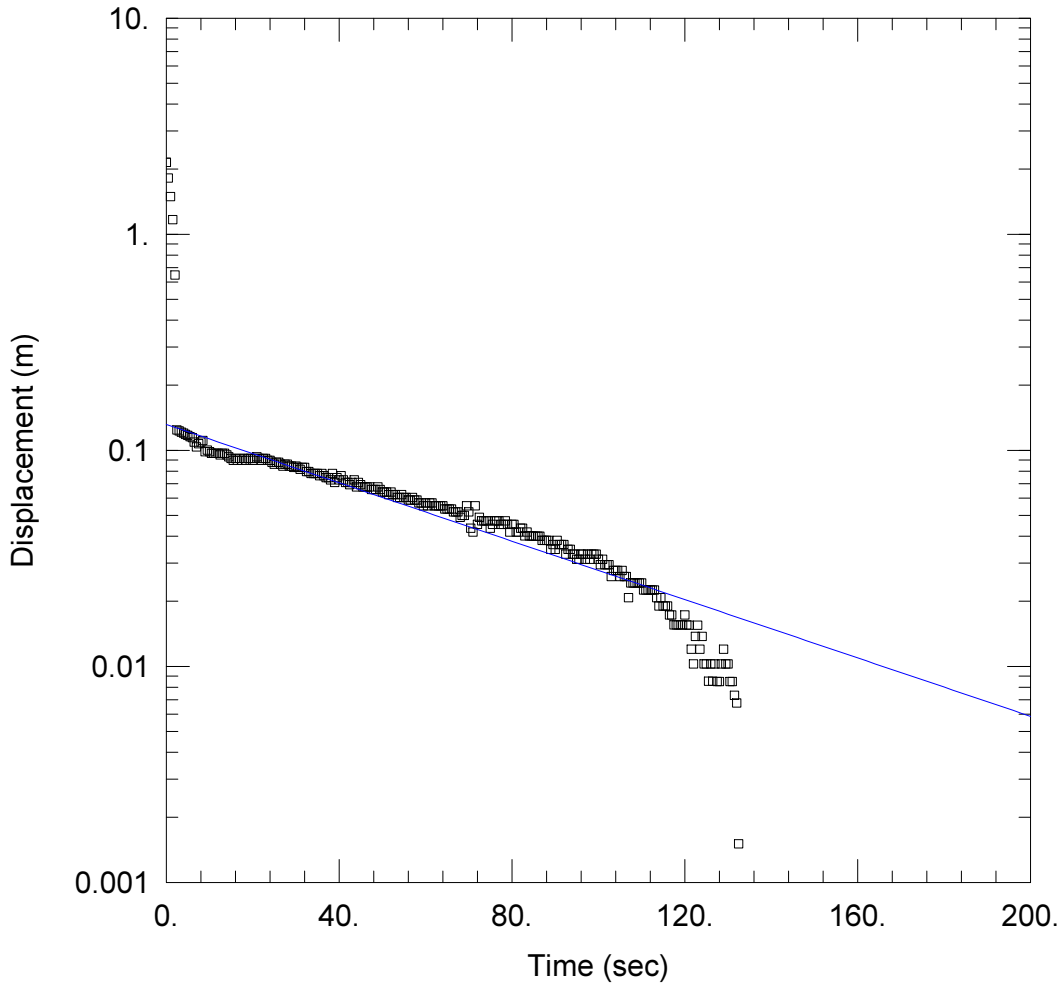
Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1926

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	3.45	m/day
y0	-0.05295	m

BH114 Falling Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 10:17:06

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH114
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH114)

Initial Displacement: 2.15 m
Total Well Penetration Depth: 4.5 m
Casing Radius: 0.025 m
Static Water Column Height: 3.93 m
Screen Length: 4.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.4845 m/day
y0 = 0.1317 m

Data Set:
Date: 12/17/14
Time: 12:13:21

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH114

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH114

X Location: 0. m
Y Location: 0. m

Initial Displacement: 2.15 m
Static Water Column Height: 3.93 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 4.5 m
Total Well Penetration Depth: 4.5 m

No. of Observations: 266

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	2.147	66.5	0.05178
0.5	1.821	67.	0.05178
1.	1.495	67.5	0.05178
1.5	1.17	68.	0.04886
2.	0.6469	68.5	0.05003
2.5	0.1242	69.	0.05003
3.	0.1228	69.5	0.05528
3.5	0.1214	70.	0.05178
4.	0.12	70.5	0.04361
4.5	0.1186	71.	0.04186
5.	0.1171	71.5	0.05527
5.5	0.1157	72.	0.04536
6.	0.1143	72.5	0.04886
6.5	0.109	73.	0.0471
7.	0.1038	73.5	0.0471
7.5	0.1073	74.	0.0471
8.	0.109	74.5	0.0471
8.5	0.1108	75.	0.0436
9.	0.09854	75.5	0.04535
9.5	0.1003	76.	0.0471
10.	0.09854	76.5	0.0471
10.5	0.09679	77.	0.0471
11.	0.09679	77.5	0.04535
11.5	0.09679	78.	0.04535
12.	0.09679	78.5	0.0471
12.5	0.09504	79.	0.04534
13.	0.09679	79.5	0.04184
13.5	0.09679	80.	0.04534
14.	0.09504	80.5	0.04534
14.5	0.09329	81.	0.04184
15.	0.09153	81.5	0.04184

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	0.08978	82.	0.04359
16.	0.09153	82.5	0.04359
16.5	0.08978	83.	0.04009
17.	0.09153	83.5	0.04184
17.5	0.08978	84.	0.04009
18.	0.09153	84.5	0.04009
18.5	0.08978	85.	0.04008
19.	0.09153	85.5	0.04008
19.5	0.09153	86.	0.04008
20.	0.08978	86.5	0.04008
20.5	0.09153	87.	0.03833
21.	0.09327	87.5	0.03833
21.5	0.09152	88.	0.03833
22.	0.08977	88.5	0.03833
22.5	0.09152	89.	0.03483
23.	0.09152	89.5	0.03658
23.5	0.08977	90.	0.03483
24.	0.08977	90.5	0.03833
24.5	0.08802	91.	0.03657
25.	0.08627	91.5	0.03657
25.5	0.08802	92.	0.03657
26.	0.08802	92.5	0.03307
26.5	0.08627	93.	0.03482
27.	0.08451	93.5	0.03482
27.5	0.08626	94.	0.03307
28.	0.08626	94.5	0.03307
28.5	0.08451	95.	0.03132
29.	0.08451	95.5	0.03132
29.5	0.08334	96.	0.03307
30.	0.08451	96.5	0.03307
30.5	0.08334	97.	0.03131
31.	0.08159	97.5	0.03306
31.5	0.08334	98.	0.03131
32.	0.08334	98.5	0.03306
32.5	0.07984	99.	0.03306
33.	0.07984	99.5	0.03306
33.5	0.07809	100.	0.03131
34.	0.07809	100.5	0.02956
34.5	0.07809	101.	0.03131
35.	0.07808	101.5	0.02956
35.5	0.07633	102.	0.02956
36.	0.07808	102.5	0.02956
36.5	0.07633	103.	0.02605
37.	0.07458	103.5	0.0278
37.5	0.07458	104.	0.0278
38.	0.07283	104.5	0.0278
38.5	0.07808	105.	0.02605
39.	0.07108	105.5	0.0278
39.5	0.07458	106.	0.02605
40.	0.07283	106.5	0.02605
40.5	0.07633	107.	0.0208
41.	0.07282	107.5	0.0243
41.5	0.07107	108.	0.0243
42.	0.07107	108.5	0.0243
42.5	0.06932	109.	0.02429
43.	0.07107	109.5	0.02429
43.5	0.07282	110.	0.02429
44.	0.06757	110.5	0.02254
44.5	0.07107	111.	0.02254
45.	0.06932	111.5	0.02254
45.5	0.06757	112.	0.02254
46.	0.06757	112.5	0.02254
46.5	0.06757	113.	0.02254
47.	0.06756	113.5	0.02079
47.5	0.06581	114.	0.01904
48.	0.06581	114.5	0.02079
48.5	0.06581	115.	0.01903

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
49.	0.06756	115.5	0.01903
49.5	0.06581	116.	0.01903
50.	0.06406	116.5	0.01728
50.5	0.06406	117.	0.01728
51.	0.06406	117.5	0.01553
51.5	0.06231	118.	0.01553
52.	0.06406	118.5	0.01553
52.5	0.06231	119.	0.01553
53.	0.0623	119.5	0.01553
53.5	0.06055	120.	0.01728
54.	0.06055	120.5	0.01553
54.5	0.0623	121.	0.01552
55.	0.06055	121.5	0.01202
55.5	0.06055	122.	0.01027
56.	0.0588	122.5	0.01377
56.5	0.0588	123.	0.01552
57.	0.06055	123.5	0.01202
57.5	0.0588	124.	0.01377
58.	0.0588	124.5	0.01027
58.5	0.05705	125.	0.01027
59.	0.05704	125.5	0.00852
59.5	0.05529	126.	0.01027
60.	0.05704	126.5	0.00852
60.5	0.05529	127.	0.01026
61.	0.05704	127.5	0.00851
61.5	0.05704	128.	0.00851
62.	0.05529	128.5	0.01026
62.5	0.05529	129.	0.01201
63.	0.05529	129.5	0.01026
63.5	0.05529	130.	0.01026
64.	0.05529	130.5	0.00851
64.5	0.05354	131.	0.00851
65.	0.05353	131.5	0.00734
65.5	0.05353	132.	0.00676
66.	0.05353	132.5	0.00151

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1926

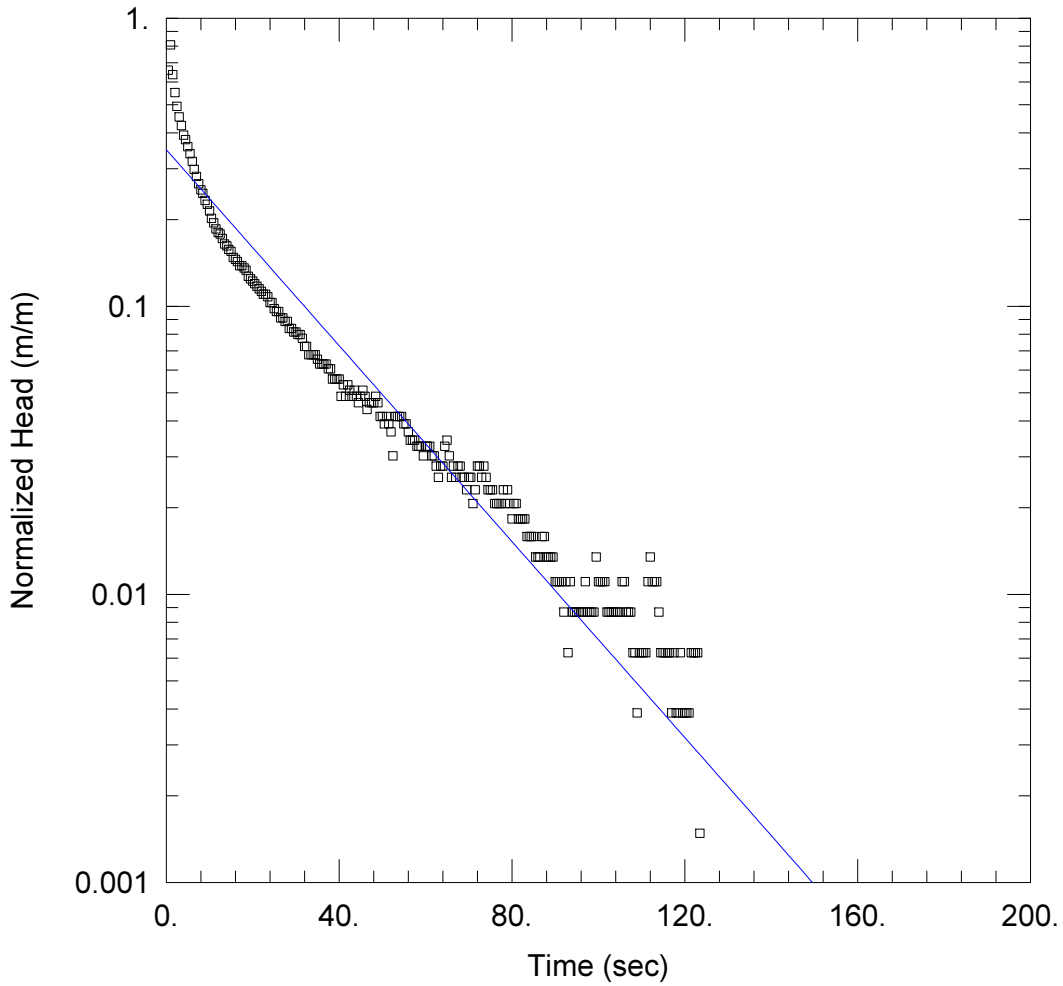
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.4845	m/day
y0	0.1317	m

K = 0.0005608 cm/sec
T = K*b = 14.54 m²/day (1.682 sq. cm/sec)

BH114 Rising Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 14:41:54

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH114
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH114)

Initial Displacement: -0.73 m
Total Well Penetration Depth: 2.5 m
Casing Radius: 0.025 m
Static Water Column Height: 3.93 m
Screen Length: 2.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.948 m/day
y0 = -0.255 m

Data Set:
Date: 12/17/14
Time: 14:42:11

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH114

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH114

X Location: 0. m
Y Location: 0. m

Initial Displacement: -0.73 m
Static Water Column Height: 3.93 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 2.5 m
Total Well Penetration Depth: 2.5 m

No. of Observations: 248

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-0.739	62.	-0.02208
0.5	-0.4812	62.5	-0.02033
1.	-0.5897	63.	-0.01858
1.5	-0.4643	63.5	-0.02033
2.	-0.4024	64.	-0.02033
2.5	-0.361	64.5	-0.02383
3.	-0.3318	65.	-0.025
3.5	-0.3091	65.5	-0.02208
4.	-0.2869	66.	-0.01858
4.5	-0.2764	66.5	-0.02033
5.	-0.2612	67.	-0.01858
5.5	-0.2473	67.5	-0.02033
6.	-0.2321	68.	-0.02033
6.5	-0.2181	68.5	-0.01858
7.	-0.2058	69.	-0.01858
7.5	-0.1942	69.5	-0.01683
8.	-0.185	70.	-0.01858
8.5	-0.18	70.5	-0.01858
9.	-0.17	71.	-0.01508
9.5	-0.165	71.5	-0.01683
10.	-0.1563	72.	-0.02033
10.5	-0.1475	72.5	-0.02033
11.	-0.1422	73.	-0.01858
11.5	-0.1353	73.5	-0.02033
12.	-0.1318	74.	-0.01858
12.5	-0.13	74.5	-0.01683
13.	-0.1253	75.	-0.01683
13.5	-0.1201	75.5	-0.01683
14.	-0.1183	76.	-0.01508
14.5	-0.1148	76.5	-0.01508
15.	-0.1131	77.	-0.01508

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	-0.1078	77.5	-0.01508
16.	-0.1061	78.	-0.01683
16.5	-0.1043	78.5	-0.01508
17.	-0.1008	79.	-0.01683
17.5	-0.1008	79.5	-0.01508
18.	-0.09908	80.	-0.01333
18.5	-0.09733	80.5	-0.01508
19.	-0.09267	81.	-0.01508
19.5	-0.09092	81.5	-0.01333
20.	-0.08917	82.	-0.01333
20.5	-0.08742	82.5	-0.01333
21.	-0.08567	83.	-0.01333
21.5	-0.08392	83.5	-0.01158
22.	-0.08217	84.	-0.01158
22.5	-0.08042	84.5	-0.01158
23.	-0.08042	85.	-0.01158
23.5	-0.07867	85.5	-0.00983
24.	-0.07517	86.	-0.00983
24.5	-0.07517	86.5	-0.00983
25.	-0.07167	87.	-0.01158
25.5	-0.06992	87.5	-0.01158
26.	-0.06992	88.	-0.00983
26.5	-0.06642	88.5	-0.00983
27.	-0.06642	89.	-0.00983
27.5	-0.06467	89.5	-0.00983
28.	-0.06467	90.	-0.00808
28.5	-0.06117	90.5	-0.00808
29.	-0.06117	91.	-0.00808
29.5	-0.05942	91.5	-0.00808
30.	-0.05942	92.	-0.00633
30.5	-0.05825	92.5	-0.00808
31.	-0.05825	93.	-0.00458
31.5	-0.0565	93.5	-0.00808
32.	-0.053	94.	-0.00633
32.5	-0.053	94.5	-0.00633
33.	-0.0495	95.	-0.00633
33.5	-0.0495	95.5	-0.00633
34.	-0.0495	96.	-0.00633
34.5	-0.0495	96.5	-0.00633
35.	-0.04775	97.	-0.00808
35.5	-0.046	97.5	-0.00633
36.	-0.046	98.	-0.00633
36.5	-0.046	98.5	-0.00633
37.	-0.046	99.	-0.00633
37.5	-0.04425	99.5	-0.00983
38.	-0.04425	100.	-0.00808
38.5	-0.04075	100.5	-0.00808
39.	-0.04075	101.	-0.00808
39.5	-0.04075	101.5	-0.00808
40.	-0.04075	102.	-0.00633
40.5	-0.0355	102.5	-0.00633
41.	-0.039	103.	-0.00633
41.5	-0.0355	103.5	-0.00633
42.	-0.039	104.	-0.00633
42.5	-0.03725	104.5	-0.00633
43.	-0.0355	105.	-0.00633
43.5	-0.03725	105.5	-0.00808
44.	-0.0355	106.	-0.00808
44.5	-0.03375	106.5	-0.00633
45.	-0.0355	107.	-0.00633
45.5	-0.03725	107.5	-0.00633
46.	-0.0355	108.	-0.00458
46.5	-0.032	108.5	-0.00458
47.	-0.03375	109.	-0.00283
47.5	-0.03375	109.5	-0.00458
48.	-0.03375	110.	-0.00458
48.5	-0.0355	110.5	-0.00458

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
49.	-0.03375	111.	-0.00458
49.5	-0.03025	111.5	-0.00808
50.	-0.03025	112.	-0.00983
50.5	-0.0285	112.5	-0.00808
51.	-0.03025	113.	-0.00808
51.5	-0.0285	113.5	-0.00808
52.	-0.02675	114.	-0.00633
52.5	-0.02208	114.5	-0.00458
53.	-0.03025	115.	-0.00458
53.5	-0.03025	115.5	-0.00458
54.	-0.03025	116.	-0.00458
54.5	-0.03025	116.5	-0.00458
55.	-0.0285	117.	-0.00283
55.5	-0.0285	117.5	-0.00458
56.	-0.02675	118.	-0.00283
56.5	-0.025	118.5	-0.00283
57.	-0.025	119.	-0.00458
57.5	-0.025	119.5	-0.00283
58.	-0.02383	120.	-0.00283
58.5	-0.02383	120.5	-0.00283
59.	-0.02383	121.	-0.00283
59.5	-0.02208	121.5	-0.00458
60.	-0.02383	122.	-0.00458
60.5	-0.02383	122.5	-0.00458
61.	-0.02383	123.	-0.00458
61.5	-0.02208	123.5	-0.00108

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.2171

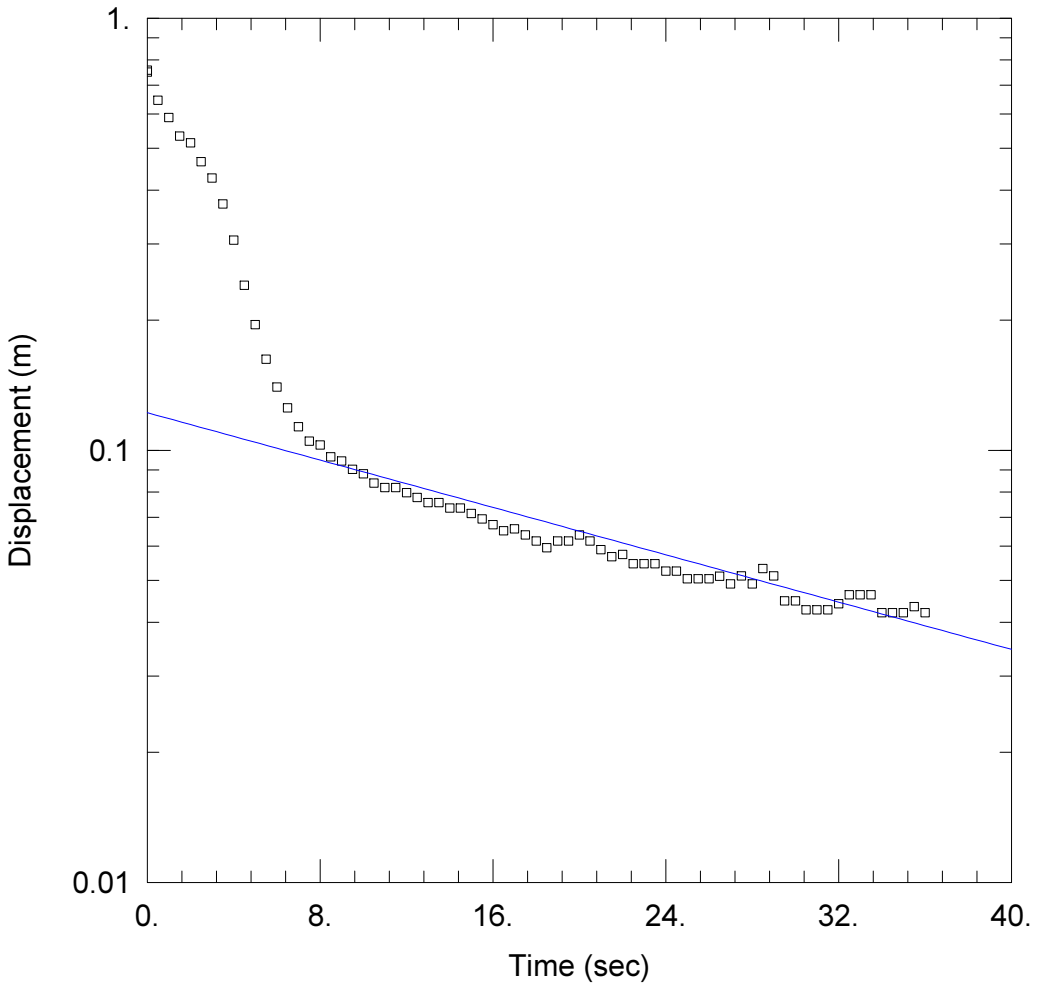
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.948	m/day
y0	-0.255	m

K = 0.002254 cm/sec
T = K*b = 58.43 m²/day (6.762 sq. cm/sec)

BH204R Falling Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\204R FH.aqt
Date: 12/18/14 Time: 16:27:21

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH204R
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH204R)

Initial Displacement: 0.75 m
Total Well Penetration Depth: 5.85 m
Casing Radius: 0.025 m
Static Water Column Height: 5.49 m
Screen Length: 5. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.9018 m/day
y0 = 0.1221 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\204R FH.aqt
Date: 12/18/14
Time: 16:27:40

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH204R

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH204R

X Location: 0. m
Y Location: 0. m

Initial Displacement: 0.75 m
Static Water Column Height: 5.49 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 5. m
Total Well Penetration Depth: 5.85 m

No. of Observations: 73

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	0.7581	18.5	0.05953
0.5	0.6456	19.	0.06163
1.	0.5893	19.5	0.06163
1.5	0.5331	20.	0.06373
2.	0.5145	20.5	0.06163
2.5	0.4655	21.	0.05884
3.	0.4266	21.5	0.05674
3.5	0.3716	22.	0.05744
4.	0.3066	22.5	0.05464
4.5	0.2408	23.	0.05465
5.	0.1953	23.5	0.05465
5.5	0.1624	24.	0.05255
6.	0.14	24.5	0.05255
6.5	0.1253	25.	0.05045
7.	0.1134	25.5	0.05045
7.5	0.105	26.	0.05045
8.	0.1029	26.5	0.05114
8.5	0.09661	27.	0.04906
9.	0.09451	27.5	0.05116
9.5	0.09031	28.	0.04906
10.	0.08821	28.5	0.05326
10.5	0.08401	29.	0.05116
11.	0.08192	29.5	0.04486
11.5	0.08192	30.	0.04486
12.	0.07982	30.5	0.04276
12.5	0.07772	31.	0.04276
13.	0.07562	31.5	0.04276
13.5	0.07562	32.	0.04416
14.	0.07352	32.5	0.04626
14.5	0.07352	33.	0.04626
15.	0.07142	33.5	0.04626

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	0.06932	34.	0.04206
16.	0.06722	34.5	0.04206
16.5	0.06512	35.	0.04207
17.	0.06583	35.5	0.04346
17.5	0.06373	36.	0.04207
18.	0.06163		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1887

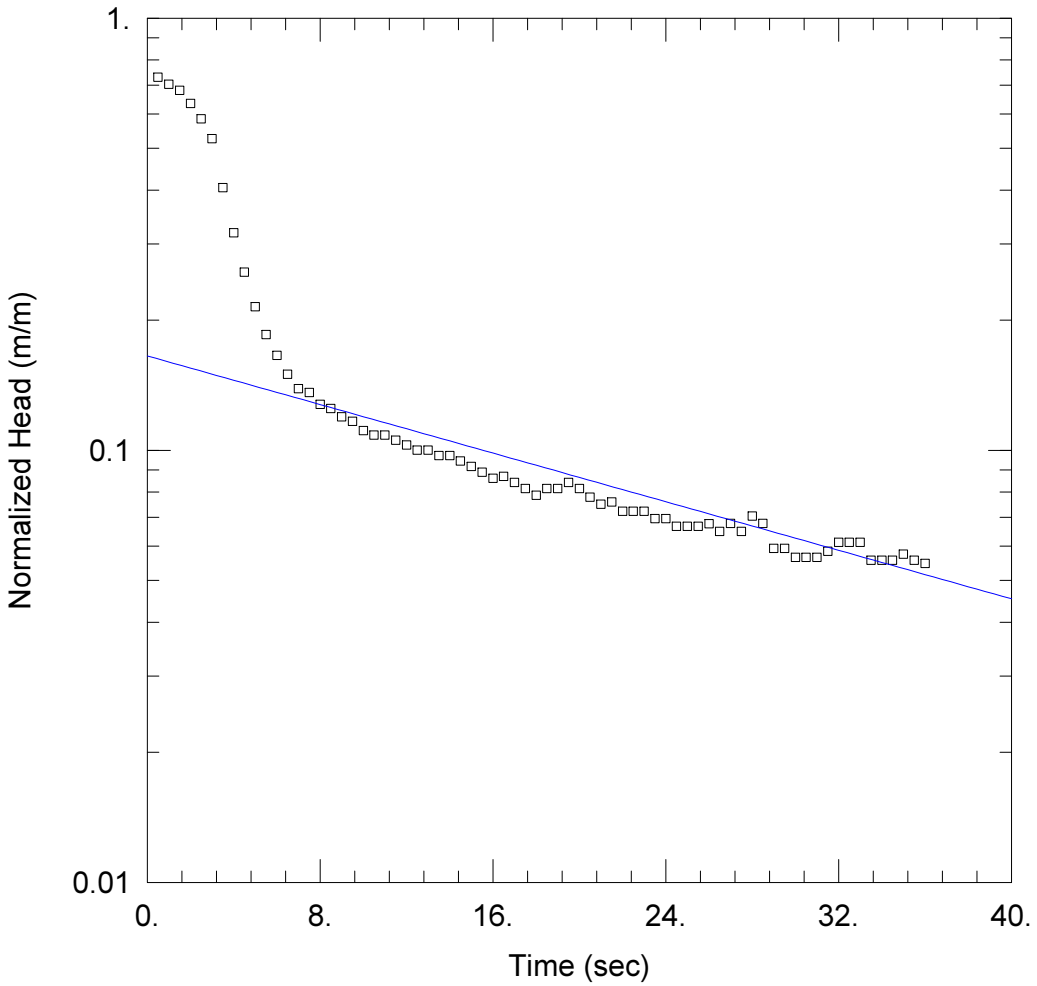
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.9018	m/day
y0	0.1221	m

K = 0.001044 cm/sec
T = K*b = 27.05 m²/day (3.131 sq. cm/sec)

BH204R Rising Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\204R RH.aqt
Date: 12/18/14 Time: 16:28:31

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH204R
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH204R)

Initial Displacement: -0.63 m
Total Well Penetration Depth: 5.85 m
Casing Radius: 0.025 m
Static Water Column Height: 5.49 m
Screen Length: 5. m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.9255 m/day
y0 = -0.1041 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\204R RH.aqt
Date: 12/18/14
Time: 16:29:25

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH204R

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH204R

X Location: 0. m
Y Location: 0. m

Initial Displacement: -0.63 m
Static Water Column Height: 5.49 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 5. m
Total Well Penetration Depth: 5.85 m

No. of Observations: 73

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-0.6318	18.5	-0.05136
0.5	-0.4597	19.	-0.05136
1.	-0.4433	19.5	-0.05311
1.5	-0.4288	20.	-0.05136
2.	-0.4	20.5	-0.04903
2.5	-0.3682	21.	-0.04728
3.	-0.3313	21.5	-0.04787
3.5	-0.2555	22.	-0.04553
4.	-0.2007	22.5	-0.04554
4.5	-0.1628	23.	-0.04554
5.	-0.1353	23.5	-0.04379
5.5	-0.1167	24.	-0.04379
6.	-0.1044	24.5	-0.04204
6.5	-0.09451	25.	-0.04204
7.	-0.08751	25.5	-0.04204
7.5	-0.08576	26.	-0.04262
8.	-0.08051	26.5	-0.04088
8.5	-0.07876	27.	-0.04263
9.	-0.07526	27.5	-0.04088
9.5	-0.07351	28.	-0.04438
10.	-0.07001	28.5	-0.04263
10.5	-0.06827	29.	-0.03738
11.	-0.06827	29.5	-0.03738
11.5	-0.06652	30.	-0.03563
12.	-0.06477	30.5	-0.03563
12.5	-0.06302	31.	-0.03563
13.	-0.06302	31.5	-0.0368
13.5	-0.06127	32.	-0.03855
14.	-0.06127	32.5	-0.03855
14.5	-0.05952	33.	-0.03855
15.	-0.05777	33.5	-0.03505

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	-0.05602	34.	-0.03505
16.	-0.05427	34.5	-0.03506
16.5	-0.05486	35.	-0.03622
17.	-0.05311	35.5	-0.03506
17.5	-0.05136	36.	-0.03447
18.	-0.04961		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1887

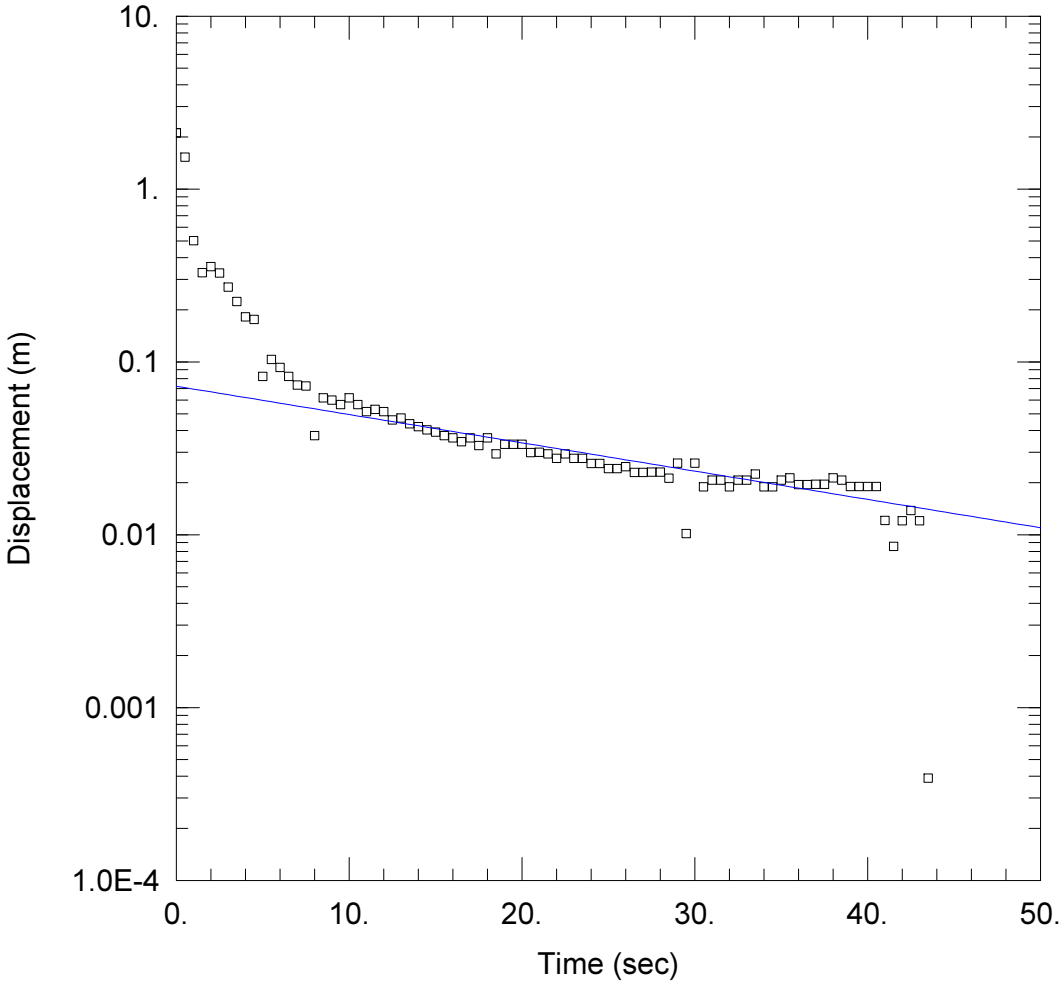
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.9255	m/day
y0	-0.1041	m

K = 0.001071 cm/sec
T = K*b = 27.77 m²/day (3.214 sq. cm/sec)

BH206 Falling Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\2702 Haulbowline.aqt
Date: 12/19/14 Time: 16:44:41

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH206
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH206)

Initial Displacement: 2.11 m
Total Well Penetration Depth: 11.3 m
Casing Radius: 0.025 m
Static Water Column Height: 9.44 m
Screen Length: 11.3 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.5508 m/day
y0 = 0.07226 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\2702 Haulbowline.aqt
Date: 12/19/14
Time: 16:45:09

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH206

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH206

X Location: 0. m
Y Location: 0. m

Initial Displacement: 2.11 m
Static Water Column Height: 9.44 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 0.025 m
Screen Length: 11.3 m
Total Well Penetration Depth: 11.3 m

No. of Observations: 88

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	2.112	22.	0.02759
0.5	1.527	22.5	0.02935
1.	0.5023	23.	0.0276
1.5	0.3284	23.5	0.0276
2.	0.3559	24.	0.02586
2.5	0.3267	24.5	0.02586
3.	0.2701	25.	0.02412
3.5	0.2235	25.5	0.02412
4.	0.182	26.	0.02471
4.5	0.1756	26.5	0.02296
5.	0.0823	27.	0.02296
5.5	0.1033	27.5	0.02297
6.	0.09281	28.	0.02297
6.5	0.08231	28.5	0.02122
7.	0.07356	29.	0.0259
7.5	0.0724	29.5	0.01015
8.	0.0374	30.	0.0259
8.5	0.06191	30.5	0.01891
9.	0.06016	31.	0.02066
9.5	0.05667	31.5	0.02066
10.	0.06192	32.	0.01892
10.5	0.05667	32.5	0.02067
11.	0.05143	33.	0.02068
11.5	0.05318	33.5	0.02243
12.	0.05143	34.	0.01893
12.5	0.04619	34.5	0.01894
13.	0.04736	35.	0.02069
13.5	0.04386	35.5	0.02128
14.	0.04212	36.	0.01953
14.5	0.04037	36.5	0.01953
15.	0.03921	37.	0.01954

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	0.03746	37.5	0.01954
16.	0.0363	38.	0.0213
16.5	0.03455	38.5	0.02072
17.	0.03631	39.	0.01897
17.5	0.03281	39.5	0.01897
18.	0.03631	40.	0.01898
18.5	0.02932	40.5	0.01898
19.	0.0334	41.	0.01207
19.5	0.03341	41.5	0.00856
20.	0.03341	42.	0.01206
20.5	0.02991	42.5	0.01381
21.	0.02992	43.	0.01205
21.5	0.02934	43.5	0.00039

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1636

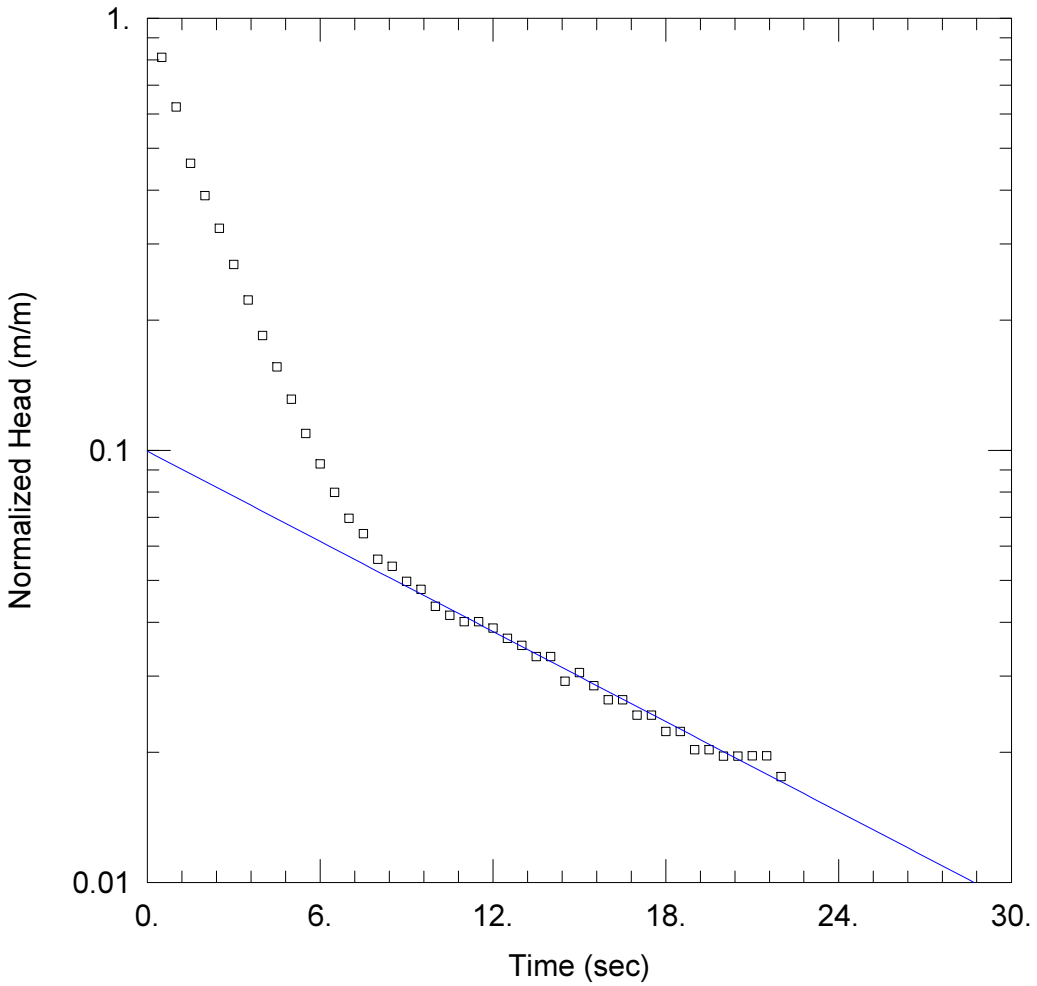
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.5508	m/day
y0	0.07226	m

K = 0.0006375 cm/sec
T = K*b = 16.52 m²/day (1.912 sq. cm/sec)

BH206 Rising Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\206 RH.aqt
Date: 12/18/14 Time: 16:31:17

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH206
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH206)

Initial Displacement: -0.85 m
Total Well Penetration Depth: 11.3 m
Casing Radius: 0.025 m
Static Water Column Height: 9.44 m
Screen Length: 11.3 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.169 m/day
y0 = -0.08457 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\206 RH.aqt
Date: 12/18/14
Time: 16:31:35

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH206

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH206

X Location: 0. m
Y Location: 0. m

Initial Displacement: -0.85 m
Static Water Column Height: 9.44 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 11.3 m
Total Well Penetration Depth: 11.3 m

No. of Observations: 45

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-0.8536	11.5	-0.03412
0.5	-0.6903	12.	-0.03296
1.	-0.5299	12.5	-0.03121
1.5	-0.3922	13.	-0.03005
2.	-0.3304	13.5	-0.0283
2.5	-0.2773	14.	-0.0283
3.	-0.2289	14.5	-0.02481
3.5	-0.1892	15.	-0.02598
4.	-0.1566	15.5	-0.02423
4.5	-0.1327	16.	-0.02248
5.	-0.1117	16.5	-0.02248
5.5	-0.093	17.	-0.02074
6.	-0.07901	17.5	-0.02074
6.5	-0.06793	18.	-0.01899
7.	-0.05918	18.5	-0.019
7.5	-0.05452	19.	-0.01725
8.	-0.04752	19.5	-0.01725
8.5	-0.04577	20.	-0.01667
9.	-0.04227	20.5	-0.01667
9.5	-0.04053	21.	-0.01668
10.	-0.03703	21.5	-0.01668
10.5	-0.03528	22.	-0.01493
11.	-0.03412		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.1636

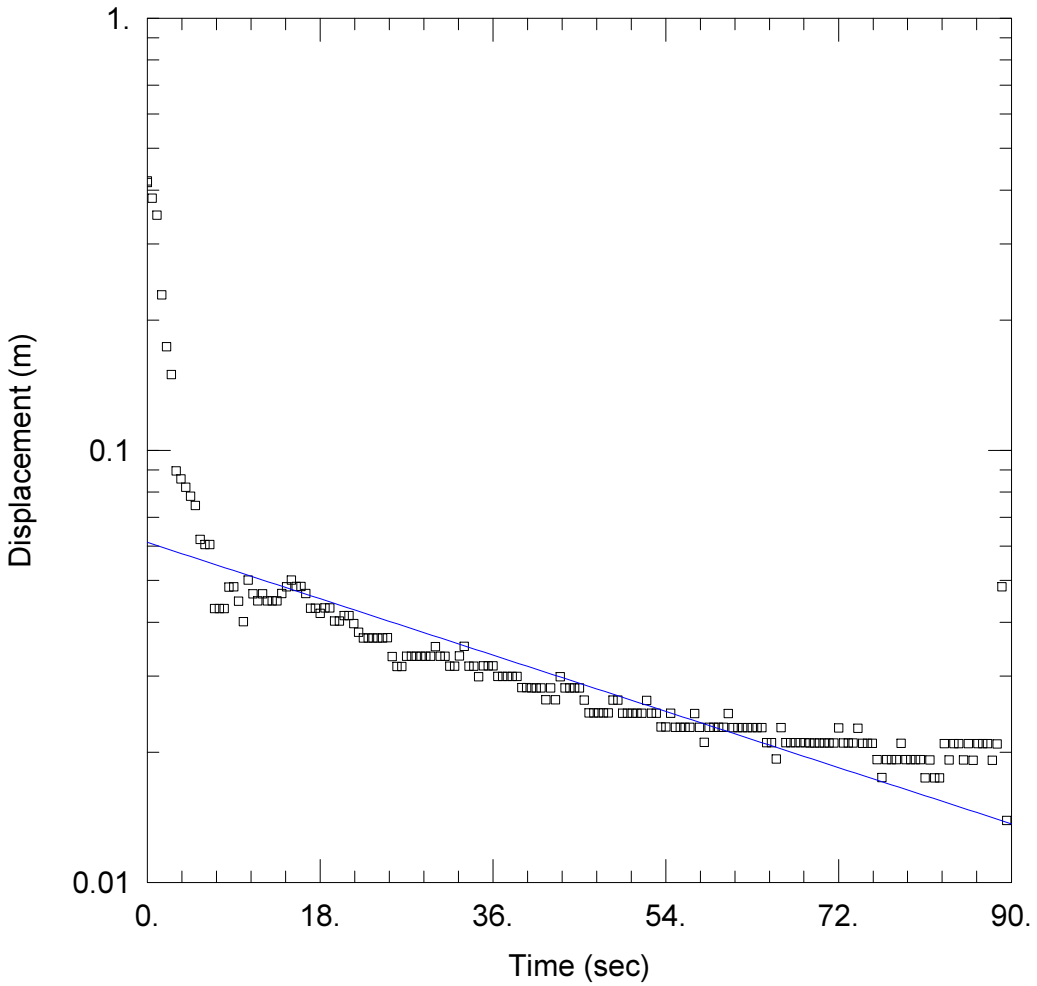
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.169	m/day
y0	-0.08457	m

K = 0.001353 cm/sec
T = K*b = 35.08 m²/day (4.06 sq. cm/sec)

BH216 Falling Head Test Results



WELL TEST ANALYSIS

Data Set:
Date: 12/17/14 Time: 09:57:44

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH216
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH216)

Initial Displacement: 0.42 m
Total Well Penetration Depth: 2.5 m
Casing Radius: 0.025 m
Static Water Column Height: 0.75 m
Screen Length: 2.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.8286 m/day
y0 = 0.06119 m

Data Set:
Date: 12/17/14
Time: 12:14:05

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH216

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH216

X Location: 0. m
Y Location: 0. m

Initial Displacement: 0.42 m
Static Water Column Height: 0.75 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 2.5 m
Total Well Penetration Depth: 2.5 m

No. of Observations: 180

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	0.4163	45.	0.02817
0.5	0.383	45.5	0.02642
1.	0.3498	46.	0.02467
1.5	0.229	46.5	0.02466
2.	0.1736	47.	0.02466
2.5	0.1497	47.5	0.02466
3.	0.08962	48.	0.02466
3.5	0.08583	48.5	0.0264
4.	0.08205	49.	0.0264
4.5	0.07827	49.5	0.02465
5.	0.07448	50.	0.02464
5.5	0.06223	50.5	0.02464
6.	0.06049	51.	0.02464
6.5	0.0605	51.5	0.02464
7.	0.043	52.	0.02638
7.5	0.04301	52.5	0.02463
8.	0.04301	53.	0.02463
8.5	0.04827	53.5	0.02287
9.	0.04828	54.	0.02287
9.5	0.04478	54.5	0.02462
10.	0.04012	55.	0.02286
10.5	0.05005	55.5	0.02286
11.	0.04655	56.	0.02286
11.5	0.04481	56.5	0.02286
12.	0.04656	57.	0.0246
12.5	0.04482	57.5	0.02285
13.	0.04483	58.	0.0211
13.5	0.04483	58.5	0.02284
14.	0.04659	59.	0.02284
14.5	0.04834	59.5	0.02284
15.	0.0501	60.	0.02284

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	0.04836	60.5	0.02458
16.	0.04836	61.	0.02283
16.5	0.04662	61.5	0.02283
17.	0.04313	62.	0.02282
17.5	0.04313	62.5	0.02282
18.	0.04197	63.	0.02282
18.5	0.04315	63.5	0.02282
19.	0.04315	64.	0.02281
19.5	0.04024	64.5	0.02106
20.	0.04025	65.	0.02106
20.5	0.04142	65.5	0.0193
21.	0.04143	66.	0.0228
21.5	0.03968	66.5	0.02105
22.	0.03794	67.	0.02104
22.5	0.03678	67.5	0.02104
23.	0.03679	68.	0.02104
23.5	0.03679	68.5	0.02104
24.	0.0368	69.	0.02103
24.5	0.0368	69.5	0.02103
25.	0.03681	70.	0.02103
25.5	0.03332	70.5	0.02102
26.	0.03157	71.	0.02102
26.5	0.03158	71.5	0.02102
27.	0.03334	72.	0.02277
27.5	0.03334	72.5	0.02101
28.	0.03335	73.	0.02101
28.5	0.03335	73.5	0.02101
29.	0.03336	74.	0.02275
29.5	0.03337	74.5	0.021
30.	0.03512	75.	0.021
30.5	0.03338	75.5	0.021
31.	0.03339	76.	0.01924
31.5	0.03164	76.5	0.01749
32.	0.03165	77.	0.01924
32.5	0.0334	77.5	0.01923
33.	0.03516	78.	0.01923
33.5	0.03167	78.5	0.02098
34.	0.03167	79.	0.01922
34.5	0.02993	79.5	0.01922
35.	0.03169	80.	0.01922
35.5	0.03169	80.5	0.01922
36.	0.0317	81.	0.01746
36.5	0.02995	81.5	0.01921
37.	0.02996	82.	0.01746
37.5	0.02997	82.5	0.01745
38.	0.02996	83.	0.02095
38.5	0.02996	83.5	0.0192
39.	0.02821	84.	0.02095
39.5	0.02821	84.5	0.02094
40.	0.0282	85.	0.01919
40.5	0.0282	85.5	0.02094
41.	0.0282	86.	0.01918
41.5	0.02644	86.5	0.02093
42.	0.02819	87.	0.02093
42.5	0.02644	87.5	0.02093
43.	0.02993	88.	0.01917
43.5	0.02818	88.5	0.02092
44.	0.02818	89.	0.04833
44.5	0.02818	89.5	0.01391

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.2171

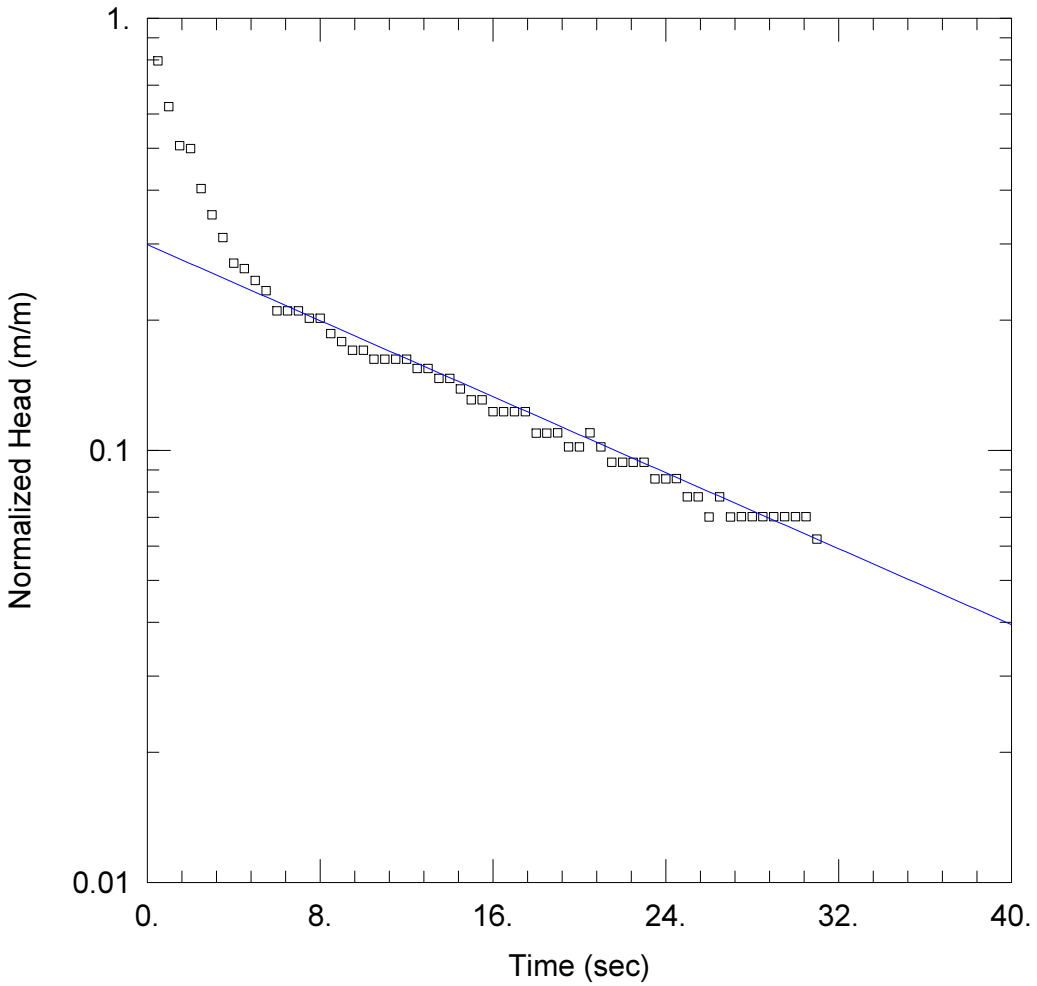
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.8286	m/day
y0	0.06119	m

K = 0.000959 cm/sec
T = K*b = 24.86 m²/day (2.877 sq. cm/sec)

BH216 Rising Head Test Results



WELL TEST ANALYSIS

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\216 RH.aqt
Date: 12/18/14 Time: 16:33:29

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Well: BH216
Test Date: 9/12/14

AQUIFER DATA

Saturated Thickness: 30. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH216)

Initial Displacement: -0.22 m
Total Well Penetration Depth: 2.5 m
Casing Radius: 0.025 m
Static Water Column Height: 0.75 m
Screen Length: 2.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
K = 2.517 m/day
Solution Method: Hvorslev
y0 = -0.06579 m

Data Set: C:\Program Files (x86)\HydroSOLVE\AQTESOLV Std 4.0\216 RH.aqt
Date: 12/18/14
Time: 16:33:49

PROJECT INFORMATION

Company: Minerex
Client: CCC
Project: 2702
Location: Haulbowline
Test Date: 9/12/14
Test Well: BH216

AQUIFER DATA

Saturated Thickness: 30. m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: BH216

X Location: 0. m
Y Location: 0. m

Initial Displacement: -0.22 m
Static Water Column Height: 0.75 m
Casing Radius: 0.025 m
Well Radius: 0.025 m
Well Skin Radius: 1. m
Screen Length: 2.5 m
Total Well Penetration Depth: 2.5 m

No. of Observations: 63

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	-0.2212	16.	-0.02702
0.5	-0.1751	16.5	-0.02703
1.	-0.1372	17.	-0.02703
1.5	-0.1115	17.5	-0.02703
2.	-0.1098	18.	-0.02412
2.5	-0.08878	18.5	-0.02412
3.	-0.07712	19.	-0.02413
3.5	-0.06837	19.5	-0.02238
4.	-0.05962	20.	-0.02238
4.5	-0.05787	20.5	-0.02413
5.	-0.05438	21.	-0.02239
5.5	-0.05146	21.5	-0.02064
6.	-0.04622	22.	-0.02064
6.5	-0.04622	22.5	-0.02065
7.	-0.04622	23.	-0.02065
7.5	-0.04448	23.5	-0.0189
8.	-0.04448	24.	-0.0189
8.5	-0.04098	24.5	-0.01891
9.	-0.03923	25.	-0.01716
9.5	-0.03749	25.5	-0.01716
10.	-0.03749	26.	-0.01542
10.5	-0.03574	26.5	-0.01717
11.	-0.03575	27.	-0.01542
11.5	-0.03575	27.5	-0.01543
12.	-0.03575	28.	-0.01543
12.5	-0.034	28.5	-0.01543
13.	-0.03401	29.	-0.01543
13.5	-0.03226	29.5	-0.01544
14.	-0.03226	30.	-0.01544
14.5	-0.03052	30.5	-0.01544
15.	-0.02877	31.	-0.0137

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
15.5	-0.02877		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Hvorslev
Log Factor: 0.2171

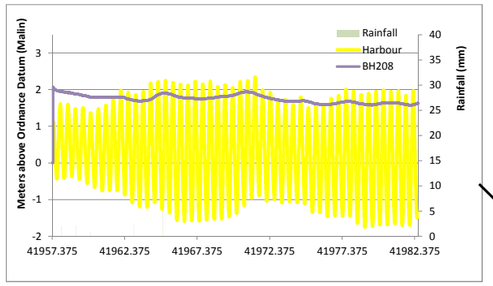
VISUAL ESTIMATION RESULTS

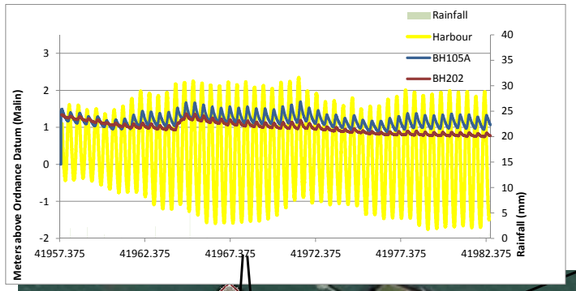
Estimated Parameters

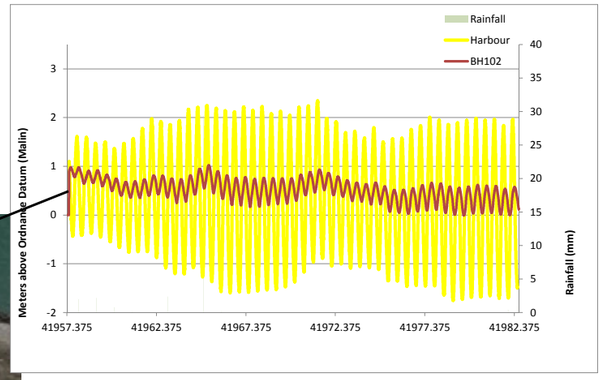
Parameter	Estimate	
K	2.517	m/day
y0	-0.06579	m

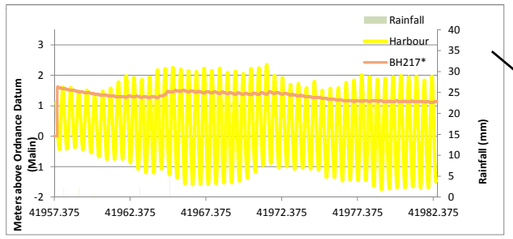
K = 0.002913 cm/sec
T = K*b = 75.5 m²/day (8.738 sq. cm/sec)

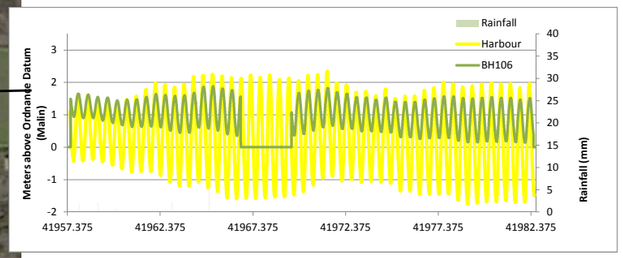
Appendix N Graphed Logger Data

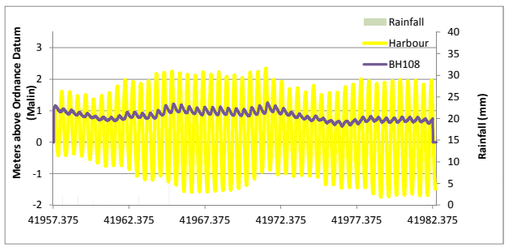

Rainfall
Harbour
BH208
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

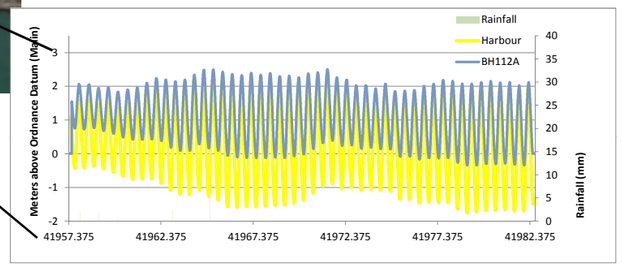

Rainfall
Harbour
BH105A
BH202
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

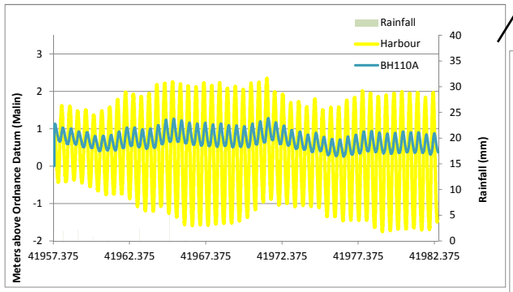

Rainfall
Harbour
BH102
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

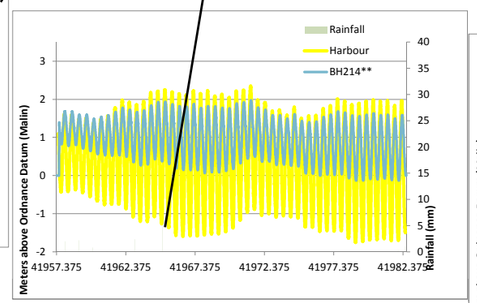

Rainfall
Harbour
BH217*
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

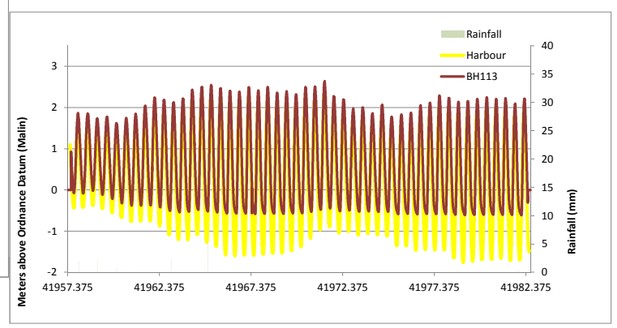

Rainfall
Harbour
BH106
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

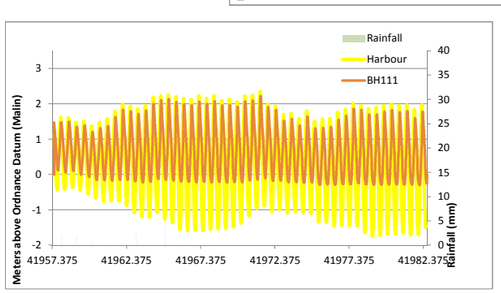

Rainfall
Harbour
BH108
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375


Rainfall
Harbour
BH112A
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375


Rainfall
Harbour
BH110A
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375


Rainfall
Harbour
BH214**
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

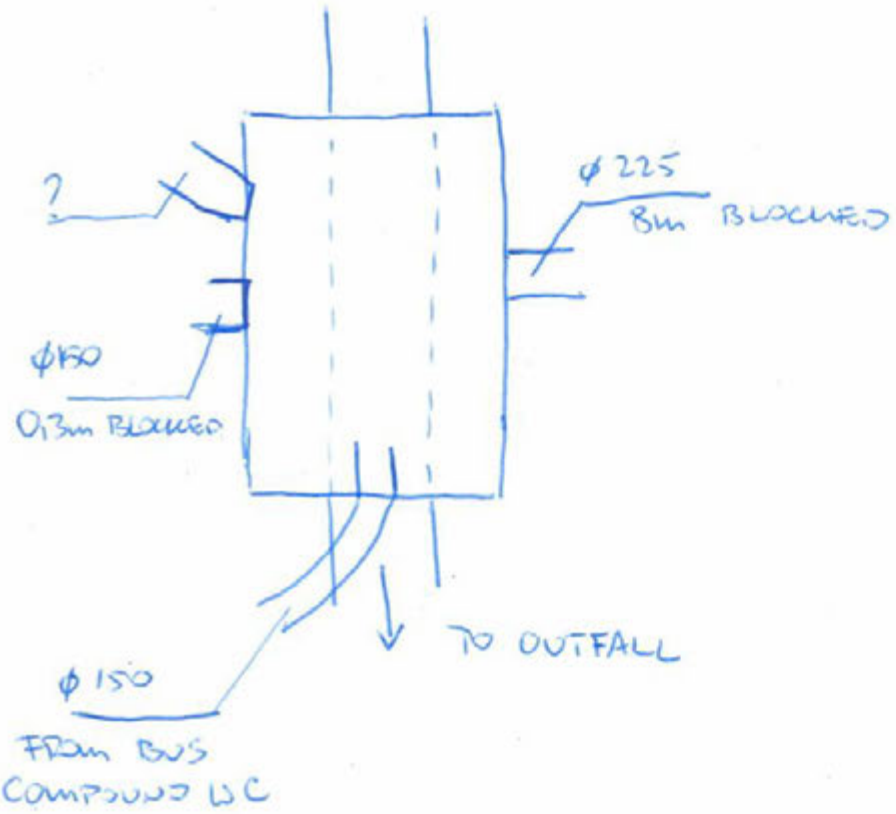

Rainfall
Harbour
BH113
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375


Rainfall
Harbour
BH111
Meters above Ordnance Datum (Malin)
Rainfall (mm)
41957.375
41962.375
41967.375
41972.375
41977.375
41982.375

Appendix O Drain Survey

20
21
22
23
26
25
24

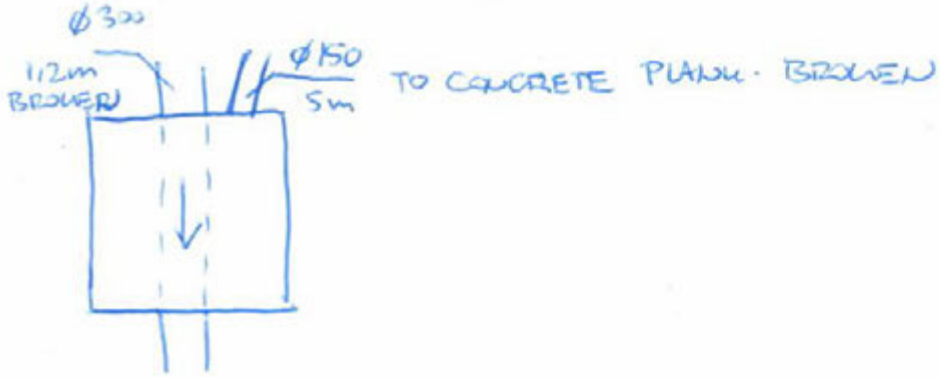
MH 19 DEPTH 2400 CSE REQUIRED



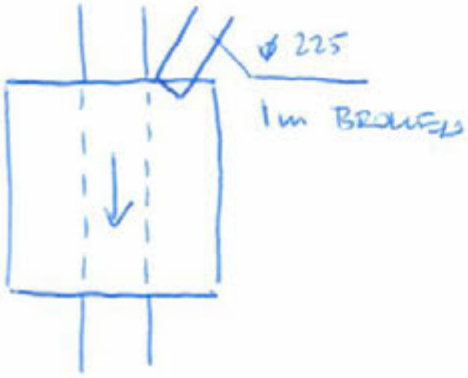
OILY SMELL FROM MH 19 -> MH A -> MH E

AND MH 24 DS

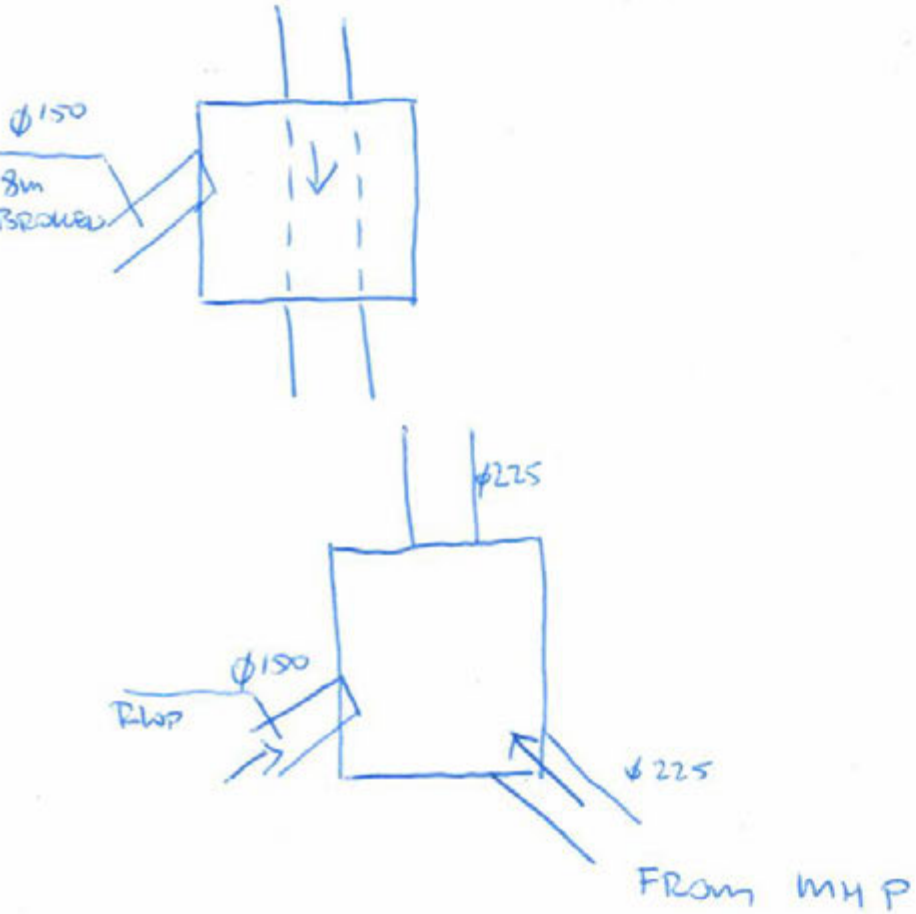
MH N DEPTH 700 mm

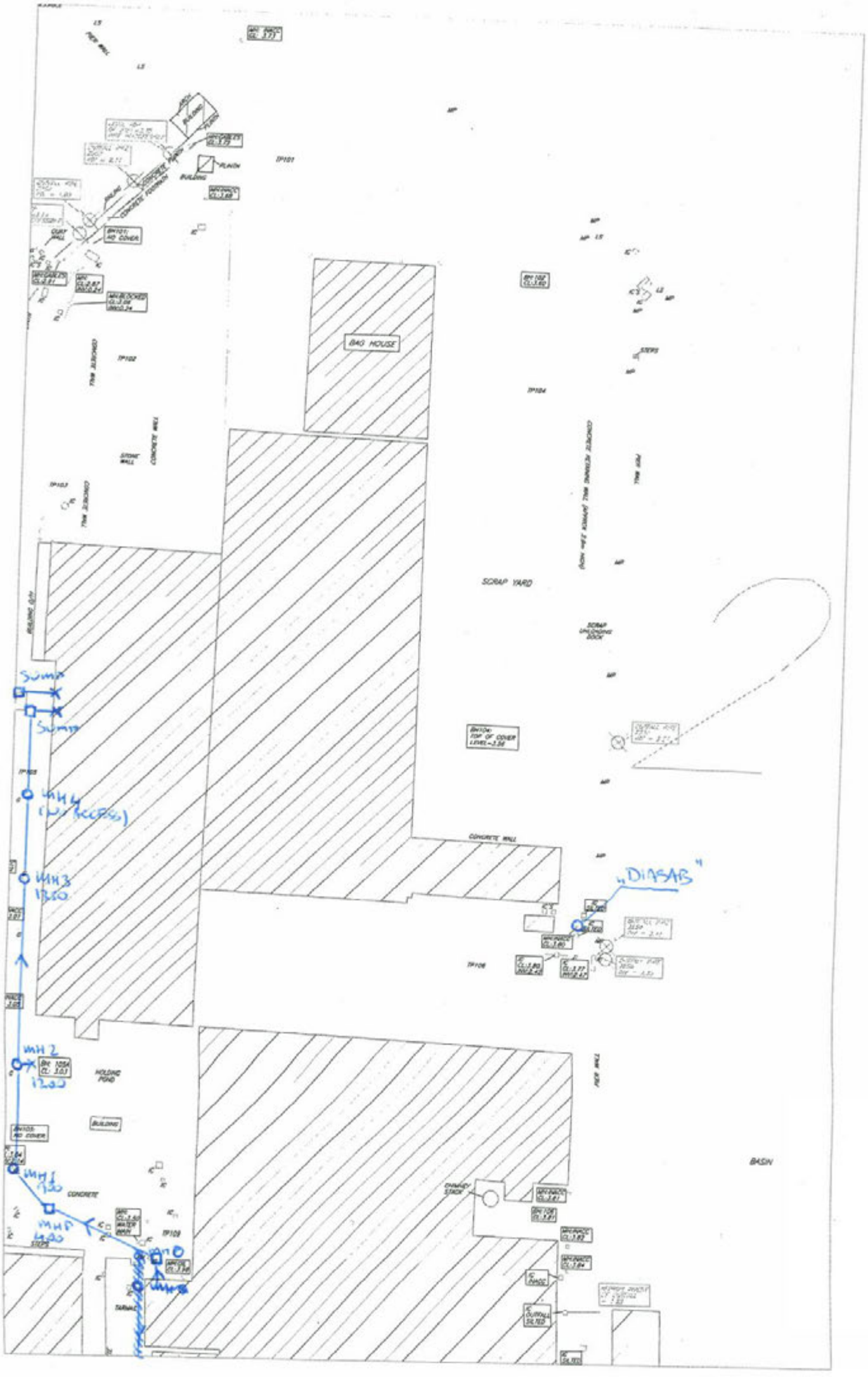


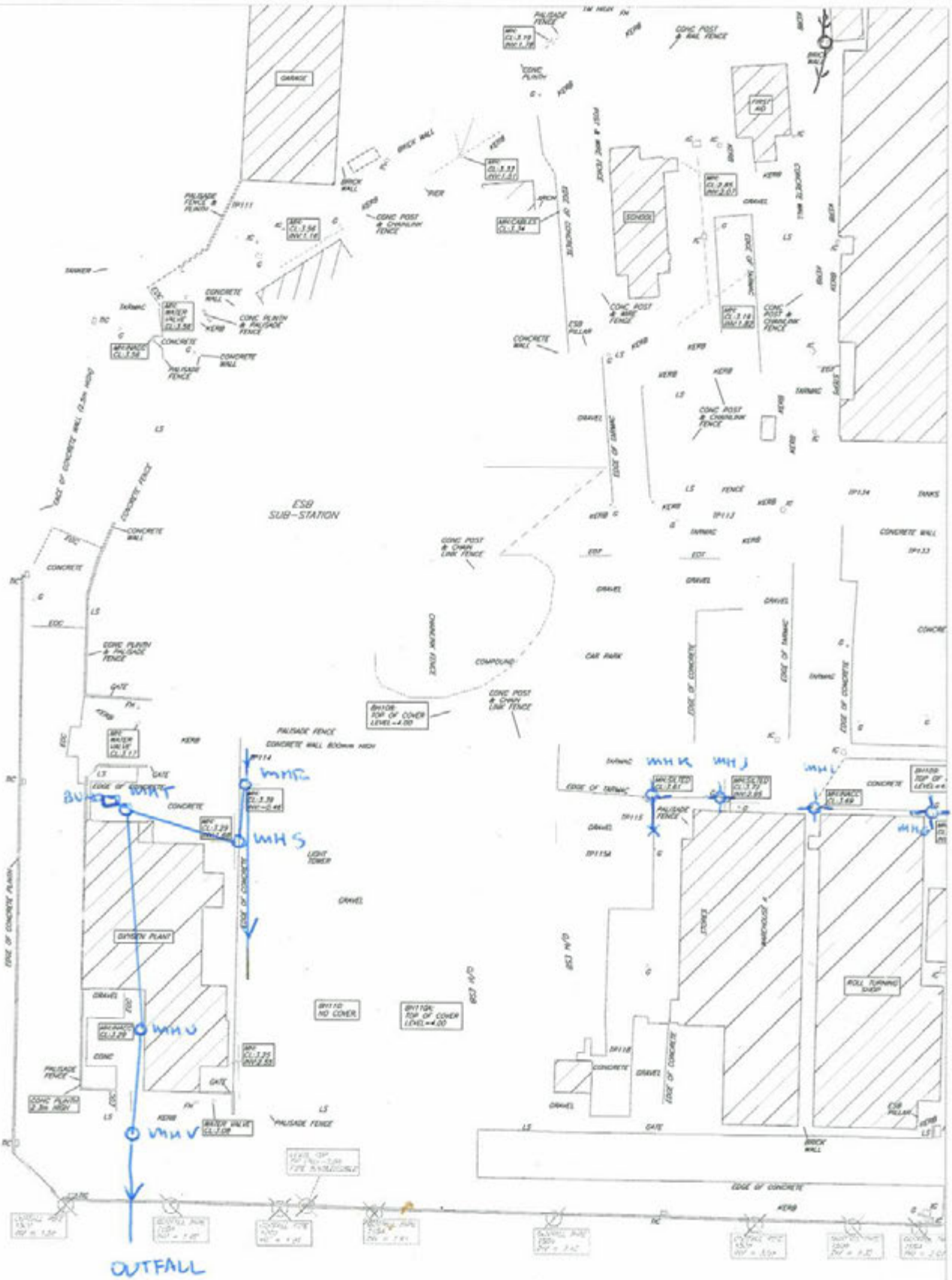
MH 22 DEPTH 1050

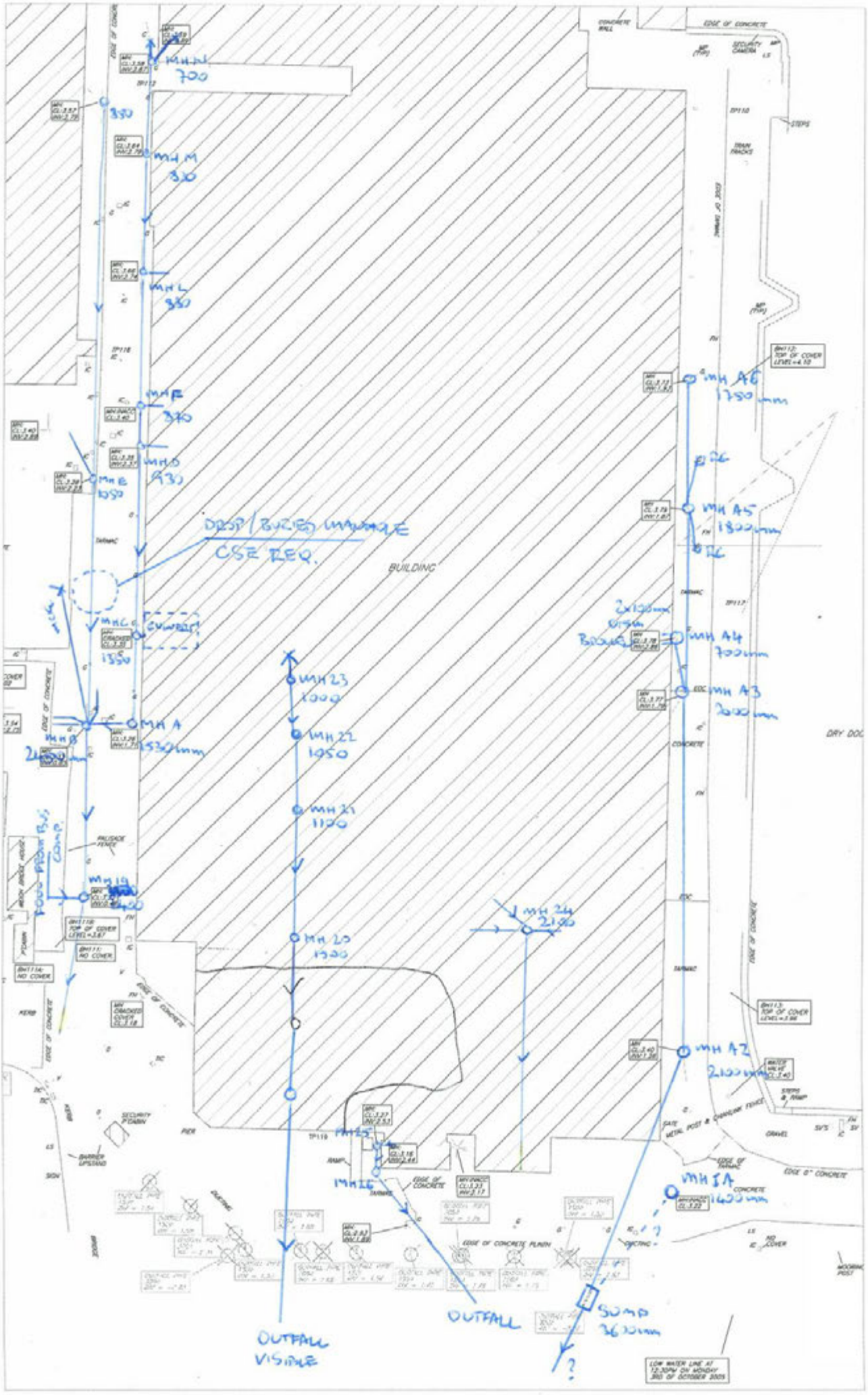


MH 21 DEPTH 1100



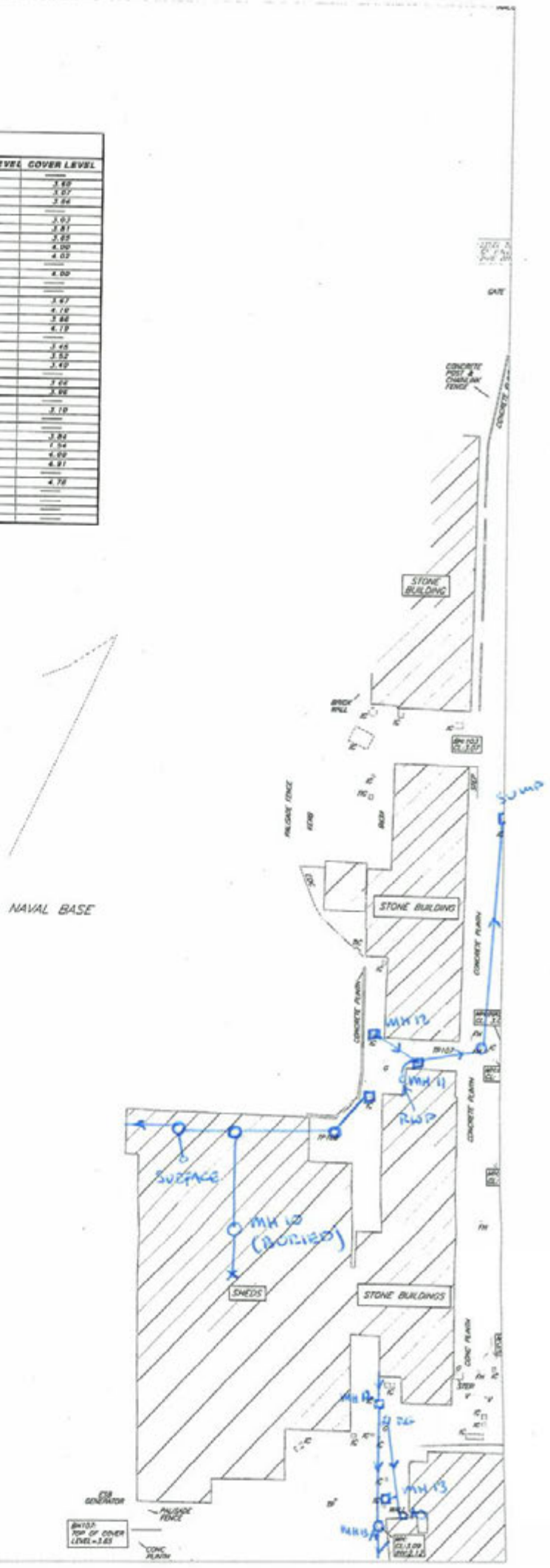

BAG HOUSE
SCRAP YARD
SCRAP UNLOADING DOCK
CONCRETE WALL
HOLDING POND
BUILDING
CONCRETE
BASIN
CHIMNEY STACK
STEPS
TARMAC
Sump
Sump
MH4
MH3
1350
MH 2
1200
MH1
900
MH0
„DIASAB"


ESB
SUB-STATION
GARAGE
SCHOOL
FIRST AID
OXYGEN PLANT
CAR PARK
COMPOUND
LIGHT TOWER
ROLL TURNING SHOP
MHT
MHS
MHU
MHV
MHK
MHJ
OUTFALL

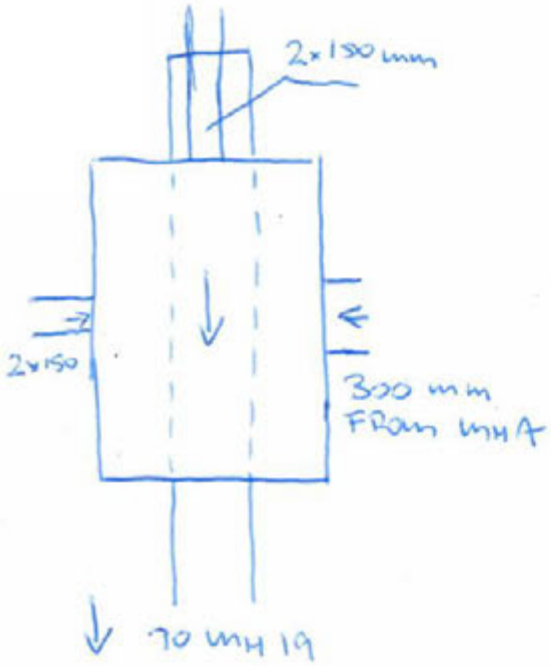

MH N
700
MH M
MH L
MH F
MH D
MH E
1050
DROP / BURIED MANHOLE
CSE REQ.
BUILDING
MH C
1350
MH A
1530mm
MH 23
1000
MH 22
1050
MH 21
1100
MH 20
1500
MH 24
2100
MH 19
MH A6
1750mm
MH A5
1800mm
MH A4
700mm
MH A3
2000mm
MH A2
2100mm
MH 25
MH 26
MH 1A
1400mm
SUMP
3600mm
OUTFALL
VISIBLE
OUTFALL
DRY DOC
EDGE OF CONCRETE
TARMAC
CONCRETE
PALISADE FENCE
SECURITY P'CABIN
BARRIER UPSTAND
PIER
RAMP
EDGE OF CONCRETE PLINTH
METAL POST & CHAINLINK FENCE
GRAVEL
STEPS
TRAIN TRACKS
SECURITY CAMERA
CONCRETE WALL
LOW WATER LINE AT 12:30PM ON MONDAY 3RD OF OCTOBER 2005

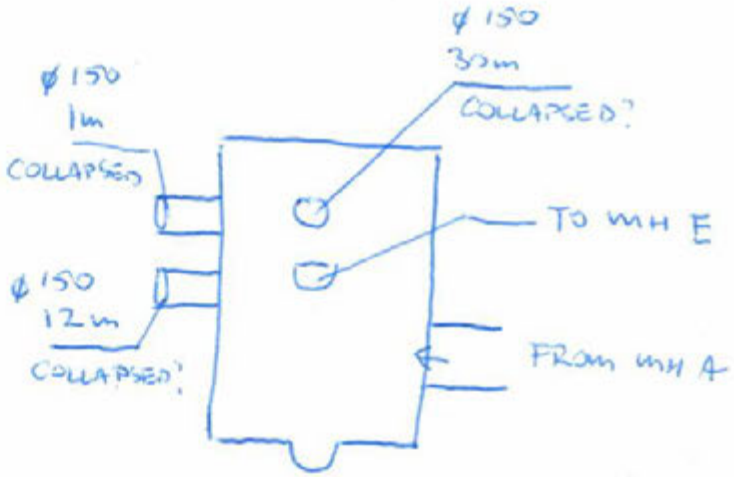
BOREHOLES			
NO:	COVER	GROUND LEVEL	COVER LEVEL
BH:101	NO	2.98	——
BH:102	YES	3.65	3.62
BH:103	YES	3.07	3.07
BH:104	YES	3.43	3.96
BH:105	NO	3.00	——
BH:105A	YES	3.03	3.03
BH:106	YES	3.91	3.81
BH:107	YES	3.71	3.85
BH:108	YES	3.48	4.00
BH:109	YES	3.61	4.03
BH:110	NO	3.49	——
BH:110A	YES	3.59	4.00
BH:111	NO	3.22	——
BH:111A	NO	3.14	——
BH:111B	YES	3.18	3.67
BH:112	YES	3.93	4.10
BH:113	YES	3.91	3.88
BH:114	YES	3.73	4.12
BH:115	NO	3.75	——
BH:116	YES	3.09	3.45
BH:117	YES	3.17	3.52
BH:118	YES	2.97	3.40
BH:118A	NO	3.23	——
BH:119	YES	3.71	3.66
BH:120	YES	3.45	3.86
BH:121	NO	3.97	——
BH:122	YES	3.79	3.19
BH:123	NO	3.12	——
BH:124	NO	2.93	——
BH:125	YES	3.46	3.84
BH:126	YES	1.21	1.54
BH:127	YES	3.09	4.09
BH:128	YES	4.42	4.91
BH:129	NO	4.11	——
BH:130	YES	4.48	4.78
BH:131	NO	4.90	——
BH:131A	NO	3.33	——
BH:131B	NO	3.45	——
BH:131C	NO	3.44	——

TRIAL PITS	
NO:	GROUND LEVEL
TP:101	3.67
TP:102	3.71
TP:103	3.53
TP:104	3.98
TP:105	3.05
TP:106	3.80
TP:107	3.15
TP:108	3.28
TP:109	3.36
TP:110	3.62
TP:111	3.56
TP:112	3.55
TP:113	3.62
TP:114	3.55
TP:115	3.39
TP:115A	3.06
TP:116	3.53
TP:117	3.80
TP:118	3.34
TP:119	3.40
TP:121	3.48
TP:122	3.40
TP:123	2.98
TP:124	3.41
TP:125	3.36
TP:126	3.13
TP:127	1.86
TP:128	3.87
TP:129	3.58
TP:130	4.53
TP:131	3.95
TP:132	3.42
TP:133	3.33
TP:134	3.47

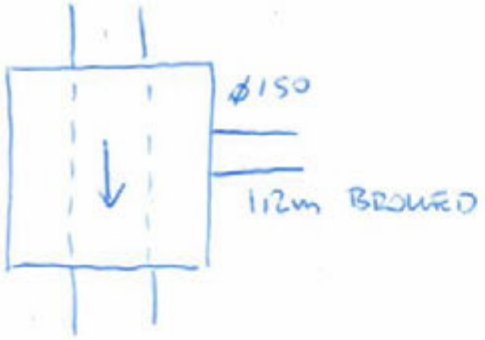


MH B DEPTH 2450

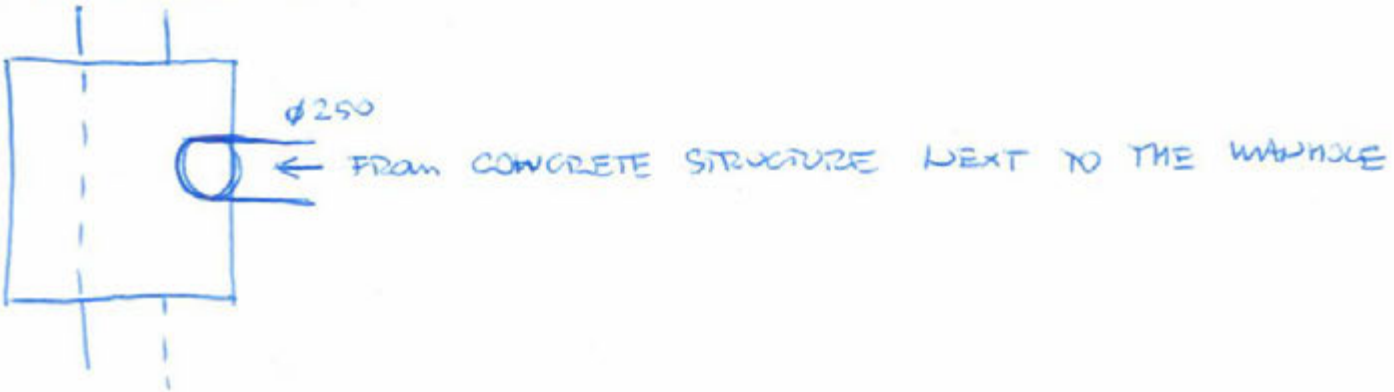




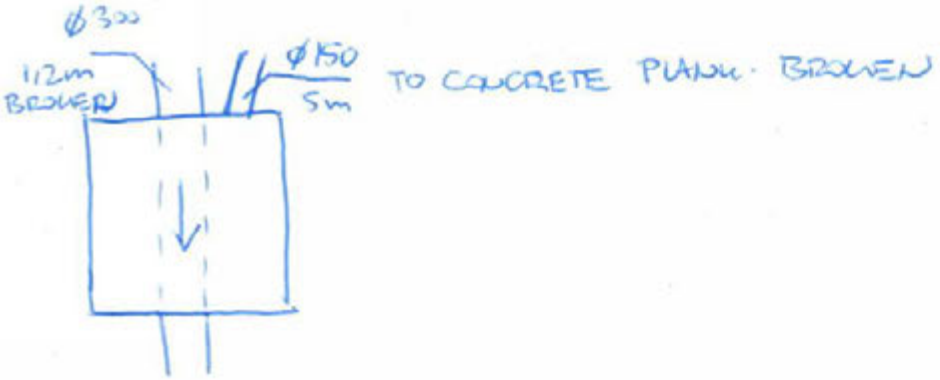
MH D DEPTH 930



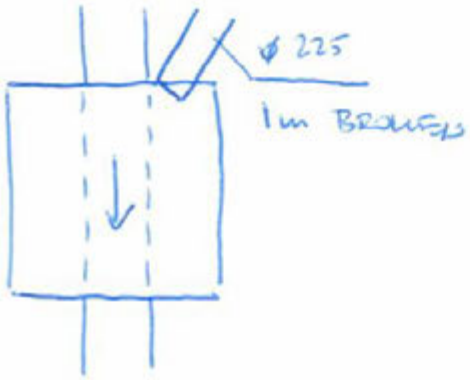
MH M DEPTH 820 mm



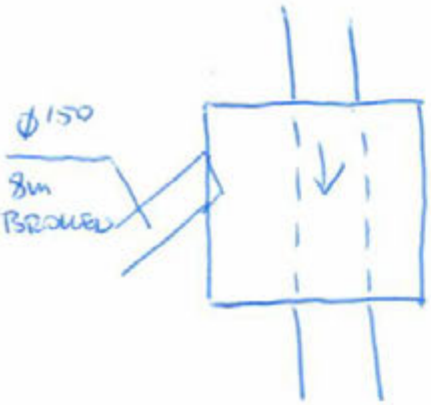
MH N DEPTH 700 mm

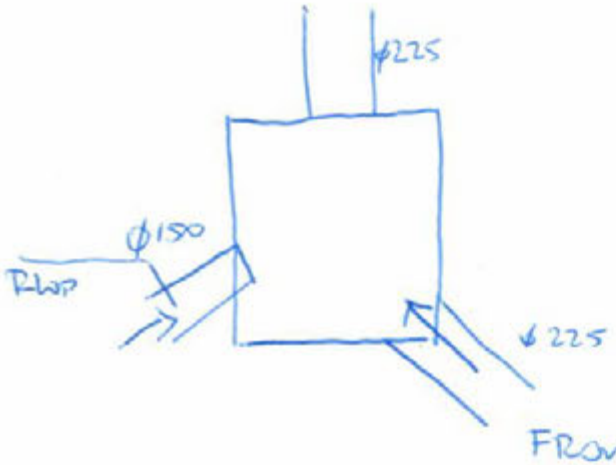


MH 22 DEPTH 1050

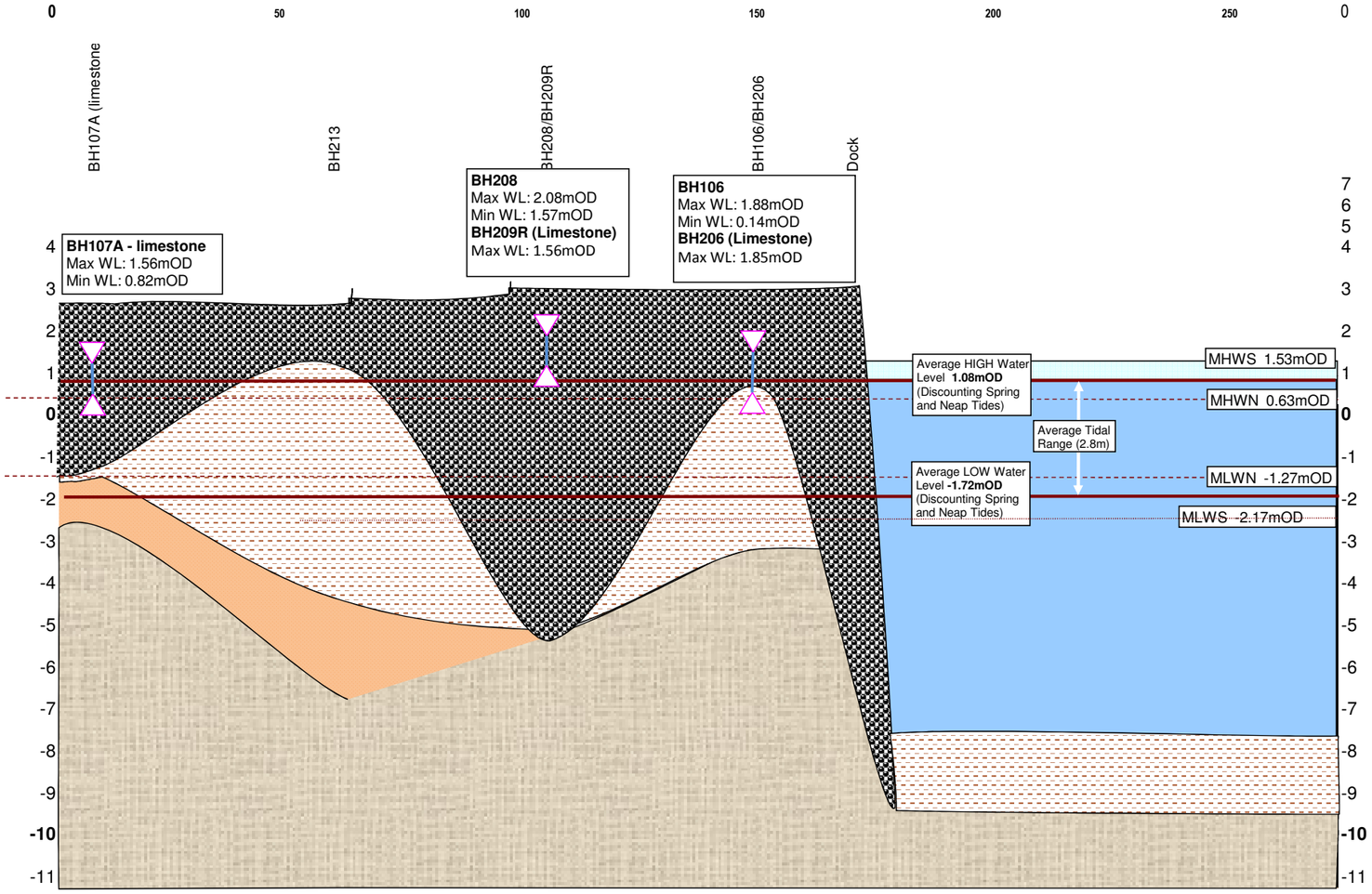


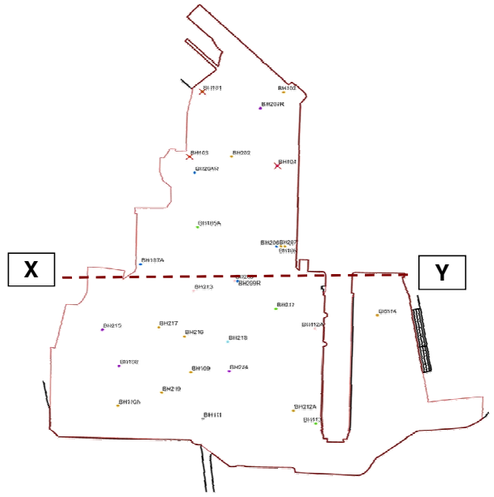
MH 21 DEPTH 1100



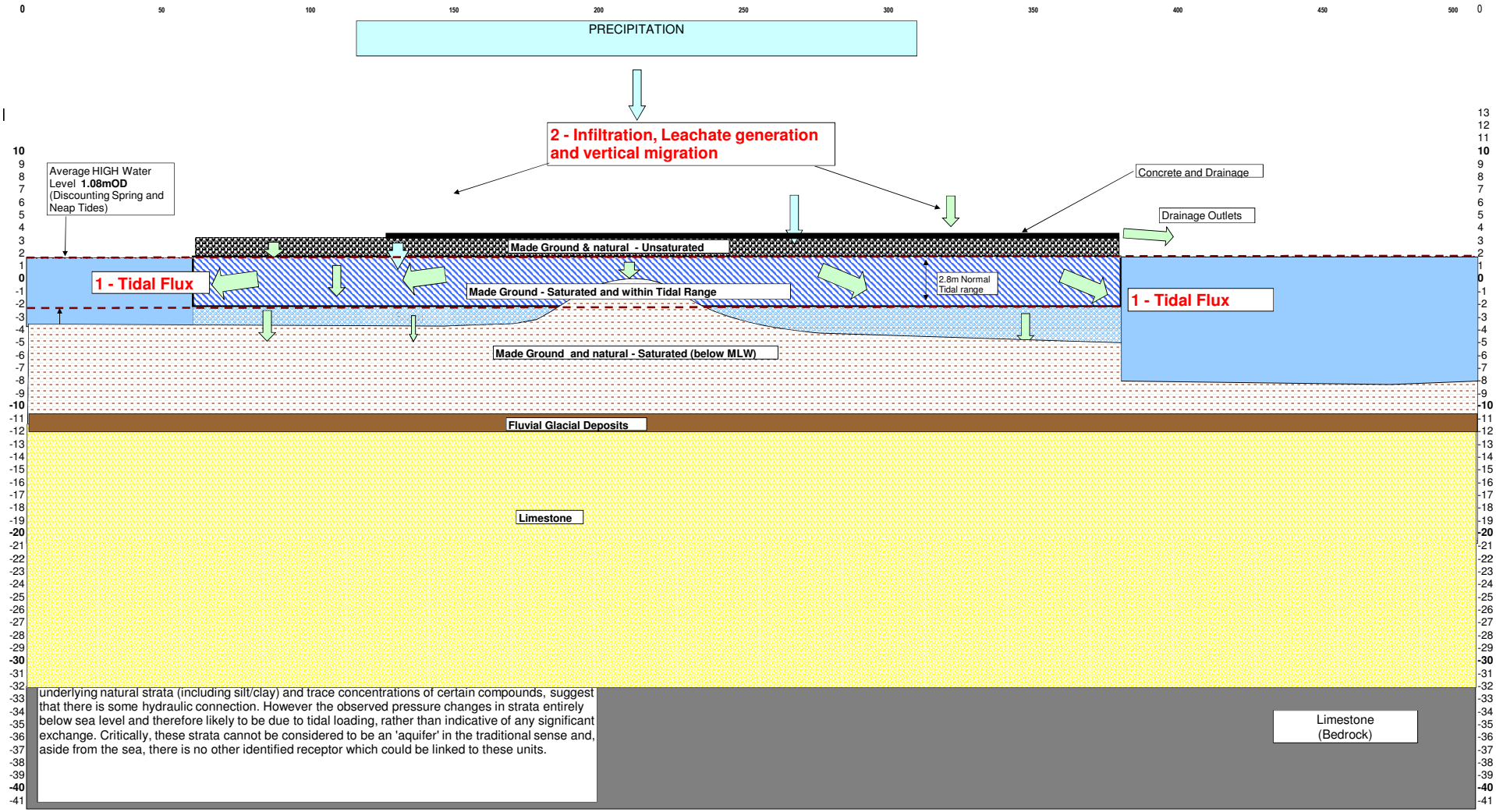


Appendix P Tidal CSM, Groundwater and Tidal Influence


0
50
100
150
200
250
0
BH107A (limestone
BH213
BH208/BH209R
BH106/BH206
Dock
BH107A - limestone
Max WL: 1.56mOD
Min WL: 0.82mOD
BH208
Max WL: 2.08mOD
Min WL: 1.57mOD
BH209R (Limestone)
Max WL: 1.56mOD
BH106
Max WL: 1.88mOD
Min WL: 0.14mOD
BH206 (Limestone)
Max WL: 1.85mOD
Average HIGH Water Level 1.08mOD (Discounting Spring and Neap Tides)
Average Tidal Range (2.8m)
Average LOW Water Level -1.72mOD (Discounting Spring and Neap Tides)
MHWS 1.53mOD
MHWN 0.63mOD
MLWN -1.27mOD
MLWS -2.17mOD
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11


X
Y

Appendix Q Tier 4 Conceptual Site Models


PRECIPITATION
2 - Infiltration, Leachate generation and vertical migration
Average HIGH Water Level 1.08mOD (Discounting Spring and Neap Tides)
Concrete and Drainage
Drainage Outlets
Made Ground & natural - Unsaturated
1 - Tidal Flux
Made Ground - Saturated and within Tidal Range
2.8m Normal Tidal range
1 - Tidal Flux
Made Ground and natural - Saturated (below MLW)
Fluvial Glacial Deposits
Limestone
underlying natural strata (including silt/clay) and trace concentrations of certain compounds, suggest that there is some hydraulic connection. However the observed pressure changes in strata entirely below sea level and therefore likely to be due to tidal loading, rather than indicative of any significant exchange. Critically, these strata cannot be considered to be an 'aquifer' in the traditional sense and, aside from the sea, there is no other identified receptor which could be linked to these units.
Limestone (Bedrock)

Appendix R Tier 4 Calculations

WATER FLUX MODEL - SOUTH

Site Dimensions	Notations	Values	**Units**	Source / Comments
Length (m)	l	230	m	North - South
Width (m)		150	m	East - West (approx)
Area (m2)		46,500	m2	Approximate from CAD plan
Perimeter of shoreline (m)	r	393	m	Approximate from CAD plan

Precipitation				
Total rainfall		1022	mm/year	Annual Average =1022mm Cork Airport (2011)
Effective Precipitation:		50%	mm/year	Conservative over estimate but loss via evapotranspiration and run-off is expected to be relatively high where concrete present with drainage. Also assumed high leack age from drainage (with high permeability) underlying made ground and soils
Daily average inflitration		1.40	mm/day	50% of total annual precipitation divided by 365 days
Total infiltration per day		65100	mm/day	Daily average mutiplied by site area
Total infiltration per day	**p**	**65**	m3/day	Average daily infiltration at 50% of total

Aquifer				
Saturated Made Ground and Natural Soils volume within normal Tidal cycle		55800	m3	Average tidal range x site area. Very conservative as full tidal range not experienced in centre of site
Effective porosity	34%	18972	m3	Mid-range estimate of Sand/Gravel (Fine Sand) Brassington 2007 provides an estimate of the total volume of water held within made ground and soils within tidal range
Specific Yield	25%	13950	m3	Mid-range estimate of Sand/Gravel (Fine Sand) Brassington 2007 - provides an estimate of the total volume of water held within made ground and soils which could theoretically drain in perfect conditions (i.e. without hydrostatic pressure from surrounding soil/water mass)

Tides				
Mean High Water Spring	MHWS	1.53	mOD	mOD (corrected from local Chart Datum (-2.57m)
Mean High Water Neap	MHWN	0.63	mOD	mOD (corrected from local Chart Datum (-2.57m)
Mean Low Water Neap	MLWN	-1.27	mOD	mOD (corrected from local Chart Datum (-2.57m)
Mean Low Water Spring	MHWS	-2.17	mOD	mOD (corrected from local Chart Datum (-2.57m)
Calculated average High Water Level		1.08	mOD	Mid point between Spring High and Neap High Water
Calculated average mid tide		-0.32	mOD	Meal Local sea Level (corrected to mOD)
Calculated average Low Water Level		-1.72	mOD	Mid point between Spring Low and Neap Low Water
Calculated average Tidal range		1.2	mOD	Range between high tide and low tide water levels in boreholes

Flow Calculations input parameters (Darcys Law Q=KIA)

Nominal Hydraulic Head (conservative hypothetical value adopted for modelling purposes)	**h**	**1.1**		*NB: In situ data logger results show hydraulic head at BH208 (ie highest water level in borehole) is 2.1mAOD to average Low Water Level in BH111 -0.1mAOD. For this site hydraulic gradient not completely reversed. Is reversed around perimeter but in centre at high tide BH208 level remains approxiamtely same during low and high tide. BH111 water levels varies with tide from 2.1mAOD to -0.1mAOD. Average value of 1.1m calculated. This nominal value takes account of the diminishing effect of the tidal pressure signal with increasing distance inland and away from the shoreline.*
Cross sectional area	**a**	**471.6**	m2	Perimeter of shoreline x normal tidal range. Area of made Ground and natural material through which tidal flux can occur within the normal tidal range
Hydraulic Gradient (h/l)	**i**	**0.006**	Dimensionless	Change in hydraulic head over distance. In this instance assumed to be the nominal head level from BH208 to BH111 divided by distance, averaged high tide value and low tide value.
Alternative Hydraulic Gradient (h/l) for sensitivity analysis	i(1)	0.428571429	Dimensionless	Using full 2.8m tidal range is extremely conservative given that the observed change in head level for the inland wells (upto 200m from shoreline) exhibit only small changes in head (circa 0.5m range)

Permeability

Values for permeability have been selected from a range of testing including; Rising Head tests, Falling Head Tests. Falling and rising head estimates are subject to interference from the tidal cycle and should be viewed as indicative only. However, these results are in broad agreement with literature values

Maximum	K(0)	1.00E-03	m/second	Unrealistic over-estimate - see sensitivity analysis
		8.64E+01	m/day	
Average	**K(1)**	**5.08E-05**	**m/second**	**Adopted conservative and representive value**
		4.39E+00	**m/day**	
Average - decreased by 1 order of magnitude (for sensitivity analysis)	K(2)	5.08E-06	m/second	Less conservative estimate
		4.39E-01	m/day	
Average - decreased by 2 orders of magnitude (for sensitivity analysis)	K(3)	5.08E-07	m/second	Estimates for sensitivity analysis and outline remedation/risk management design
		4.39E-02	m/day	
Average - decreased by 4 order of magnitude (for sensitivity analysis)	K(4)	5.08E-07	m/second	
		4.39E-03	m/day	
Minimum measured permeability (for sensitivity analysis)	K(5)	5.61E-06	m/second	
		0.48	m/day	

Flow Calculations			m3/day	Q (Flow) = k i a
Maximum Flow calcuation	Q(0)	244	m3/day	Permeability (86m/day)
Representative Flow Calculation	**Q(1)**	**12**	**m3/day**	**Assuming average permeability (4.4m/day)**
	Q(2)	1.24	m3/day	Permeability (0.44m/day)
	Q(3)	0.12	m3/day	Permeability (0.044m/day)
	Q(4)	0.01	m3/day	Permeability (0.0044m/day)
Minimum Flow calcuation	Q(5)	1.36	m3/day	Assuming Minimum permeability (0.48)

Total flux calculation				
Representative estimated daily flux	**Q1 + p**	**78**	**m3/day**	Precipitation/infiltration plus tidal flux assuming 24 hour outgoing tide based on'Representitive flow' (Q1)

WATER FLUX MODEL - SENSITIVITY ANALYSIS

Context - Reconciliation of estimated tidal flow compared to specific yield of the saturated soil mass within normal tidal range

	Estimated Flow (Darcy) (m3)	Estimated Specific Yield (m3)	% flux	
Maximum Theoretical Flow calcuation (assuming the highest recorded permeability86m/day)	244	13950	1.8%	This scenario envisages 1.8% of the total saturated water mass being discharged/exchanged in each tidal cycle which is considered to be an over-estimate. Whilst the observations of average head variations are pronounced around the periphery of the site and in the order of 2m, with little in the central region of the site. However, given the relatively high permeabilties locally encountered across the site, an element of flow may be occuring at least from the periphery of the site .
Average Flow calculation	12	13950	0.1%	This scenario envisages 0.1% of the total saturated water mass being discharged/exchanged in each tidal cycle. The hydraulic gradient created by the tidal cycle, particularly around the periphery of the site, is short-lived and then partially reversed, leaving relatively little time for flow to occur. On this basis, this value is considered to represent a reasonable but conservative estimate.

* Specific yield is the maximum theoretical volume of water which could drain from the saturated soil mass if there was no resisting hydrostatic pressure or re-charge (i.e. if sea level remained permenantly below the MLWS). However, this theoretical value is considered to be useful in contextualising the range of fluxes estimated using Darcy's Law.

Sensitivity Analysis

Darcys Law - Calculations - sensitivity analysis on hydraulic gradient (i) in Darcys Law flow calculations assuming a full **2.8m normal tidal range** rather than adopted value

Maximum Flow calcuation	Q(0)	17463	m3/day	Assuming Highest (worst case) permeability
Average Flow calcuation	Q(1)	887	m3/day	Assuming average permeability
Minimum Flow calcuation	Q(5)	97.015	m3/day	Assuming Minimum permeability

Notes: Assuming a hydrualic head created by full **2.8m** tidal range is extremely conservative as this siutation would only occur for a few minutes each tide and there is insufficent time to drain the site in this period. There is also limited evidence of actual flow in the central regions of the site. However, for the purposes of sensitivity analysis, this assessment is considered to be useful in providing a theoretical upper limit on flux estimates which is highly unlikely to be reached in reality.

Total flux calculation - Sensitivity analysis on total flux by varying Permeability (k) In Darcys Law calcuations

	Q(0) +p	310	m3/day	Using Q(0) flow estimate, the flux estimate in this scenario would require approximately 2.4% of all available water within the saturated mass (i.e. specific yeild) to be discharged into the estuary each day, which in the absence of any measureable hydraulic gradient is considered not to be viable.

Estimated daily flux assuming 2 tidal cycles per day and an average daily contribution from infiltration	Q(1) +p	78	m3/day	Using Q(1) flow estimate, the contribution from flow is approximately 0.1% of specific yield, which is considered to be conservative but theoretically viable. In this scenario the contribution from precipitation/Infilitration is relatively large by comparison to the main tidally driven flux estimate.
	Q(2) +p	66	m3/day	Using Q(2) flow estimate, the contribution from precipitation/Infilitration accounts for approximately 94% of the total flux. In theory, this estimate may be realisitic given that model has adopted an artificial hydraulic gradient in order to drive flow (using Darcys Law). However, in the interests of maintaining conservatism throughout every element of this model, a higher flow rate has been adopted (i.e. Q(1))
	Q(3) +p	65	m3/day	Using (Q3) and Q(4) flow estimates, the contribution from precipitation/Infilitration is the main flow driver. The tidally driven flow volumes (in conjunction with precipitation/Infilitration) are considered to be too low to account for the more signifncant variations in head level observed in wells around the 393m shoreline of the site.
	Q(4) +p	65	m3/day	
	Q(5) +p	66	m3/day	Using Q(5) flow estimate, minimum measured permeability

N

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

KEY:

- ZONE 1 - 10m
- ZONE 2 - 20m
- ZONE 3 - 50m
- ZONE 4 - 100m
- ZONE 5 - 150m
- LATERAL EXTENT OF ZONES 1 - 5
- 0.13 - WATER LEVEL (m OD)
- -4.20 - MARINE BED LEVEL (m OD)
- -4.33 - WATER DEPTH (m)
- MAJOR CONTOUR
- -5.50 - MINOR CONTOUR

NORTH WATER VOLUME (BASED ON WATER LEVEL OF -0.32m OD)			
ZONE	AREA (m^2)	VOLUME OF WATER (m^3)	AVERAGE WATER DEPTH (m)
ZONE 1 (SHORELINE TO 10m)	4,847	9,403	1.94
ZONE 2 (SHORELINE TO 20m)	9,723	30,433	3.13
ZONE 3 (SHORELINE TO 50m)	24,789	108,080	4.36
ZONE 4 (SHORELINE TO 100m)	51,263	226,582	4.42
ZONE 5 (SHORELINE TO 150m)	79,694	317,182	3.98

0m
10m
20m
50m
100m
150m

PRELIMINARY

REV	DESCRIPTION	BY	CHK	APP	DATE
A	POSITIVE DEPTH VALUES REMOVED	LA			21.12.15

CLIENT

CORK COUNTY COUNCIL

1 LOCKSLEY BUSINESS PARK
MONTGOMERY ROAD
BELFAST
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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

SOUTH WATER VOLUME

Scale @ A1	Drawn	Date	Checked	Date	Approved	Date
1/1250	JS	24/11/15	PJC	24/11/15	PJC	24/11/15

Project No.	Office	Type	Drawing No.	Revision
A092989	36	01	W-002	P2

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DILUTION MODEL - SOUTH

Site Dimensions	Units	Values	Source / Comments
Site perimeter (shoreline)	m	393	Approximate from CAD plan
Radius	m		Assuming the site is a semi-circle for modelling purposes
Site area	m2	46,500	Measured from CAD

	Site area	Radius			Volume of water	Volume of water	Tidal flux
					m3	litres/day	litres/day
Zone 1 (Shoreline perimeter to 10m)	46500	10			5.E+03	5.E+06	9.69E+06
Zone 2 (Shoreline perimeter to 20m)	46,500	20			3.E+04	3.E+07	6.09E+07
Zone 3 (Shoreline perimeter to 50m)	46,500	50			1.E+05	1.E+08	2.16E+08
Zone 4 (Shoreline perimeter to 100m)	46,500	100			2.E+05	2.E+08	4.53E+08
Zone 5 (Shoreline perimeter to 150m)	46,500	150			3.E+05	3.E+08	6.34E+08

Daily Water Flux	m3	litres /day	Comments
Representative estimated daily flux	**78**	**77525**	Precipitation/infiltration plus tidal flux assuming 24 hour outgoing tide based on'Representitive flow' (Q1)
High Level Estimate	97	96906	Conservative over-estimate of daily flux based on 50% increase over Representative estimate (for sensitivity analysis)

Priority CoCs

Groundwater chemistry results obtained from within the saturated mass of the made ground and natural.

Determinant	WQS (µg/l)	Total No. of Samples	Minimum	Predicted Average	Maximum	No. Samples Exceeding WQS	Comments
Cadmium	0.2	26	<0.02	**0.36**	3.73	7	Average' values adopted for modelling to be representative of the groundwater as a whole. 'Maximum' values used in sensitivity analysis
Chromium VI	0.6	26	<2	**2.08**	4	4	
Copper	5	26	<3	**4.08**	19	2	
Zinc	40	26	<1.5	**45.24**	174.9	8	
Lead	1.3	26	<0.4	**3.37**	27.9	12	
Manganese	30	26	<1.5	**933**	6278	17	
Mercury	0.07	26	<0.01	**0.21**	1.31	7	
Anthracene	0.1	26	<0.01	**0.27**	46.23	1	
Benzo(a)pyrene	0.00017	26	<0.01	**0.6**	92.43	5	
Benzo(b)fluoranthene	0.03	26	<0.01	**2**	109.84	4	
Benzo(k)fluoranthene	0.03	26	<0.01	**0.8**	42.72	4	
benzo(ghi)perylene	0.002	26	<0.01	**0.5**	34.98	4	
Fluoranthene	0.0063	26	<0.01	**1.73**	255.52	19	
Indeno(123cd)pyrene	0.002	26	<0.01	**0.5**	40.11	4	
Total TPH	10	26	<10	**8089**	187094	4	
Aliphatics >C8-C10	10	26	<5	**0.2**	64	1	
Aliphatics >C10-C12	10	26	<5	**1.8**	9035	1	
Aliphatics >C12-C16	10	26	<10	**4.1**	34640	4	
Aliphatics >C16-C21	10	26	<10	**750**	47040	4	
Aliphatics >C21-C35	10	26	<10	**307**	17880	2	
Aromatics >EC8-EC10	10	26	<5	**0.1**	10	0	
Aromatics >EC10-EC12	10	26	<5	**0.4**	2135	2	
Aromatics >EC12-EC16	10	26	<10	**2.3**	19450	4	
Aromatics >EC16-EC21	10	26	<10	**630**	39000	4	
Aromatics >EC21-EC35	10	26	<10	**321**	17840	4	

Estimated diluted concentrations

Conservatively representative scenario assuming average concentration of contaminant is distributed equally through entire saturated mass (groundwater) and diluted into a static water body. The model outputs predicted concentrations of the COC within the harbour water at each distance increment (ug/l)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**8.E-03**	**1.E-03**	**4.E-04**	**2.E-04**	**1.E-04**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.02	0.00	0.00	0.00	0.00	
Copper	**5**	0.03	0.01	0.00	0.00	0.00	
Zinc	**40**	0.36	0.06	0.02	0.01	0.01	
Lead	**1.3**	0.03	0.00	0.00	0.00	0.00	
Manganese	**30**	7.46	1.19	0.33	0.16	0.11	
Mercury	**0.07**	0.00	0.00	0.00	0.00	0.00	
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Benzo(a)pyrene	**0.00017**	0.0048	0.0008	0.0002	0.0001	0.0001	
Benzo(b)fluoranthene	**0.03**	0.0160	0.0025	0.0007	0.0003	0.0002	
Benzo(k)fluoranthene	**0.03**	0.0064	0.0010	0.0003	0.0001	0.0001	
benzo(ghi)perylene	**0.002**	0.0040	0.0006	0.0002	0.0001	0.0001	
Fluoranthene	**0.0063**	0.0138	0.0022	0.0006	0.0003	0.0002	
Indeno(123cd)pyrene	**0.002**	0.0040	0.0006	0.0002	0.0001	0.0001	
Aliphatics >C8-C10	**10**	0.00	0.000	0.00	0.00	0.00	
Aliphatics >C10-C12	**10**	0.01	0.002	0.00	0.00	0.00	
Aliphatics >C12-C16	**10**	0.03	0.005	0.00	0.00	0.00	
Aliphatics >C16-C21	**10**	6.00	0.955	0.27	0.13	0.09	
Aliphatics >C21-C35	**10**	2.46	0.391	0.11	0.05	0.04	
Aromatics >EC8-EC10	**10**	0.00	0.000	0.00	0.00	0.00	
Aromatics >EC10-EC12	**10**	0.00	0.001	0.00	0.00	0.00	
Aromatics >EC12-EC16	**10**	0.02	0.003	0.00	0.00	0.00	
Aromatics >EC16-EC21	**10**	5.04	0.802	0.23	0.11	0.08	
Aromatics >EC21-EC35	**10**	2.57	0.409	0.12	0.05	0.04	

DILUTION MODEL - SENSITIVITY ANALYSIS

Dilution factor - Assuming Maximum (rather than average) recorded concentration is distributed equally through entire saturated mass (within normal tidal range)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		**8.E-03**	**1.E-03**	**4.E-04**	**2.E-04**	**1.E-04**
Cadmium	**0.2**	0.03	0.00	0.00	0.00	0.00
Chromium VI	**0.6**	0.03	0.01	0.00	0.00	0.00
Copper	**5**	0.15	0.02	0.01	0.00	0.00
Zinc	**40**	1.40	0.22	0.06	0.03	0.02
Lead	**1.3**	0.22	0.04	0.01	0.00	0.00
Manganese	**30**	50.21	8.00	2.25	1.07	0.77
Mercury	**0.07**	0.01	0.00	0.00	0.00	0.00
Anthracene	**0.1**	0.37	0.06	0.02	0.01	0.01
Benzo(a)pyrene	**0.00017**	0.74	0.12	0.03	0.02	0.01
Benzo(b)fluoranthene	**0.03**	0.88	0.14	0.04	0.02	0.01
Benzo(k)fluoranthene	**0.03**	0.34	0.05	0.02	0.01	0.01
benzo(ghi)perylene	**0.002**	0.28	0.04	0.01	0.01	0.00
Fluoranthene	**0.0063**	2.04	0.33	0.09	0.04	0.03
Indeno(123cd)pyrene	**0.002**	0.32	0.05	0.01	0.01	0.00
Aliphatics >C8-C10	**10**	0.51	0.08	0.02	0.01	0.01
Aliphatics >C10-C12	**10**	72.25	11.51	3.24	1.55	1.10
Aliphatics >C12-C16	**10**	277.02	44.12	12.42	5.93	4.23
Aliphatics >C16-C21	**10**	376.19	59.91	16.87	8.05	5.75
Aliphatics >C21-C35	**10**	142.99	22.77	6.41	3.06	2.19
Aromatics >EC8-EC10	**10**	0.08	0.01	0.00	0.00	0.00
Aromatics >EC10-EC12	**10**	17.07	2.72	0.77	0.37	0.26
Aromatics >EC12-EC16	**10**	155.55	24.77	6.98	3.33	2.38
Aromatics >EC16-EC21	**10**	311.89	49.67	13.99	6.67	4.77
Aromatics >EC21-EC35	**10**	142.67	22.72	6.40	3.05	2.18

Dilution factor - High Level Estimate with 50% increase over average estimated flux

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		**1.E-02**	**2.E-03**	**4.E-04**	**2.E-04**	**2.E-04**
Chromium VI	**0.6**	0.02	0.00	0.00	0.00	0.00
Copper	**5**	0.04	0.01	0.00	0.00	0.00
Zinc	**40**	0.45	0.07	0.02	0.01	0.01
Lead	**1.3**	0.03	0.01	0.00	0.00	0.00
Manganese	**30**	9.33	1.49	0.42	0.20	0.14
Mercury	**0.07**	0.00	0.00	0.00	0.00	0.00
Total TPH	**10**	0.00	0.00	0.00	0.00	0.00
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00
Benzo(a)pyrene	**0.00017**	0.0060	0.0010	0.0003	0.0001	0.0001
Benzo(b)fluoranthene	**0.03**	0.0200	0.0032	0.0009	0.0004	0.0003
Benzo(k)fluoranthene	**0.03**	0.0080	0.0013	0.0004	0.0002	0.0001
benzo(ghi)perylene	**0.002**	0.0050	0.0008	0.0002	0.0001	0.0001
Fluoranthene	**0.0063**	0.0173	0.0028	0.0008	0.0004	0.0003
Indeno(123cd)pyrene	**0.002**	0.0050	0.0008	0.0002	0.0001	0.0001
Aliphatics >C8-C10	**10**	0.0020	0.0003	0.0001	0.0000	0.0000
Aliphatics >C10-C12	**10**	0.0180	0.0029	0.0008	0.0004	0.0003
Aliphatics >C12-C16	**10**	0.0410	0.0065	0.0018	0.0009	0.0006
Aliphatics >C16-C21	**10**	7.4974	1.1941	0.3362	0.1604	0.1146
Aliphatics >C21-C35	**10**	3.0689	0.4888	0.1376	0.0656	0.0469
Aromatics >EC8-EC10	**10**	0.0010	0.0002	0.0000	0.0000	0.0000
Aromatics >EC10-EC12	**10**	0.0040	0.0006	0.0002	0.0001	0.0001
Aromatics >EC12-EC16	**10**	0.0230	0.0037	0.0010	0.0005	0.0004
Aromatics >EC16-EC21	**10**	6.2978	1.0030	0.2824	0.1347	0.0962
Aromatics >EC21-EC35	**10**	3.2089	0.5111	0.1439	0.0686	0.0490

Dilution factors considering a range permeability estimates used in the Flux model

Permeability (86m/day)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		**3.E-02**	**5.E-03**	**1.E-03**	**7.E-04**	**5.E-04**
Cadmium	**0.2**	0.01	0.00	0.00	0.00	0.00
Chromium VI	**0.6**	0.07	0.01	0.00	0.00	0.00
Copper	**5**	0.13	0.02	0.01	0.00	0.00
Zinc	**40**	1.44	0.23	0.06	0.03	0.02
Lead	**1.3**	0.11	0.02	0.00	0.00	0.00
Manganese	**30**	29.80	4.75	1.34	0.64	0.46
Mercury	**0.07**	0.01	0.001	0.000	0.000	0.000
Total TPH	**10**	0.00	0.000	0.000	0.000	0.000
Anthracene	**0.1**	0.01	0.001	0.000	0.000	0.000
Benzo(a)pyrene	**0.00017**	0.02	0.003	0.001	0.000	0.000
Benzo(b)fluoranthene	**0.03**	0.06	0.010	0.003	0.001	0.001
Benzo(k)fluoranthene	**0.03**	0.03	0.004	0.001	0.001	0.000
benzo(ghi)perylene	**0.002**	0.02	0.003	0.001	0.000	0.000
Fluoranthene	**0.0063**	0.06	0.009	0.002	0.001	0.001
Indeno(123cd)pyrene	**0.002**	0.02	0.003	0.001	0.000	0.000
Aliphatics >C8-C10	**10**	0.01	0.001	0.000	0.000	0.000
Aliphatics >C10-C12	**10**	0.06	0.009	0.003	0.001	0.001
Aliphatics >C12-C16	**0**	0.13	0.021	0.006	0.003	0.002
Aliphatics >C16-C21	**10**	23.95	3.815	1.074	0.512	0.366
Aliphatics >C21-C35	**10**	9.80	1.561	0.440	0.210	0.150
Aromatics >EC8-EC10	**10**	0.00	0.001	0.000	0.000	0.000
Aromatics >EC10-EC12	**10**	0.01	0.002	0.001	0.000	0.000
Aromatics >EC12-EC16	**10**	0.07	0.012	0.003	0.002	0.001
Aromatics >EC16-EC21	**10**	20.12	3.204	0.902	0.430	0.307
Aromatics >EC21-EC35	**10**	10.25	1.633	0.460	0.219	0.157

Permeability (0.4m/day)							
	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**7.E-03**	**1.E-03**	**3.E-04**	**1.E-04**	**1.E-04**	
Cadmium	**0.2**	2.46E-03	3.92E-04	1.10E-04	5.27E-05	3.76E-05	
Chromium VI	**0.6**	1.42E-02	2.27E-03	6.38E-04	3.05E-04	2.18E-04	
Copper	**5**	2.79E-02	4.45E-03	1.25E-03	5.97E-04	4.27E-04	
Zinc	**40**	3.10E-01	4.93E-02	1.39E-02	6.62E-03	4.73E-03	
Lead	**1.3**	2.31E-02	3.67E-03	1.03E-03	4.93E-04	3.52E-04	
Manganese	**30**	6.39E+00	1.02E+00	2.86E-01	1.37E-01	9.76E-02	
Mercury	**0.07**	1.44E-03	2.29E-04	6.45E-05	3.07E-05	2.20E-05	
Total TPH	**10**	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Anthracene	**0.1**	1.85E-03	2.94E-04	8.29E-05	3.95E-05	2.82E-05	
Benzo(a)pyrene	**0.00017**	4.11E-03	6.54E-04	1.84E-04	8.78E-05	6.27E-05	
Benzo(b)fluoranthene	**0.03**	1.37E-02	2.18E-03	6.14E-04	2.93E-04	2.09E-04	
Benzo(k)fluoranthene	**0.03**	5.47E-03	8.72E-04	2.46E-04	1.17E-04	8.37E-05	
benzo(ghi)perylene	**0.002**	3.42E-03	5.45E-04	1.53E-04	7.32E-05	5.23E-05	
Fluoranthene	**0.0063**	1.18E-02	1.89E-03	5.31E-04	2.53E-04	1.81E-04	
Indeno(123cd)pyrene	**0.002**	3.42E-03	5.45E-04	1.53E-04	7.32E-05	5.23E-05	
Aliphatics >C8-C10	**10**	1.37E-03	2.18E-04	6.14E-05	2.93E-05	2.09E-05	
Aliphatics >C10-C12	**10**	1.23E-02	1.96E-03	5.52E-04	2.64E-04	1.88E-04	
Aliphatics >C12-C16	**10**	2.81E-02	4.47E-03	1.26E-03	6.00E-04	4.29E-04	
Aliphatics >C16-C21	**10**	5.13E+00	8.17E-01	2.30E-01	1.10E-01	7.84E-02	
Aliphatics >C21-C35	**10**	2.10E+00	3.35E-01	9.42E-02	4.49E-02	3.21E-02	
Aromatics >EC8-EC10	**10**	6.84E-04	1.09E-04	3.07E-05	1.46E-05	1.05E-05	
Aromatics >EC10-EC12	**10**	2.74E-03	4.36E-04	1.23E-04	5.86E-05	4.18E-05	
Aromatics >EC12-EC16	**10**	1.57E-02	2.51E-03	7.06E-04	3.37E-04	2.41E-04	
Aromatics >EC16-EC21	**10**	4.31E+00	6.87E-01	1.93E-01	9.22E-02	6.59E-02	
Aromatics >EC21-EC35	**10**	2.20E+00	3.50E-01	9.85E-02	4.70E-02	3.36E-02	

Permeability (0.04m/day)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		**7.E-03**	**1.E-03**	**3.E-04**	**1.E-04**	**1.E-04**
Cadmium	**0.2**	2.42E-03	3.86E-04	1.09E-04	5.18E-05	3.70E-05
Chromium VI	**0.6**	1.40E-02	2.23E-03	6.28E-04	2.99E-04	2.14E-04
Copper	**5**	2.75E-02	4.37E-03	1.23E-03	5.87E-04	4.19E-04
Zinc	**40**	3.04E-01	4.85E-02	1.37E-02	6.51E-03	4.65E-03
Lead	**1.3**	2.27E-02	3.61E-03	1.02E-03	4.85E-04	3.46E-04
Manganese	**30**	6.28E+00	1.00E+00	2.82E-01	1.34E-01	9.59E-02
Mercury	**0.07**	1.41E-03	2.25E-04	6.34E-05	3.02E-05	2.16E-05
Anthracene	**0.1**	1.82E-03	2.89E-04	8.15E-05	3.89E-05	2.78E-05
Benzo(a)pyrene	**0.00017**	4.04E-03	6.43E-04	1.81E-04	8.64E-05	6.17E-05
Benzo(b)fluoranthene	**0.03**	1.35E-02	2.14E-03	6.03E-04	2.88E-04	2.06E-04
Benzo(k)fluoranthene	**0.03**	5.38E-03	8.57E-04	2.41E-04	1.15E-04	8.23E-05
benzo(ghi)perylene	**0.002**	3.36E-03	5.36E-04	1.51E-04	7.20E-05	5.14E-05
Fluoranthene	**0.0063**	1.16E-02	1.85E-03	5.22E-04	2.49E-04	1.78E-04
Indeno(123cd)pyrene	**0.002**	3.36E-03	5.36E-04	1.51E-04	7.20E-05	5.14E-05
Aliphatics >C8-C10	**10**	1.35E-03	2.14E-04	6.03E-05	2.88E-05	2.06E-05
Aliphatics >C10-C12	**10**	1.21E-02	1.93E-03	5.43E-04	2.59E-04	1.85E-04
Aliphatics >C12-C16	**10**	2.76E-02	4.39E-03	1.24E-03	5.90E-04	4.22E-04
Aliphatics >C16-C21	**10**	5.05E+00	8.04E-01	2.26E-01	1.08E-01	7.71E-02
Aliphatics >C21-C35	**10**	2.07E+00	3.29E-01	9.26E-02	4.42E-02	3.16E-02
Aromatics >EC8-EC10	**10**	6.73E-04	1.07E-04	3.02E-05	1.44E-05	1.03E-05
Aromatics >EC10-EC12	**10**	2.69E-03	4.29E-04	1.21E-04	5.76E-05	4.11E-05
Aromatics >EC12-EC16	**10**	1.55E-02	2.46E-03	6.94E-04	3.31E-04	2.36E-04
Aromatics >EC16-EC21	**10**	4.24E+00	6.75E-01	1.90E-01	9.07E-02	6.48E-02
Aromatics >EC21-EC35	**10**	2.16E+00	3.44E-01	9.69E-02	4.62E-02	3.30E-02

Permeability (0.004m/day)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)
Dilution Factor		**7.E-03**	**1.E-03**	**3.E-04**	**1.E-04**	**1.E-04**
Cadmium	**0.2**	2.42E-03	3.85E-04	1.08E-04	5.17E-05	3.70E-05
Chromium VI	**0.6**	1.40E-02	2.23E-03	6.27E-04	2.99E-04	2.13E-04
Copper	**5**	2.74E-02	4.36E-03	1.23E-03	5.86E-04	4.19E-04
Zinc	**40**	3.04E-01	4.84E-02	1.36E-02	6.50E-03	4.64E-03
Lead	**1.3**	2.26E-02	3.61E-03	1.02E-03	4.84E-04	3.46E-04
Manganese	**30**	6.27E+00	9.98E-01	2.81E-01	1.34E-01	9.58E-02
Mercury	**0.07**	1.41E-03	2.25E-04	6.33E-05	3.02E-05	2.16E-05
Anthracene	**0.1**	1.81E-03	2.89E-04	8.13E-05	3.88E-05	2.77E-05
Benzo(a)pyrene	**0.00017**	4.03E-03	6.42E-04	1.81E-04	8.62E-05	6.16E-05
Benzo(b)fluoranthene	**0.03**	1.34E-02	2.14E-03	6.02E-04	2.87E-04	2.05E-04
Benzo(k)fluoranthene	**0.03**	5.37E-03	8.56E-04	2.41E-04	1.15E-04	8.21E-05
benzo(ghi)perylene	**0.002**	3.36E-03	5.35E-04	1.51E-04	7.18E-05	5.13E-05
Fluoranthene	**0.0063**	1.16E-02	1.85E-03	5.21E-04	2.49E-04	1.78E-04
Indeno(123cd)pyrene	**0.002**	3.36E-03	5.35E-04	1.51E-04	7.18E-05	5.13E-05
Total TPH	**10**	5.43E+01	8.65E+00	2.44E+00	1.16E+00	8.30E-01
Aliphatics >C8-C10	**10**	1.34E-03	2.14E-04	6.02E-05	2.87E-05	2.05E-05
Aliphatics >C10-C12	**10**	1.21E-02	1.93E-03	5.42E-04	2.59E-04	1.85E-04
Aliphatics >C12-C16	**10**	2.75E-02	4.39E-03	1.24E-03	5.89E-04	4.21E-04
Aliphatics >C16-C21	**10**	5.04E+00	8.02E-01	2.26E-01	1.08E-01	7.70E-02
Aliphatics >C21-C35	**10**	2.06E+00	3.28E-01	9.25E-02	4.41E-02	3.15E-02
Aromatics >EC8-EC10	**10**	6.72E-04	1.07E-04	3.01E-05	1.44E-05	1.03E-05
Aromatics >EC10-EC12	**10**	2.69E-03	4.28E-04	1.20E-04	5.75E-05	4.11E-05
Aromatics >EC12-EC16	**10**	1.54E-02	2.46E-03	6.93E-04	3.30E-04	2.36E-04
Aromatics >EC16-EC21	**10**	4.23E+00	6.74E-01	1.90E-01	9.05E-02	6.47E-02
Aromatics >EC21-EC35	**10**	2.16E+00	3.43E-01	9.67E-02	4.61E-02	3.29E-02

WATER FLUX MODEL - NORTH

Site Dimensions	Notations	Values	**Units**	Source / Comments
Length (m)		560	m	North - South
Width (m)	**l**	**70**	m	From BH208 to dock
Area (m2)		67,800	m2	Approximate from CAD plan
Perimeter of shoreline (m)	r	915	m	Approximate from CAD plan

Precipitation				
Total rainfall		1022	mm/year	Annual Average =1022mm Cork Airport (2011)
Effective Precipitation:		50%	mm/year	Conservative over estimate but loss via evapotranspiration and run-off is expected to be relatively high on this site given concrete and drainage cover. Likely high leakage from drains
Daily average inflitration		1.40	mm/day	50% of total annual precipitation divided by 365 days
Total infiltration per day		94920	mm/day	Daily average mutiplied by site area
Total infiltration per day	**p**	**95**	m3/day	Average daily infiltration at 50% of total

Aquifer				
Saturated Made Ground and Natural Soils volume within normal Tidal cycle		189840	m3	Average tidal range x site area
Effective porosity	34%	64546	m3	Mid-range estimate of Sand/Gravel (Fine Sand) Brassington 2007 provides an estimate of the total volume of water held within made ground and natural
Specific Yeild	25%	47460	m3	Mid-range estimate of Sand/Gravel (Fine Sand) Brassington 2007 - provides an estimate of the total volume of water held within made ground which could theoretically drain in perfect conditions (i.e. without hydrostatic pressure from surrounding soil/water mass)

Tides				
Mean High Water Spring	MHWS	1.53	mOD	mOD (corrected from local Chart Datum (-2.57m)
Mean High Water Neap	MHWN	0.63	mOD	mOD (corrected from local Chart Datum (-2.57m)
Mean Low Water Neap	MLWN	-1.27	mOD	mOD (corrected from local Chart Datum (-2.57m)
Mean Low Water Spring	MHWS	-2.17	mOD	mOD (corrected from local Chart Datum (-2.57m)
Calculated average High Water Level		1.08	mOD	Mid point between Spring High and Neap High Water
Calculated average mid tide		-0.32	mOD	Meal Local sea Level (corrected to mOD)
Calculated average Low Water Level		-1.72	mOD	Mid point between Spring Low and Neap Low Water
Calculated average Tidal range		2.8	mOD	Range between Mid Point Estimates (i.e. 'Normal Tidal Range' averaging Spring and Neap Tides)

Flow Calculations input parameters (Darcys Law Q=KIA)

Nominal Hydraulic Head (conservative hypothetical value adopted for modelling purposes)	**h**	**1.9**		*NB: In situ data logger results show hydraulic head at BH208 (ie highest average water level in borehole) is 2.07mAOD to average LOW Water Level -1.72mOD. For this site hydraulic gradient not completely reversed. Is reversed around perimeter but in centre at high tide BH208 level was approximately 2mAOD with high water tide ave of 1.08m, still give gradient towards cork harbour. Consequently average of two utilised, ie an average of full tide range 2.8m plus high tide tidal hydraulic head of 0.99m. This nominal value takes account of the diminishing effect of the tidal pressure signal with increasing distance inland and away from the shoreline.*
Cross sectional area	**a**	**2562**	m2	Perimeter of shoreline x normal tidal range. Area of made Ground and natural material through which tidal flux can occur within the normal tidal range
Hydraulic Gradient (h/l)	**i**	**0.027142857**	Dimensionless	Change in hydraulic head over distance. In this instance assumed to be the nominal head level across transect site (1.9m) divided by the distance from BH208 (max water level) to dock to east.
Alternative Hydraulic Gradient (h/l) for sensitivity analysis	i(1)	0.04	Dimensionless	Using full 2.8m tidal range is extremely conservative given that the observed change in head level for the inland wells (upto 70m from shoreline) exhibit only small changes in head (circa 0.5m range)

Permeability

Values for permeability have been selected from a range of testing including; Rising Head tests, Falling Head Tests. Falling and rising head estimates are subject to interference from the tidal cycle and should be viewed as indicative only.

Maximum	K(0)	1.00E-03	m/second	Unrealistic over-estimate - see sensitivity analysis
		86	m/day	
Average	**K(1)**	3.67E-04	**m/second**	**Adopted conservative and representive value**
		32	**m/day**	
Average - decreased by 1 order of magnitude (for sensitivity analysis)	K(2)	3.67E-05	m/second	Less conservative estimate
		3.2	m/day	
Average - decreased by 2 orders of magnitude (for sensitivity analysis)	K(3)	3.67E-06	m/second	Estimates for sensitivity analysis and outline remedation/risk management design
		0.32	m/day	
Average - decreased by 4 order of magnitude (for sensitivity analysis)	K(4)	3.67E-07	m/second	
		0.032	m/day	
Minimum measured permeability (for sensitivity analysis)	K(5)	5.56E-06	m/second	
		0.48	m/day	

Flow Calculations			m3/day	Q (Flow) = k i a
Maximum Flow calcuation	Q(0)	6008	m3/day	Permeability (16m/day)
Representative Flow Calculation	**Q(1)**	**2204**	**m3/day**	**Assuming average permeability (4m/day)**
	Q(2)	220.44	m3/day	Permeability (0.4m/day)
	Q(3)	22.25	m3/day	Permeability (0.04m/day)
	Q(4)	2.23	m3/day	Permeability (0.004)
Minimum Flow calcuation	Q(5)	33.38	m3/day	Assuming Minimum permeability (0.48)

Total flux calculation				
Representative estimated daily flux	**Q1 + p**	**2299**	**m3/day**	Precipitation/infiltration plus tidal flux assuming 24 hour outgoing tide based on'Representitive flow' (Q1)

WATER FLUX MODEL - SENSITIVITY ANALYSIS

Context - Reconciliation of estimated tidal flow compared to specific yield of the saturated soil mass within normal tidal range

	Estimated Flow (Darcy) (m3)	Estimated Specific Yield (m3)	% flux	
Maximum Theoretical Flow calcuation (assuming the highest recorded permeability16m/day)	6008	64546	9%	This scenario envisages 9% of the total saturated water mass being discharged/exchanged in each tidal cycle . Whilst the observations of average head variations are pronounced around the periphery of the site and in the order of 2m, with little in the central region of the site. However, given the relatively high permeabilties locally encountered across the site, an element of flow may be occuring at least from the periphery of the site
Average Flow calculation	2204	47460	4.6%	This scenario envisages 4.6% of the total saturated water mass being discharged/exchanged in each tidal cycle which is considered to be a reasonable estimate. Critically, any hydraulic gradient created by the tidal cycle is short-lived and then reversed, leaving relatively little time for flow to occur. **On this basis, this value is considered to represent a reasonable but conservative estimate**.

* Specific yeild is the maximum theoretical volume of water which could drain from the saturated soil mass if there was no resisting hydrostatic pressure or re-charge (i.e. if sea level remained permenantly below the MLWS). However, this theoretical value is considered to be useful in contextualising the range of fluxes estimated using Darcy's Law.

Sensitivity Analysis

Darcys Law - Calculations - sensitivity analysis on hydraulic gradient (i) in Darcys Law flow calculations assuming a full **2.8m normal tidal range** rather than adopted value

Maximum Flow calcuation	Q(0)	8854	m3/day	Assuming Highest (worst case) permeability
Average Flow calcuation	Q(1)	3249	m3/day	Assuming average permeability
Minimum Flow calcuation	Q(5)	49.190	m3/day	Assuming Minimum permeability

Notes: Assuming a hydrualic head created by full **2.8m** tidal range is extremely conservative as this siutation would only occur for a few minutes each tide and there is insufficent time to drain the site in this period. There is also limited evidence of actual flow in the central regions of the site. However, for the purposes of sensitivity analysis, this assessment is considered to be useful in providing a theoretical upper limit on flux estimates which is highly unlikely to be reached in reality.

Total flux calculation - Sensitivity analysis on total flux by varying Permeability (k) In Darcys Law calcuations				
Estimated daily flux assuming 2 tidal cycles per day and an average daily contribution from infiltration	Q(0) +p	6103	m3/day	Using Q(0) flow estimate, the flux estimate in this scenario would require approximately 9% of all available water within the saturated mass (i.e. specific yield) to be discharged into the estuary each day, which in the absence of any measureable hydraulic gradient is considered not to be viable.
	Q(1) +p	2299	m3/day	Using Q(1) flow estimate, the contribution from flow is approximately 4.6% of specific yeild, which is considered to be conservative but theoretically viable. In this sceanrio the contribution from precipitation/Infilitration is realtively small by comparison to the main tidally driven flux estimate.
	Q(2) +p	315	m3/day	Using Q(2) flow estimate, the contribution from precipitation/Infilitration accounts for approximately 30% of the total flux. In theory, this estimate may be realisitic given that model has adopted an artificial hydraulic gradient in order to drive flow (using Darcys Law). However, in the interests of maintaining conservatism throughout every element of this model, a higher flow rate has been adopted (i.e. Q(1))
	Q(3) +p	117	m3/day	Using (Q3) and Q(4) flow estimates, the contribution from precipitation/Infilitration is the main flow driver. The tidally driven flow volumes (in conjunction with precipitation/Infilitration) are considered to be too low to account for the more signifncant variations in head level observed in wells around the 915m shoreline of the site.
	Q(4) +p	97	m3/day	
	Q(5) +p	128	m3/day	Using Q(5) flow estimate, minimum measured permeability

DO NOT SCALE: CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ANY OMISSIONS OR ERRORS

KEY:

- ZONE 1 - 10m
- ZONE 2 - 20m
- ZONE 3 - 50m
- ZONE 4 - 100m
- ZONE 5 - 150m
- LATERAL EXTENT OF ZONES 1 - 5
- 0.13 - WATER LEVEL (m OD)
- -4.20 - MARINE BED LEVEL (m OD)
- -4.33 - WATER DEPTH (m)
- MAJOR CONTOUR
- -5.50 - MINOR CONTOUR

NORTH WATER VOLUME (BASED ON WATER LEVEL OF -0.32m OD)			
ZONE	AREA (m^2)	VOLUME OF WATER (m^3)	AVERAGE WATER DEPTH (m)
ZONE 1 (SHORELINE TO 10m)	24,634	180,321	7.32
ZONE 2 (SHORELINE TO 20m)	26,129	187,868	7.19
ZONE 3 (SHORELINE TO 50m)	30,992	214,465	6.92
ZONE 4 (SHORELINE TO 100m)	40,067	298,098	7.44
ZONE 5 (SHORELINE TO 150m)	50,325	420,214	8.35

PRELIMINARY

REV	DESCRIPTION	BY	CHK	APP	DATE
A	WESTERN ZONE BOUNDARY AMENDED	LA			14.12.15

CLIENT

CORK COUNTY COUNCIL

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Project:

HAULBOWLINE FACTORY SITE

Drawing Title:

NORTH WATER VOLUME

Scale @ A1	Drawn	Date	Checked	Date	Approved	Date
1/1250	JS	24/11/15	PJC	24/11/15	PJC	24/11/15

Project No.	Office	Type	Drawing No.	Revision
A092989	36	01	W-001	P2

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DILUTION MODEL - NORTH

Site Dimensions	Units	Values	Source / Comments
Site perimeter (shoreline)	m	915	Approximate from CAD plan
Radius	m		Assuming the site is a semi-circle for modelling purposes
Site area	m2	67,800	Assuming the site is a semi-circle for modelling purposes

	Site area	Radius			Volume of water	Volume of water	Tidal flux
					m3	litres/day	litres/day
Zone 1 (Shoreline perimeter to 10m)	67800	10			2.E+05	2.E+08	3.61E+08
Zone 2 (Shoreline perimeter to 20m)	67800	20			2.E+05	2.E+08	3.76E+08
Zone 3 (Shoreline perimeter to 50m)	67800	50			2.E+05	2.E+08	4.29E+08
Zone 4 (Shoreline perimeter to 100m)	67800	100			3.E+05	3.E+08	5.96E+08
Zone 5 (Shoreline perimeter to 150m)	67800	150			4.E+05	4.E+08	8.40E+08

Daily Water Flux	m3	litres /day	Comments
Representative estimated daily flux	**2299**	**2299338**	Precipitation/infiltration plus tidal flux assuming 24 hour outgoing tide based on'Representitive flow' (Q1)
High Level Estimate	2874	2874173	Conservative over-estimate of daily flux based on 50% increase over Representative estimate (for sensitivity analysis)

Priority CoCs

Groundwater chemistry results obtained from within the saturated mass of the made ground and natural.

Determinant	WQS (µg/l)	Total No. of Samples	Minimum	Average	Maximum	No. Samples Exceeding WQS	Comments
Cadmium	0.2	22	<0.03	**0.03**	0.11	0	
Chromium VI	0.6	28	<2	**1.82**	8	4	
Chromium Total	4.6	28	<2	**1.58**	8.9	4	
Copper	5	28	<3	**2.69**	13	3	
Zinc	40	28	1.9	**19.68**	123.2	5	
Lead	7.2	28	<0.4	**2.79**	1	1	
Manganese	30	28	<1.5	**603.99**	1173	17	
Total TPH	10	28	<10	**187.46**	5114	1	
Anthracene	0.1	28	<0.01	**0.02**	0.18	2	
Benzo(a)pyrene	0.05	28	<0.01	**0.01**	0.11	1	
Benzo(b)fluoranthene	0.03	28	<0.01	**0.01**	0.21	1	
Benzo(k)fluoranthene	0.03	28	<0.01	**0.01**	0.08	1	
benzo(ghi)perylene	0.02	28	<0.01	**0.01**	0.05	1	
Fluoranthene	0.1	28	<0.01	**0.03**	0.4	1	
Indeno(123cd)pyrene	0.02	28	<0.01	**0.01**	0.06	1	
Naphthalene	1.2	28	<0.1	**0.3**	3.3	2	

Average' values adopted for modelling to be representative of the groundwater as a whole. 'Maximum' values used in sensitivity analysis

* LOD > WQS. Only 1 sample recorded concentrations above WQS

Estimated diluted concentrations

Conservatively representative scenario assuming average concentration of contaminant is distributed equally through entire saturated mass (groundwater) and diluted into a static water body. The model outputs predicted concentrations of the COC within the harbour water at each distance increment (ug/l)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**6.E-03**	**6.E-03**	**5.E-03**	**4.E-03**	**3.E-03**	
Cadmium	**0.2**	0.000	0.000	0.000	0.000	0.000	
Chromium VI	**0.6**	0.012	0.011	0.010	0.007	0.005	
Chromium Total	**4.6**	0.010	0.010	0.008	0.006	0.004	
Copper	**5**	0.017	0.016	0.014	0.010	0.007	
Zinc	**40**	0.125	0.120	0.105	0.076	0.054	
Lead	**7.2**	0.018	0.017	0.015	0.011	0.008	
Manganese	**30**	3.851	3.696	3.238	2.329	1.652	
Total TPH	**10**	1.195	1.147	1.005	0.723	0.513	
Anthracene	**0.1**	0.000	0.000	0.000	0.000	0.000	
Benzo(a)pyrene	**0.05**	0.000	0.000	0.000	0.000	0.000	
Benzo(b)fluoranthene	**0.03**	0.000	0.000	0.000	0.000	0.000	
Benzo(k)fluoranthene	**0.03**	0.000	0.000	0.000	0.000	0.000	
benzo(ghi)perylene	**0.02**	0.000	0.000	0.000	0.000	0.000	
Fluoranthene	**0.1**	0.000	0.000	0.000	0.000	0.000	
Indeno(123cd)pyrene	**0.02**	0.000	0.000	0.000	0.000	0.000	

DILUTION MODEL - SENSITIVITY ANALYSIS

Dilution factor - Assuming Maximum (rather than average) recorded concentration is distributed equally through entire saturated mass (within normal tidal range)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**6.E-03**	**6.E-03**	**5.E-03**	**4.E-03**	**3.E-03**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.05	0.05	0.04	0.03	0.02	
Chromium Total	**4.6**	0.06	0.05	0.05	0.03	0.02	
Copper	**5**	0.08	0.08	0.07	0.05	0.04	
Zinc	**40**	0.79	0.75	0.66	0.48	0.34	
Lead	**7.2**	0.01	0.01	0.01	0.00	0.00	
Manganese	**30**	7.48	7.18	6.29	4.52	3.21	
Total TPH	**10**	32.61	31.30	27.41	19.72	13.99	
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Benzo(a)pyrene	**0.05**	0.00	0.00	0.00	0.00	0.00	
Benzo(b)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
Benzo(k)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
benzo(ghi)perylene	**0.02**	0.00	0.00	0.00	0.00	0.00	
Fluoranthene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Indeno(123cd)pyrene	**0.02**	0.00	0.00	0.00	0.00	0.00	

Dilution factor - High Level Estimate with 50% increase over average estimated flux

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**8.E-03**	**8.E-03**	**7.E-03**	**5.E-03**	**3.E-03**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.01	0.01	0.01	0.01	0.01	
Chromium Total	**4.6**	0.01	0.01	0.01	0.01	0.01	
Copper	**5**	0.02	0.02	0.02	0.01	0.01	
Zinc	**40**	0.16	0.15	0.13	0.09	0.07	
Lead	**7.2**	0.02	0.02	0.02	0.01	0.01	
Manganese	**30**	4.81	4.62	4.05	2.91	2.07	
Total TPH	**10**	1.49	1.43	1.26	0.90	0.64	
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Benzo(a)pyrene	**0.05**	0.00	0.00	0.00	0.00	0.00	
Benzo(b)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
Benzo(k)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
benzo(ghi)perylene	**0.02**	0.00	0.00	0.00	0.00	0.00	
Fluoranthene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Indeno(123cd)pyrene	**0.02**	0.00	0.00	0.00	0.00	0.00	

Dilution factors considering a range permeability estimates used in the Flux model

Permeability (86m/day)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**2.E-02**	**2.E-02**	**1.E-02**	**1.E-02**	**7.E-03**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.03	0.03	0.03	0.02	0.01	
Chromium Total	**4.6**	0.03	0.03	0.02	0.02	0.01	
Copper	**5**	0.05	0.04	0.04	0.03	0.02	
Zinc	**40**	0.33	0.32	0.28	0.20	0.14	
Lead	**7.2**	0.05	0.05	0.04	0.03	0.02	
Manganese	**30**	10.22	9.81	8.59	6.18	4.39	
Total TPH	**10**	3.17	3.045	2.667	1.919	1.361	
Anthracene	**0.1**	0.00	0.000	0.000	0.000	0.000	
Benzo(a)pyrene	**0.05**	0.00	0.000	0.000	0.000	0.000	
Benzo(b)fluoranthene	**0.03**	0.00	0.000	0.000	0.000	0.000	
Benzo(k)fluoranthene	**0.03**	0.00	0.000	0.000	0.000	0.000	
benzo(ghi)perylene	**0.02**	0.00	0.000	0.000	0.000	0.000	
Fluoranthene	**0.1**	0.00	0.000	0.000	0.000	0.000	
Indeno(123cd)pyrene	**0.02**	0.00	0.000	0.000	0.000	0.000	

Permeability (3.2m/day)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**9.E-04**	**8.E-04**	**7.E-04**	**5.E-04**	**4.E-04**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.00	0.00	0.00	0.00	0.00	
Chromium Total	**4.6**	0.00	0.00	0.00	0.00	0.00	
Copper	**5**	0.00	0.00	0.00	0.00	0.00	
Zinc	**40**	0.02	0.02	0.01	0.01	0.01	
Lead	**7.2**	0.00	0.00	0.00	0.00	0.00	
Manganese	**30**	0.53	0.51	0.44	0.32	0.23	
Total TPH	**10**	0.16	0.16	0.14	0.10	0.07	
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Benzo(a)pyrene	**0.05**	0.00	0.00	0.00	0.00	0.00	
Benzo(b)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
Benzo(k)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
benzo(ghi)perylene	**0.02**	0.00	0.00	0.00	0.00	0.00	
Fluoranthene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Indeno(123cd)pyrene	**0.02**	0.00	0.00	0.00	0.00	0.00	

Permeability (0.32m/day)

	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**3.E-04**	**3.E-04**	**3.E-04**	**2.E-04**	**1.E-04**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.00	0.00	0.00	0.00	0.00	
Chromium Total	**4.6**	0.00	0.00	0.00	0.00	0.00	
Copper	**5**	0.00	0.00	0.00	0.00	0.00	
Zinc	**40**	0.01	0.01	0.01	0.00	0.00	
Lead	**7.2**	0.00	0.00	0.00	0.00	0.00	
Manganese	**30**	0.20	0.19	0.16	0.12	0.08	
Total TPH	**10**	0.06	0.06	0.05	0.04	0.03	
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Benzo(a)pyrene	**0.05**	0.00	0.00	0.00	0.00	0.00	
Benzo(b)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
Benzo(k)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
benzo(ghi)perylene	**0.02**	0.00	0.00	0.00	0.00	0.00	
Fluoranthene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Indeno(123cd)pyrene	**0.02**	0.00	0.00	0.00	0.00	0.00	

Permeability (0.032m/day)							
	WQS (µg/l)	Zone 1 (Shoreline perimeter to 10m)	Zone 2 (Shoreline perimeter to 20m)	Zone 3 (Shoreline perimeter to 50m)	Zone 4 (Shoreline perimeter to 100m)	Zone 5 (Shoreline perimeter to 150m)	
Dilution Factor		**3.E-04**	**3.E-04**	**3.E-04**	**2.E-04**	**2.E-04**	
Cadmium	**0.2**	0.00	0.00	0.00	0.00	0.00	
Chromium VI	**0.6**	0.00	0.00	0.00	0.00	0.00	
Chromium Total	**4.6**	0.00	0.00	0.00	0.00	0.00	
Copper	**5**	0.00	0.00	0.00	0.00	0.00	
Zinc	**40**	0.01	0.01	0.01	0.00	0.00	
Lead	**7.2**	0.00	0.00	0.00	0.00	0.00	
Manganese	**30**	0.16	0.21	0.18	0.13	0.09	
Mercury	**0.05**	0.00	0.00	0.00	0.00	0.00	
Total TPH	**10**	0.05	0.06	0.06	0.04	0.03	
Anthracene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Benzo(a)pyrene	**0.05**	0.00	0.00	0.00	0.00	0.00	
Benzo(b)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
Benzo(k)fluoranthene	**0.03**	0.00	0.00	0.00	0.00	0.00	
benzo(ghi)perylene	**0.02**	0.00	0.00	0.00	0.00	0.00	
Fluoranthene	**0.1**	0.00	0.00	0.00	0.00	0.00	
Indeno(123cd)pyrene	**0.02**	0.00	0.00	0.00	0.00	0.00	

Appendix S RTM Modelling and degradation Rates

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		anthracene		from Level 1
Target Concentration	C_T	1.00E-04	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: **Simulate vertical dispersion in 2 directions**

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: **Apply degradation rate to dissolved pollutants only**

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.94E-03	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	5.10E+02	days	*howard average*
Calculated decay rate	λ	1.36E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.54E+02	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	1.72E+03	fraction
Decay rate used	λ	7.90E-07	d^{-1}
Rate of contaminant flow due to retardation	u	4.51E-05	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	2.65E-04	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**7.31E+00**	

Remedial Targets

Remedial Target		**7.31E-04**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**2.65E-04**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	2.95E+04	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	3.54E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

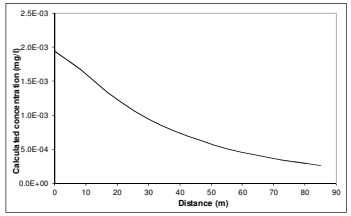
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.9E-03
4.3	1.81E-03
8.5	1.66E-03
12.8	1.50E-03
17.0	1.34E-03
21.3	1.19E-03
25.5	1.07E-03
29.8	9.54E-04
34.0	8.56E-04
38.3	7.69E-04
42.5	6.93E-04
46.8	6.25E-04
51.0	5.66E-04
55.3	5.12E-04
59.5	4.65E-04
63.8	4.22E-04
68.0	3.84E-04
72.3	3.50E-04
76.5	3.19E-04
80.8	2.91E-04
85.0	2.65E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Bap		from Level 1
Target Concentration	C_T	1.70E-07	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable			Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	3.88E-03	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	5.89E+02	days	*howard*
Calculated decay rate	λ	1.18E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.48E+03	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	7.18E+03	fraction
Decay rate used	λ	1.64E-07	d^{-1}
Rate of contaminant flow due to retardation	u	1.08E-05	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	6.34E-04	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**6.12E+00**	

Remedial Targets

Remedial Target		**1.04E-06**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**6.34E-04**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	1.23E+05	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.48E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

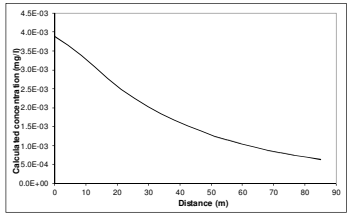
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	3.9E-03
4.3	3.65E-03
8.5	3.38E-03
12.8	3.07E-03
17.0	2.77E-03
21.3	2.49E-03
25.5	2.25E-03
29.8	2.03E-03
34.0	1.84E-03
38.3	1.67E-03
42.5	1.51E-03
46.8	1.38E-03
51.0	1.26E-03
55.3	1.15E-03
59.5	1.05E-03
63.8	9.65E-04
68.0	8.85E-04
72.3	8.13E-04
76.5	7.48E-04
80.8	6.88E-04
85.0	6.34E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		benzo(b)fluoranthene		from Level 1
Target Concentration	C_T	3.00E-05	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	4.62E-03	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	3.03E+03	days	*howard average*
Calculated decay rate	λ	2.29E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	7.79E+03	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	3.78E+04	fraction
Decay rate used	λ	6.05E-09	d^{-1}
Rate of contaminant flow due to retardation	u	2.05E-06	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	2.00E-03	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.31E+00**	

Remedial Targets

Remedial Target		**6.94E-05**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	**C_{ED}/C_0**	**2.00E-03**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	6.50E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	7.79E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

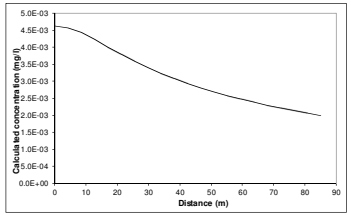
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	4.6E-03
4.3	4.56E-03
8.5	4.43E-03
12.8	4.23E-03
17.0	4.01E-03
21.3	3.79E-03
25.5	3.58E-03
29.8	3.40E-03
34.0	3.23E-03
38.3	3.07E-03
42.5	2.93E-03
46.8	2.80E-03
51.0	2.69E-03
55.3	2.58E-03
59.5	2.48E-03
63.8	2.38E-03
68.0	2.29E-03
72.3	2.21E-03
76.5	2.14E-03
80.8	2.06E-03
85.0	2.00E-03

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		benzo(ghi)perylene		from Level 1
Target Concentration	C_T	2.00E-06	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.48E-03	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.24E+03	days	*howard average*
Calculated decay rate	λ	5.59E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	4.89E+03	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	2.37E+04	fraction
Decay rate used	λ	2.35E-08	d^{-1}
Rate of contaminant flow due to retardation	u	3.27E-06	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	4.52E-04	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**3.28E+00**	

Remedial Targets

Remedial Target		**6.55E-06**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**4.52E-04**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	4.07E+05	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	4.89E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

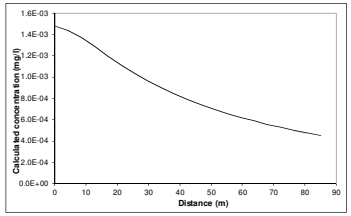
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.5E-03
4.3	1.44E-03
8.5	1.37E-03
12.8	1.29E-03
17.0	1.20E-03
21.3	1.11E-03
25.5	1.03E-03
29.8	9.64E-04
34.0	9.00E-04
38.3	8.42E-04
42.5	7.89E-04
46.8	7.42E-04
51.0	6.98E-04
55.3	6.58E-04
59.5	6.22E-04
63.8	5.88E-04
68.0	5.56E-04
72.3	5.27E-04
76.5	5.00E-04
80.8	4.75E-04
85.0	4.52E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		benzo(k)fluoranthene		from Level 1
Target Concentration	C_T	3.00E-05	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.80E-03	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	3.03E+03	days	*howard average*
Calculated decay rate	λ	2.29E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.48E+04	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	7.16E+04	fraction
Decay rate used	λ	3.19E-09	d^{-1}
Rate of contaminant flow due to retardation	u	1.08E-06	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	7.78E-04	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.31E+00**	

Remedial Targets

Remedial Target		**6.94E-05**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**7.78E-04**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	1.23E+06	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.48E+04	l/kg

Define dispersivity (click brown cell and use pull down list)

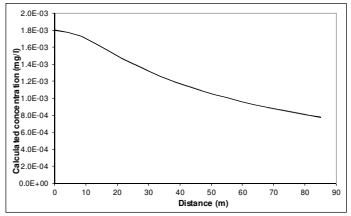
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.8E-03
4.3	1.78E-03
8.5	1.73E-03
12.8	1.65E-03
17.0	1.56E-03
21.3	1.48E-03
25.5	1.40E-03
29.8	1.32E-03
34.0	1.26E-03
38.3	1.20E-03
42.5	1.14E-03
46.8	1.09E-03
51.0	1.05E-03
55.3	1.00E-03
59.5	9.64E-04
63.8	9.28E-04
68.0	8.94E-04
72.3	8.62E-04
76.5	8.32E-04
80.8	8.04E-04
85.0	7.78E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		Fluoranthene		from Level 1
Target Concentration	C_T	6.30E-06	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable			Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.08E-02	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	5.80E+02	days	*howard average*
Calculated decay rate	λ	1.20E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.29E+03	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	6.24E+03	fraction
Decay rate used	λ	1.91E-07	d^{-1}
Rate of contaminant flow due to retardation	u	1.24E-05	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	1.73E-03	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**6.23E+00**	

Remedial Targets

Remedial Target		**3.92E-05**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**1.73E-03**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	1.07E+05	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.29E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

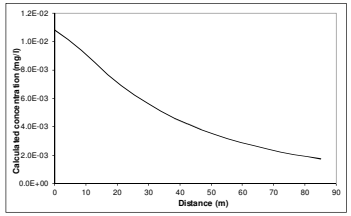
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E+00	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.1E-02
4.3	1.01E-02
8.5	9.39E-03
12.8	8.53E-03
17.0	7.68E-03
21.3	6.91E-03
25.5	6.22E-03
29.8	5.62E-03
34.0	5.08E-03
38.3	4.60E-03
42.5	4.18E-03
46.8	3.80E-03
51.0	3.47E-03
55.3	3.16E-03
59.5	2.89E-03
63.8	2.65E-03
68.0	2.43E-03
72.3	2.23E-03
76.5	2.05E-03
80.8	1.88E-03
85.0	1.73E-03

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH ali c-10-12		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable			Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	3.81E-01	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.30E+02	days	*howard average*
Calculated decay rate	λ	5.35E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	2.88E+03	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	1.40E+04	fraction
Decay rate used	λ	3.83E-07	d^{-1}
Rate of contaminant flow due to retardation	u	5.55E-06	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	1.77E-03	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.15E+02**	

Remedial Targets

Remedial Target		**2.15E+00**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**1.77E-03**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	2.40E+05	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	2.88E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

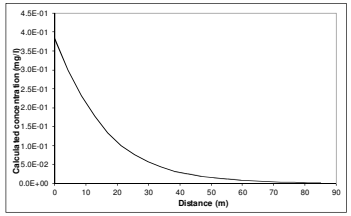
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		m
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	3.8E-01
4.3	3.00E-01
8.5	2.32E-01
12.8	1.77E-01
17.0	1.33E-01
21.3	1.01E-01
25.5	7.58E-02
29.8	5.73E-02
34.0	4.34E-02
38.3	3.29E-02
42.5	2.51E-02
46.8	1.91E-02
51.0	1.46E-02
55.3	1.12E-02
59.5	8.54E-03
63.8	6.55E-03
68.0	5.03E-03
72.3	3.87E-03
76.5	2.98E-03
80.8	2.29E-03
85.0	1.77E-03

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH ali c-12-16		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.47E+00	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.15E+02	days	*howard average*
Calculated decay rate	λ	6.05E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	6.44E+04	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	3.13E+05	fraction
Decay rate used	λ	1.94E-08	d^{-1}
Rate of contaminant flow due to retardation	u	2.48E-07	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	4.06E-03	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**3.62E+02**	

Remedial Targets

Remedial Target Ogata Banks		**3.62E+00**	**mg/l**	For comparison with measured groundwater concentration.
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**4.06E-03**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	5.37E+06	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	6.44E+04	l/kg

Define dispersivity (click brown cell and use pull down list)

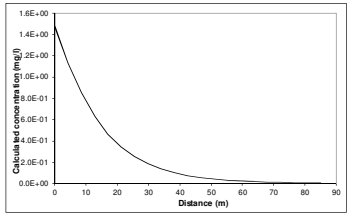
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.5E+00
4.3	1.13E+00
8.5	8.52E-01
12.8	6.32E-01
17.0	4.65E-01
21.3	3.41E-01
25.5	2.51E-01
29.8	1.85E-01
34.0	1.36E-01
38.3	1.01E-01
42.5	7.47E-02
46.8	5.55E-02
51.0	4.13E-02
55.3	3.07E-02
59.5	2.29E-02
63.8	1.71E-02
68.0	1.28E-02
72.3	9.61E-03
76.5	7.21E-03
80.8	5.41E-03
85.0	4.06E-03

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH ali c-16-21		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	2.00E+00	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.92E+03	days	*howard average*
Calculated decay rate	λ	3.62E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	6.91E+06	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	3.35E+07	fraction
Decay rate used	λ	1.08E-11	d^{-1}
Rate of contaminant flow due to retardation	u	2.31E-09	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	7.50E-01	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.67E+00**	

Remedial Targets

Remedial Target		**2.67E-02**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**7.50E-01**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	5.75E+08	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	6.91E+06	l/kg

Define dispersivity (click brown cell and use pull down list)

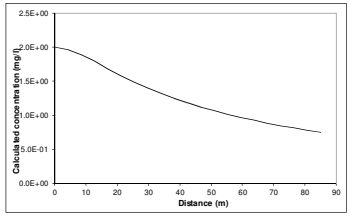
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	2.0E+00
4.3	1.96E+00
8.5	1.89E+00
12.8	1.79E+00
17.0	1.69E+00
21.3	1.58E+00
25.5	1.49E+00
29.8	1.40E+00
34.0	1.32E+00
38.3	1.25E+00
42.5	1.18E+00
46.8	1.12E+00
51.0	1.07E+00
55.3	1.02E+00
59.5	9.70E-01
63.8	9.27E-01
68.0	8.87E-01
72.3	8.49E-01
76.5	8.14E-01
80.8	7.81E-01
85.0	7.50E-01

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH ali c-21-35		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	8.18E-01	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.92E+03	days	*howard average*
Calculated decay rate	λ	3.62E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	6.91E+06	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	3.35E+07	fraction
Decay rate used	λ	1.08E-11	d^{-1}
Rate of contaminant flow due to retardation	u	2.31E-09	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	3.07E-01	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.67E+00**	

Remedial Targets

Remedial Target		**2.67E-02**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**3.07E-01**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

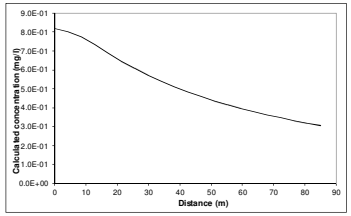
Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	5.75E+08	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	6.91E+06	l/kg

Define dispersivity (click brown cell and use pull down list)

Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0
For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x
Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.
By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.
Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	8.2E-01
4.3	8.02E-01
8.5	7.74E-01
12.8	7.34E-01
17.0	6.90E-01
21.3	6.47E-01
25.5	6.08E-01
29.8	5.72E-01
34.0	5.40E-01
38.3	5.11E-01
42.5	4.84E-01
46.8	4.59E-01
51.0	4.37E-01
55.3	4.16E-01
59.5	3.97E-01
63.8	3.79E-01
68.0	3.63E-01
72.3	3.47E-01
76.5	3.33E-01
80.8	3.19E-01
85.0	3.07E-01

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH aro 8-10		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable			Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	5.21E-03	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.86E+02	days	*howard average*
Calculated decay rate	λ	3.74E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.90E+01	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	9.33E+01	fraction
Decay rate used	λ	4.01E-05	d^{-1}
Rate of contaminant flow due to retardation	u	8.30E-04	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	8.61E-05	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**6.05E+01**	

Remedial Targets

Remedial Target		**6.05E-01**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**8.61E-05**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	1.59E+03	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.90E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

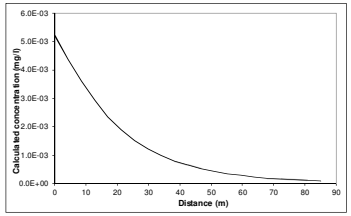
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E+00	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-01	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	5.2E-03
4.3	4.37E-03
8.5	3.61E-03
12.8	2.93E-03
17.0	2.35E-03
21.3	1.89E-03
25.5	1.52E-03
29.8	1.22E-03
34.0	9.87E-04
38.3	7.98E-04
42.5	6.47E-04
46.8	5.25E-04
51.0	4.27E-04
55.3	3.48E-04
59.5	2.84E-04
63.8	2.32E-04
68.0	1.90E-04
72.3	1.56E-04
76.5	1.28E-04
80.8	1.05E-04
85.0	8.61E-05

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH aro c-10-12		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	9.50E-02	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.30E+02	days	*howard average*
Calculated decay rate	λ	5.35E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	3.01E+01	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	1.47E+02	fraction
Decay rate used	λ	3.63E-05	d^{-1}
Rate of contaminant flow due to retardation	u	5.26E-04	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	4.41E-04	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.15E+02**	

Remedial Targets

	Remedial Target	**2.15E+00**	**mg/l**	For comparison with measured groundwater concentration.
	Ogata Banks			
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**4.41E-04**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient — Kd — l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer — foc — 1.20E-02 — fraction

Organic carbon partition coefficient — Koc — 2.51E+03 — l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species — $K_{oc,n}$ — l/kg

Sorption coefficient for ionised species — $K_{oc,i}$ — l/kg

pH value — pH

acid dissociation constant — pKa

Fraction of organic carbon in aquifer — foc — fraction

Soil water partition coefficient — Kd — 3.01E+01 — l/kg

Define dispersivity (click brown cell and use pull down list)

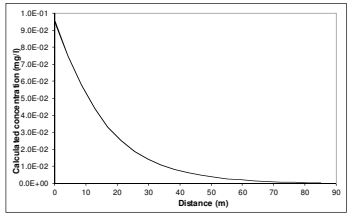
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	9.5E-02
4.3	7.47E-02
8.5	5.79E-02
12.8	4.41E-02
17.0	3.33E-02
21.3	2.51E-02
25.5	1.89E-02
29.8	1.43E-02
34.0	1.08E-02
38.3	8.22E-03
42.5	6.25E-03
46.8	4.76E-03
51.0	3.64E-03
55.3	2.78E-03
59.5	2.13E-03
63.8	1.63E-03
68.0	1.25E-03
72.3	9.64E-04
76.5	7.42E-04
80.8	5.72E-04
85.0	4.41E-04

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH aro c-12-16		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable			Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	8.34E-01	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.15E+02	days	*howard average*
Calculated decay rate	λ	6.05E-03	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	6.01E+01	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	2.93E+02	fraction
Decay rate used	λ	2.07E-05	d^{-1}
Rate of contaminant flow due to retardation	u	2.65E-04	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	2.30E-03	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**3.62E+02**	

Remedial Targets

Remedial Target		**3.62E+00**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**2.30E-03**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	5.01E+03	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	6.01E+01	l/kg

Define dispersivity (click brown cell and use pull down list)

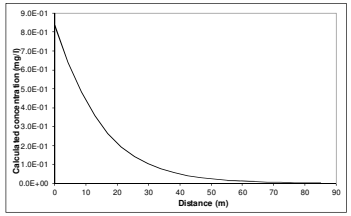
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+01	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	8.3E-01
4.3	6.39E-01
8.5	4.83E-01
12.8	3.58E-01
17.0	2.63E-01
21.3	1.93E-01
25.5	1.42E-01
29.8	1.05E-01
34.0	7.72E-02
38.3	5.71E-02
42.5	4.23E-02
46.8	3.14E-02
51.0	2.34E-02
55.3	1.74E-02
59.5	1.30E-02
63.8	9.71E-03
68.0	7.27E-03
72.3	5.44E-03
76.5	4.08E-03
80.8	3.06E-03
85.0	2.30E-03

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH aro c-16-21		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: Simulate vertical dispersion in 2 directions

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: Apply degradation rate to dissolved pollutants only

	Variable			Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	1.68E+00	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.92E+03	days	*howard average*
Calculated decay rate	λ	3.62E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.70E+02	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	8.24E+02	fraction
Decay rate used	λ	4.39E-07	d^{-1}
Rate of contaminant flow due to retardation	u	9.41E-05	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	6.30E-01	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.67E+00**	

Remedial Targets

Remedial Target		**2.67E-02**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**6.30E-01**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)

Soil water partition coefficient	Kd		l/kg

Entry for non-polar organic chemicals (option)

Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	1.41E+04	l/kg

Entry for ionic organic chemicals (option)

Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.70E+02	l/kg

Define dispersivity (click brown cell and use pull down list)

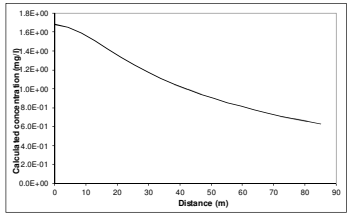
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	1.7E+00
4.3	1.65E+00
8.5	1.59E+00
12.8	1.51E+00
17.0	1.42E+00
21.3	1.33E+00
25.5	1.25E+00
29.8	1.18E+00
34.0	1.11E+00
38.3	1.05E+00
42.5	9.94E-01
46.8	9.44E-01
51.0	8.97E-01
55.3	8.55E-01
59.5	8.16E-01
63.8	7.79E-01
68.0	7.45E-01
72.3	7.14E-01
76.5	6.84E-01
80.8	6.56E-01
85.0	6.30E-01

R&D Publication 20 Remedial Targets Worksheet, Release 3.2

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)

	Variable	Value	Unit	Source
Contaminant		TPH aro c-21-35		from Level 1
Target Concentration	C_T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks — Equations in HRA publication

Approach for simulating vertical dispersion: **Simulate vertical dispersion in 2 directions**

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants: **Apply degradation rate to dissolved pollutants only**

				Source of parameter value
Initial contaminant concentration in groundwater at plume core	C_0	8.56E-01	mg/l	*ave*
Half life for degradation of contaminant in water	$t_{1/2}$	1.92E+03	days	*howard average*
Calculated decay rate	λ	3.62E-04	$days^{-1}$	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.50E+02	m	
Plume thickness at source	Sy	4.00E+00	m	
Saturated aquifer thickness	da	6.00E+00	m	
Bulk density of aquifer materials	ρ	1.65E+00	g/cm^3	
Effective porosity of aquifer	n	3.40E-01	fraction	
Hydraulic gradient	i	6.00E-03	fraction	
Hydraulic conductivity of aquifer	K	4.39E+00	m/d	
Distance to compliance point	x	8.50E+01	m	
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	*time variant options only*
Parameters values determined from options				
Partition coefficient	Kd	1.51E+03	l/kg	*see options*
Longitudinal dispersivity	ax	4.06E+00	m	*see options*
Transverse dispersivity	az	4.06E-01	m	*see options*
Vertical dispersivity	ay	4.06E-02	m	*see options*

Calculated Parameters

	Variable		
Groundwater flow velocity	v	7.75E-02	m/d
Retardation factor	Rf	7.33E+03	fraction
Decay rate used	λ	4.93E-08	d^{-1}
Rate of contaminant flow due to retardation	u	1.06E-05	m/d
Contaminant concentration at distance x, assuming two-way vertical dispersion	C_{ED}	3.21E-01	mg/l
Attenuation factor (two way vertical dispersion, CO/CED)	**AF**	**2.67E+00**	

Remedial Targets

Remedial Target		**2.67E-02**	**mg/l**	For comparison with measured groundwater concentration.
Ogata Banks				
Distance to compliance point		**85**	**m**	
Concentration of contaminant at compliance point	C_{ED}/C_0	**3.21E-01**	**mg/l**	Ogata Banks
after		**1.0E+100**	**days**	

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target.
The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)			
Soil water partition coefficient	Kd		l/kg
Entry for non-polar organic chemicals (option)			
Fraction of organic carbon in aquifer	foc	1.20E-02	fraction
Organic carbon partition coefficient	Koc	1.26E+05	l/kg
Entry for ionic organic chemicals (option)			
Sorption coefficient for related species	$K_{oc,n}$		l/kg
Sorption coefficient for ionised species	$K_{oc,i}$		l/kg
pH value	pH		
acid dissociation constant	pKa		
Fraction of organic carbon in aquifer	foc		fraction
Soil water partition coefficient	Kd	1.51E+03	l/kg

Define dispersivity (click brown cell and use pull down list)

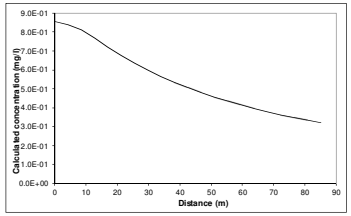
Dispersivity based on Xu & Eckstein (1995)

		Enter value	Calc value Xu & Eckstein		
Longitudinal dispersivity	**ax**	0.00E+00	8.50E+00	4.06E+00	m
Transverse dispersivity	**az**	0.00E+00	8.50E-01	4.06E-01	m
Vertical dispersivity	**ay**	0.00E+00	8.50E-02	4.06E-02	

Note values of dispersivity must be > 0

For calculated value, assumes ax = 0.1 *x, az = 0.01 * x, ay = 0.001 * x

Xu & Eckstein (1995) report ax = $0.83(\log_{10}x)^{2.414}$; az = ax/10, ay = ax/100 are assumed



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source Three solution methods are included, the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best desribed by an electron limited degradation such as oxidation by O2, NO3, SO4 etc than an alternative solution should be used

Site being assessed:	haulbowline
Completed by:	YB
Date:	########
Version:	x.xx

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet

Distance	Concentration
	mg/l
0	8.6E-01
4.3	8.39E-01
8.5	8.10E-01
12.8	7.68E-01
17.0	7.22E-01
21.3	6.77E-01
25.5	6.36E-01
29.8	5.99E-01
34.0	5.65E-01
38.3	5.34E-01
42.5	5.06E-01
46.8	4.81E-01
51.0	4.57E-01
55.3	4.35E-01
59.5	4.15E-01
63.8	3.97E-01
68.0	3.80E-01
72.3	3.63E-01
76.5	3.48E-01
80.8	3.34E-01
85.0	3.21E-01

TPH Fraction	Indicator Compounds	Soils Range of HALF LIFE (DAYS). Howard, P.H., R.S. Boethling, et al. (1991). Handbook of environmental degradation rates	Groundwater Range of HALF LIFE (DAYS)	Soils HALF LIFE (DAYS)			Groundwater HALF LIFE (DAYS)		REFERENCE	
				High	**Low**	**Mean**	High	Low		
Aromatic EC5-EC7	Benzene (EC6.5)	5-16	10-730				50	**350**	EA R&D P2-228/TR (p34-38) Value quoted for aerobic degradation for a sand and gravel aquifer.	
Aromatic EC7-EC8	Toluene (EC7.6)	4-22	7-28				20	**200**		
Aromatic EC8-EC10	Ethylbenzene (EC8.5)	3-10	6-228				50	**200**		
	Xylene (avg. o-,m-,p-, EC8.7)	7-28	14-365				50	**200**		
Aromatic EC10-EC12	Naphthalene (EC11.7)	17-48	1-258				100	**300**		
Aromatic EC12-EC16	Acenaphthene (EC 15.5) Acenaphthylene (EC15)	12.3-102 42.5-60	25-204 85-120	125	**415**	230			P5-079/TR1 (p46)(soil)	Mackay, D., W. Shiu, et al. (1991). Illustrated Handbook of physical-chemical properties and environmental fate for organic chemicals. Polynuclear aromatic hydrocarbons, polychlorinated dioxins and dibenzofurans. Boca Raton, Florida, Lewis Publishers: 1-367
Aromatic EC16-EC21	Fluorene (EC16.5) Phenanthrene (19.4) Anthracene (EC19.4)	32-62 16-200 50-460	64-120 32-401 100-920	125	**415**	230			P5-079/TR1 (p46)(soil)	
	Pyrene (EC20.8)	210-1900	420-3800	415	**1250**	708			P5-079/TR1 (p46)(soil)	
Aromatic EC21-EC35	Fluoranthene (EC21.8)	140-440	280-880	415	**1250**	708			P5-079/TR1 (p46)(soil)	
	Chrysene (EC27.4)	372-993	744-2000							
	Benzo(a)anthracene (26.4)	102-679	204-1361							
	Benzo(k)fluoranthene (EC30)	910-2140	1778-4280							
	Benzo(a)pyrene (EC31.3)	57- 530	114-1064							
	Benzo(ghi)perylene (EC34)	590-650	1168-1314							
Aliphatic EC5-EC6	MTBE	28-180	56-365	55	**360**	-			TNO-Nicole Report TNO-MEP-R99/313	Suthersan, S.S. (1996). Remediation engineering:

TPH Fraction	Indicator Compounds	Soils Range of HALF LIFE (DAYS). Howard, P.H., R.S. Boethling, et al. (1991). Handbook of environmental degradation rates	Groundwater Range of HALF LIFE (DAYS)	Soils HALF LIFE (DAYS)			Groundwater HALF LIFE (DAYS)		REFERENCE	
				High	Low	Mean	High	Low		
									MNA: review of existing guidelines and protocols. RISC 4 User Manual.	design and concepts. Boca Raton: CRC Lewis Publishers
Aliphatic EC6-EC8	Cyclohexane	28-180	56-365	56	**365**	-			Howard, P.H., R.S. Boethling, et al. (1991). Handbook of environmental degradation rates. Chelsea, MI, Lewis Publishers, Inc.	
Aliphatic EC8-EC10	No specific data identified			-	**360**	-			Limited refs (below) suggest aromatic and aliphatic degradation to be similar, with aromatic degradation potentially slower than aliphatics. Where no specific aliphatic indicator compounds could be identified with degradation data, the most conservative data from either the equivalent aromatic fraction or the lighter aliphatic fractions has been used.	
Aliphatic EC10-EC12	No specific data identified			-	**360**	-				
Aliphatic EC12-EC16	No specific data identified			-	**415**	-				
Aliphatic EC16-EC35	No specific data identified			-	**1250**	-				
Phenol		1-10	0.25-8							
VOCs										
Trichloroethene		183-365	183-1642.5							
Vinyl Chloride		28-183	28-2890							

'The biodegradation rate for the aromatic fraction was significantly slower than the aliphatic fraction.' (Olsen, J.J. et al. (1999). Biodegradation rates of separated diesel components. *Environmental Toxicology and Chemistry* 18 (11): 2448-2453)

The presence of the compounds as either an aliphatic or aromatic mixture did not change the degradation trend.' (Zytner, R.G. et al. (2006). Bioremediation of Diesel Fuel Contaminated Soil: Comparison of Individual Compounds to Complex Mixtures. *Soil and Sediment Contamination* 15: 277-297)

Appendix T RBCA Model Inputs

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Haulbowline Factory - Park End Use
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Exposure Parameters		Residential				Commercial/Industrial		User Defined
		Child*	Adolescent	Adult	Age Adjusted**	Adult	Construct.	
ATc	Averaging time for carcinogens (yr)	6	6	6	NA	6	6	-
ATn	Averaging time for non-carcinogens (yr)	6	6	6	NA	49	49	-
BW	Body weight (kg)	13.3	13.3	13.3	NA	70	70	-
ED	Exposure duration (yr)	6	6	6	NA	49	49	-
τ	Averaging time for vapor flux (yr)	6	6	6	NA	49	49	-
EF	Exposure frequency (days/yr)	170	170	170	NA	365	365	-
EFD	Exposure frequency for dermal exposure	170	170	170	NA	250	180	-
IRw	Ingestion rate of water (L/day)	1	1	2	0.0	1	NA	-
IRs	Ingestion rate of soil (mg/day)	200	200	100	300	50	100	-
SA	Skin surface area (dermal) (cm^2)	2023	2023	3160	886	3160	3160	-
M	Soil to skin adherence factor	0.5	0.5	0.5	NA	0.5	0.5	-
ETswim	Swimming exposure time (hr/event)	1	3	3	NA	NA	NA	NA
EVswim	Swimming event frequency (events/yr)	12	12	12	NA	NA	NA	NA
IRswim	Water ingestion while swimming (L/hr)	0.5	0.5	0.05	0.3	NA	NA	NA
SAswim	Skin surface area for swimming (cm^2)	3500	8100	23000	-14900	NA	NA	NA
IRfish	Ingestion rate of fish (kg/yr)	0.025	0.025	0.025	0.025	NA	NA	NA
FIfish	Contaminated fish fraction (unitless)	1	1	1	NA	NA	NA	NA
IRbg	Below-ground vegetable ingestion	0.002	0.002	0.006	-0.340	NA	NA	NA
IRabg	Above-ground vegetable ingestion	0.001	0.001	0.002	0.000	NA	NA	NA
VGbg	Above-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA
VGabg	Below-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA

* = Child Receptor used for Non-Carcinogens
** = Age-adjusted rate is effective value corresponding to adult exposure factors.

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	None	None	None
Soil Leaching to Groundwater Ingestion	None	None	None
Apply MCL Values	No	No	No
Applicable Surface Water Exposure Routes:			
Swimming	NA	NA	None
Fish Consumption	NA	NA	None
Aquatic Life Protection	NA	NA	None
Soil:			
Direct Contact: direct combined pathways	None	NA	NA
Apply CLEA- UK SGV levels		No	
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	None	None	None
Volatilization from Groundwater	Residential	None	None
Indoor Air:			
Volatilization from Soils	None	NA	NA
Volatilization from Groundwater	Residential	None	None
Soil Leaching to Groundwater Volatilization	None	None	None

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	NA	NA	NA	(m)
Outdoor air inhalation receptor	0	NA	NA	(m)
Indoor air inhalation receptor	0	NA	NA	(m)

Target Health Risk Values		Individual	Cumulative
TR	Target Risk (carcinogens)	1.0E-5	1.0E-5
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & Subsurface Models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Use dual equilibrium desorption model?	NA
Apply Mass Balance Limit for Soil Volatilization?	NA
Apply UK (CLEA) SGV as soil concentration limit	No
Vegetable calculation options	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable
Orange = Site-specific value (different from current default value)

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Haulbowline Factory - Park End Use
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	0.05			(m)
h_v	Vadose zone thickness	***0.95***			(m)
ρ_s	Soil bulk density	***1.21***			(g/cm^3)
f_{oc}	Fraction organic carbon	***0.006***			(-)
θ_T	Soil total porosity	***0.53***			(-)
		capillary	**vadose**	**foundation**	
θ_w	Volumetric water content	***0.33***	***0.33***	***0***	(-)
θ_a	Volumetric air content	***0.2***	***0.2***	0.26	(-)
K_{vs}	Vertical hydraulic conductivity	***0.00356***			(cm/s)
k_v	Vapor permeability	***3.05E-12***			(m^2)
L_{gw}	Depth to groundwater	***1***			(m)
pH	Soil/groundwater pH	***7.4***			(-)
W	Length of source-zone area parallel to wind	45			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	2025			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	194400	(m/d)
δ_{air}	Air mixing zone height	2	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	***9.6***	NA	(m)
A_b	Foundation area	***424***	NA	(m^2)
X_{crk}	Foundation perimeter	***82.4***	NA	(m)
ER	Building air exchange rate	***24***	NA	(1/d)
L_{crk}	Foundation thickness	0.15	NA	(m)
Z_{crk}	Depth to bottom of foundation slab	0.15	NA	(m)
η	Foundation crack fraction	***0.002***	NA	(-)
dP	Indoor/outdoor differential pressure	***4.4***	NA	(Pa)
Q_s	Convective air flow through slab	***9.834322445***	NA	(m^3/d)
θ_{wcrack}	Volumetric water content of cracks	***0***	NA	(-)
θ_{acrack}	Volumetric air content of cracks	0.26	NA	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(cm/yr)
U_{gw}	Groundwater Darcy velocity	NA	(cm/s)
V_{gw}	Groundwater seepage velocity	NA	(cm/s)
K_s	Saturated hydraulic conductivity	NA	(cm/s)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(m)
S_d	Depth of groundwater source zone	NA	(m)
θ_{eff}	Effective porosity in water-bearing unit	NA	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{sat}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		**Groundwater Ingestion**		**Groundwater to Indoor Air**		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(m)
α_y	Transverse dispersivity	NA	NA	NA	NA	(m)
α_z	Vertical dispersivity	NA	NA	NA	NA	(m)
Lateral Outdoor Air Transport		**Soil to Outdoor Air Inhal.**		**GW to Outdoor Air Inhal.**		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/d)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Haulbowline Factory - Commercial
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Exposure Parameters		Residential				Commercial/Industrial		User Defined
		Child*	Adolescent	Adult	Age Adjusted**	Adult	Construct.	
ATc	Averaging time for carcinogens (yr)	49	49	49	NA	49	49	-
ATn	Averaging time for non-carcinogens (yr)	6	12	30	NA	49	49	-
BW	Body weight (kg)	15	35	70	NA	70	70	-
ED	Exposure duration (yr)	6	12	30	NA	49	49	-
τ	Averaging time for vapor flux (yr)	30	30	30	NA	49	49	-
EF	Exposure frequency (days/yr)	350	350	350	NA	230	230	-
EFD	Exposure frequency for dermal exposure	350	350	350	NA	250	180	-
IRw	Ingestion rate of water (L/day)	1	1	2	2.5	1	NA	-
IRs	Ingestion rate of soil (mg/day)	200	200	100	387	50	100	-
SA	Skin surface area (dermal) (cm^2)	2023	2023	3160	4771	3160	3160	-
M	Soil to skin adherence factor	0.5	0.5	0.5	NA	0.5	0.5	-
ETswim	Swimming exposure time (hr/event)	1	3	3	NA	NA	NA	NA
EVswim	Swimming event frequency (events/yr)	12	12	12	NA	NA	NA	NA
IRswim	Water ingestion while swimming (L/hr)	0.5	0.5	0.05	0.3	NA	NA	NA
SAswim	Skin surface area for swimming (cm^2)	3500	8100	23000	15680	NA	NA	NA
IRfish	Ingestion rate of fish (kg/yr)	0.025	0.025	0.025	0.053	NA	NA	NA
FIfish	Contaminated fish fraction (unitless)	1	1	1	NA	NA	NA	NA
IRbg	Below-ground vegetable ingestion	0.002	0.002	0.006	2.053	NA	NA	NA
IRabg	Above-ground vegetable ingestion	0.001	0.001	0.002	0.887	NA	NA	NA
VGbg	Above-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA
VGabg	Below-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA

* = Child Receptor used for Non-Carcinogens
** = Age-adjusted rate is effective value corresponding to adult exposure factors.

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	None	None	None
Soil Leaching to Groundwater Ingestion	None	None	None
Apply MCL Values	No	No	No
Applicable Surface Water Exposure Routes:			
Swimming	NA	NA	None
Fish Consumption	NA	NA	None
Aquatic Life Protection	NA	NA	None
Soil:			
Direct Contact: direct combined pathways	None	NA	NA
Apply CLEA- UK SGV levels		No	
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	None	None	None
Volatilization from Groundwater	None	None	None
Indoor Air:			
Volatilization from Soils	None	NA	NA
Volatilization from Groundwater	Commercial	None	None
Soil Leaching to Groundwater Volatilization	None	None	None

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	NA	NA	NA	(m)
Outdoor air inhalation receptor	NA	NA	NA	(m)
Indoor air inhalation receptor	0	NA	NA	(m)

Target Health Risk Values		Individual	Cumulative
TR	Target Risk (carcinogens)	1.0E-5	1.0E-5
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	NA
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Use dual equilibrium desorption model?	NA
Apply Mass Balance Limit for Soil Volatilization?	NA
Apply UK (CLEA) SGV as soil concentration limit	No
Vegetable calculation options	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable
Orange = Site-specific value (different from current default value)

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Haulbowline Factory - Commercial
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	0.05			(m)
h_v	Vadose zone thickness	***0.95***			(m)
ρ_s	Soil bulk density	***1.21***			(g/cm^3)
f_{oc}	Fraction organic carbon	***0.006***			(-)
θ_T	Soil total porosity	***0.53***			(-)
		capillary	**vadose**	**foundation**	
θ_w	Volumetric water content	***0.33***	***0.33***	***0***	(-)
θ_a	Volumetric air content	***0.2***	***0.2***	0.26	(-)
K_{vs}	Vertical hydraulic conductivity	***0.00356***			(cm/s)
k_v	Vapor permeability	***3.05E-12***			(m^2)
L_{gw}	Depth to groundwater	***1***			(m)
pH	Soil/groundwater pH	***7.4***			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/d)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	***9.6***	(m)
A_b	Foundation area	NA	***424***	(m^2)
X_{crk}	Foundation perimeter	NA	***82.4***	(m)
ER	Building air exchange rate	NA	***24***	(1/d)
L_{crk}	Foundation thickness	NA	0.15	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	0.15	(m)
η	Foundation crack fraction	NA	***0.002***	(-)
dP	Indoor/outdoor differential pressure	NA	***4.4***	(Pa)
Q_s	Convective air flow through slab	NA	***9.834322445***	(m^3/d)
θ_{wcrack}	Volumetric water content of cracks	NA	***0***	(-)
θ_{acrack}	Volumetric air content of cracks	NA	0.26	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(cm/yr)
U_{gw}	Groundwater Darcy velocity	NA	(cm/s)
V_{gw}	Groundwater seepage velocity	NA	(cm/s)
K_s	Saturated hydraulic conductivity	NA	(cm/s)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(m)
S_d	Depth of groundwater source zone	NA	(m)
θ_{eff}	Effective porosity in water-bearing unit	NA	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{sat}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		**Groundwater Ingestion**		**Groundwater to Indoor Air**		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(m)
α_y	Transverse dispersivity	NA	NA	NA	NA	(m)
α_z	Vertical dispersivity	NA	NA	NA	NA	(m)
Lateral Outdoor Air Transport		**Soil to Outdoor Air Inhal.**		**GW to Outdoor Air Inhal.**		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/d)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Haulbowline Factory - Commercial Residential Navy
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Exposure Parameters		Residential				Commercial/Industrial		User Defined
		Child*	Adolescent	Adult	Age Adjusted**	Adult	Construct.	
ATc	Averaging time for carcinogens (yr)	49	49	49	NA	49	49	-
ATn	Averaging time for non-carcinogens (yr)	6	12	30	NA	49	49	-
BW	Body weight (kg)	15	35	70	NA	70	70	-
ED	Exposure duration (yr)	6	12	30	NA	49	49	-
τ	Averaging time for vapor flux (yr)	30	30	30	NA	49	49	-
EF	Exposure frequency (days/yr)	350	350	350	NA	365	365	-
EFD	Exposure frequency for dermal exposure	350	350	350	NA	250	180	-
IRw	Ingestion rate of water (L/day)	1	1	2	2.5	1	NA	-
IRs	Ingestion rate of soil (mg/day)	200	200	100	387	50	100	-
SA	Skin surface area (dermal) (cm^2)	2023	2023	3160	4771	3160	3160	-
M	Soil to skin adherence factor	0.5	0.5	0.5	NA	0.5	0.5	-
ETswim	Swimming exposure time (hr/event)	1	3	3	NA	NA	NA	NA
EVswim	Swimming event frequency (events/yr)	12	12	12	NA	NA	NA	NA
IRswim	Water ingestion while swimming (L/hr)	0.5	0.5	0.05	0.3	NA	NA	NA
SAswim	Skin surface area for swimming (cm^2)	3500	8100	23000	15680	NA	NA	NA
IRfish	Ingestion rate of fish (kg/yr)	0.025	0.025	0.025	0.053	NA	NA	NA
FIfish	Contaminated fish fraction (unitless)	1	1	1	NA	NA	NA	NA
IRbg	Below-ground vegetable ingestion	0.002	0.002	0.006	2.053	NA	NA	NA
IRabg	Above-ground vegetable ingestion	0.001	0.001	0.002	0.887	NA	NA	NA
VGbg	Above-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA
VGabg	Below-ground Veg. Ingest. Correction Factor	0.01	0.01	0.01	NA	NA	NA	NA

* = Child Receptor used for Non-Carcinogens
** = Age-adjusted rate is effective value corresponding to adult exposure factors.

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	None	None	None
Soil Leaching to Groundwater Ingestion	None	None	None
Apply MCL Values	No	No	No
Applicable Surface Water Exposure Routes:			
Swimming	NA	NA	None
Fish Consumption	NA	NA	None
Aquatic Life Protection	NA	NA	None
Soil:			
Direct Contact: direct combined pathways	None	NA	NA
Apply CLEA- UK SGV levels		No	
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	None	None	None
Volatilization from Groundwater	None	None	None
Indoor Air:			
Volatilization from Soils	None	NA	NA
Volatilization from Groundwater	Commercial	None	None
Soil Leaching to Groundwater Volatilization	None	None	None

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	NA	NA	NA	(m)
Outdoor air inhalation receptor	NA	NA	NA	(m)
Indoor air inhalation receptor	0	NA	NA	(m)

Target Health Risk Values		Individual	Cumulative
TR	Target Risk (carcinogens)	1.0E-5	1.0E-5
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	NA
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Use dual equilibrium desorption model?	NA
Apply Mass Balance Limit for Soil Volatilization?	NA
Apply UK (CLEA) SGV as soil concentration limit	No
Vegetable calculation options	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	NA

NOTE: NA = Not applicable
Orange = Site-specific value (different from current default value)

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Haulbowline Factory - Commercial Residential Navy
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	0.05			(m)
h_v	Vadose zone thickness	***0.95***			(m)
ρ_s	Soil bulk density	***1.21***			(g/cm^3)
f_{oc}	Fraction organic carbon	***0.006***			(-)
θ_T	Soil total porosity	***0.53***			(-)
		capillary	**vadose**	**foundation**	
θ_w	Volumetric water content	***0.33***	***0.33***	***0***	(-)
θ_a	Volumetric air content	***0.2***	***0.2***	0.26	(-)
K_{vs}	Vertical hydraulic conductivity	***0.00356***			(cm/s)
k_v	Vapor permeability	***3.05E-12***			(m^2)
L_{gw}	Depth to groundwater	***1***			(m)
pH	Soil/groundwater pH	***7.4***			(-)
W	Length of source-zone area parallel to wind	NA			(m)
W_{gw}	Length of source-zone area parallel to GW flow	NA			(m)
L_{ss}	Thickness of affected surface soils	NA			(m)
A	Source zone area	NA			(m^2)
L_s	Depth to top of affected soils	NA			(m)
L_{base}	Depth to base of affected soils	NA			(m)
L_{subs}	Thickness of affected soils	NA			(m)

Outdoor Air Parameters		Value	(Units)
U_{air}	Ambient air velocity in mixing zone	NA	(m/d)
δ_{air}	Air mixing zone height	NA	(m)
Q/C	Inverse mean concentration at the center of source	NA	
P_a	Areal particulate emission rate	NA	(g/cm^2/s)
V	Fraction of vegetative cover	NA	
U_m	Mean annual airvelocity at 7m	NA	
U_t	Equivalent 7m air velocity threshold value	NA	
F(x)	Windspeed function dependant on Um/Ut	NA	
PEF	Partculate Emission Factor	NA	

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	NA	***9.6***	(m)
A_b	Foundation area	NA	***424***	(m^2)
X_{crk}	Foundation perimeter	NA	***82.4***	(m)
ER	Building air exchange rate	NA	***24***	(1/d)
L_{crk}	Foundation thickness	NA	0.15	(m)
Z_{crk}	Depth to bottom of foundation slab	NA	0.15	(m)
η	Foundation crack fraction	NA	***0.002***	(-)
dP	Indoor/outdoor differential pressure	NA	***4.4***	(Pa)
Q_s	Convective air flow through slab	NA	***9.834322445***	(m^3/d)
θ_{wcrack}	Volumetric water content of cracks	NA	***0***	(-)
θ_{acrack}	Volumetric air content of cracks	NA	0.26	(-)
BV	Building Volume	NA	NA	(m^3)
w	Building Width Perpendicular to GW flow	NA	NA	(m)
L	Building Length Parallel to GW flow	NA	NA	(m)
v	Saturated Soil Zone Porosity	NA	NA	(-)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(m)
I_f	Net groundwater infiltration rate	NA	(cm/yr)
U_{gw}	Groundwater Darcy velocity	NA	(cm/s)
V_{gw}	Groundwater seepage velocity	NA	(cm/s)
K_s	Saturated hydraulic conductivity	NA	(cm/s)
i	Groundwater gradient	NA	(-)
S_w	Width of groundwater source zone	NA	(m)
S_d	Depth of groundwater source zone	NA	(m)
θ_{eff}	Effective porosity in water-bearing unit	NA	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	NA	(-)
pH_{sat}	Groundwater pH	NA	(-)
	Biodegradation considered?	NA	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		**Groundwater Ingestion**		**Groundwater to Indoor Air**		
α_x	Longitudinal dispersivity	NA	NA	NA	NA	(m)
α_y	Transverse dispersivity	NA	NA	NA	NA	(m)
α_z	Vertical dispersivity	NA	NA	NA	NA	(m)
Lateral Outdoor Air Transport		**Soil to Outdoor Air Inhal.**		**GW to Outdoor Air Inhal.**		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(m)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(m)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(m^3/d)
W_{pi}	Width of GW plume at SW discharge	NA	(m)
δ_{pi}	Thickness of GW plume at SW discharge	NA	(m)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

Orange = Site-specific value (different from current default value)

Appendix U RBCA Model Outputs

RBCA SITE ASSESSMENT

Site Name: Haulbowline Factory - Park End Use
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Job ID: A092989

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option:

SSTL Results For Complete Exposure Pathways (Checked if Pathway is Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	☐ Groundwater Ingestion / Discharge to Surface Water			■ Groundwater Volatilization to Indoor Air			■ Groundwater Volatilization to Outdoor Air			Applicable SSTL	SSTL Exceeded ?	Required CRF
			On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)	On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)	On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)			Only if "yes" left
CAS No.	**Name**	(mg/L)	None	None	None	Residential	None	None	Residential	None	None	(mg/L)	"■" if yes	
79-01-6	Trichloroethylene (S4UL) *	1.2E-1				8.8E-1			1.1E+1			8.8E-1	☐	<1
T-al0506	TPH Aliphatic C5-6 (S4UL) *	0.0E+0				>3.6E+1			>3.6E+1			>3.6E+1	☐	NA
T-al0608	TPH Aliphatic C6-8 (S4UL) *	1.0E-2				>5.4E+0			>5.4E+0			>5.4E+0	☐	NA
T-al0810	TPH Aliphatic C8-10 (S4UL) *	6.4E-1				>4.3E-1			>4.3E-1			>4.3E-1	☐	NA
T-al1012	TPH Aliphatic C10-12 (S4UL) *	9.0E+0				>3.4E-2			>3.4E-2			>3.4E-2	☐	NA
T-al1216	TPH Aliphatic C12-16 (S4UL) *	3.7E+1				>7.6E-4			>7.6E-4			>7.6E-4	☐	NA
T-ar0507	TPH Aromatic C5-7 (S4UL) *	0.0E+0				>1.8E+3			>1.8E+3			>1.8E+3	☐	NA
T-ar0708	TPH Aromatic C7-8 (S4UL) *	0.0E+0				>5.9E+2			>5.9E+2			>5.9E+2	☐	NA
T-ar0810	TPH Aromatic C8-10 (S4UL) *	3.2E-2				5.9E+1			>6.5E+1			5.9E+1	☐	<1
T-ar1012	TPH Aromatic C10-12 (S4UL) *	2.1E+0				>2.5E+1			>2.5E+1			>2.5E+1	☐	NA
T-ar1216	TPH Aromatic C12-16 (S4UL) *	1.9E+1				>5.8E+0			>5.8E+0			>5.8E+0	☐	NA
-	o xylene (S4UL)	9.7E-4				>1.7E+2			>1.7E+2			>1.7E+2	☐	NA
-	m/p xylene (S4UL)	4.6E-3				1.7E+2			>2.0E+2			1.7E+2	☐	<1
83-32-9	Acenaphthene (S4UL) *	6.0E-2				>4.1E+0			>4.1E+0			>4.1E+0	☐	NA
208-96-8	Acenaphthylene (S4UL) *	6.4E-2				>7.9E+0			>7.9E+0			>7.9E+0	☐	NA
120-12-7	Anthracene (S4UL) *	4.6E-2				>5.6E-2			>5.6E-2			>5.6E-2	☐	NA
56-55-3	Benz(a)anthracene *	1.2E-1				>3.8E-3			>3.8E-3			>3.8E-3	☐	NA
50-32-8	Benzo(a)pyrene (S4UL) *	9.2E-2				>3.8E-3			>3.8E-3			>3.8E-3	☐	NA
205-99-2	Benzo(b)fluoranthene (S4UL) *	1.1E-1				>2.0E-3			>2.0E-3			>2.0E-3	☐	NA
191-24-2	Benzo(ghi)perylene (S4UL) *	3.5E-2				>2.6E-4			>2.6E-4			>2.6E-4	☐	NA
207-08-9	Benzo(k)fluoranthene (S4UL) *	4.3E-2				>8.0E-4			>8.0E-4			>8.0E-4	☐	NA
218-01-9	Chrysene (S4UL) *	1.0E-1				>2.0E-3			>2.0E-3			>2.0E-3	☐	NA
53-70-3	Dibenz(ah)anthracene (S4UL) *	4.4E-3				>6.0E-4			>6.0E-4			>6.0E-4	☐	NA
206-44-0	Fluoranthene (S4UL) *	2.6E-1				>2.3E-1			>2.3E-1			>2.3E-1	☐	NA
86-73-7	Fluorene (S4UL) *	2.0E-1				>1.9E+0			>1.9E+0			>1.9E+0	☐	NA
193-39-5	Indeno(123-cd)pyrene (S4UL) *	4.0E-2				>2.0E-4			>2.0E-4			>2.0E-4	☐	NA
91-20-3	Naphthalene (S4UL) *	3.3E-3				>1.9E+1			>1.9E+1			>1.9E+1	☐	NA
85-01-8	Phenanthracene (S4UL) *	4.5E-1				>1.1E+0			>1.1E+0			>1.1E+0	☐	NA
129-00-0	Pyrene (S4UL) *	2.7E-1				>1.3E-1			>1.3E-1			>1.3E-1	☐	NA
NA	Total TPH mixture	6.8E+1	NA	NA	NA	>2.5E+3	NA	NA	>2.5E+3	NA	NA	>2.5E+3	☐	NA

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Haulbowline Factory - Commercial
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Job ID: A092989

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option:

SSTL Results For Complete Exposure Pathways (Checked if Pathway is Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	☐ Groundwater Ingestion / Discharge to Surface Water			■ Groundwater Volatilization to Indoor Air			☐ Groundwater Volatilization to Outdoor Air			Applicable SSTL	SSTL Exceeded ?	Required CRF
			On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)	On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)	On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)			Only if "yes" left
CAS No.	Name	(mg/L)	None	None	None	Commercial	None	None	None	None	None	(mg/L)	"■" if yes	
79-01-6	Trichloroethylene (S4UL) *	1.2E-1				6.5E-1						6.5E-1	☐	<1
T-al0506	TPH Aliphatic C5-6 (S4UL) *	0.0E+0				>3.6E+1						>3.6E+1	☐	NA
T-al0608	TPH Aliphatic C6-8 (S4UL) *	1.0E-2				>5.4E+0						>5.4E+0	☐	NA
T-al0810	TPH Aliphatic C8-10 (S4UL) *	6.4E-1				>4.3E-1						>4.3E-1	☐	NA
T-al1012	TPH Aliphatic C10-12 (S4UL) *	9.0E+0				>3.4E-2						>3.4E-2	☐	NA
T-al1216	TPH Aliphatic C12-16 (S4UL) *	3.7E+1				>7.6E-4						>7.6E-4	☐	NA
T-ar0507	TPH Aromatic C5-7 (S4UL) *	0.0E+0				>1.8E+3						>1.8E+3	☐	NA
T-ar0708	TPH Aromatic C7-8 (S4UL) *	0.0E+0				>5.9E+2						>5.9E+2	☐	NA
T-ar0810	TPH Aromatic C8-10 (S4UL) *	3.2E-2				4.4E+1						4.4E+1	☐	<1
T-ar1012	TPH Aromatic C10-12 (S4UL) *	2.1E+0				>2.5E+1						>2.5E+1	☐	NA
T-ar1216	TPH Aromatic C12-16 (S4UL) *	1.9E+1				>5.8E+0						>5.8E+0	☐	NA
-	o xylene (S4UL)	9.7E-4				1.5E+2						1.5E+2	☐	<1
-	m/p xylene (S4UL)	4.6E-3				1.2E+2						1.2E+2	☐	<1
83-32-9	Acenaphthene (S4UL) *	6.0E-2				>4.1E+0						>4.1E+0	☐	NA
208-96-8	Acenaphthylene (S4UL) *	6.4E-2				>7.9E+0						>7.9E+0	☐	NA
120-12-7	Anthracene (S4UL) *	4.6E-2				>5.6E-2						>5.6E-2	☐	NA
56-55-3	Benz(a)anthracene *	1.2E-1				>3.8E-3						>3.8E-3	☐	NA
50-32-8	Benzo(a)pyrene (S4UL) *	9.2E-2				>3.8E-3						>3.8E-3	☐	NA
205-99-2	Benzo(b)fluoranthene (S4UL) *	1.1E-1				>2.0E-3						>2.0E-3	☐	NA
191-24-2	Benzo(ghi)perylene (S4UL) *	3.5E-2				>2.6E-4						>2.6E-4	☐	NA
207-08-9	Benzo(k)fluoranthene (S4UL) *	4.3E-2				>8.0E-4						>8.0E-4	☐	NA
218-01-9	Chrysene (S4UL) *	1.0E-1				>2.0E-3						>2.0E-3	☐	NA
53-70-3	Dibenz(ah)anthracene (S4UL) *	4.4E-3				>6.0E-4						>6.0E-4	☐	NA
206-44-0	Fluoranthene (S4UL) *	2.6E-1				>2.3E-1						>2.3E-1	☐	NA
86-73-7	Fluorene (S4UL) *	2.0E-1				>1.9E+0						>1.9E+0	☐	NA
193-39-5	Indeno(123-cd)pyrene (S4UL) *	4.0E-2				>2.0E-4						>2.0E-4	☐	NA
91-20-3	Naphthalene (S4UL) *	3.3E-3				>1.9E+1						>1.9E+1	☐	NA
85-01-8	Phenanthracene (S4UL) *	4.5E-1				>1.1E+0						>1.1E+0	☐	NA
129-00-0	Pyrene (S4UL) *	2.7E-1				>1.3E-1						>1.3E-1	☐	NA
NA	Total TPH mixture	6.8E+1	NA	NA	NA	>2.5E+3	NA	NA	NA	NA	NA	>2.5E+3	☐	NA

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Haulbowline Factory - Commercial Residential Navy
Site Location: Haulbowline Island, Cork

Completed By: Yvonne Buchanan
Date Completed: 12th December 2015

Job ID: A092989

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-5
Target Hazard Quotient 1.0E+0

Groundwater DAF Option:

SSTL Results For Complete Exposure Pathways (Checked if Pathway is Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	☐ Groundwater Ingestion / Discharge to Surface Water			■ Groundwater Volatilization to Indoor Air			☐ Groundwater Volatilization to Outdoor Air			Applicable SSTL	SSTL Exceeded ?	Required CRF
			On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)	On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)	On-site (0 m)	Off-site 1 (0 m)	Off-site 2 (0 m)			Only if "yes" left
CAS No.	Name	(mg/L)	None	None	None	Commercial	None	None	None	None	None	(mg/L)	"■" if yes	
79-01-6	Trichloroethylene (S4UL) *	1.2E-1				4.1E-1						4.1E-1	☐	<1
T-al0506	TPH Aliphatic C5-6 (S4UL) *	0.0E+0				2.7E+1						2.7E+1	☐	<1
T-al0608	TPH Aliphatic C6-8 (S4UL) *	1.0E-2				>5.4E+0						>5.4E+0	☐	NA
T-al0810	TPH Aliphatic C8-10 (S4UL) *	6.4E-1				>4.3E-1						>4.3E-1	☐	NA
T-al1012	TPH Aliphatic C10-12 (S4UL) *	9.0E+0				>3.4E-2						>3.4E-2	☐	NA
T-al1216	TPH Aliphatic C12-16 (S4UL) *	3.7E+1				>7.6E-4						>7.6E-4	☐	NA
T-ar0507	TPH Aromatic C5-7 (S4UL) *	0.0E+0				1.3E+3						1.3E+3	☐	<1
T-ar0708	TPH Aromatic C7-8 (S4UL) *	0.0E+0				>5.9E+2						>5.9E+2	☐	NA
T-ar0810	TPH Aromatic C8-10 (S4UL) *	3.2E-2				2.8E+1						2.8E+1	☐	<1
T-ar1012	TPH Aromatic C10-12 (S4UL) *	2.1E+0				>2.5E+1						>2.5E+1	☐	NA
T-ar1216	TPH Aromatic C12-16 (S4UL) *	1.9E+1				>5.8E+0						>5.8E+0	☐	NA
-	o xylene (S4UL)	9.7E-4				9.6E+1						9.6E+1	☐	<1
-	m/p xylene (S4UL)	4.6E-3				7.8E+1						7.8E+1	☐	<1
83-32-9	Acenaphthene (S4UL) *	6.0E-2				>4.1E+0						>4.1E+0	☐	NA
208-96-8	Acenaphthylene (S4UL) *	6.4E-2				>7.9E+0						>7.9E+0	☐	NA
120-12-7	Anthracene (S4UL) *	4.6E-2				>5.6E-2						>5.6E-2	☐	NA
56-55-3	Benz(a)anthracene *	1.2E-1				>3.8E-3						>3.8E-3	☐	NA
50-32-8	Benzo(a)pyrene (S4UL) *	9.2E-2				>3.8E-3						>3.8E-3	☐	NA
205-99-2	Benzo(b)fluoranthene (S4UL) *	1.1E-1				>2.0E-3						>2.0E-3	☐	NA
191-24-2	Benzo(ghi)perylene (S4UL) *	3.5E-2				>2.6E-4						>2.6E-4	☐	NA
207-08-9	Benzo(k)fluoranthene (S4UL) *	4.3E-2				>8.0E-4						>8.0E-4	☐	NA
218-01-9	Chrysene (S4UL) *	1.0E-1				>2.0E-3						>2.0E-3	☐	NA
53-70-3	Dibenz(ah)anthracene (S4UL) *	4.4E-3				>6.0E-4						>6.0E-4	☐	NA
206-44-0	Fluoranthene (S4UL) *	2.6E-1				>2.3E-1						>2.3E-1	☐	NA
86-73-7	Fluorene (S4UL) *	2.0E-1				>1.9E+0						>1.9E+0	☐	NA
193-39-5	Indeno(123-cd)pyrene (S4UL) *	4.0E-2				>2.0E-4						>2.0E-4	☐	NA
91-20-3	Naphthalene (S4UL) *	3.3E-3				1.9E+1						1.9E+1	☐	<1
85-01-8	Phenanthracene (S4UL) *	4.5E-1				>1.1E+0						>1.1E+0	☐	NA
129-00-0	Pyrene (S4UL) *	2.7E-1				>1.3E-1						>1.3E-1	☐	NA
NA	Total TPH mixture	6.8E+1	NA	NA	NA	>2.5E+3	NA	NA	NA	NA	NA	>2.5E+3	☐	NA

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.