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INVISTA Textiles (UK) Limited
PO Box 401
Wilton
Redcar
TS10 4XY

Surrender Site Condition Report
Permit Application No. BM 2063IR
INVISTA Textiles (UK) Limited
PO Box 401
Wilton
Redcar
TS10 4XY

April 2011
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Prepared by:

ARCADIS (UK) Ltd
2 Craven Court
Newmarket
CB8 7FA
Tel: 01638 674767
Fax: 01638 668191
www.arcadis-uk.com

Report Details

Client	INVISTA Textiles (U.K.) Limited
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If you have any queries regarding this project, please contact [redacted]

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Glossary

bgl	Below Ground Level
BOD	Biochemical Oxygen Demand
CCTV	Closed Circuit Television
COD	Chemical Oxygen Demand
COGA	Common Off Gas Abatement unit
COMAH	Control of Major Accident Hazards
COSHH	Control of Substances Hazardous to Health
DRO	Diesel Range Organics
EA	Environment Agency
HSE	Health & Safety Executive
HMD	Hexamethylene diamine
HV	High Voltage
IBC	Intermediate Bulk Container
ICI	Imperial Chemical Industries
KA	Ketone Alcohol
m	Metres
NACS	Nitric Acid Concentration Still
PCB	Polychlorinated Biphenyls
PPC	Pollution Prevention and Control
PRO	Petrol Range Organics
PVC	Polyvinyl Chloride
SVOC	Semi Volatile Organic Compounds
TIC	Tentatively Identified Compounds
TOC	Total Organic Carbon
UKAS	United Kingdom Accreditation Service
VOC	Volatile Organic Compounds
WALE	Waste and Liquor Equalisation
WEEE	Waste Electrical and Electronic Equipment

1. INTRODUCTION

ARCADIS (UK) Ltd (ARCADIS) was commissioned by INVISTA Textiles (UK) Limited (INVISTA) to assist with the surrender of the Environmental Permit for the INVISTA manufacturing site located at Wilton, Redcar, TS10 4XY ("the Site"). Figure 1 presents the Site location and Figure 2 presents the Site boundary.

1.1 Site Details

Name of the applicant	INVISTA Textiles (UK) Ltd
Activity address	PO Box 401 Wilton Redcar TS10 4XY
National grid reference	NZ 565 210

Document reference and dates for Site Condition Report	URS Corporation Ltd, October 2002, Phase 2 Environmental Site Assessment Report for IPPC Permit Application Number BM 2063 ARCADIS (UK) Ltd, February 2010; Environmental Assessment

Document references for site plans	Figure 1 Site Location Plan Figure 2 Site Boundary and Location of Kettle Beck Figure 4 Sample Locations - 2002 Baseline Survey Figure 8 Sample Locations - 2009 Closure Survey Figure 9 BH304 Characterisation Borehole Locations Figure 10 BH1101 Characterisation Borehole Locations Figure 11 BH1104 Characterisation Borehole Locations

2. CONDITION OF THE LAND AT PERMIT ISSUE

The condition of the land is described in the Site Condition Report which was prepared for DuPont Textiles & Interiors (U.K.), the then operator of the Site, by URS Corporation in October 2002. This report was included in the Application of the Pollution Prevention and Control (PPC) Permit which was made on 12th August 2003. The Permit was granted on 15th November 2004.

This section summarises information supplied in the Site Condition Report and also includes the results of routine groundwater monitoring carried out on-site and the records of pollution incidents between the permit application and issue of the permit.

2.1 Geology

The formation sequence below the Site comprises of unconsolidated drift deposits overlying mudstone. The drift deposits comprise silty clay overlying glacial Boulder Clay and in places the silty clay is overlain by a layer of black laminated clay. The mudstone is approximately 300m thick and is generally considered to be impermeable. The mudstone formation overlays the Sherwood Sandstone Group.

The characteristics of the unconsolidated deposits have been explored through Site investigations carried out at the Site between 1993 and 2002 for geotechnical and due diligence purposes. Fifty-one shallow boreholes were drilled as part of the investigations.

Unconsolidated formations encountered during the drilling of these boreholes are as follows:

- Made ground comprising a mix of brown or black clay, broken bricks, concrete rubble, furnace clinker, mudstone cobbles and gravels. Made ground has also been found to contain fragments of plastic sheeting, slag, glass and coal. The made ground extends to depths up to 1.5 metres (m) below ground level (bgl) but is typically to 0.5m bgl.
- Black laminated clay up to 1.0m in thickness.
- Soft to firm medium brown silty clay with some mottling and occasional lenses of sandy silt up to 4.0m in thickness.
- Stiff reddish brown clay with occasional gravel which has been inferred to be Boulder Clay. The Bolder Clay has been found to extend to depths of between seven and fourteen metres below ground level.

In places the laminated clay and, less commonly, the silt clay formations have been found to be absent. Figure 3 presents a typical section through the shallow geology below the Site.

2.2 Hydrogeology

The Environment Agency's Groundwater Vulnerability Map shows the Wilton Industrial Complex including the Site to be an area classified as a "non-aquifer (negligibly permeable)", this has since been reclassified as Secondary B Aquifer (April 2010).

Shallow groundwater monitoring wells were installed in thirty two of the boreholes drilled on Site. In summary:

- Little or no shallow groundwater inflows have been observed from either the black laminated clay or the Bolder Clay;
- Significant seepages of shallow groundwater into the boreholes occur from the sand and silt horizons in the brown silty clay and, in particular, the more granular types of made ground;
- The clay is relatively impermeable and the sand and silt horizons which occur with in it are discontinuous; and

- Groundwater levels have been found to vary widely over short distances and it has not been possible to infer any shallow groundwater flow direction.

It has therefore been concluded that the majority of the groundwater detected comprises localised perched water bodies.

2.3 Surface waters

The Kettle Beck, a partially culverted stream, flows in a northerly direction parallel to the western boundary of the Site. (See Figure 2) A flood relief ditch runs from the beck south of Broadway, along the north-western boundary of Site, and discharges into the INVISTA Site H Drain. The Site's drainage system is further described in Section 5.1. The Kettle Beck has not been classified by the Environment Agency.

The Kinkerdale Beck is mentioned in the Site Report, however there is no evidence of this stream on or near the Site but it would appear, from examination of plans, to drain in to the old rail sidings located to the north of Broadway, which run parallel to but north of the northern boundary of the Site. This land is now occupied by a wood recycling company (UK Wood Recycling Limited).

2.4 Pollution History

The Wilton Industrial Complex remained as agricultural fields with small roads and drainage ditches until it was developed between 1955 and 1961. Production on the Site commenced with the start-up of the Salt and Polymer Plants in 1957. Cyclohexane was produced on Site by the hydrogenation of benzene, as a feed stock for the Ketone Alcohol (KA) Plant, from 1957 to 1968. A number of expansions and rationalisations occurred on Site over the intervening years culminating in the closure of the Acids 1 Plant in August 2004 and the commissioning of the Non-Boric KA production process in January 2005.

Detailed records of pollution incidents have been kept since 2002 but there is limited information available prior to that date.

2.5 Evidence of Historic Contamination

Data collected from the due diligence investigation (1993) and geotechnical investigations carried out between 1993 and 1998 identified contamination of soil and groundwater due to historic events and work practices.

2.5.1 Site Investigation (1993)

The 1993 site investigation, comprised the drilling of forty shallow boreholes, the collection of soil samples and the installation of twenty-four monitoring wells. It was carried out as part of the due diligence process for the sale of the Site by ICI to DuPont Textiles & Interiors (UK) Limited.

According to the summary documented in the 2002 baseline survey two "residual contaminant sources areas" were identified during the 1993 site investigation:

- Soil below the former benzene bulk storage facility within the KA Plant was contaminated with benzene; and
- Shallow groundwater below the Acids 2 Plant re-crystallisation area had low pH (<1) and elevated concentrations of copper, vanadium, general inorganic compounds and dibasic acids.

2.5.2 Geotechnical Investigations (1993-1998)

Site investigations, in preparation for various construction projects, were carried out between 1993 and 1998. Testing of a relatively small number of samples identified:

- An elevated concentration of copper detected in one of nine soil samples taken from made ground on the site of the proposed effluent treatment plant (Zone 5 - south);
- Elevated concentrations of sulphide and sulphur in soil and groundwater pH of 8 to 9.9 on the site of the new Salt Plant on the Polymer Plant (Zone 4);
- Elevated concentrations of arsenic, nickel and sulphide in soil samples taken from the site of the HMD product loading facility (Zone 6);
- Elevated concentrations of arsenic, nickel and sulphide in soil samples taken from the site of the proposed NACS Purge Plant (Zone 5);
- Elevated concentrations of zinc in a sample taken from the made ground on the proposed site of the COGA unit (Zone 5 - south);
- Elevated concentrations of chromium, lead, copper and zinc in the made ground and of copper and zinc in the clay on the proposed site of the WALE tank (Zone 5 - south); and
- Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) in soil on the proposed site for the Acids 2 Plant crude crystalliser (Zone 5 - south).

The zones referred to here are shown on Figure 4.

It is understood that steel works slag was used for fill in the made ground under much of the Site and that this material may be the source of the heavy metals rather than the processes used on Site.

2.6 Baseline Soil and Groundwater Reference Data (2002)

A site investigation was carried out for the baseline assessment for the PPC Permit application in 2002. This comprised the drilling of eight shallow boreholes (BH1101 to BH1108), the installation of monitoring wells and the collection of soil, soil vapour and groundwater samples. In addition groundwater was sampled from seventeen of the wells completed in 1993. The locations of these boreholes are shown in Figure 4 and results of testing are presented in Appendix A.

A summary of the results from this investigation are as follows:

- Elevated concentrations of ammoniacal nitrogen were detected in soil samples taken from the made ground horizon in BH1105 (Zone 6) and BH1108 (Zone 5);
- Elevated concentrations of metals were found in soil samples taken from BH1104, BH1105 and BH1106 (Zone 6);
- Elevated concentrations of C6 to C9 acids were found in soil samples taken from BH1101 (Zone 3);
- Elevated concentrations of ammoniacal nitrogen were found in groundwater sampled in BH1105 (Zone 6);
- Boron was found at an elevated concentration in groundwater sampled in BH1101 (Zone 3);
- Petrol range organics (PRO) were found at elevated concentrations in groundwater sampled in BH1105 and BH304 (Zone 6); and
- Diesel range organics (DROs) were found at elevated concentrations in groundwater sampled in BH1101 (Zone 3), BH1103 (Zone 4) and BH304 (Zone 6).

2.7 Conceptual model

The conceptual model provided in the 2002 Site Report is summarised as:

a) Sources – no specific sources of soil and groundwater contamination were identified. However all operations on Site have the potential to be sources of such contamination.

b) Potential pathways for contaminant migration given in the report were:
- Run off of leaked or spilled material across hard standing into surface drainage or ground in the vicinity of the edge of the hard standing. It was suggested that this would be unlikely given the quality of containment around the edges of these areas.
- Potentially rapid migration of leaked or spilt material through cracks in hard standing. Again it was suggested that this was unlikely given the quality of hard standing on Site.
- Potentially rapid migration of leaked or spilt material through cracks in sumps.
- Potentially rapid horizontal migration of contamination through groundwater in made ground into the Site drainage system.
- Potentially slow horizontal migration through the sand lenses and laminations in the drift. The depth and characteristics of the boulder clay probably rule out vertical migration of contamination through the drift to rock head.

c) Receptors for contaminant migration given in the report include:
- Kettle Beck to the west of the Site – discounted due to the distance from Site and the presence of drain channels;
- Filled zones around underground drainage systems which could act as pathways to the Tees; and
- People working on or near to Site.

It was concluded that the Site had low sensitivity with respect to groundwater. This was due to the considerable depth of low permeability material which underlies the Site. The shallow groundwater that does occur is limited to a number of discontinuous perched water bodies in the unconsolidated formations. The Site also has low sensitivity to surface waters given the distance to surface water courses and the protection provided by the intervening Site drainage system.

2.8 Reference Data between Permit Application (2002) and Permit Issue (2004)

2.8.1 Groundwater Sampling

As part of the Site's routine monitoring programme groundwater was sampled during the period between the baseline survey and the granting of the Permit. The sample locations are shown on Figure 4.

Wells were purged and sampled using the installed inertia pumps. Samples were analysed in the Site laboratory for pH, conductivity and TOC. Samples from boreholes in the Acids 1 and Acids 2 Plant areas were also analysed for copper. Samples from boreholes on the KA Plant area were analysed for cyclohexane. Results of sampling are presented on Table 1 to Table 5.

Groundwater samples were also taken from leak detection wells installed around the WALE and Dump tanks. These wells are all 1.5 metres deep. Wells are located as shown on Figure 5. Water sampled from the leak detection wells was analysed for pH, conductivity, nitric acid and copper. Results from representative wells are presented on Table 6.

2.8.2 Recorded Incidents

Incidents which occurred in the period between the baseline survey and the permit issue and had the potential to result in contamination of soil and groundwater are listed below. Locations of any losses of containment are shown on Plan 1 in Appendix B.

Date	Incident	Result	Potential for contamination	Ref on plan
29-Oct-02	No 1 Crystalliser Overflow	Contained within plant	No	1
06-Dec-02	Emission of Thermex Heater Combustion material.	Small release of combustion solids found on parked cars	No	2
23-Jan-03	Dilute Acetic Acid leakage when breaking flange joint	Small spillage flushed to drain	No	3
06-Mar-03	Seal failure on Disintegrator.	Leak within contained area transferred to Spill containment Tank	No	4
12-Jun-03	Diesel leak from bowser on N3 Road.	Sand applied to spilled material and then swept up	No	5
04-Oct-03	Crude Slurry Leak	Leak contained and collected in crude building sump. Contents transferred to the Spill Containment Tank.	No	6
20-Nov-03	Oil separator collection IBC overtopped to drain	Small loss to drain	No	7
08-Feb-04	Crude condensate tank overflowed to crude building sump.	Sump contents transferred to Spill Containment Tank	No	8
20-Feb-04	Diesel leak on Aggreko Generator	Leak contained with spill mats and sandbags. Material (less than 5 kg) collected and disposed.	No	9
22-Mar-04	Loss of containment from Draining Oxidiser	Loss of about 2m3 of caustic and demineralised water to road drains to the west of KA Plant	No	10
03-May-04	Spillage from settling tank containment bund into plant drains	Loss of TiO2 slurry to drain	No	11
11-May-04	Overfilling of IBC requiring diversion to Buffer Tanks	Loss of TiO2 slurry to drain	No	12

None of the incidents listed above are believed to have caused any actual contamination to soil and groundwater, due to their scale, secondary containment and/or response actions

2.8.3 Zone 1 – KA Plant

No contamination was detected during routine groundwater sampling. No losses of containment occurred which could have caused contamination of soil or groundwater. There is no evidence to suggest that conditions had changed over the two year interval.

2.8.4 Zone 2 – Services Area

No contamination was detected during routine groundwater sampling. No losses of containment occurred which could have caused contamination of soil or groundwater during the period. There is no evidence to suggest that conditions had changed over the two year interval.

2.8.5 Zone 3 – Nitric Acid and the redundant Acids 1 Plants

No contamination was detected during routine groundwater sampling. No losses of containment occurred which could have caused contamination of soil or groundwater. BH1101, in which Diesel Range Organics (DRO) were found in the base line survey, was not re-sampled. There is no evidence to suggest that conditions had changed over the two year interval.

2.8.6 Zone 4 – Polymer Plant

No losses of containment occurred which could have caused contamination of soil or groundwater. BH1103, in which DRO were found in the base line survey, was not re-sampled. There is no evidence to suggest that conditions had changed over the two year interval.

2.8.7 Zone 5 – Acids 2 Plant, WALE Tank, Dump Tank and COGA

No losses of containment occurred which could have caused contamination of soil or groundwater. Boreholes 1107 and 1108 were not re-sampled.

2.8.8 Zone 6 – HMD Plant

No losses of containment occurred which could have caused contamination of soil or groundwater. Boreholes 1105, 1104 and 1106 were not re-sampled. Borehole 304, in which PRO was found, was re-sampled but was not found to have elevated levels of TOC or conductivity.

3. PERMITTED ACTIVITIES

The Site falls under Schedule 1 of The Environmental Permitting (England and Wales) Regulations 2010. Sections of Schedule 1 applicable to the Site are:

- Section 1.1 Part A(1)b(iii) – the burning of fuel manufactured from waste
- Section 4.1 Part A(1)a(ii) – the production of organic chemicals containing oxygen
- Section 4.1 Part A(1)a(iv) – the production of organic chemicals containing nitrogen
- Section 4.1 Part A(1)a(viii) – the production of polymer

Details of the operations are covered in Section 2.3 of the PPC Application

- 2.3a(1) – Manufacture of KA oil and co-products
- 2.3a(2) – Manufacture of Nitric Acid
- 2.3a(3) – Manufacture of Adipic Acid and co-products
- 2.3b – Manufacture of HMD
- 2.3c – Manufacture of Nylon Polymer

The operation of the installation was authorised by PPC Permit BM2063IR on 15-Nov-04.

Other aspects of the operation include:

- Operation of four cooling towers, which are regulated by the Local Authority; and
- Processing of waste, using a compactor, and the storage of waste samples, for which an exemption was obtained under the Environmental Permitting Regulations.

No other activities were carried out on the Site. Given the nature of the processes carried out on Site very high standards of house keeping, inspection and maintenance and security were expected by the regulators (the HSE and the EA) and achieved by the company.

3.1 Environmental Risk Assessment

The environmental risk assessment of the Site was carried out in accordance with the Environment Agency's H1 Guidance document. Results of the H1 assessment form part of the PPC Application.

It was concluded that the Site had low sensitivity with respect to groundwater. This was due to the considerable depth of low permeability material which underlies the Site. The shallow groundwater that does occur is limited to a number of discontinuous perched water bodies in the unconsolidated formations. The Site also has low sensitivity to surface waters given the distance to surface water courses and the protection provided by the intervening Site drainage system.

4. CHANGES TO THE ACTIVITY

Changes to the activity boundary - the activity boundary has not changed from that shown on the Site plan attached to the Application.

- Changes to the permitted actives have been authorised by the granting of Variations to the Permit. In summary these have been:
  - 15-Apr-05; JP3438SF – change in pH limits for discharges to the Tees from continuous to daily composite
  - 22-Dec-05; XP3232ST – waste incineration permitted in Thermex heaters
  - 30-Jul-07; JP3138UG – waste incineration emission limit values altered
  - 06-Jun-08; EP3431UA – change in TOC limits for discharges to the Tees from continuous to daily composite and COGA availability

- There have been no changes to the “dangerous substances” used or produced on Site since the granting of the Permit.

5. MEASURES TAKEN TO PROTECT LAND

Measures to protect land, surface water and groundwater are described in Section 2.3.4 of the PPC Application and in Site Procedure WSP1719 (Appendix D).

5.1 Drainage System

Drainage on the Site comprised original underground drains and modern above ground piped systems. A general schematic of the Site's underground drains is shown in Appendix C. The original drain systems discharged into the Wilton Site C Drain and carried storm water, foul effluent and cooling tower purge as well as condensate from the autoclaves and evaporators on the Polymer Plant. Most process effluent flowed to sumps in the plant areas from where it was pumped above ground to the WALE (Waste and Liquor Equalisation) Tank and then sent via surface pipeline to Northumbrian Water Ltd's Bran Sands Waste Water Treatment plant. With the exception of the HMD Plant and the modern stainless steel lined drains on the Nitric Acid Plant, process effluent did not flow underground to collection sumps.

Process drains containing or likely to contain corrosive material (e.g. nitric acid) were lined with acid resistant paint, tiles or stainless steel. Other process drains were constructed from concrete, with stainless steel liners where required. Drains were categorised using a risk based process described in Site procedure NES8407 (Appendix D). In summary drainage was considered to be "critical" where a loss of containment could cause significant harm to people or the environment. Critical drains are listed below and a plan showing the critical drains is given in Appendix C.

Zone	Plant	Drain system	Flows to	Comment
Zone 1	KA Plant	Process drains	SDC Sump	Drains are channels cast in concrete
Zone 2	Services	None	-	-
Zone 3	Nitric Acid	Nitric	Nitric sump	Drains are lined with stainless steel
Zone 4	Polymer Plant	None	-	-
Zone 5	Crude Building	Crude	Crude sump	Drains are channels cast in concrete
Zone 6	HMD Plant	Plant drains	HMD sump	Underground drains 12", 9" and 6" diameter.

Drains were registered and were periodically inspected in accordance with the Site procedure NES8407. Results of drain inspections were maintained in the Site engineering registry.

A general schematic is shown in Appendix C. The north and western portion of the Site drains via the H Drain. The south-eastern portion of the Site drains via the NY Drain. The H Drain also picks up waste water from Air Product's Hydrogen Plant (Environmental Permit PP3236LS), flood water from the Kettle Beck in times of storm and rain water from the road surface of Broadway and the UK Wood Recycling yard. Discharges from the Wilton Waste site (Environmental Permit QP3838XG) will flow through the H Drain once this plant comes into production.

Water quality in the H Drain is monitored at release point W1. Water quality in the NY Drain is monitored at release point W4. Flow, pH and TOC were monitored in real time at these two locations.

Daily composite samples were taken until December 2009 from W1 and W4 and analysed by Sembcorp (UKAS accredited) for a range of parameters and substances including BOD, COD, TOC, suspended solids, NH_3-N, NO_3-N, Cu and Zn.

Since cessation of production, in April 2009, the results of the composite sampling have been reported at much lower values than during operation of the facility. In January 2010 the frequency of sampling was reduced to spot sampling. The spot samples continue to show a very low level of effluent loading.

5.2 Surfacing

Areas within the Nitric and Adipic Acid Plants where corrosive chemicals (nitric acid) were used, are surfaced with acid-resistant tiling, concrete and/or PVC. These areas are kerbed to ensure that any losses of containment were directed to the process drains, thereby going for treatment, rather than to the storm water drainage system. Contained areas were routinely inspected by plant personnel.

5.3 Storage Tanks and Vessels

Storage tanks and other vessels containing liquid raw materials, intermediates and products were risk assessed and appropriate inspection regimes put in place in accordance with Site procedure NES8201B. Results of these inspections were maintained in the engineering registry. Tanks were designed to facilitate visual detection of leaks. Most tanks were constructed on plinths with a clear break between the base of the tank and the top of the plinth. (See example in Appendix E – photograph 2). Contents of tanks in the permitted areas is presented in Table 7a to 7f)

5.4 Secondary Containment Measures

Appendix E presents a photolog of the secondary containment systems used on the Site. Tables 7a to 7f provide a description of the secondary containment for the storage tanks on Site.

Bulk storages and other vessels containing liquid raw materials, intermediates and products and associated transfer facilities on the Site were assessed, during 1997 and 1998, for their potential to cause pollution. The assessments were carried out to meet the EA's requirement to prevent, minimise or render harmless releases of organic compounds from tanks, vessels and pipework and from leaks during chemical transfer to/from tankers. Assessments reviewed the potential for a leak to impact on the River Tees, Northumbrian Water's Bran Sands waste water treatment plant and/or groundwater below the Site.

Controls taken into account as part of the assessments included level indication and alarms, vessel inspection routines, sump discharge analysers and alarms, contained areas and bunds. The nature of stored substances was also taken into account, many of which (for example blended acid, salt and HMD) would solidify at ambient temperatures. Releases of 67% nitric acid and other hot liquors containing nitric acid are quickly identified by the smell and colour of the NO_x fumes evolved facilitating timely response to any release.

Containment structures were designed with regard to British Standard design codes, for example BS8007; Design of Concrete Structure for Retaining Aqueous Liquids, BS8110; Structural use of Concrete and BS5950; Structural use of Steelwork in Building. Account was also taken of the properties of the materials stored and the need to provide specific linings to prevent corrosion.

Site procedure NES8410 covers the inspection regimes for secondary containment systems for all storage tanks. Results of inspections were maintained in the engineering registry. All listed bunds were last inspected in 2007 and found to be in good condition.

A list of tanks containing liquids, including dangerous substances under COMAH, hazardous materials and other materials with a potential for environmental impact, are listed in Tables 7a to 7f. The locations of these tanks in relation to the various boreholes are shown on schematic diagrams in Appendix F.

5.5 Chemical Transfer Area

Chemical transfers e.g. raw material unloading and product loading activities, were carried out in contained zones with drains leading to containment sumps. An example of such a facility is shown on Plate 3, Appendix E.

5.6 Storage of Materials

IBCs and drums were stored in designated areas which were either contained or where containment pallets were provided. Examples of arrangements are shown on Plates 4 and 5. IBC and drum storage areas are inspected as part of the plant routines. Water treatment chemicals were stored in double skinned containers as shown on Plates 6 and 7 of Appendix E.

5.7 Transformers

All transformers were located in bunded compounds, Plate 8. Transformer oil was tested and PCBs were not detected in excess of 50 parts per million (ppm).

6. POLLUTION INCIDENTS THAT MAY HAVE HAD AN IMPACT ON LAND, AND THEIR REMEDIATION

6.1 Recorded Incidents (2004 – 2009)

Recorded incidents at the Site since the issue of the Permit are listed below. Locations of these incidents are shown on Plan 2 in Appendix B. None of the incidents were thought to have had the potential to impact on soil or groundwater based on the containment measures, actions taken or severity of the incident.

Date	Incident	Result	Potential for contamination	Ref on plan
25-Apr-05	Following a change over of the salt filters, the main body joint of the filter brought on line leaked.	Salt solution spilled from through the building and some entered the Site drains. EA notified.	No	1
05-Jul-06	Cold cyclohexane leak from vaporiser feed tank isolation valve body.	300 to 490 kg of cyclohexane lost but contained on the plant. EA notified.	No	2
15-Jul-06	A plug blew out from the west side header on No1 Oil Cooler, releasing mineral oil into the bund and splashing onto adjacent floor area.	Isolations made to minimise leak rate and replacement plug fitted. Spillage contained using spill kits.	No	3
18-Sep-06	Leak of 106 kg of 40% TiO2 and 20 kgs flushing water from 27 Auto.	Spill mats put in place but about 50% of release went to drain. C Drain diverted to Sembcorp buffer tanks.	No	4
07-Oct-06	Crude building sump overflowed. Release was about 5 tonnes of acid.	Ground floor flooded but contained by bund wall.	No	5
27-Jan-07	Salt leaked out from the gaskets of No.1 Salt Preheater.	The potential for a release of had been anticipated, a temporary bund was in place and it was contained	No	6
02-Apr-07	After a tanker offloading operation, approximately 500kgs of Caprolactam solution entered the Site drain.	No breach of PPC limit.	No	7
09-Aug-07	HMD tanker was being loaded with 60% solution for export, tanker over-filled and over flowed in drainage system.	Spillage estimated to be 600 kg, of this about 60 kg was not contained and was washed down to the Site drainage system. No breach of PPC limit.	No	8
12-Oct-07	During start up of ammonia recovery the Weak Liquor Tank overfilled resulting in a blown bursting disc.	The release was contained in the bunded area. The ammonia content of the liquor was negligible due to washing during shutdown.	No	9
28-Nov-07	80% HMD Tanker loading hose leaked.	Washed to drain to W1. No breach of PPC limit	No	10
06-Sep-08	AGS methanol loss into sump.	Loss (approximately 34 tonnes) was fully contained and, after testing, sent forward to NWL for treatment.	No	11
01-Jan-09	Release of HMD from the Refinery stack. Fire brigade attended and washed down structure and surfaces.	No breach of PPC limit. EA notified.	Area washed to drain after incident	12

7. SOIL, GAS AND WATER QUALITY MONITORING

7.1 Soil sampling

Soil sampling activities were carried out across the Site by URS in 2002 to determine the Site baseline conditions as part of the permit application. Results of the baseline survey are detailed in Section 2.6.

No further soil samples were collected during the lifetime of the permit.

7.2 Groundwater

Groundwater sampling was carried out by URS to determine the Site baseline conditions as part of the permit application as detailed in Section 2.6.

As part of the Site's routine monitoring programme groundwater was sampled during the lifetime of the permit from the following monitoring wells using the installed inertia pumps; 201, 202, 203, 204, 112, 601B, 605, 606, 501, 504, 401, 404, 405, 105 and 304 (Figure 4). Groundwater was analysed at the in-house laboratory for pH, TOC, copper, conductivity and cyclohexane. The results are presented in Table 8 to Table 12.

Groundwater samples were also taken from leak detection wells installed around the WALE and Dump tanks. Wells are located as shown on Figure 5. Water sampled from the leak detection wells was analysed for pH, conductivity, nitric acid and copper. Results from representative wells are presented in Table 13.

8. DECOMMISSIONING AND REMOVAL OF POLLUTION RISK

8.1 Site closure plan

The Site closure plan was submitted as Section 2.11 of the PPC Application. The closure plan was reviewed following INVISTA's announcement of the Site closure on 13th January 2009 and the revised document was submitted to the EA on 13th March 2009. A copy of the revised closure plan is attached in Appendix G.

8.2 Site decommissioning

The general principles for Site decommissioning and decontamination are described in the Site Closure Plan. In practice these objectives have been delivered and demonstrated as summarised below.

Each of the Site's process plants were divided into a number of "systems" and each system was made up of a number of different vessels and associated pipework. These were identified on system equipment lists and process and instrument diagrams (P&IDs). An example of the decontaminated equipment and systems located in the Acids area is presented as Appendix H. This spreadsheet serves to demonstrate how each plant operating team tracked the progression of decommissioning from the development of the scope of the decontamination, through equipment inspections, decommissioning of associated electrical and/or rotating equipment, to the final sign off and filing of the documentation. As each step was completed the appropriate cell in the spreadsheet was marked off in red.

Process Hazards Analysis (PHA) teams, made up of a cross section of the operating team in each area, carried out PHA on the installations to determine the level of cleanliness and methods of decontamination necessary for each part of the plant in order to leave the plant in a safe condition and to remove any pollution risk. Typically this meant removal of material, including hazardous material, from vessels and pipelines with the goal being to have vessels as clean as if they were being prepared for vessel entry and pipelines, material free as if they were being prepared for hot work.

In a minority of cases where the material could be shown to be non-hazardous, not a pollution risk and/or where it would be very difficult to remove e.g. inert polymeric material coated on the walls of the KA Wash Water Recovery Column, it was left in-situ, secure within the vessel. Each of these exceptions was reviewed, documented and approved by INVISTA Area leadership.

The execution of the decontamination work was carried out under the Permit to Work system which included a requirement to identify risks to safety and the environment and to put in place risk control measures before work can start.

Once cleaning work on a piece of equipment was completed, the equipment was inspected, photographed and a decontamination certificate was completed and approved by Area Leadership. This, together with the photographs and a marked up copy of the P&ID showing the final condition of vessels and pipework have been collected together in a "Decontamination Pack" which documents the condition of each system on the Plant. An example of a typical decontamination pack is presented in Appendix I.

Progress of the decontamination programme, system cleaning and filing of the completed decontamination packs was tracked weekly by the Site leadership team. A graphical summary of the completed site-wide decontamination work plan is presented as Appendix J. This shows how cleaning of the vessels and pipework progressed throughout 2009. This work was

essentially complete by the end of 2009. The only remaining item remaining by then was final cleaning of the WALE tank. This was completed and all wastes disposed of during Feb 2010.

8.2.1 Tanks

Tanks used for the storage and transfer of hazardous or potentially contaminating materials were subjected to the following decontamination process:

- Vessel and associated linework boiled, steamed out and drained. Wash waters were sent to effluent treatment.
- Lines isolated (by disconnection where possible).
- Manways removed, valves opened, vessel ventilated and internal atmosphere tested for entry.
- Any solid residues removed and disposed of as waste
- Internal condition inspected and photographic record of condition and effectiveness of cleaning operations. If required additional cleaning would be conducted.
- Any residual hazards (e.g. slight residues) are documented within the decontamination certificate.

KA Tanks

Five of the vessels in the KA plant contained solid process residues, which were tested and identified as hazardous waste. The tanks were identified for demolition, details of which are provided below;

- Organic Recovery Column – removed in December 2010, residues disposed of and cleanliness photographs sent to local EA representative.
- SDC Mother Liquor Tank – removed in March 2011, Environment Agency representative visited Site to observe the vessel and get an understanding of the process to be used. The residues were disposed of and cleanliness photographs were sent to the local EA representative.
- 3 Oil Wash Water Settlers – scheduled to be removed from Site by the end April 2011, INVISTA intend to send to the EA representative before and after photographs as proof of cleanliness before the vessels are sent for scrap.

Prior to the EA inspection INVISTA provided the Agency with a copy of the method statement which identified the techniques used to safely decommission including pre-weakening and felling of high level structures. The process included ensuring that the column was sealed and then moved to a processing area where it was opened to allow the extent of any residue/contamination to be assessed. The EA report concluded that the demolition was professionally planned, carried out in a controlled manner, and were adequate controls in place to minimise any potential environmental impact as result of the demolition process.

8.2.2 Sumps

Sumps used for the collection and transfer of hazardous or potentially contaminated water or materials were subjected to the following decontamination process:

- Sump chamber washed and pumped out.
- Analysis of sump rinse water to determine effectiveness. Wash waters were sent to effluent treatment.
- Gratings or covers removed and internal condition inspected, photographic record of condition and effectiveness of cleaning operations. If required additional cleaning would be conducted.
- Any residual hazards (e.g. slight residues) are documented within the decontamination certificate.
- Gratings or covers replaced.

8.2.3 Pumps

Pumps used for the transfer of hazardous materials or potentially contaminated water or materials were subjected to the following decontamination process:

- Pumps flushed / cleaned (e.g. with hot demineralised water) and drained. Wash waters were sent to effluent treatment.
- Inspection or testing of rinse water to verify cleaning effectiveness.
- Valves left open.
- Pumps isolated.

8.2.4 Radioactive Sources

All radioactive sources were removed from the Site by a licensed contractor (Tracerco). Notification of their removal and transport was provided to the EA in July 2009 and the notices of cancellation of certificates to keep and dispose of radioactive sources was received on 18th August 2009.

8.2.5 Oils

Any oil being stored in drums was removed from the Site. All equipment containing oil was identified and as far as possible with the oil drained, collected and disposed off. If possible, oil was sent for reuse or recycling. In the event that the oil was not reusable, or it was contaminated it was send for disposal to a licensed disposal facility.

8.2.6 Gearboxes, Pumps and Compressors

All gearbox, pump and compressor systems had oil removed and then allowed to stand for a few days so that any residual oil could be collected. Once as much oil as possible had been removed, the equipment was boxed up to ensure that any small remaining amounts of oil would be contained. Trace amounts of oil may remain, coating the insides of the equipment.

8.2.7 Transformers

Transformer oil within on-site systems had previously been tested and confirmed as PCB free or levels below 50 ppm. Once circuits fed from a transformer had been decommissioned and disconnected, the transformer oil was drained down and left to stand to ensure that the bulk of residues were removed. The waste oil was removed from Site for recycling. The drain valves were then closed to prevent any remaining seepage. All power cables were removed from the transformer. Transformer bays were cleaned of any oil contamination or residue.

Examples of oil cooled transformer decontamination records are presented as Appendix K.

8.2.8 Batteries

All batteries which posed a risk of leaking and presented a potential pollution risk e.g. lead acid type associated with Uninterruptable Power Supply (UPS) systems, have been removed and disposed off in accordance with the Hazardous Waste Regulations. Other batteries, which were in good condition and did not pose a pollution risk, such as those associated with emergency lighting systems have been left in place and will be removed and disposed off as part of any future demolition project.

8.2.9 Equipment

Process equipment and vessels were cleaned as stated and left in place, with a few exceptions which have been removed for resale or reuse at other INVISTA facilities. Portable

electrical equipment such as fridges, microwave ovens etc, have been removed and sent for reuse elsewhere or disposed off in accordance with Waste Electronic and Electrical Equipment Regulations.

Desktop and laptop computers and other portable computer equipment such as printers have been removed from the Site. This equipment has been removed and sent to another INVSITA location for reuse. Other process control equipment, integrated in the plant design, has been left in place.

Analyzers have been cleaned and de-energized. Gas cylinders have been removed from the units and sent off-site.

8.2.10 Mercury containing equipment

All equipment containing mercury has been identified and as far as possible mercury has been safely removed. A tracking document for the removal of mercury from all identified equipment is presented as Appendix L.

A decommissioning survey was undertaken in the laboratory which included an assessment of any residual mercury within the working areas in the laboratory building. There was no positive visual evidence of mercury found during the survey however, there was a small amount of mercury remaining in inaccessible parts of the lab and has been recorded so that future demolition contractors are aware of its presence. The results of the survey can be found in the Wilton Nylon Laboratory Decommissioning Report in Appendix L.

8.2.11 Asbestos

Inspection of INVISTA's asbestos inventory was completed by the end of November 2009, in accordance with Site procedures, all necessary repairs were completed and the records were brought up to date.

INVISTA have appointed an Asbestos Manager for the Site who will be responsible for compliance with asbestos legislation.

INVISTA will manage the asbestos program to the schedule using competent third parties. Contracts will set up with independent providers of inspection and repair/disposal services. The repair and disposal contractor will set up his own facilities to execute their work.

The asbestos inspection frequency will remain consistent with past practice i.e. all asbestos will be formally inspected every twelve months. The asbestos management process is documented separately within INVISTA's procedures. Routine security related patrols by the local INVISTA team will also look out for asbestos falls to initiate clean up and further inspection.

8.2.12 Electrical supply

The Site's electrical supply system has been isolated at the 11kV sources. All circuits once isolated and locked out have been physically tested, using an approved voltage tester, to prove them dead.

Area electrical inspection files contain copies of all the documentation for each HV circuit breaker's redundant distribution. Plant hand over electrical certificates have been completed and signed off by the electrical inspector.

A few live cables belonging to SembCorp Utilities remain on the facility. To facilitate identification of these cables in the event of a demolition project, all redundant cable has been

removed from the Site cable/pipe trenches. This leaves only a few cables and these remain live.

8.2.13 Critical drains

Critical drains, including sumps, have been treated as plant systems. A plan showing the location of all critical drains, marked in green, is attached in Appendix C. Decontamination packs have been prepared for these drains and a summary is presented below.

KA Plant

Plant drains were washed and inspected. Sumps were cleaned.

Nitric Acid Plant

Plant drains were washed through to the sump. Sump was then cleaned.

HMD plant drains

Drain gullies, sumps and oil separators on the HMD synthesis, ammonia recovery and refinery areas were cleaned. Underground drains, including oil separators, were cleaned using a water wash and gully sucking vehicle. The planned inspection of the underground drains with a CCTV camera was precluded by the presence of hard deposits. Attempts to remove these hard deposits with a high pressure water jet were unsuccessful. A sample of the solids was taken, analysed and found to be calcium carbonate. The final effluent sump was cleaned and the drains flushed.

Acids 2 Plant drains

Drain gullies on the Acids 2 Crude and NACS Purge Buildings and all collection sumps were cleaned.

Polymer Plant

Drain gullies and the underground drain to the north of the plant were cleaned.

8.2.14 Residual contamination in H and NY drains.

The storm water drains were monitored after plant operation ceased, the results identified that the drains did not pose a potential source of pollution.

Following an intense rain storm (17mm) on 3rd July 2009 peak flow rate was recorded at 1,000 m^3/hr. Figure 6 and Figure 7, generated by the Site's InfoPlus (IP) 21 system, show real time data for flow (blue) and TOC (red) from 1st to 6th July 2009. TOC results did not exceed permitted limits; 800mg/l for W1 and 500mg/l for W4 during the rain storm, indicating that there is no residual contamination in the drainage network.

Daily composite sampling results for this period were generally very low or below the limit of detection (Table 14 and Table 15).

8.2.15 Residual Wastes

The objective of the decontamination process was to clean vessels to a standard suitable for vessel entry and for pipes so that they were suitable for hot work i.e. no residues. Appendix M presents a list of equipment where that standard was not achieved and where residual contamination remains. The decision to leave these residues was based on a number of factors e.g.

- In most cases the bulk of the material had been removed and the effort to remove the amount remaining was very significant for little or no environmental benefit since the materials were typically solids and non-hazardous
- In many cases removal of the residual material would have required vessel entry with difficult access thereby posing an unacceptable risk to personnel with no benefit for environmental protection
- In all cases since the material is secure and contained it is considered that it does not pose an environmental risk
- In all cases safe removal of the material can best be achieved as part of the demolition process.

All demolition contractors being considered for the demolition project have been made aware of these residual materials and have included the cost of safe removal and disposal as part of their bids for the project. Detailed risk assessments, including environmental risk, will be carried out on every aspect of the demolition. This will include COSHH assessments for potential exposure, the necessary soil and groundwater protection, collection, treatment and disposal of any resultant water run off, as well as waste analysis and designation of suitable disposal routes for the material.

In many cases, the amount of residue is very small or represents a coating on the walls of the vessel or pipework. In some cases there are more significant amounts. For example there are vessels in the KA plant remaining which contain solid process residues, which have been tested and would be classified as hazardous waste. Two of the tanks have been demolished and the three remaining are planned to be removed by the end of April 2011.

8.2.16 Security

A security fence has been erected around the periphery of the installation. This fence is made up of two metre high weldmesh panels topped with barbed wire. The line of the fence is shown on the plan in Appendix N. Gates through the fence are marked with an “X”. Security patrols are being carried out by a third party provider, SembCorp, with the status reported to INVISTA personnel still located in the vicinity of the Site.

9. REFERENCE DATA AND REMEDIATION

ARCADIS was contracted by INVISTA to collect data for comparison against the 2002 baseline survey. The repeat groundwater sampling exercise comprised an initial round of groundwater monitoring in July 2009 followed by an intrusive investigation and groundwater monitoring in November 2009. Following this an additional two rounds of groundwater monitoring of selected boreholes was undertaken in June 2010.

9.1 Permit Surrender Groundwater Monitoring (July 2009)

In July 2009, a site reconnaissance was undertaken at the Site which included well inspection, purging of the monitoring wells and subsequent groundwater monitoring (Figure 8). Wells were generally found to be in good condition with little silting, including wells which had not been sampled since 2002. A number of the well covers required remedial works to maintain their integrity: i.e. the borehole cover at BH304 was observed to be damaged and the monitoring well potentially exposed to the inflow of surface water runoff from the surrounding area. The monitoring well was subsequently fitted with a protective standpipe to prevent surface water running into the well.

All wells were purged using a surge block and where possible the equivalent of ten well volumes of water was purged from each well. However, many of the wells ran dry before this volume had been removed. In such cases wells were left to recharge before being purged again.

Groundwater samples were taken, using a low flow, peristaltic pump system. Low flow techniques allow the collection of representative samples from the screened formation without entrained particulate material. Hydro-geochemical data (pH, Redox, dissolved oxygen, conductivity and temperature) was collected, where there was sufficient recharge, during sampling.

Groundwater samples were submitted for testing, to a UKAS accredited laboratory, for the same analytical suites used in the baseline survey in 2002:

- VOC inc TIC, all groundwater samples;
- SVOC inc TIC, all groundwater samples;
- TPH separated into Petrol Range Organics (PRO) and Diesel Range Organics (DRO), including benzene, toluene, ethyl benzene and xylene (BTEX), selected samples;
- Metals – arsenic, boron, cadmium, chromium, copper, mercury, nickel, lead, selenium, vanadium and zinc, selected samples;
- Ammonia, all groundwater samples;
- Acids, pH and acids identified in the VOC and SVOC TIC, selected samples;
- Methanol, selected samples;
- PCBs by Aroclor, selected samples;
- Cyclohexane, all groundwater samples; and
- TOC, all groundwater samples.

For quality assurance and quality control, three samples, comprising two blind duplicates and one field blank were also submitted for analysis for the complete set of suites.

All boreholes sampled during the baseline survey were re-sampled with the exception of boreholes BH207, BH1107 and BH1108 which could not be located and BH1105 which had insufficient water to sample.

9.1.1 Results of Groundwater Monitoring

A detailed report of the July 2009 groundwater monitoring is presented as Appendix O and a summary of the results is presented below.

Analytical results for the majority of samples collected in 2009 were of similar magnitude to the 2002 baseline monitoring with the following exceptions: BH1101; BH1104 and BH304. A comparison of analytical results, showing key increases in concentrations, is presented below:

Borehole	Analysis	2002 (µg/l)	2009 (µg/l)
304	TOC	10,000	580,000
	SVOC	<MDL	311
	NH_4(N)	1,200	260,000
1101	SVOC (TIC)	595 (1)	101,920 (2)
	TPH – GRO	<MDL	931
	NH_4(N)	1,000	4,000
1104	Boron	590	15,000

- Below method detection levels
Note SVOC-TICs (1); C_6 to C_9 acids, (2); carboxylic acid group and dicarboxylic acid.

BH304
Concentrations of total organic carbon (TOC), ammonium and SVOC were recorded above the baseline investigation. It is considered likely that the source of the elevated concentrations may be a result of the damaged borehole cover and potentially contaminated surface water run-off that has entered the monitoring well.

BH1101
Concentrations of tentatively identified semi-volatile organic compounds, TPH-GRO and ammonium were recorded above the baseline levels. It is likely that the variations of TPH GRO are a result of differing sampling techniques. ARCADIS undertook sampling utilising low flow sampling techniques and Invista samples have been historically collected using a bailer. Low flow sampling minimises the disturbance to the water column and so reduces the possibility of VOCs volatilizing and being "lost" from the sample. The use of a bailer to develop and sample will significantly increase the disturbance of the sample collected which may have resulted in loss of volatiles (including GRO). Thus the two different collection methodologies could result in significantly different laboratory results for a given groundwater sample. EA Technical Report P5-065/TR Volume 2, Table 6.3 indicates that bailer sampling may not be suitable for VOC sampling, subject to the type of bailer employed.

The tentatively identified elevated concentrations of SVOC are from historical activities prior to the issue of the permit. Elevated levels of SVOC-TIC C_6 to C_9 acids were reported in the soil sample from BH1101 in 2002 at concentrations of 14.94mg/kg.

BH1104
Concentrations of boron were detected in higher concentrations than in the baseline investigation. The 2002 baseline investigation recorded elevated concentrations of boron (50ug/l to 1,010ug/l) across the Site and the 1993 investigation also recorded elevated levels of boron across the Site (max. 56,150ug/l). There have been no recorded releases of this material over the lifetime of the permit.

Based on the findings from the groundwater monitoring it was decided to undertake additional characterisation of the soil and groundwater around boreholes BH304, BH1101 and BH1104.

9.2 Additional Characterisation (November 2009)

An investigation was designed to provide additional characterisation of impacts identified in and around the three boreholes.

The investigation, carried out by ARCADIS, comprised the drilling of four boreholes around BH304 (Figure 9), three boreholes around BH1101 (Figure 10) and three boreholes around BH1104 (Figure 11). The additional boreholes were drilled to comparable depths as the target boreholes with comparable monitoring well design. Soil and groundwater samples were collected and submitted to an accredited laboratory.
Ground conditions encountered in boreholes comprised made ground, consisting of concrete and a layer of gravel, over clay. Groundwater recharge into the new wells was slow. Rest water levels indicated that groundwater is non-continuous.

Groundwater was sampled on two occasions; 4th November and 18th November 2009. Samples were scheduled for the same suite of analysis as previously tested and results are presented in Appendix O.

9.2.1 BH304 Area

Results of analysis of groundwater samples taken from BH304 and the four newly installed monitoring wells are presented below.

Borehole	Analysis	2002	July 2009	04/11/09	18/11/09
		(µg/l)			
304	TOC	10,000	580,000	160,000	N/S
	TPH - DRO	2,062	643	1,100	N/S
	$NH_4(N)$	1,200	260,000	390,000	N/S
304-1 (*1.2m)	TOC	-	-	N/S	<MDL
	TPH - DRO	-	-	N/S	<MDL
	$NH_4(N)$	-	-	N/S	<MDL
304-2 (*6.0m)	TOC	-	-	6,000	4,000
	TPH - DRO	-	-	<MDL	<MDL
	$NH_4(N)$	-	-	<MDL	<MDL
304-3 (*6.5m)	TOC	-	-	N/S	8,000
	TPH - DRO	-	-	N/S	<MDL
	$NH_4(N)$	-	-	N/S	<MDL
304-4 (*7.0m)	TOC	-	-	10,000	6,000
	TPH - DRO	-	-	<MDL	<MDL
	$NH_4(N)$	-	-	<MDL	<MDL

-: Borehole not in existence; N/S: Not sampled; <MDL: Below method detection levels *: Distance from BH304

The elevated concentrations of ammonium detected in borehole BH304 in July 2009 were not recorded in any of the characterisation boreholes. As such borehole BH304 is considered an isolated hotspot and likely caused by surface water run off ingress into the unprotected borehole.

9.2.2 BH1101 Area

A summary of the results of groundwater samples taken from BH1101, and the three new installed monitoring wells is presented below. An additional groundwater sample was also collected from borehole BH501 located between BH1101 and the former Nitric Acid plant.

Borehole	Analysis	2002	July 2009	03/11/09	18/11/09
		(µg/l)			
1101	SVOC (TIC)	595	101,920	487,753	N/S
	TPH – GRO	<MDL	931	190	N/S
	NH_4(N)	1,000	4,000	500	N/S
501	SVOC (TIC)	<MDL	<MDL	<MDL	N/S
	TPH – GRO	<MDL	<MDL	<MDL	N/S
	NH_4(N)	<MDL	800	400	N/S
1101-1	SVOC (TIC)	-	-	451,841	263,147
	TPH – GRO	-	-	1,600	1,800
	NH_4(N)	-	-	13,000	9,100
1101-2	SVOC (TIC)	-	-	413	<MDL
	TPH – GRO	-	-	N/T	<MDL
	NH_4(N)	-	-	600	200
1101-3	SVOC (TIC)	-	-	144	<MDL
	TPH – GRO	-	-	N/T	<MDL
	NH_4(N)	-	-	300	200

-: Borehole not in existence; N/S: Not sampled; N/T: Not tested <MDL: Below method detection levels

Soil

The laboratory analysis from the soil samples collected from the three new boreholes tentatively identified organic acids in borehole BH1101-1 which is located to the immediate south (<10m) of borehole BH 1101. None of the other soil samples collected from the surrounding boreholes identified elevated concentrations of tentatively identified organic acid compounds.

Groundwater

Results of the laboratory analysis recorded tentatively identified organic acids in all of the characterisation boreholes with the exception of borehole BH501.

Borehole BH1101 is located in an area that historically used organic acids similar to those tentatively identified in the permit monitoring. These activities ceased in this area prior to 1990 and have been subsequently decommissioned and demolished. An area 95m to the east of BH1101 did use a mixture of organic acids during the lifetime of the permit (Figure 12). However, there have been no recorded releases over the lifetime permit.

Based on the evidence of the July 2009 monitoring and subsequent characterisation work, along with a review of Site processes and records for the lifetime of the permit it is concluded that the organic acids are associated with historical Site activities.

9.2.3 BH1104 Area

A summary of the results of the groundwater samples taken from BH1104 and adjacent boreholes is presented below. The July 2009 closure survey recovered elevated concentration of boron above the baseline survey. Subsequent monitoring was conducted in November 2009 and June 2010 to provide trending data for the contaminant of concern.

Borehole	Analysis	2002	July 2009	04/11/09	18/11/09	10/06/10	23/06/10
		(µg/l)					
1104	Boron	590	15,000	1,100	N/S	16,400	14,300
1104-1	Boron	-	-	1,200	1,100	676	1,030
1104-2	Boron	-	-	1,500	1,000	1,010	1,310
1104-3	Boron	-	-	1,800	1,500	1,230	998

The results of characterisation exercise show that concentrations of boron in borehole BH1104 are elevated above the 2002 baseline conditions and that concentrations of boron are also detected in all of the characterisation boreholes.

Borehole BH1104 is located immediately adjacent to a building which historically was used to manufacture Ammoniated Boron Phosphate (ABP) catalyst. The ABP plant closed in 1992 when the Site began to import adiponitrile (ADN) and since 2002 the building has been used as a warehouse to store boxes of new lagging for the on-site Lagging Contractor. Borehole BH1104 is also located in close proximity (<5m) to a sump / interceptor which would have contained any effluent generated in the ABP plant. It is likely that the potential source of boron in this area from the historical ABP catalyst plant and/or associated drainage.

Following a review of the historical activities that took place in and around borehole BH1104, the elevated concentrations of boron identified in the groundwater in the baseline survey in 2002 (see section 2.6) and in consideration the Site process changes to the non-boric KA process in 2004, it is concluded that the elevated levels of boron are related to historical Site activities that took place prior to issue of the environmental permit.

9.3 Remedial Actions

Elevated concentrations of contaminants of concern have been recorded in three isolated areas of the Site between the granting of the PPC Permit and closure. However, the organic acids tentatively identified in BH1101 and elevated concentrations of boron in borehole BH1104 are considered to be an historic issue and not associated with permitted activities, as such no remedial actions are considered necessary under this environmental permitting regime.

9.3.1 BH304

The elevated concentration of ammonium recorded in BH304 is considered to be an isolated hotspot. Given the nature of the Site geology which comprises of made ground over clay with pockets of discontinuous sand lenses, and the limited area of impact, this borehole will be decommissioned and a limited excavation of the immediate area (approx 2m x 2m) will be undertaken. The excavation material will be sampled to enable a suitable disposal route to be defined.

Due to the fact that there is no baseline for ammonium in soil for borehole BH304 and that the soil in the area has shown historically to have been impacted, ARCADIS did not define specific remedial targets for this work, but aimed to improve ground conditions so that the land immediately around BH304 was in a satisfactory state at surrender. The remediation report is summarised below, the full report can be found in Appendix P.

ARCADIS attended Site on 16th August 2010 accompanied by a representative from INVISTA. A visual inspection of the proposed excavation works was undertaken and utility locations were discussed and the area was cleared by the INVISTA representative. Due to the nature of the Site geology and the limited area of impact a small excavation of the immediate area was undertaken and the borehole was decommissioned.

As the soil was removed the excavation was logged and sampled. Approximately 16 tonnes of material was excavated and was disposed of via road transport to landfill. The excavation was backfilled with some of the concrete removed from the surface and 6F2. Based on the elevated ammonium levels identified in the previous monitoring and discussions with INVISTA, the soil and groundwater samples were submitted for the ammonium analysis.

Ammonium was not detected in any of the samples from the excavation. Following the removal of the target material around BH304 and the decommissioning of the well it is the opinion of ARCADIS that the area is no longer impacted and requires no further action.

10. STATEMENT OF SITE CONDITION

Based on the information presented in this report, it is concluded that the Site was operated to Best Available Techniques with respect to protection of soil and groundwater.

The 2009/10 conditions are generally comparable to those seen in 2002 when the permit was issued, with the exception of three remaining areas where detected concentrations of contaminants of concern are above the initial baseline survey. Of these three areas; the concentrations of contaminants of concern in BH1101 and BH1104 are attributed to historical activities (pre environmental permit) and the ground around borehole BH304 is considered to be a result of permitted activities. Subsequently, no further works are proposed around BH1101 and BH1104. A limited excavation and removal of impacts was successfully undertaken around BH304.

INVISTA consider that these proposed works are adequate to enable the surrender of the environmental permit and return the Site to a satisfactory state in accordance with the relevant guidelines and legislation.

11. REFERENCES

1. Dames and Moore International, May 1993, Phase 2 Due Diligence Investigation – Project Blue, Wilton Site

2. URS Corporation Ltd, October 2002, Phase 2 Environmental Site Assessment Report for IPPC Permit Application Number BM 2063

3. ARCADIS (UK) Ltd, February 2010, Environmental Assessment

TABLES

Environmental Permit Surrender INVISTA Textiles (UK) Ltd

Table 1 - Groundwater Quality Between Baseline and Granting of Permit (pH)

Area	Borehole	Jul-02	Dec-02	Jun-03
Zone 1	201	6.9	6.5	7.4
	202	5.9	6.5	7.2
	203	6.2	6.7	7.5
	204	6.2	6.6	7.3
Zone 2	112	6.2	6	6.9
	601 B	6.4	5.5	7.1
	605	6.5	6	7.1
	606	6.7	6.6	7.5
Zone 3	501	6.7	6.5	7.5
	504	6.3	6.8	7.8
Zone 5	401	5	4.8	6.8
	404	6.1	5.2	7.8
	405	5.1	5.6	6.6
	105	5.5	6.2	8.9
Zone 6	304	5.3	6.4	7.8

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Table 2 - Groundwater Quality Between Baseline and Granting of Permit (Conductivity uS)

Area	Borehole	Jul-02	Dec-02	Jun-03
Zone 1	201	800	595	810
	202	810	780	817
	203	595	615	595
	204	700	800	643
Zone 2	112	2,920	1,850	2,170
	601 B	1,350	1,422	1,405
	605	1,410	1,334	1,355
	606	570	308	520
Zone 3	501	1,499	1,305	1,205
	504	715	463	705
Zone 5	401	1,175	1,120	789
	404	1,060	703	650
	405	5,750	6	4
	105	530	722	661
Zone 6	304	1,700	1,005	1,253

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Table 3 - Groundwater Quality Between Baseline and Granting of Permit (TOC ppm)

Area	Borehole	Jul-02	Dec-02	Jun-03
Zone 1	201	15	10	10
	202	5	5	3
	203	10	15	5
	204	25	20	25
Zone 2	112	20	15	40
	601 B	<5	<5	<5
	605	5	70	10
	606	10	15	10
Zone 3	501	<5	20	5
	504	5	10	10
Zone 5	401	15	15	15
	404	15	25	20
	405	1,800	2,305	310
	105	10	25	110
Zone 6	304	10	<5	30

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Table 4 - Groundwater Quality Between Baseline and Granting of Permit (Copper ppm)

Area	Borehole	Jul-02	Dec-02	Jun-03
Zone 3	501	<0.01	<0.01	0
	504	<0.01	<0.01	0
Zone 5	401	1	0.33	0
	404	0	<0.01	0
	405	0	<0.01	0

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Table 5 - Groundwater Quality Between Baseline and Granting of Permit (Cyclohexane ppm)

Area	Borehole	Jul-02	Dec-02	Jun-03
Zone 1	201	<5	<5	0
	202	<5	<5	0
	203	<5	<5	0
	204	<5	<5	0

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Table 6 - Water Quality Between Baseline and Granting of Permit WALE and Dump Tanks

	DATE	Dec-02	Jun-03	Dec-03	Jul-04
WALE 1	Cu (ppm)	<0.01	<0.01	<0.01	<0.01
WALE 6	Cu (ppm)	<0.01	<0.01	<0.01	<0.01
WALE1	HNO3 (ppm)	25	10	10	10
WALE6	HNO3 (ppm)	25	10	10	10
WALE1	Conductivity (uS)	980	720	690	860
WALE6	Conductivity (uS)	820	640	590	845
WALE1	pH	7.7	6.8	6.3	7.5
WALE6	pH	7.4	6.6	6.6	7.4
DT 5	Cu (ppm)	0.04	0.01	0.02	<0.01
DT 5	HNO3 (ppm)	50	25	25	50
DT 5	Conductivity (uS)	8,170	7,600	7,700	8,300
DT 5	pH	7.4	6.7	6.4	7.5

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Table 7a - Adipic Acid Storage Tanks

Tank number	Description	Capacity(m3)	Substance stored
5031-141	60% HMD storage tank	198	60% HMD
5031-142	60% HMD storage tank	198	60% HMD
5031-160	Spill containment tank	80	high copper/ high conductivity sump material from Crude building/ NACS/ Purge building, normally disposed of to Bio.
5031-163	Mother liquor storage	205	Collection of liquors from various different sources; Semi-ref dissolvers drain headers/ soution recycle manifold/ semi-ref crystalliser drain.
5031-164	Mother liquor storage	206	Collection of liquors from various different sources; Semi-ref dissolvers drain headers/ soution recycle manifold/ semi-ref crystalliser drain.
5031-171	Dryer liquor tank	180	liquor from 3 and 4 Dry Refined Centrifuges and No. 2 dryer Scrubber. Comp????
5031-191	1st ML collection tank	308	filtrate from Semi ref thickeners and centrifuges & Semi-ref slurry from the thickener ringmain
5031-200	Salt-refined crystaliser feed tank	180	Salt
5031-203	Wash liquor storage	275	~78% water, 11% nitric, 9% Adipic & 2% trace elements.
5031-220	Recycled Acid Tank (RAT)	968	Nitric & organic acids
5031-233	Blended Acid Tank (BAT)	968	Nitric & organic acids
5031-246	Spilliage disolver		00S
5031-276	No 2 Mother liquor collection tank		DI water with low Adipic content (~5%) & Nitric acid (trace only) - from filtrate from the 4 Salt refined c/fuges.
5031-303	Semi-refined sol collection	90	typically 45 - 49% Adipic <100ppm Nitric Acid
5031-340	No 1 Semi-refined solution tank	90	used as buffer space. typically 45 - 49% Adipic <100ppm Nitric Acid
5031-341	No 2 Semi-refined solution tank	90	used as buffer space. typically 45 - 49% Adipic <100ppm Nitric Acid
5031-346	Dryer crstaliser feed tank	90	35 - 40% adipic acid dissolved in water, plus impurities mainly NA at < 150ppm.
5031-371	Half-salt disolver		half - salt solution (DI water/ HMD / Salt ref c/fuges export)
5031-422	Re-work solution tank		out of spec material from Semi - ref/ Salt refined that require recyclig & re-added to the process, in solution.
5031-466	Waste liquor tank		Semi - Ref distillate. Process effluent (sent via AA sump)
5031-600	WALE	5,500	Process effluent
5031-605	Dump Tank	1,467	Process effluent
5031-690	Crude solution tank		Crude solution - exit Crude dissolvers 40 - 42% Adipic, <0.2% Ntiric
5031-2152	60% HMD storage tank	748	60% HMD
5031-2250	Salt solution tanks	145 (te)	Salt solution
5031-2251	Salt solution tanks	145 (te)	Salt solution
5031-2252	Salt solution tanks	145 (te)	Salt solution
5031-2257	Blended salt solution tank	3,398	Blended salt solution
5031-4700	NACS tails tank	40	Typical comp: 35% nitric, 33% water, 22% Adipic, 8% Glutaric, 3% Succinic, pp, levels vanadium & copper.
5031-4900	Sulphuric acid tank	23	Sulphuric acid
5031-5900	Recovered catalyst storage tank		Regen acid containing copper & vanadium catalyst exit ISEP unit
5031-5990	Methanol storage tank	95	Methanol
5031-5951	AGS Methanol storage tank	232	Methanol and a mixture of organic acids
	IBCs in curbed Area within the Acids Area		Copper (II) Nitrate

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Table 7b -HMD Storage Tanks

Tank number	Description	Capacity (m3)	Substance stored
5101-112	Liquid ammonia (100%) storage	25 (te)	NH_3 (100%)
5102-134	HMI storage tank	40	Crude HMI
5101-147	No 3 Refined ADN storage tank	62 (te)	Adipontrile
5101-148	No 4 Refined ADN storage tank	62 (te)	Adipontrile
5101-154	No 1Crude HMD storage tank	280 (te)	HMD
5101-155	No 2 Crude HMD storage tank	280 (te)	HMD
5101--156	No 3 Crude HMD storage tank	280 (te)	HMD
5103-115	No 1 DH forshots	4.5 (te)	Crude HMI
5103-116	No 2 DH forshots	4.5 (te)	Crude HMI
5103-134	HMI storage tank	40 (te)	HMI
5103-187	No 1 TCT storage tank	145 (te)	TCT
5103-188	No 2 TCT storage tank	145 (te)	TCT
5103-189	Nos 3 TCT storage tank	112 (te)	TCT
5103-190	Nos 4 TCT storage tank	112 (te)	TCT
5103-210	No 1 Salt Plant Feed Tank	70 (te)	Salt
5103-211	No 2 Salt Plant Feed Tank	70 (te)	Salt
5103-212	No 1 Solution Mix Tank	75 (te)	Salt
5103-213	No 2 Solution Mix Tank	75 (te)	Salt
5103-271	DACH storage tank	37 (te)	DACH
5103-275	Purge column tops tank	19 (te)	DACH
5103-286	No 5 Salt Plant Feed Tank	82 (te)	Salt
5103-325	Methanol storage tank		OOU
5111-110	Weak liquor storage tank	450 (te)	
5111-120	20% ammonia storage	650 (te)	NH_3 (20%)
5111-121	20% ammonia storage	650 (te)	NH_3 (20%)
5111-122	20% ammonia storage	650 (te)	NH_3 (20%)
5111-142	Recovered ammonia (100%) storage	70 (te)	NH_3 (100%)
5111-153	Ammonia (100%) drain tank	30	NH_3 (100%)

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Table 7c - KA Storage Tanks

Tank number	Description	Capacity (m3)	Substance stored
5020-212	Caustic	109	Caustic (47%)
5020-321	No 1 ICI KA test tanks	196	KA - used oil
5020-322	No 2 ICI KA test tanks	196	KA - used oil
5020-323	No 3 ICI KA test tanks	196	KA - used oil
5020-326	No 4 General Storage	495	NIRU
5020-330	No 1 CH buffer tank	1,845	Boric (8%) washings
5020-331	No 2 CH buffer tank	1,845	Cyclohexane
5020-351	No 5 KA storage tank	2,003	KA
5020-352	No 6 KA storage tank	2,003	KA
5020-356	No 8 KA storage tank	2,930	KA
5020-357	No 9 KA storage tank	2,930	KA
5020-590 a	Chromium octoate storage	23	OOS
5020-590 b	Chromium octoate storage	23	OOS
5020-595	New mineral oil storage	78	
F102	CH recycle tank	333	Cyclohexane
F543	No 1 Dycal 66	182	Dycal
5020-1815	No 2 Dycal 66	184	Dycal
5020-1816	No 3 Dycal 75	184	Dycal
F930	No 4 Dycal 75	280	Dycal
F931	No 5 Dycal 75		
F551-1	No 1 SDC KA test tank	196	40% KA in water
F551-2	No 2 SDC KA test tank	196	5% KA in water
F551-3	No 3 SDC KA test tank	196	5% KA in water
F551-4	No 4 SDC KA test tank	210	5% KA in water
F9110	Caustic effluent storage	4,764	Caustic washings

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Table 7d - Nitric and Services Storage Tanks

Tank number	Description	Capacity(m3)	Substance stored
5051-252	Nitric acid export buffer tank	3,885 (te)	Nitric Acid
5051-231	No 3 Nitric acid storage tank	700 (te)	Nitric Acid
5051- 232	No 4 Nitric acid storage tank	700 (te)	Nitric Acid

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Table 7e - Polymer Storage Tanks

Tank number	Description	Capacity(m3)	Substance stored
5130-1862	Copper acetate tank		Copper Acetate
5130-1864	Copper acetate tank		Copper Acetate
5151-203	TiO_2 mill feed tank		TiO2 Slurry
5151-204	TiO_2 mill feed tank		TiO2 Slurry
5151-212,	TiO_2 settling tank	2.8	TiO2 Slurry
5151- 213	TiO_2 settling tank	2.8	TiO2 Slurry
5151-214	TiO_2 settling tank	2.8	TiO2 Slurry
5151-215	TiO_2 settling tank	2.8	TiO2 Slurry
5151-224	TiO_2 bulk storage	10	TiO2 Slurry
5151-225	TiO_2 bulk storage	10	TiO2 Slurry
5151-227	No 1 TiO_2 conc adjustment tank	2.5	TiO2 Slurry
5151-229	No 2 TiO_2 conc adjustment tank		TiO2 Slurry
5151-245	TiO_2 tanker offloading tank	135	TiO2 Slurry
5151-7810	TiO_2 drainage collection tank	56	TiO2 Slurry
5151-949	Effluent tank	56	Process Effluent
5151-925	Dycal storage tank	50	Dycal
5130-2526	Dowtherm storage tanks	105	Dowtherm
5130-2527	Dowtherm storage tanks	105	Dowtherm
5130-2537	Dowtherm storage tanks	14	Dowtherm
	80% acetic acid tank		Acetic Acid
	Casting water storage tank	22	Water
	No 1 & 2 vent drains tanks	0.5	
	Thermex E, W & containment tanks		Dowtherm
	Calgon solution & storage tanks		
	Caprolactam storage tank		Caprolactam
	TiO_2 weak storage		TiO2 Slurry

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Table 7f -NALCO Storage Tanks

Location	Number	Comment
NITRICS 2 BOILERS (72100)	907575	
NITRICS 2 BOILERS (7208)	907559	
NITRICS 3 BOILERS (72100)	182216	
NITRICS 3 BOILERS (7208)	181444	
COGA BOILER (72100)	180059	Plastic IBC (379 l) in plastic containment tank
COGA BOILER (72210)	180124	Plastic IBC (379 l) in plastic containment tank
POLYMER CASTING (93033)	181869	
NITRICS 2 CT (HYPO)	TS06 – 039A	HDPE double skinned tank (3,000 l)
NITRICS 2 CT (23210)	IPS4088	Steel IBC (PE lined) in steel containment tank
NYLON 1A CT (72211)	CT003211	HDPE tank with steel IBC on frame above
NYLON 1A (HYPO)	TS06 – 039B	HDPE double skinned tank (5,000 l)
NYLON 1B (HYPO)	IBC - TEMPORARY	Hays IBC (No 2516)
NYLON 2 CT (HYPO)	PV 198	GRP tank in concrete bund (5320-255)
NYLON 2 CT (H_2S0_4)	PV 250	Steel tank in concrete bund
NYLON 2 CT (73275)	96850	Double stack steel IBC in steel tank - hose linking IBCs protrudes beyond tank outline
NYLON 2 CT (CL-50)	6220	Double stack steel IBC in steel tank - hose linking IBCs protrudes beyond tank outline
NYLON 2 CT (Phosphoric Acid)	IBC - TEMPORARY	Two plastic IBCs in steel cages on containment pallet
NYLON 3 CT (HYPO)	PV 199	GRP tank in concrete bund (5320/260)
NYLON 3 CT (H_2S0_4)	PV 192	Steel tank in concrete bund
NYLON 3 CT (7396)	PV 196	Steel tank in concrete bund
NYLON 3 CT (23203)	PV 197	Steel tank in concrete bund
NYLON 3 CT (CL-37)	IBC - TEMPORARY	Two plastic IBCs in steel cages. No containment (east side of tower)
ALL COOLING TOWERS (7348)	25KG DRUMS	

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Table 8 - Groundwater Quality During the Lifetime of the Permit (pH)

Area	Borehole	Jul-07	Apr-08	Nov-08	May-09
Zone 1	201	7.1	7.3	7.3	7.3
	202	7.3	7.4	7.3	7.5
	203	7.7	7.9	7.9	8.1
	204	7.4	7.4	7.5	7.6
Zone 2	112	7	7.1	6.9	7.2
	601 B	7.5	7.5	7.4	7.5
	605	7.1	7.8	7.5	7.4
	606	7.5	7.4	7.7	7.7
Zone 3	501	6.8	7.6	7.5	7.5
	504	6.9	8.1	7.8	8.2
Zone 5	401	6.6	6.8	4.9	6.8
	404	7.9	7.9	7.5	8.1
	405	7.3	7.2	7.3	7.5
	105	8.2	8.7	8.4	8.2
Zone 6	304	7.2	7.9	10.1	8.7

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Table 9 - Groundwater Quality During the Lifetime of the Permit (Conductivity uS)

Area	Borehole	Jul-07	Apr-08	Nov-08	May-09
Zone 1	201	761	743	810	988
	202	583	583	740	856
	203	397	388	440	583
	204	509	576	500	635
Zone 2	112	1,386	1,448	1,450	4,380
	601 B	1,343	1,295	1,274	1,702
	605	1,378	1,509	1,535	1,860
	606	175	388	250	375
Zone 3	501	1,530	983	1,315	1,628
	504	516	457	500	743
Zone 5	401	1,692	27,400	795	2,850
	404	632	1,090	585	1,424
	405	635	787	810	159
	105	415	523	435	533
Zone 6	304	4,070	1,775	1,680	918

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Table 10 - Groundwater Quality During the Lifetime of the Permit (TOC ppm)

Area	Borehole	Jul-07	Apr-08	Nov-08	May-09
Zone 1	201	46	22	14	50
	202	12	13	12	45
	203	9	5	7	10
	204	5	6	17	55
Zone 2	112	30	16	4	12
	601 B			10	N/D
	605	11	18	8	7
	606	19	17	10	9
Zone 3	501	8	11		4
	504	14	9		3
Zone 5	401	14	18	489	65
	404	15	11	14	6
	405	13	10	17	20
	105	12	9	7	13
Zone 6	304	3,170	420	1,589	11,610

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Table 11 - Groundwater Quality During the Lifetime of the Permit (Copper ppm)

Area	Borehole	Jul-07	Apr-08	Nov-08	May-09
Zone 3	501	<0.1	0	0.02	<0.01
	504	<0.1	0	0.01	<0.01
	405	0	1	0	<0.01
Zone 5	401	0.06	1.21	3.11	2.72
	404	0	0	0	<0.01

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Table 12 - Groundwater Quality During the Lifetime of the Permit (Cyclohexane ppm)

Area	Borehole	Jul-07	Apr-08	Nov-08	May-09
Zone 1	201	0	<1	0	<0.01
	202	0	<1	0	<0.01
	203	5	<1	0	<0.01
	204	0	<1	0	<0.01

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Table 13 - WALE and Dump Tank Quality During the Lifetime of the Permit

		Jan-05	Jun-05	Dec-05	Jun-06	Mar-07	Mar-09
WALE 1	Cu (ppm)	0.02	<0.01	0.01	0.01	0.01	<0.01
WALE 6	Cu (ppm)	0.01	<0.01	0.01	0.01	0.01	<0.01
WALE1	HNO3 (ppm)	10	10	10	5	10	10
WALE6	HNO3 (ppm)	<10	10	10	<5	<5	<5
WALE1	Conductivity (uS)	745	775	780	685	695	755
WALE6	Conductivity (uS)	620	755	765	570	635	625
WALE1	pH	7.5	7.4	7.6	8.6	7.6	7
WALE6	pH	8.4	7.9	8.5	9.3	8.6	7.4
DT 5	Cu (ppm)	0.01	0.09	0.1	0.03	0.03	0.01
DT 5	HNO3 (ppm)	50	50	50	50	50	50
DT 5	Conductivity (uS)	6,200	6,320	6,060	6,610	6,840	4,300
DT 5	pH	8.1	7.5	8.1	7.9	7.5	7.9

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Table 14 - Effluent Quality W1 (H Drain)

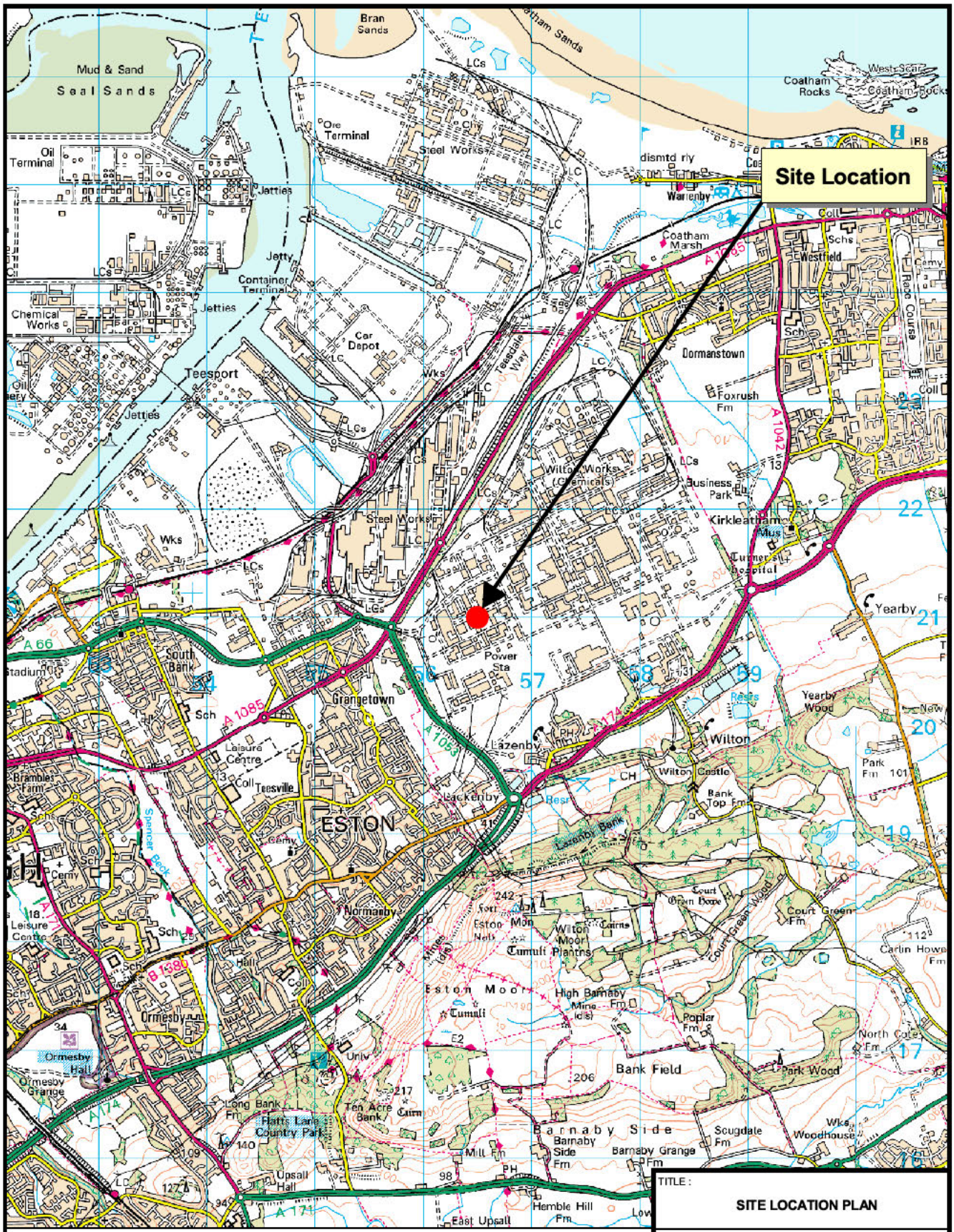
Date	pH	BOD	TOC	COD	NH_3-N	NO_3-N	Cu	Zn	S Solids
		ppm							
01/07/2009	8.5	<10	10	74	2	1	<0.01	0.04	12
02/07/2009	8.7	<10	<10	70	<1	1	<0.01	0.02	2
03/07/2009	7.6	<10	<10	36	<1	2	<0.01	0.04	2
04/07/2009	7.6	13	<10	34	<1	2	<0.01	0.04	2
05/07/2009	7.1	<10	<10	50	1	3	<0.01	0.04	13

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Table 15 - Effluent Quality W4 (NY Drain)

Date	pH	BOD	TOC	COD	NH_3-N	NO_3-N	Cu	Zn	S Solids
		ppm							
01/07/2009	7.5	<10	<10	66	<1	2	<0.01	0.02	5
02/07/2009	7.5	<10	<10	48	<1	2	<0.01	0.01	2
03/07/2009	7.6	<10	<10	42	<1	3	<0.01	0.01	2
04/07/2009	7.5	<10	<10	38	<1	2	<0.01	0.01	3
05/07/2009	7.4	10	<10	56	<1	2	0.01	0.02	31

FIGURES



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LEGEND

- SITE LOCATION

NOTES

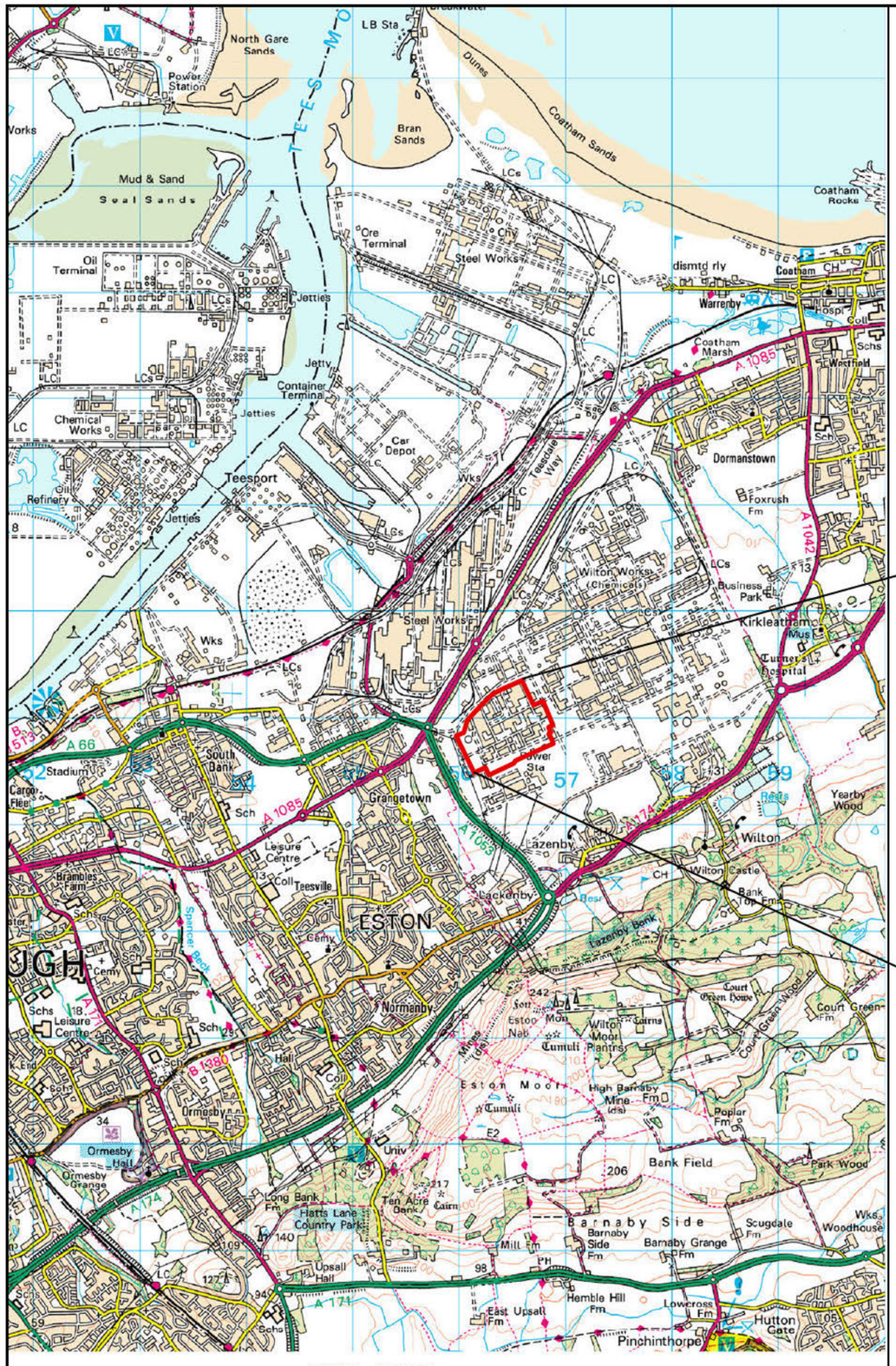
TITLE : **SITE LOCATION PLAN**

SITE : **INVISTA WILTON**

CLIENT : **INVISTA TEXTILES (UK) LTD**

PROJECT :	96010.03	FIGURE	1
DATE :	30/04/10	DRAWN BY :	BNB
DRG No :	9601003.apr / SLP		
SCALE :	1 : 50,000	PRINT :	A4

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SCALE: **1:50,000**

0 625 1,250 2,500 3,750 5,000 Meters

SCALE: **1 : 7,500**

0 100 200 400 600 800 Meters

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LEGEND

SITE BOUNDARY

NOTES

N

TITLE: **SITE BOUNDARY AND LOCATION OF KETTLE BECK**

SITE : **INVISTA**

CLIENT : **INVISTA TEXTILES (UK) LTD**

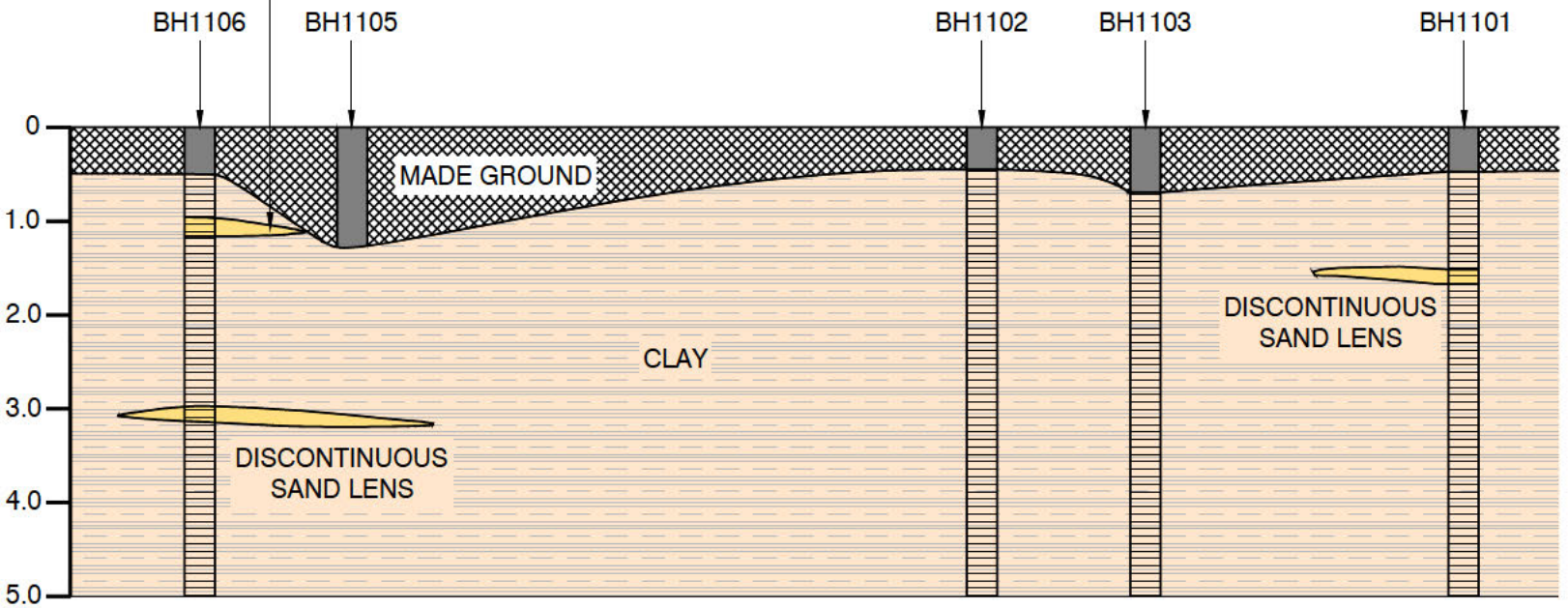
PROJECT :	96010.03	FIGURE 2	
DATE :	06/05/10	DRAWN BY :	ASZ
DRG No. :	960100314 GIS		
SCALE :		PRINT :	A3

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SOUTH

NORTH

POTENTIAL MIGRATION PATHWAY FROM
MADE GROUND TO WET SAND LENSES



KEY

NOTES

NOT TO SCALE

REV	DATE	COMMENT	CAD

TITLE: GEOLOGICAL SECTION

SITE: INVISTA WILTON

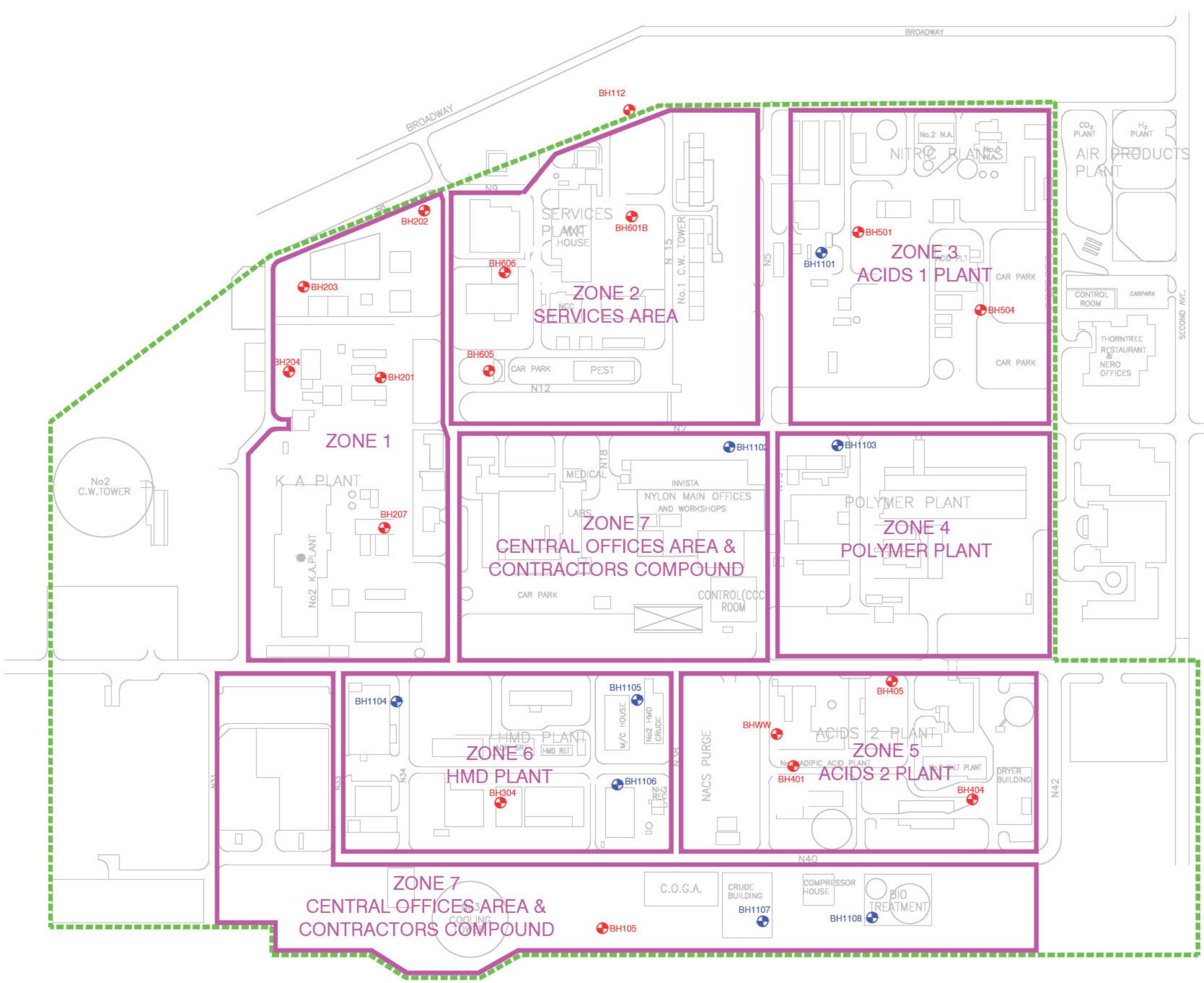
CLIENT: INVISTA TEXTILES (UK) LTD

PROJECT: 96010.03 | FIGURE 3

DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100305-CAD | PRINT: A4

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KEY

- APPROXIMATE BOREHOLE LOCATION
- APPROXIMATE BOREHOLE LOCATION (SAMPLED DURING BASELINE SURVEY AND GRANTING OF PERMIT)
- PROPERTY BOUNDARY
- ZONE BOUNDARY

NOTES

BASED ON DRAWING BY INVISTA UK LTD.
DRAWING No: E5004526 Rev.P3
DATE: 02/09/04

REV	DATE	COMMENT	CAD

TITLE: SAMPLE LOCATIONS - 2002 BASELINE SURVEY

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

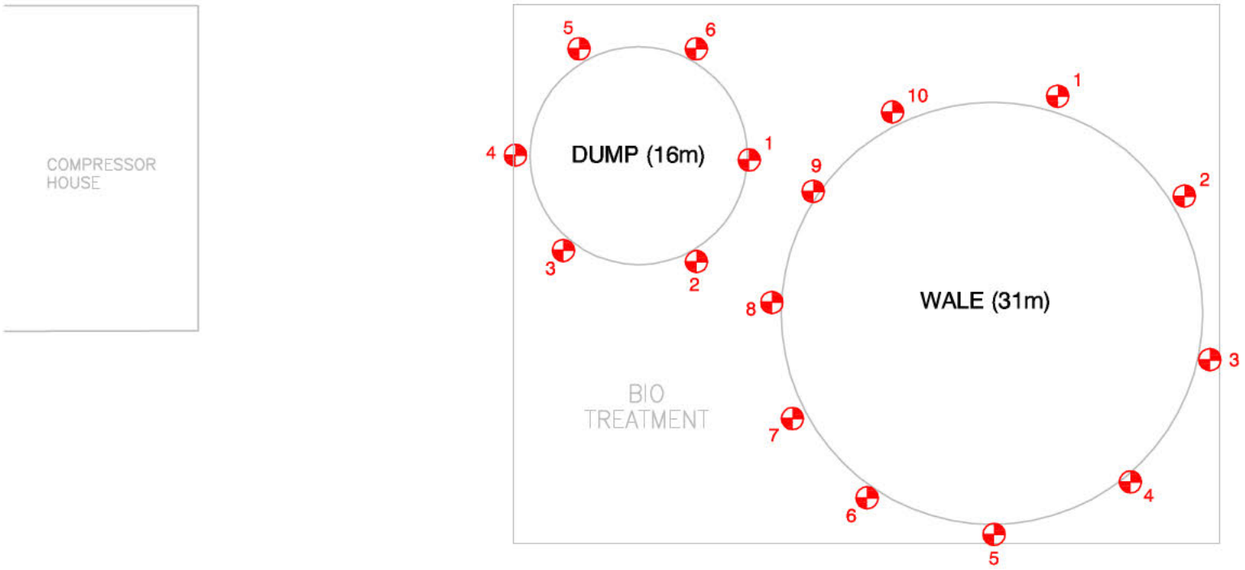
PROJECT: 96010.03 | FIGURE 4

DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100307-CAD | PRINT: A3

NOTE: THE LOCATIONS OF ANY UNDERGROUND SERVICES SHOWN ON THIS DRAWING HAVE BEEN DETERMINED USING ELECTRO-MAGNETIC TECHNIQUES AND VISUAL OBSERVATIONS. THE LIMITATIONS OF THIS DRAWING SHOULD BE REALISED AND NO GUARANTEE CAN BE GIVEN THAT ALL SERVICES HAVE BEEN IDENTIFIED. ANY AMENDMENTS TO THE SITE LAYOUT AFTER THE ISSUE OF THIS DRAWING WILL MAKE THIS DRAWING INVALID. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS IN CASE OF ANY QUERY

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N
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KEY

APPROXIMATE WELL LOCATION

PROPERTY BOUNDARY

NOTES

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DRAWING No: E5004526 Rev.P3
DATE: 02/09/04

REV	DATE	COMMENT	CAD

TITLE: WALE AND DUMP TANK LEAK DETECTION WELLS

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

PROJECT: 96010.03 | FIGURE 5

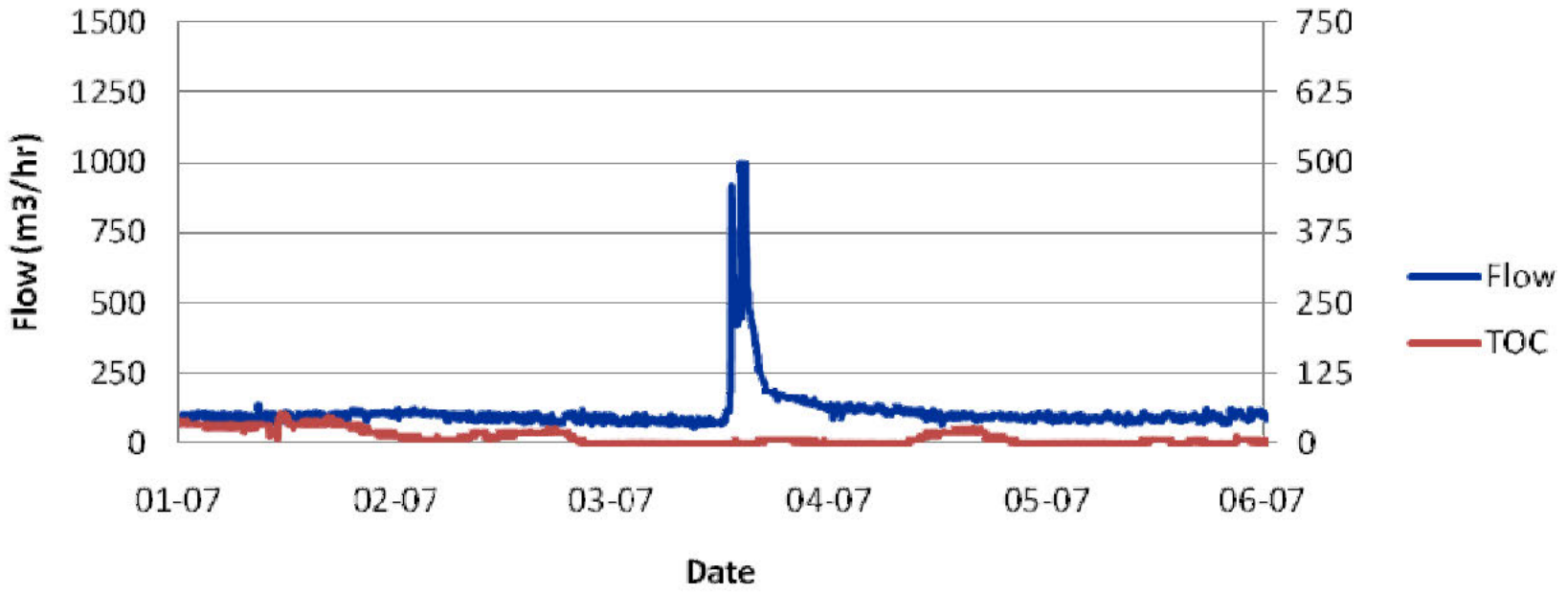
DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100308-CAD | PRINT: A3

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Wilton Nylon H Drain



NOTES

REV	DATE	COMMENT	CAD

TITLE: IP21 DATA FOR W1

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

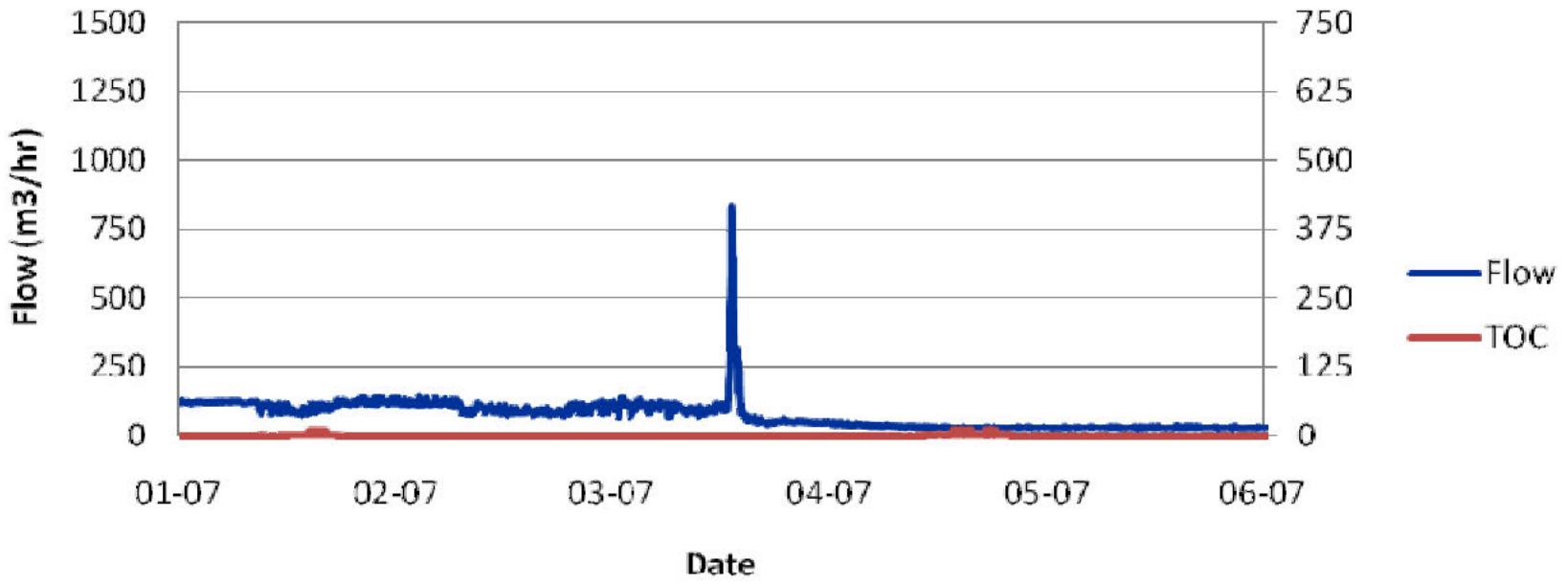
PROJECT: 96010.03 | FIGURE 6

DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100309-CAD | PRINT: A4

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Wilton Nylon NY Drain



NOTES

REV	DATE	COMMENT	CAD

TITLE: IP21 DATA FOR W4

SITE: INVISTA WILTON

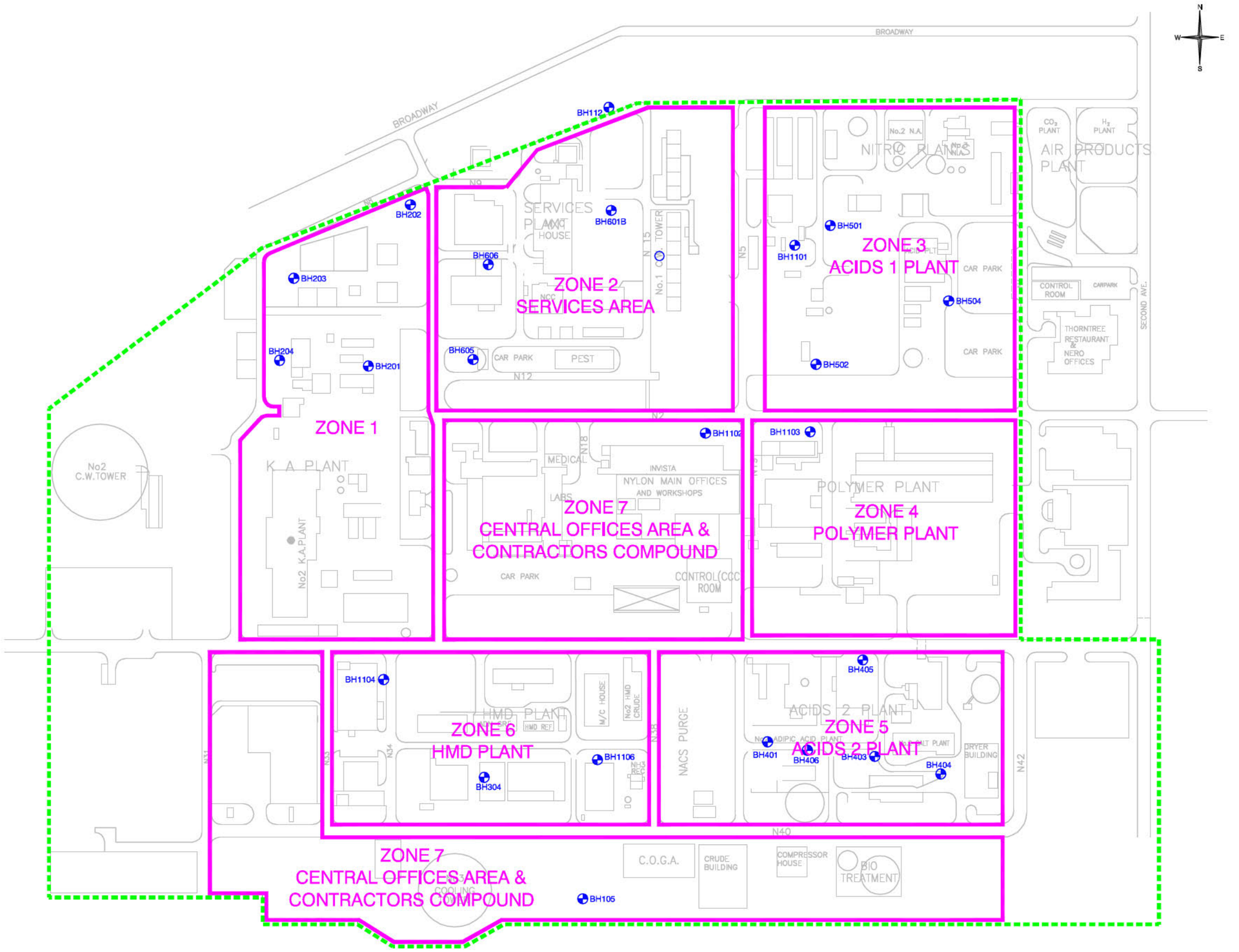
CLIENT: INVISTA TEXTILES (UK) LTD

PROJECT: 96010.03 | FIGURE 7

DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100310-CAD | PRINT: A4

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KEY

- APPROXIMATE BOREHOLE LOCATION
- PROPERTY BOUNDARY

NOTES

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DRAWING No: E5004526 Rev.P3
DATE: 02/09/04

REV	DATE	COMMENT	CAD

TITLE: SAMPLE LOCATIONS - 2009 CLOSURE SURVEY

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

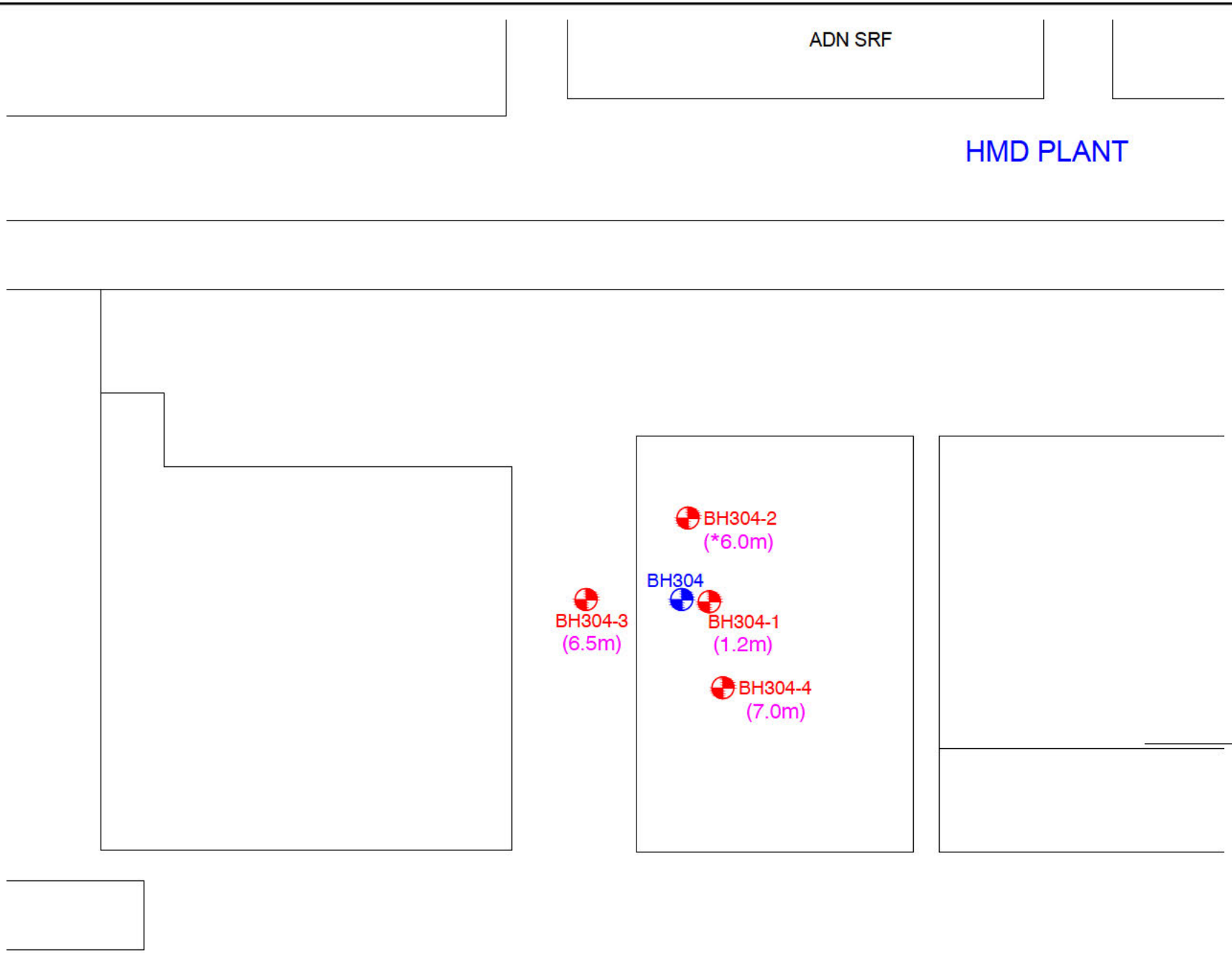
PROJECT: 96010.03 | FIGURE 8

DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100311-CAD | PRINT: A3

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KEY

ORIGINAL BOREHOLE LOCATION

ADDITIONAL BOREHOLE LOCATION (Nov 09)

(6.0m) DISTANGE FROM BH304

REV	DATE	COMMENT	CAD

TITLE: 304 BOREHOLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

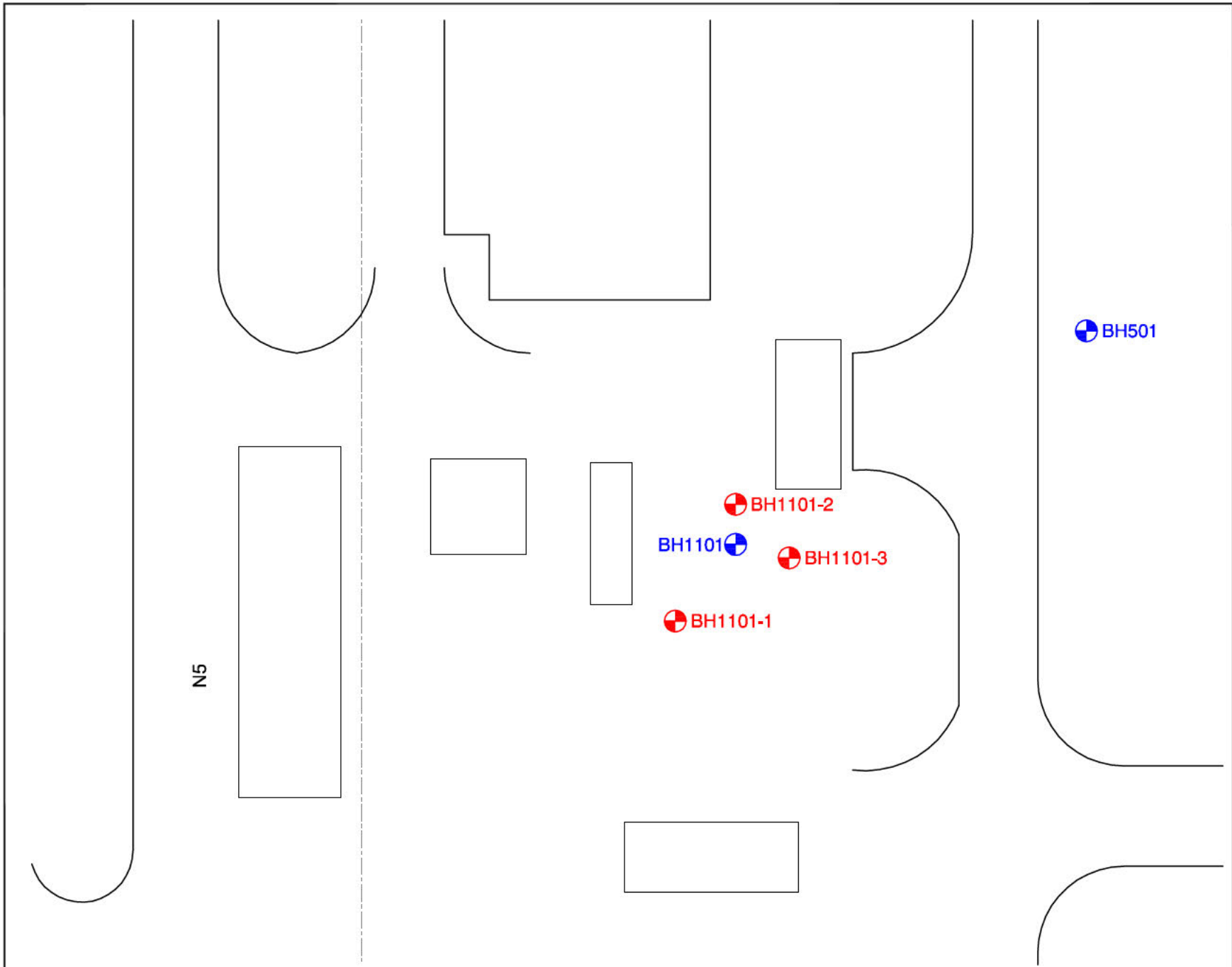
PROJECT: 96010.03 | FIGURE 9

DATE: 28/03/11 | DRAWN: BNB | REV: -

DRG.No.: 960100312-CAD | PRINT: A4

NOTE: ALL ENTITIES SHOWN ON THIS DRAWING ARE TO BE REGARDED AS APPROXIMATE AND ARE INDICATIVE ONLY. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS IN CASE OF ANY QUERY

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KEY

ORIGINAL BOREHOLE LOCATION

ADDITIONAL BOREHOLE LOCATION (Nov 09)

REV	DATE	COMMENT	CAD

TITLE: 1101 BOREHOLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

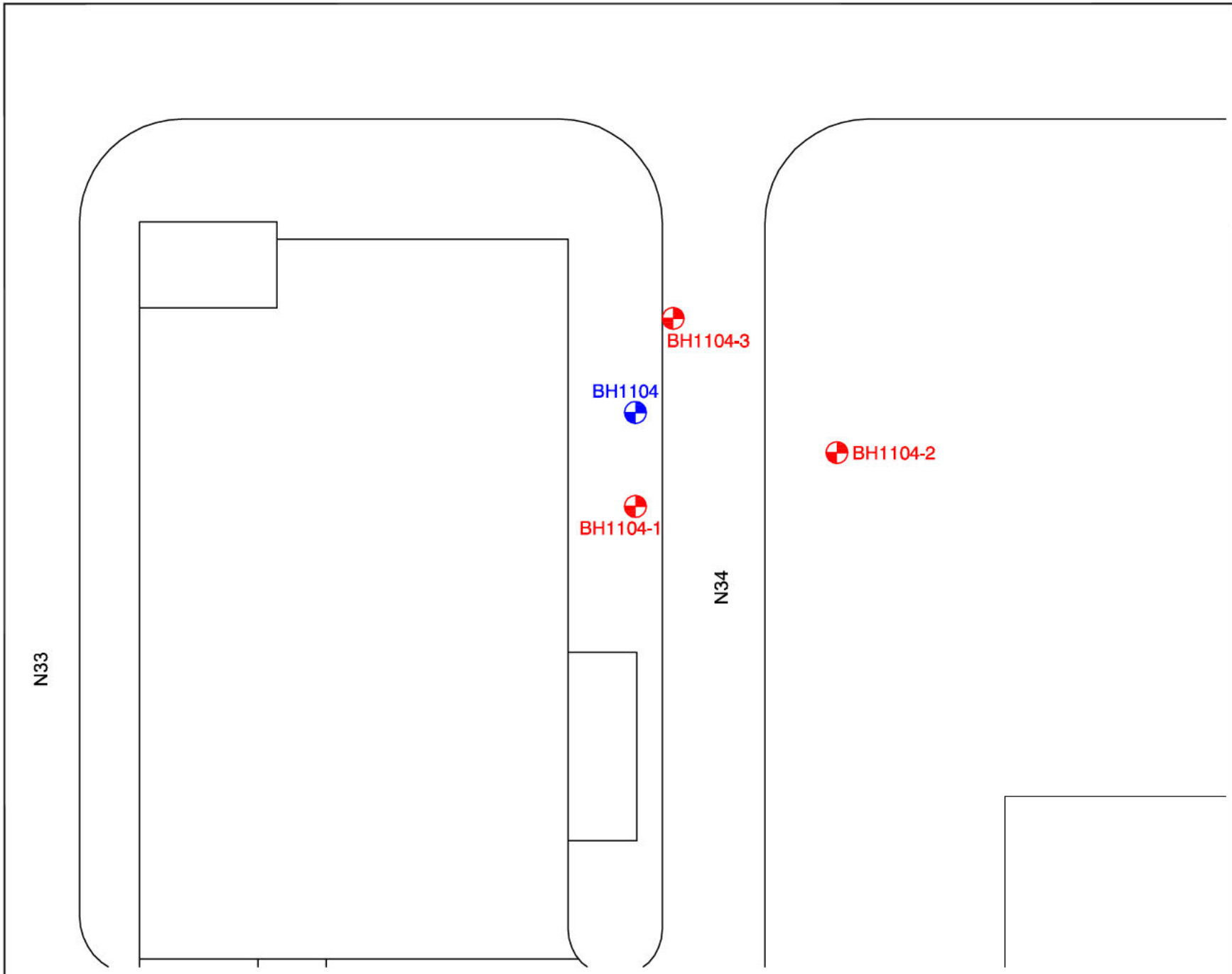
PROJECT: 96010.03 | FIGURE 10

DATE: 04/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100313-CAD | PRINT: A4

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KEY

ORIGINAL BOREHOLE LOCATION

ADDITIONAL BOREHOLE LOCATION (Nov 09)

REV	DATE	COMMENT	CAD

TITLE: BH1104 CHARACTERISATION BOREHOLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA

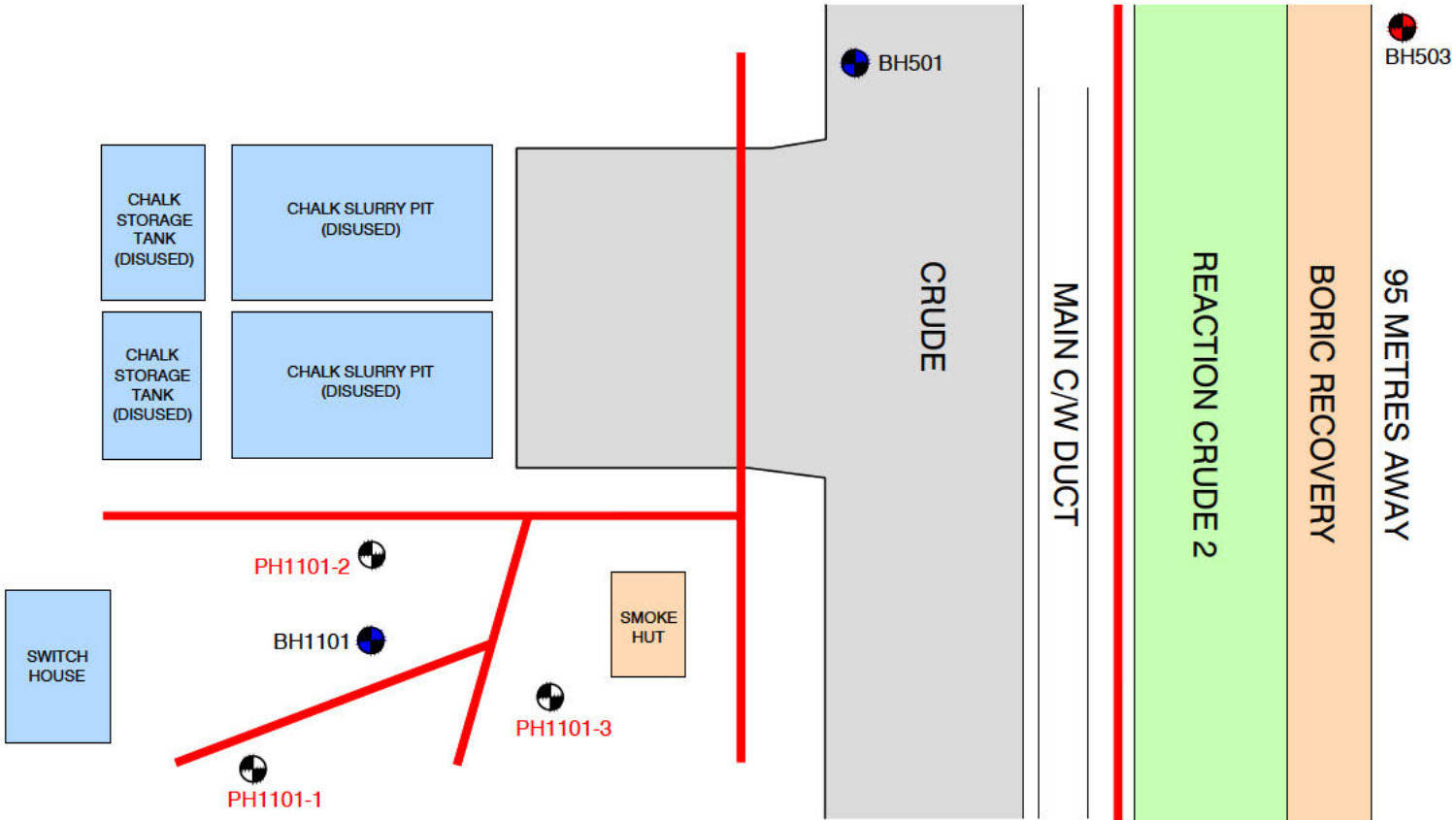
PROJECT: 96010.03 | FIGURE 11

DATE: 14/07/10 | DRAWN: ASZ | REV: -

DRG.No.: 960100316-CAD | PRINT: A4

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KEY

NOTES

NOT TO SCALE

REV	DATE	COMMENT	CAD

TITLE: BH1101 AND BORIC RECOVERY

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

PROJECT: 96010.03 | FIGURE 12

DATE: 12/05/10 | DRAWN: BNB | REV: -

DRG.No.: 960100315-CAD | PRINT: A4

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APPENDICES

APPENDIX A
Application Site Condition Report Results (2002)

Table 1
Soil Sample Inventory

Borehole	Depth (m)	Metals	DRO & GRO	SVOC + TICs	VOC + TICs	Ammonia	Methanol	PCBs
BH1101	0.2-0.4	✓						
BH1101	1.4-1.5		✓	✓	✓	✓	✓	✓
BH1102	0.2-0.4	✓	✓	✓	✓	✓	✓	✓
BH1103	0.05-0.1	✓	✓	✓	✓	✓	✓	✓
BH1104	0.2-0.4	✓	✓	✓	✓	✓	✓	✓
BH1105	0.5-0.6		✓		✓		✓	
BH1105	1.0-1.1	✓	✓	✓		✓		✓
BH1106	0.2-0.35	✓	✓	✓	✓	✓	✓	✓
BH1107	0.2-0.3	✓	✓	✓	✓	✓	✓	✓
BH1108	0.3-0.5	✓	✓	✓	✓	✓	✓	✓

Table 2
Water Sample Inventory

Borehole	Metals	DRO & GRO	SVOC + TICs	VOC + TICs	Acids	Ammonia	Methanol	PCBs
BH1101	✓	✓	✓	✓	✓	✓	✓	✓
BH1102	✓	✓	✓	✓	✓	✓	✓	
BH1103	✓	✓	✓	✓	✓	✓	✓	
BH1104	✓	✓	✓	✓	✓	✓	✓	✓
BH1105	✓	✓	✓	✓	✓	✓	✓	
BH1106	✓	✓	✓	✓	✓	✓	✓	
BH1107	✓	✓	✓	✓	✓	✓	✓	
BH1108	✓	✓	✓	✓	✓	✓	✓	
BH105	✓		✓	✓		✓		
BH112	✓		✓	✓		✓		
BH201	✓	✓	✓	✓		✓		
BH202			✓	✓		✓		
BH203	✓	✓	✓	✓		✓		
BH204			✓	✓		✓		
BH207	✓		✓	✓		✓		✓
BH304	✓	✓	✓	✓		✓		
BH401		✓	✓	✓		✓		✓
BH404	✓		✓	✓		✓		✓
BH405			✓	✓		✓		
BHWW		✓	✓	✓		✓		
BH501	✓		✓	✓		✓		✓
BH504	✓		✓	✓		✓		✓
BH601B			✓	✓		✓		✓
BH605	✓		✓	✓		✓		✓
BH606			✓	✓		✓		
Duplicates								
BH105B			✓	✓		✓		
BH113			✓	✓		✓		
BH1109					✓		✓	

BH105B is a duplicate of BH105
BH113 is a duplicate of BH112
BH1109 is a duplicate of BH1105

Table 3
Well Head Parameters

Borehole	Elevation of top of casing (mASD)	DTW (mbtc)	Groundwater Elevation (mASD)	Temp (^{o}C)	Conductivity (uS/cm)	pH	Redox (mV)
BH1101	9.529	2.700	6.829	13.6	-	6.6	297
BH1102	10	0.447	9.553	13.2	1237	7.8	265
BH1103	10.093	4.357	5.736	14.2	1591	7.7	272
BH1104	11.474	1.862	9.612	12.8	1267	7.7	263
BH1105	11.944	0.799	11.145	23.4	1065	9.8	-278
BH1106	12.076	0.682	11.394	14.2	1369	7.8	24
BH1107	12.885	0.999	11.886	13.1	634	8.2	162
BH1108	13.032	2.258	10.774	14.4	986	7.8	184
BH105	13.231	0.695	12.536	14	351	9.3	-84
BH112	9.393	1.378	8.015	14.9	1350	9.0	36
BH201	Dipmeter use not allowed in KA plant area			24.8	685	7.7	115
BH202				26.9	687	7.6	124
BH203				27.3	591	7.7	122
BH204				25.2	589	7.7	127
BH207				15.5	687	7.8	121
BH304	-	-	-	18.7	920	8.3	-62
BH401	-	-	-	17.1	775	6.9	-67
BH404	12.628	0.584	12.044	16.5	740	8.2	123
BH405	12.607	0.471	12.136	16.1	830	7.9	66
BHWW	-	1.360	-	14.6	-	3.1	555
BH501	9.636	1.350	8.286	18.0	549	8.2	259
BH504	10.196	0.749	9.447	17.5	460	8.5	237
BH601B	10.726	1.134	9.592	16.6	905	7.7	220
BH605	9.645	1.230	8.415	15.2	849	7.7	256
BH606	9.004	0.502	8.502	17.5	325	8.1	28

Table 4
VOCs in Soil (mg/kg)

Compound	BH1101 1.4-1.5m	BH1102 0.2-0.4m	BH1103 0.05-0.1m	BH1104 0.2-0.4m	BH1105 0.5-0.6m	BH1106 0.2-0.35m	BH1107 0.2-0.3m	BH1108 0.2-0.3m
Dichlorodifluoromethane	-	-	-	-	-	-	-	-
Chloromethane	-	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-
Trichlorofluoromethane	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-
Carbon disulphide	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	0.003	-	-	-
tert-butyl methyl ether	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	0.002	-	-	-
Bromochloromethane	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-
2,2-Dichloropropane	-	-	-	-	-	-	-	-
1,2-Dichloroethane	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-	-
1,1-Dichloropropene	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	0.001	-	-	-
Carbontetrachloride	-	-	-	-	-	-	-	-
Dibromomethane	-	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	0.006	-	-	-
cis-1,3-Dichloropropene	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-	-
Toluene	0.004	-	-	-	0.003	-	-	-
1,3-Dichloropropane	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-
1,2-Dibromoethane	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	0.001	-	-	-
p/m-Xylene	-	-	-	-	0.002	-	-	0.002
Bromoform	-	-	-	-	-	-	-	-
Styrene	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-
o-Xylene	-	-	-	-	0.002	-	-	-
1,2,3-Trichloropropane	-	-	-	-	-	-	-	-
Isopropylbenzene	-	-	-	-	-	-	-	-
Bromobenzene	-	-	-	-	-	-	-	-
2-Chlorotoluene	-	-	-	-	-	-	-	-
Propylbenzene	-	-	-	-	-	-	-	-
4-Chlorotoluene	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-
4-Isopropyltoluene	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	-	-	-	-	0.002	-	-	-
1,3-Dichlorobenzene	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	-	-	-	-	-	-	-	-
sec-Butylbenzene	-	-	-	-	0.001	-	-	-
tert-Butylbenzene	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-
n-Butylbenzene	-	-	-	-	0.001	-	-	-
1,2-Dibromo-3-chloropropane	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	0.012	-	-	-
1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-	-

Values in mg/kg
-' Less than the method detection limit of 0.001

Table 5
SVOCs in Soils (mg/kg)

Compound	BH1101 1.4-1.5m	BH1102 0.2-0.4m	BH1103 0.05-0.1m	BH1104 0.2-0.4m	BH1105 0.5-0.6m	BH1106 0.2-0.35m	BH1107 0.2-0.3m	BH1108 0.2-0.3m
Phenol	-	-	-	-	-	-	-	-
2-Chlorophenol	-	-	-	-	-	-	-	-
2-Methylphenol	-	-	-	-	-	-	-	-
4-Methylphenol	-	-	-	-	-	-	-	-
2-Nitrophenol	-	-	-	-	-	-	-	-
4-Nitrophenol	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-
Nitrobenzene	-	-	-	-	-	-	-	-
Azobenzene	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	0.105	0.139
Pyrene	-	-	-	-	-	-	0.118	0.117
Benzo(a)anthracene	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	-	-	-	-	-	-	-	-
Benzo(a)pyrene	-	-	-	-	-	-	0.103	-
Indeno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	-	-	-	-	-	-	-	-
2-Chloronaphthalene	-	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	-
Carbazole	-	-	-	-	-	-	-	-
Isophorone	-	-	-	-	-	-	-	-
Dibenzofuran	-	-	-	-	-	-	-	-
Dimethyl phthalate	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-
Di-n-butylphthalate	-	-	-	-	-	-	-	-
Di-n-octylphthalate	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	0.135	-	-	-	-	0.245	0.184	0.368
Butylbenzylphthalate	-	-	-	-	-	-	-	-
4-Chloroaniline	-	-	-	-	-	-	-	-
2-Nitroanaline	-	-	-	-	-	-	-	-
3-Nitroaniline	-	-	-	-	-	-	-	-
4-Nitroaniline	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	-	-	-	-	-	-	-	-
Bis(2-chloroethyl)ether	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	-	-	-	-	-	-	-	-
Hexachloroethane	-	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-	-
Hexchlorocyclopentadiene	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	-	-	-	-	-	-	-	-
N-nitrosodi-n-propylamine	-	-	-	-	-	-	-	-

Values in mg/kg
-' Less than the method detection limit of 0.1

Table 6
VOCs & SVOCs (Tentatively Indentified Compounds) in Soils (µg/kg)

Compound	BH1101 1.4-1.5m	BH1102 0.2-0.4m	BH1103 0.05-0.1m	BH1104 0.2-0.4m	BH1105 0.5-0.6m	BH1106 0.2-0.35m	BH1107 0.2-0.3m	BH1108 0.2-0.3m
C6-C9 Acids	14.940	-	-	-	-	-	-	-
Adipic Acid	-	-	-	-	-	-	-	-
Biphenyl	-	-	-	-	-	-	-	-
Diphenyl Oxide	-	-	-	-	-	-	-	-
Acetic Acid	-	-	-	-	-	-	-	-

Values in mg/kg
-' Less than the method detection limit of 0.1

Table 7
TPH in Soils (GRO and DRO)

Borehole	Depth (m)	Total Volatiles C_4 to C_{13}	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylene
BH1101	1.4-1.5	0.256	-	-	-	-	-
BH1102	0.2-0.4	-	-	-	-	-	-
BH1103	0.05-0.1	-	-	-	-	-	-
BH1104	0.2-0.4	0.286	-	-	-	-	-
BH1105	0.5-0.6	3.038	0.139	0.015	-	0.034	0.032
BH1106	0.2-0.35	8.876	0.089	-	-	0.017	0.057
BH1107	0.2-0.3	-	-	-	-	-	-
BH1108	0.2-0.3	-	-	-	-	-	-

Values in mg/kg
- Less than the method detection limit of 0.01.

Borehole	Depth (m)	Diesel Range Hydrocarbons	Interpretation
BH1101	1.4-1.5	181	PAHs
BH1102	0.2-0.4	215	Lube oil/humic acids
BH1103	0.05-0.1	83	Humic acids
BH1104	0.2-0.4	131	Unknown pattern detected
BH1105	0.5-0.6	278	Lube oil
BH1106	0.2-0.35	599	Diesel/heavy n alkanes/possible lube oil
BH1107	0.2-0.3	692	Possible biodegraded diesel/possible PAHs/lube oil
BH1108	0.2-0.3	239	Lube oil

Values in mg/kg

Table 8
Inorganic Compounds in Soil

Borehole	Depth (m)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Vanadium	Zinc	Ammoniacal Nitrogen as NH4-N
BH1101	0.20-0.40	23	-	69	15	98	-	51	-	71	184	-
BH1101	1.40-1.50	na	na	na	na	na	na	na	na	na	na	5.1
BH1102	0.20-040	-	-	37	-	27	-	31	-	34	52	3.2
BH1103	0.05-0.10	-	-	28	6	22	-	25	-	30	138	3.7
BH1104	0.20-0.40	32	-	73	-	40	-	74	-	166	45	2.1
BH1105	1.00-1.10	26	-	94	-	30	-	55	-	140	87	**70.9**
BH1105	1.15-1.20	na	na	na	na	na	na	na	na	na	na	**36.7**
BH1106	0.20-0.35	**164**	-	150	-	60	-	**179**	-	292	157	8.2
BH1107	0.20-0.30	-	-	106	124	46	-	60	-	43	141	3.3
BH1108	0.20-0.30	-	-	12	137	132	-	16	-	22	183	**31.1**

Values in mg/kg except TOC which is expressed as a %.
na - not analysed
-' Less than the method detection limit of 1

Table 9
PCBs in Soil (mg/kg)

Compound	BH1101 1.4-1.5m	BH1102 0.2-0.4m	BH1103 0.05-0.1m	BH1104 0.2-0.4m	BH1105 0.5-0.6m	BH1106 0.2-0.35m	BH1107 0.2-0.3m	BH1108 0.2-0.3m
Aroclor 1016	-	-	-	-	-	-	-	-
Aroclor 1221	-	-	-	-	-	-	-	-
Aroclor 1232	-	-	-	-	-	-	-	-
Aroclor 1242	-	-	-	-	-	-	-	-
Aroclor 1248	-	-	-	-	-	-	-	-
Aroclor 1254	-	-	-	-	-	-	-	-
Aroclor 1260	-	-	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-	-	-

Values in mg/kg

-' Less than the method detection limit of 1.

Table 10
VOCs in Groundwater (μg/l)

Compound	BH1101	BH1102	BH1103	BH1104	BH1105	BH1106	BH1107	BH1108	BH1109
Dichlorodifluoromethane	-	-	-	-	-	-	-	-	-
Chloromethane	-	-	-	-	-	-	-	-	-
Vinyl chloride	-	-	-	-	-	-	-	-	-
Bromomethane	-	-	-	-	-	-	-	-	-
Chloroethane	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	-	-	-	-	-	-	-	-	-
trans-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-
Dichloromethane	-	-	-	-	-	-	-	-	-
Carbon disulphide	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	-	-	-	-	-	-	-	-	-
tert-butyl methyl ether	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	-	-	-	-	-	-	-	-
Bromochloromethane	-	-	-	-	-	-	-	-	-
Chloroform	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	-	-	-	-	-	-	-	-	-
1,1-Dichloropropene	-	-	-	-	-	-	-	-	-
Benzene	-	-	-	-	-	-	-	-	-
Carbontetrachloride	-	-	-	-	-	-	-	-	-
Dibromomethane	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	-	-	-	-	-	-	-	-	-
Bromodichloromethane	-	-	-	-	-	-	-	-	-
Trichloroethene	-	-	-	-	-	-	-	-	1
cis-1,3-Dichloropropene	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-	-	-	-
Toluene	-	-	-	-	2	-	-	-	1
1,3-Dichloropropane	-	-	-	-	-	-	-	-	-
Dibromochloromethane	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane	-	-	-	-	-	-	-	-	-
Tetrachloroethene	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-
Chlorobenzene	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	-	-	-	1	-	-	-	1
p/m-Xylene	-	-	-	-	4	-	-	-	3
Bromoform	-	-	-	-	-	-	-	-	-
Styrene	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-	-	-	-
o-Xylene	-	-	-	-	2	-	-	-	2
1,2,3-Trichloropropane	-	-	-	-	-	-	-	-	-
Isopropylbenzene	-	-	-	-	-	-	-	-	-
Bromobenzene	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	-	-	-	-	-	-	-	-	-
Propylbenzene	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	-	-	-	-	-	-	-	-	-
4-Isopropyltoluene	-	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	-	-	-	-	2	-	-	-	-
1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-	-
n-Butylbenzene	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	3	-	-	-	3
1,2,3-Trichlorobenzene	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-	-	-

Tentatively Identified Compounds

Compound	Borehole(s)	Conc (μg/l)
Acetic Acid	BH1102 & BH1104-9	--
Cyclohexane		--
Cyclohexanone		--
Cyclohexanol		--
Diaminocyclohexane		--

-' Less than the method detection limit of 1
--' Less than the method detection limit of 10.
please note: the idenification and semi-quantification of these *tentatively identified compounds is outside the scope of the UKAS accreditation for this method*

Table 10
VOCs in Groundwater (μg/l)

Compound	BH105	BH105B	BH112	BH113		BH201	BH202	BH203	BH204	BH207		BH304
Dichlorodifluoromethane	-	-	-	-		-	-	-	-	-		-
Chloromethane	-	-	-	-		-	-	-	-	-		-
Vinyl chloride	-	-	-	-		-	-	-	-	-		-
Bromomethane	-	-	-	-		-	-	-	-	-		-
Chloroethane	-	-	-	-		-	-	-	-	-		-
Trichlorofluoromethane	-	-	-	-		-	-	-	-	-		-
trans-1,2-Dichloroethene	-	-	-	-		-	-	-	-	-		-
Dichloromethane	-	-	-	-		-	-	-	-	-		-
Carbon disulphide	-	-	-	-		-	-	-	-	-		-
1,1-Dichloroethene	-	-	-	-		-	-	-	-	-		-
1,1-Dichloroethane	-	-	-	-		-	-	-	-	-		-
tert-butyl methyl ether	-	-	-	-		-	-	-	-	-		-
cis-1,2-Dichloroethene	-	-	-	-		-	-	-	-	-		-
Bromochloromethane	-	-	-	-		-	-	-	-	-		-
Chloroform	-	-	-	-		-	-	-	-	-		-
2,2-Dichloropropane	-	-	-	-		-	-	-	-	-		-
1,2-Dichloroethane	-	-	-	-		-	-	-	-	-		-
1,1,1-Trichloroethane	-	-	-	-		-	-	-	-	-		-
1,1-Dichloropropene	-	-	-	-		-	-	-	-	-		-
Benzene	-	-	-	-		-	-	-	-	-		-
Carbontetrachloride	-	-	-	-		-	-	-	-	-		-
Dibromomethane	-	-	-	-		-	-	-	-	-		-
1,2-Dichloropropane	-	-	-	-		-	-	-	-	-		-
Bromodichloromethane	-	-	-	-		-	-	-	-	-		-
Trichloroethene	-	-	-	-		-	-	-	-	-		-
cis-1,3-Dichloropropene	-	-	-	-		-	-	-	-	-		-
trans-1,3-Dichloropropene	-	-	-	-		-	-	-	-	-		-
1,1,2-Trichloroethane	-	-	-	-		-	-	-	-	-		-
Toluene	-	-	-	-		-	-	-	-	-		-
1,3-Dichloropropane	-	-	-	-		-	-	-	-	-		-
Dibromochloromethane	-	-	-	-		-	-	-	-	-		-
1,2-Dibromoethane	-	-	-	-		-	-	-	-	-		-
Tetrachloroethene	-	-	-	-		-	-	-	-	-		-
1,1,1,2-Tetrachloroethane	-	-	-	-		-	-	-	-	-		-
Chlorobenzene	-	-	-	-		-	-	-	-	-		-
Ethylbenzene	-	-	-	-		-	-	-	-	-		-
p/m-Xylene	-	-	-	-		-	-	-	-	-		-
Bromoform	-	-	-	-		-	-	-	-	-		-
Styrene	-	-	-	-		-	-	-	-	-		-
1,1,2,2-Tetrachloroethane	-	-	-	-		-	-	-	-	-		-
o-Xylene	-	-	-	-		-	-	-	-	-		-
1,2,3-Trichloropropane	-	-	-	-		-	-	-	-	-		-
Isopropylbenzene	-	-	-	-		-	-	-	-	-		-
Bromobenzene	-	-	-	-		-	-	-	-	-		-
2-Chlorotoluene	-	-	-	-		-	-	-	-	-		-
Propylbenzene	-	-	-	-		-	-	-	-	-		-
4-Chlorotoluene	-	-	-	-		-	-	-	-	-		-
1,2,4-Trimethylbenzene	-	-	-	-		-	-	-	-	-		-
4-Isopropyltoluene	-	-	-	-		-	-	-	-	-		-
1,3,5-Trimethylbenzene	-	-	-	-		-	-	-	-	-		-
1,3-Dichlorobenzene	-	-	-	-		-	-	-	-	-		-
1,4-Dichlorobenzene	-	-	-	-		-	-	-	-	-		-
sec-Butylbenzene	-	-	-	-		-	-	-	-	-		-
tert-Butylbenzene	-	-	-	-		-	-	-	-	-		-
1,2-Dichlorobenzene	-	-	-	-		-	-	-	-	-		-
n-Butylbenzene	-	-	-	-		-	-	-	-	-		-
1,2-Dibromo-3-chloropropane	-	-	-	-		-	-	-	-	-		-
1,2,4-Trichlorobenzene	-	-	-	-		-	-	-	-	-		-
Naphthalene	-	-	-	-		-	-	-	-	-		7
1,2,3-Trichlorobenzene	-	-	-	-		-	-	-	-	-		-
Hexachlorobutadiene	-	-	-	-		-	-	-	-	-		-

Values in μg/l

Tentatively Identified Compounds

Compound	Borehole(s)	Conc (μg/l)
Acetic Acid	BH105, BH105B, BH112-3, BH201-4 and BH207	--
Cyclohexane		--
Cyclohexanone		--
Cyclohexanol		--
Diaminocyclohexane		--

-' Less than the method detection limit of 1
--' Less than the method detection limit of 10.

please note: the idenification and semi-quantification of these *tentatively identified compounds is outside the scope of the UKAS accreditation for this method*

Table 10
VOCs in Groundwater (μg/l)

Compound	BH401	BH404	BH405	BHWW		BH501	BH504		BH601B	BH605	BH606
Dichlorodifluoromethane	-	-	-	-		-	-		-	-	-
Chloromethane	-	-	-	-		-	-		-	-	-
Vinyl chloride	-	-	-	-		-	-		-	-	-
Bromomethane	-	-	-	-		-	-		-	-	-
Chloroethane	-	-	-	-		-	-		-	-	-
Trichlorofluoromethane	-	-	-	-		-	-		-	-	-
trans-1,2-Dichloroethene	-	-	-	-		-	-		-	-	-
Dichloromethane	-	-	-	-		-	-		-	-	-
Carbon disulphide	-	-	-	-		-	-		-	-	-
1,1-Dichloroethene	-	-	-	-		-	-		-	-	-
1,1-Dichloroethane	-	-	-	-		-	-		-	-	-
tert-butyl methyl ether	-	-	-	-		-	-		-	-	-
cis-1,2-Dichloroethene	-	-	2	-		-	-		-	-	-
Bromochloromethane	-	-	-	-		-	-		-	-	-
Chloroform	-	-	-	-		-	-		-	-	-
2,2-Dichloropropane	-	-	-	-		-	-		-	-	-
1,2-Dichloroethane	-	-	-	-		-	-		-	-	-
1,1,1-Trichloroethane	-	-	-	-		-	-		-	-	-
1,1-Dichloropropene	-	-	-	-		-	-		-	-	-
Benzene	-	-	-	-		-	-		-	-	-
Carbontetrachloride	-	-	-	-		-	-		-	-	-
Dibromomethane	-	-	-	-		-	-		-	-	-
1,2-Dichloropropane	-	-	-	-		-	-		-	-	-
Bromodichloromethane	-	-	-	-		-	-		-	-	-
Trichloroethene	-	-	-	-		-	-		-	-	-
cis-1,3-Dichloropropene	-	-	-	-		-	-		-	-	-
trans-1,3-Dichloropropene	-	-	-	-		-	-		-	-	-
1,1,2-Trichloroethane	-	-	-	-		-	-		-	-	-
Toluene	-	-	-	1		-	-		-	-	-
1,3-Dichloropropane	-	-	-	-		-	-		-	-	-
Dibromochloromethane	-	-	-	-		-	-		-	-	-
1,2-Dibromoethane	-	-	-	-		-	-		-	-	-
Tetrachloroethene	-	-	-	-		-	-		-	-	-
1,1,1,2-Tetrachloroethane	-	-	-	-		-	-		-	-	-
Chlorobenzene	-	-	-	-		-	-		-	-	-
Ethylbenzene	-	-	-	-		-	-		-	-	-
p/m-Xylene	-	-	-	-		-	-		-	-	-
Bromoform	-	-	-	-		-	-		-	-	-
Styrene	-	-	-	-		-	-		-	-	-
1,1,2,2-Tetrachloroethane	-	-	-	-		-	-		-	-	-
o-Xylene	-	-	-	-		-	-		-	-	-
1,2,3-Trichloropropane	-	-	-	-		-	-		-	-	-
Isopropylbenzene	-	-	-	-		-	-		-	-	-
Bromobenzene	-	-	-	-		-	-		-	-	-
2-Chlorotoluene	-	-	-	-		-	-		-	-	-
Propylbenzene	-	-	-	-		-	-		-	-	-
4-Chlorotoluene	-	-	-	-		-	-		-	-	-
1,2,4-Trimethylbenzene	-	-	-	-		-	-		-	-	-
4-Isopropyltoluene	-	-	-	-		-	-		-	-	-
1,3,5-Trimethylbenzene	-	-	-	-		-	-		-	-	-
1,3-Dichlorobenzene	-	-	-	-		-	-		-	-	-
1,4-Dichlorobenzene	-	-	-	-		-	-		-	-	-
sec-Butylbenzene	-	-	-	-		-	-		-	-	-
tert-Butylbenzene	-	-	-	-		-	-		-	-	-
1,2-Dichlorobenzene	-	-	-	-		-	-		-	-	-
n-Butylbenzene	-	-	-	-		-	-		-	-	-
1,2-Dibromo-3-chloropropane	-	-	-	-		-	-		-	-	-
1,2,4-Trichlorobenzene	-	-	-	-		-	-		-	-	-
Naphthalene	-	-	-	-		-	-		-	-	-
1,2,3-Trichlorobenzene	-	-	-	-		-	-		-	-	-
Hexachlorobutadiene	-	-	-	-		-	-		-	-	-

Values in μg/l

Tentatively Identified Compounds

Compound	Borehole(s)	Conc (μg/l)
Acetic Acid		--
Cyclohexane	BH404-5, BHWV	--
Cyclohexanone	04, BH601B, BH6	--
Cyclohexanol	BH606	--
Diaminocyclohexane		--

-' Less than the method detection limit of 1
--' Less than the method detection limit of 10.

please note: the idenification and semi-quantification of these *tentatively identified compounds is outside the scope of the UKAS accreditation for this method*

Table 11
SVOCs in Groundwater (µg/l)

Compound	BH1101	BH1102	BH1103	BH1104	BH1105	BH1106	BH1107	BH1108	BH1109
Phenol	-	-	-	-	-	-	-	-	-
2-Chlorophenol	-	-	-	-	-	-	-	-	-
2-Methylphenol	-	-	-	-	-	-	-	-	-
4-Methylphenol	-	-	-	-	-	-	-	-	-
2-Nitrophenol	-	-	-	-	-	-	-	-	-
4-Nitrophenol	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	-	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-
Nitrobenzene	-	-	-	-	-	-	-	-	-
Azobenzene	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	-	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
Carbazole	-	-	-	-	-	-	-	-	-
Isophorone	-	-	-	-	-	-	-	-	-
Dibenzofuran	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	-	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-	-
Di-n-butylphthalate	-	-	-	-	-	-	-	-	-
Di-n-octylphthalate	-	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	-	-	-	-	-	-	-	-	-
Butylbenzylphthalate	-	-	-	-	-	-	-	-	-
4-Chloroaniline	-	-	-	-	-	-	-	-	-
2-Nitroanaline	-	-	-	-	-	-	-	-	-
3-Nitroaniline	-	-	-	-	-	-	-	-	-
4-Nitroaniline	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	-	-	-	-	-	-	-	-	-

Values in µg/l
-' Less than the method detection limit of 1

Table 11
SVOCs in Groundwater (μg/l)

Compound	BH105	BH105B	BH112	BH113		BH201	BH202	BH203	BH204	BH207		BH304
Phenol	-	-	-	-		-	-	-	-	-		-
2-Chlorophenol	-	-	-	-		-	-	-	-	-		-
2-Methylphenol	-	-	-	-		-	-	-	-	-		-
4-Methylphenol	-	-	-	-		-	-	-	-	-		-
2-Nitrophenol	-	-	-	-		-	-	-	-	-		-
4-Nitrophenol	-	-	-	-		-	-	-	-	-		-
2,4-Dichlorophenol	-	-	-	-		-	-	-	-	-		-
2,4-Dimethylphenol	-	-	-	-		-	-	-	-	-		-
4-Chloro-3-methylphenol	-	-	-	-		-	-	-	-	-		-
2,4,6-Trichlorophenol	-	-	-	-		-	-	-	-	-		-
2,4,5-Trichlorophenol	-	-	-	-		-	-	-	-	-		-
Pentachlorophenol	-	-	-	-		-	-	-	-	-		-
1,3-Dichlorobenzene	-	-	-	-		-	-	-	-	-		-
1,4-Dichlorobenzene	-	-	-	-		-	-	-	-	-		-
1,2-Dichlorobenzene	-	-	-	-		-	-	-	-	-		-
1,2,4-Trichlorobenzene	-	-	-	-		-	-	-	-	-		-
Nitrobenzene	-	-	-	-		-	-	-	-	-		-
Azobenzene	-	-	-	-		-	-	-	-	-		-
Hexachlorobenzene	-	-	-	-		-	-	-	-	-		-
Naphthalene	-	-	-	-		-	-	-	-	-		-
Acenaphthylene	-	-	-	-		-	-	-	-	-		-
Acenaphthene	-	-	-	-		-	-	-	-	-		-
Fluorene	-	-	-	-		-	-	-	-	-		-
Phenanthrene	-	-	-	-		-	-	-	-	-		-
Anthracene	-	-	-	-		-	-	-	-	-		-
Fluoranthene	-	-	-	-		-	-	-	-	-		-
Pyrene	-	-	-	-		-	-	-	-	-		-
Benzo(a)anthracene	-	-	-	-		-	-	-	-	-		-
Chrysene	-	-	-	-		-	-	-	-	-		-
Benzo(b)fluoranthene	-	-	-	-		-	-	-	-	-		-
Benzo(k)fluoranthene	-	-	-	-		-	-	-	-	-		-
Benzo(a)pyrene	-	-	-	-		-	-	-	-	-		-
Indeno(1,2,3-cd)pyrene	-	-	-	-		-	-	-	-	-		-
Dibenzo(a,h)anthracene	-	-	-	-		-	-	-	-	-		-
Benzo(ghi)perylene	-	-	-	-		-	-	-	-	-		-
2-Chloronaphthalene	-	-	-	-		-	-	-	-	-		-
2-Methylnaphthalene	-	-	-	-		-	-	-	-	-		-
Carbazole	-	-	-	-		-	-	-	-	-		-
Isophorone	-	-	-	-		-	-	-	-	-		-
Dibenzofuran	-	-	-	-		-	-	-	-	-		-
Dimethyl phthalate	-	-	-	-		-	-	-	-	-		-
Diethyl phthalate	-	-	-	-		-	-	-	-	-		-
Di-n-butylphthalate	-	-	-	-		-	-	-	-	-		-
Di-n-octylphthalate	-	-	-	-		-	-	-	-	-		-
Bis(2-ethylhexyl)phthalate	-	-	-	-		-	-	-	-	-		-
Butylbenzylphthalate	-	-	-	-		-	-	-	-	-		-
4-Chloroaniline	-	-	-	-		-	-	-	-	-		-
2-Nitroanaline	-	-	-	-		-	-	-	-	-		-
3-Nitroaniline	-	-	-	-		-	-	-	-	-		-
4-Nitroaniline	-	-	-	-		-	-	-	-	-		-
2,4-Dinitrotoluene	-	-	-	-		-	-	-	-	-		-

Values in μg/l
-' Less than the method detection limit of 1

Table 11
SVOCs in Groundwater (µg/l)

Compound	BH401	BH404	BH405	BHWW	BH501	BH504	BH601B	BH605	BH606
Phenol	-	-	-	-	-	-	-	-	-
2-Chlorophenol	-	-	-	-	-	-	-	-	-
2-Methylphenol	-	-	-	-	-	-	-	-	-
4-Methylphenol	-	-	-	-	-	-	-	-	-
2-Nitrophenol	-	-	-	-	-	-	-	-	-
4-Nitrophenol	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	-	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,2-Dichlorobenzene	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	-	-	-	-	-	-	-	-
Nitrobenzene	-	-	-	-	-	-	-	-	-
Azobenzene	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	-
Naphthalene	-	-	-	-	-	-	-	-	-
Acenaphthylene	-	-	-	-	-	-	-	-	-
Acenaphthene	-	-	-	-	-	-	-	-	-
Fluorene	-	-	-	-	-	-	-	-	-
Phenanthrene	-	-	-	-	-	-	-	-	-
Anthracene	-	-	-	-	-	-	-	-	-
Fluoranthene	-	-	-	-	-	-	-	-	-
Pyrene	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	-	-	-	-	-	-	-	-	-
Chrysene	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	-	-	-	-	-	-	-	-	-
Carbazole	-	-	-	-	-	-	-	-	-
Isophorone	-	-	-	-	-	-	-	-	-
Dibenzofuran	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	-	-	-	-	-	-	-	-	-
Diethyl phthalate	-	-	-	-	-	-	-	-	-
Di-n-butylphthalate	-	-	-	-	-	-	-	-	-
Di-n-octylphthalate	-	-	-	-	-	-	-	-	-
Bis(2-ethylhexyl)phthalate	-	-	-	-	-	-	-	-	-
Butylbenzylphthalate	-	-	-	-	-	-	-	-	-
4-Chloroaniline	-	-	-	-	-	-	-	-	-
2-Nitroanaline	-	-	-	-	-	-	-	-	-
3-Nitroaniline	-	-	-	-	-	-	-	-	-
4-Nitroaniline	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	-	-	-	-	-	-	-	-	-

Values in µg/l
-' Less than the method detection limit of 1

Table 12
SVOC TICs in Groundwater (µg/l)

Compound	KA/Solvents					Inters 2	Acids 2				Acids 1		Inters 1/HMD Services		
	BH201	BH202	BH203	BH204	BH207	BH304	BH401	BH404	BH405	BHWW	BH501	BH504	BH601B	BH605	BH606
C6-C8 Acids	-	-	-	-	-	-	-	-	-	45	-	-	-	-	-
C9 - 22hydrocarbons: 20% aromatic	-	-	-	-	-	-	-	-	250	-	-	-	-	-	-
Unresolved complex matter inc. some terpene	-	-	-	-	-	940	-	-	-	-	-	-	-	-	-
Dichlorophenyl isocyanate	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Adipic Acid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biphenyl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diphenyl oxide	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molecular sulphur	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-
Unknown	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-

Values in µg/l
-' Less than the method detection limit of 1

Table 13
Water PRO and DRO (µg/l)

Borehole	Total Volatiles C4 to C13	MTBE	Benzene	Toluene	Ethyl Benzene	Total Xylene
BH1101	-	-	-	-	-	-
BH1102	-	-	-	-	-	-
BH1103	-	-	-	-	-	-
BH1104	-	-	-	-	-	-
BH1105	**292**	-	-	-	-	-
BH1106	-	-	-	-	-	-
BH1107	-	-	-	-	-	-
BH1108	-	-	-	-	-	-
BH201	-	-	-	-	-	-
BH203	-	-	-	-	-	-
BH304	**770**	-	-	-	-	-
BH401	-	-	-	-	-	-
BHWW	-	-	-	-	-	-

Borehole	Diesel Range Hydrocarbons	Interpretation
BH1101	**10016**	Unknown pattern detected
BH1102	-	No identfication possible
BH1103	**1151**	Unknown pattern detected
BH1104	-	No identfication possible
BH1105	568	Lube oil
BH1106	-	No identfication possible
BH1107	-	No identfication possible
BH1108	-	No identfication possible
BH201	-	No identfication possible
BH203	-	No identfication possible
BH304	**2026**	Unknown pattern detected
BH401	292	Possible biodegraded diesel/possible lube oil
BHWW	148	Possible gasoline residues

Values in µg/l
-' Less than the method detection limit of 10.

Table 14
Inorganics in Groundwater

Borehole	Arsenic	Boron (Water Soluble)	Cadmium	Chromium	Copper	Mercury	Nickel	Lead	Selenium	Vanadium	Zinc	Ammoniacal Nitrogen as NH4-N
BH1101	5	**1000**	x	-----	---	xx	19	---	-	-	70	1
BH1102	----	220	x	-----	---	xx	--	---	-	-	-	0.8
BH1103	2	**1010**	x	-----	5	xx	--	---	-	-	-	0.4
BH1104	----	590	x	1	---	xx	--	---	-	-	-	0.3
BH1105	12	240	x	-----	---	xx	--	---	-	-	-	**87.6**
BH1106	----	370	x	-----	16	xx	--	---	-	-	-	0.3
BH1107		350	x	1	---	xx	--	---	-	-	80	1.0
BH1108	----	260	x	-----	---	xx	--	---	-	-	-	0.3
BH105	----	-	x	3	---	xx	--	---	-	-	-	0.9
BH105B	-	-	-	-	-	-	-	-	-	-	-	0.7
BH112	----	100	x	-----	---	xx	--	---	-	-	-	3.5
BH113	-	-	-	-	-	-	-	-	-	-	-	3.6
BH201	----	400	x	-----	---	xx	--	---	-	-	-	0.3
BH202	-	-	-	-	-	-	-	-	-	-	-	0.2
BH203	----	-	x	-----	---	xx	--	---	-	-	-	0.8
BH204	-	-	-	-	-	-	-	-	-	-	-	0.3
BH207	----	850	x	-----	---	xx	--	---	-	-	-	1.1
BH304	3	430	x	-----	---	xx	--	---	-	-	-	1.2
BH401												11.7
BH404	----	-	x	3	9	xx	--	---	-	-	-	0.3
BH405	-	-	-	-	-	-	-	-	-	-	-	0.9
BHWW	-	-	-	-	-	-	-	-	-	-	-	**15.8**
BH501	----	250	x	3	---	xx	--	---	-	-	-	0.0
BH504	----	360	x	19	---	xx	--	---	-	-	-	0.2
BH601B	-	-	-	-	-	-	-	-	-	-	-	0.7
BH605	----	50	x	1	---	xx	--	---	-	-	-	0.2
BH606	-	-	-	-	-	-	-	-	-	-	-	0.6

Values in µg/l except ammonical nitrogen as mg/l
-' Less than the method detection limit of 50.
--' Less than the method detection limit of 10.
---' Less than the method detection limit of 5.
----' Less than the method detection limit of 2.
-----' Less than the method detection limit of 1.
x Less than the method detection limit of 0.4.
xx Less than the method detection limit of 0.05.

Table 15
PCBs in Water (µg/l)

Compound	BH1101	BH1104	BH207	BH401	BH404	BH501	BH504	BH601B	BH605
Aroclor 1016	-	-	-	-	-	-	-	-	-
Aroclor 1221	-	-	-	-	-	-	-	-	-
Aroclor 1232	-	-	-	-	-	-	-	-	-
Aroclor 1242	-	-	-	-	-	-	-	-	-
Aroclor 1248	-	-	-	-	-	-	-	-	-
Aroclor 1254	-	-	-	-	-	-	-	-	-
Aroclor 1260	-	-	-	-	-	-	-	-	-
TOTAL	-	-	-	-	-	-	-	-	-

Values in µg/l

-' Less than the method detection limit of 1.

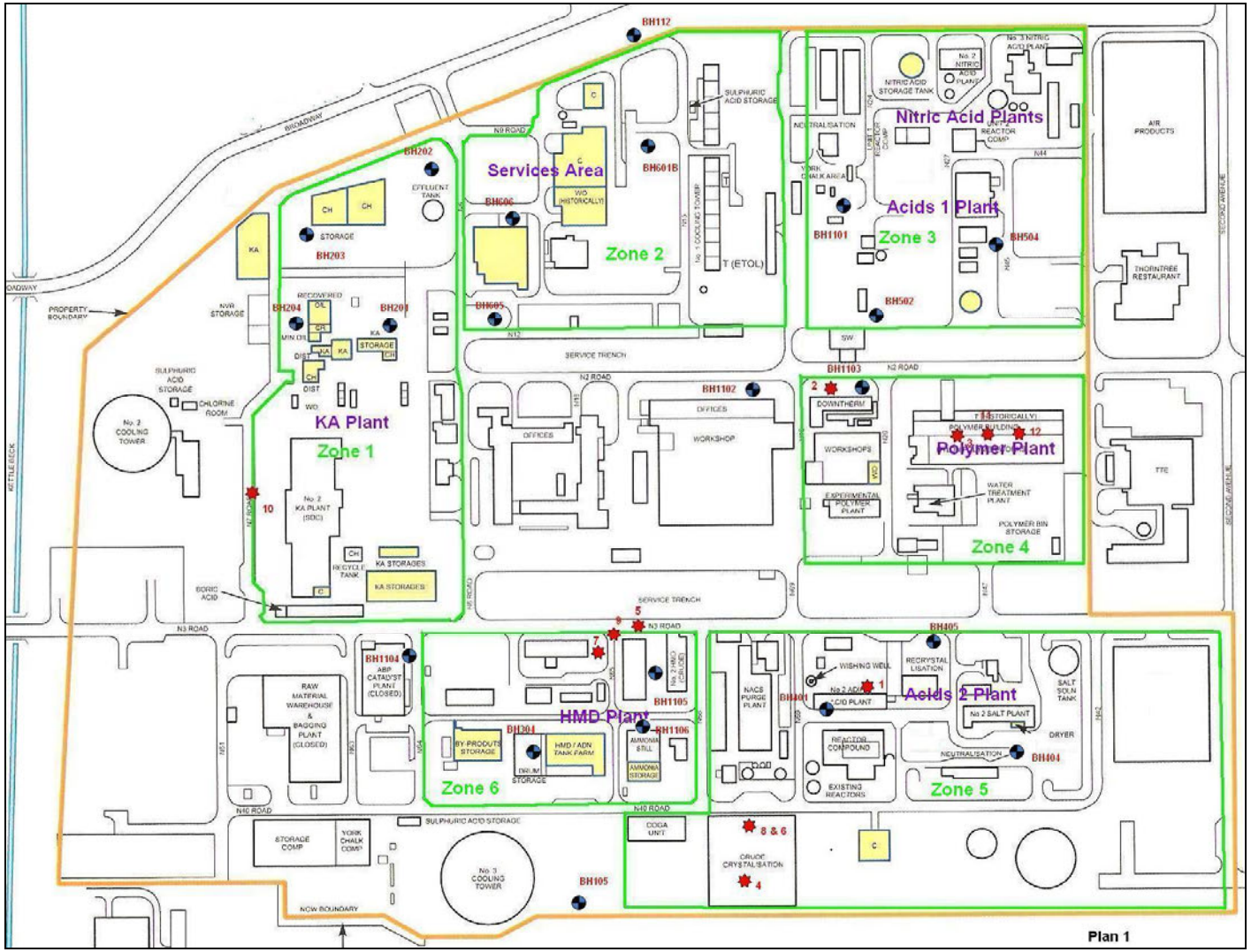
Table 16
Methanol in Water (µg/l)

Borehole	Methanol
BH1101	-
BH1102	-
BH1103	NDP
BH1104	-
BH1105	-
BH1106	-
BH1107	NDP
BH1108	-
BH1109	-

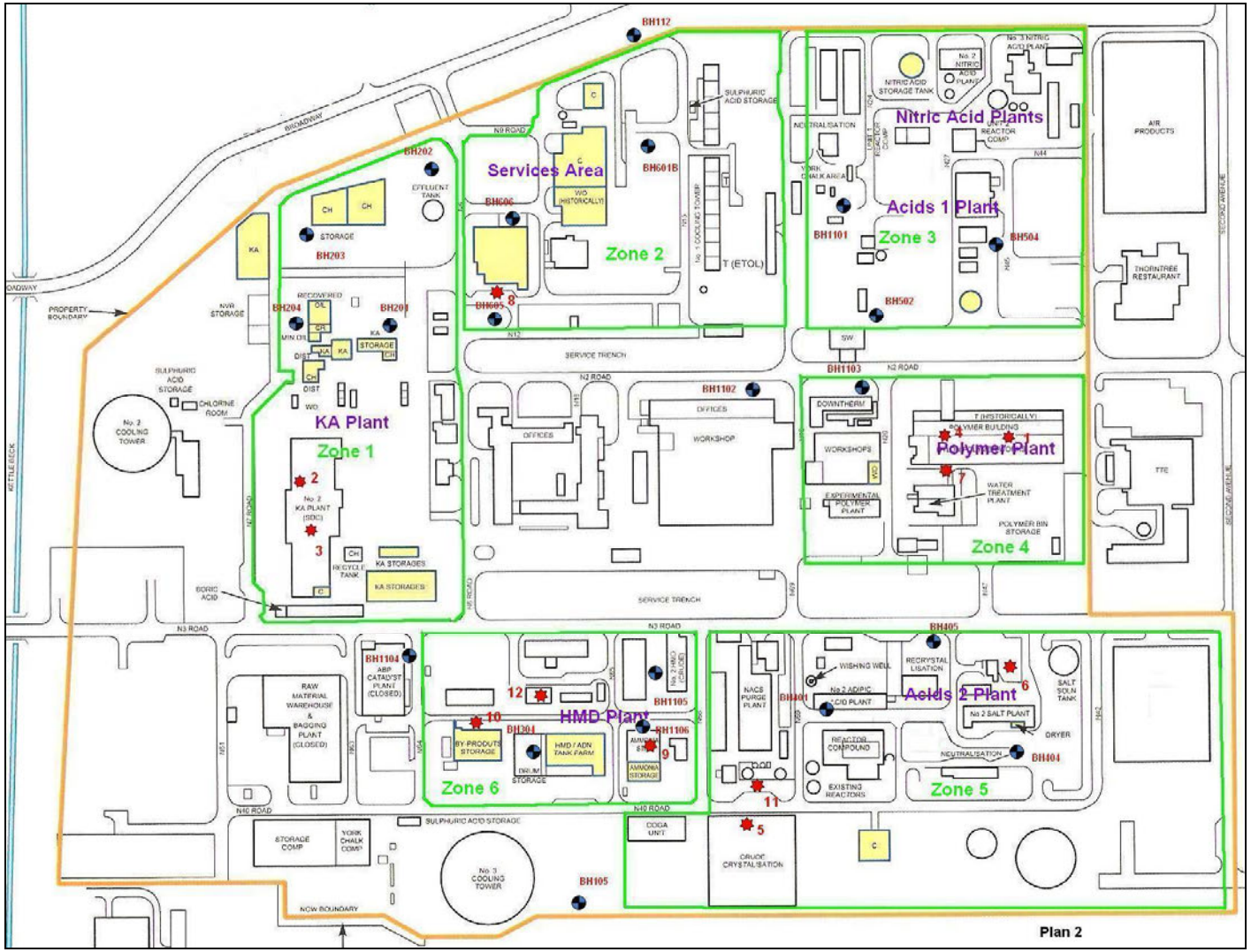
Values in µg/l
NDP = No Determination Possible
-' Less than the method detection limit of 100.

APPENDIX B
Location plan of recorded incidents (2002-2009)

Location Plan of Recorded Incidents (2002-2004)



Location Plan of Recorded Incidents (2004-2009)



APPENDIX C
Drain Plan – Schematic

6 7 8 9 10

F G H J K L M

FRESHFLAKES LTD. DEPOT

FRESHFLAKES TERMINAL

Cooling Tower

LANDSCAPE MOUND

NYLON MAIN OFFICES

CCC

Lighting Tower

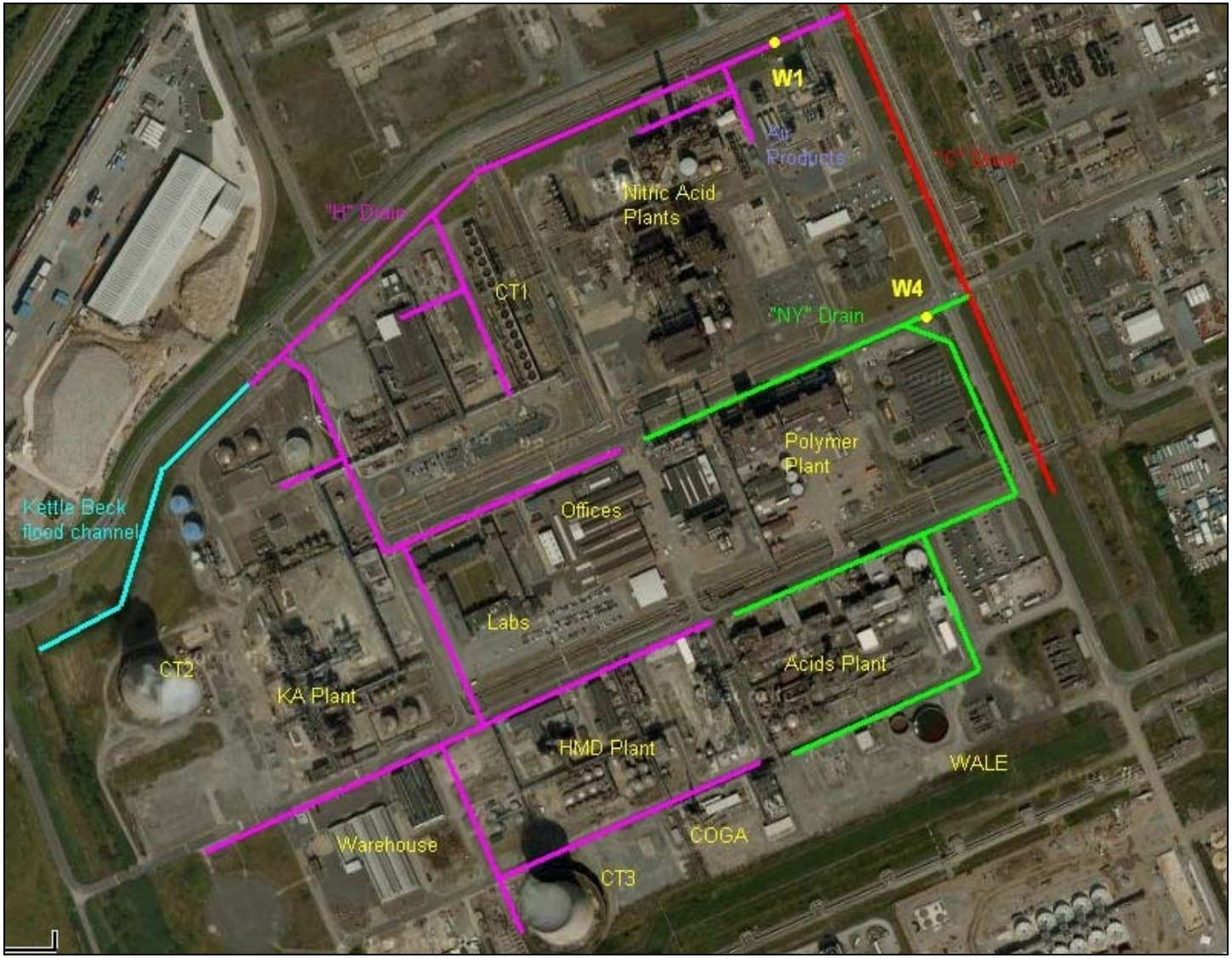
Tanks

Chimney

Cooling Tower

Appendix C

Critical Drains Plan


W1
Air Products
"G" Drain
"H" Drain
Nitric Acid Plants
CT1
W4
"NY" Drain
Polymer Plant
Kettle Beck flood channel
Offices
Labs
CT2
KA Plant
Acids Plant
HMD Plant
WALE
Warehouse
COGA
CT3

APPENDIX D
Wilton Site Procedures

EQUIPMENT STRATEGY - 8407	Issued	August 2008
Title: Examination and Maintenance of Drainage.	Review	August 2011
	Effective	Immediate
Approved [redacted] Date: 20/8/8		
Owning Manager - [redacted] Ext: 5940		

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APPENDIX

1. Selection of Drainage to be classed as Critical.	8
2. Report of Examination of Drainage Condition Categories	11
3. Record of Amendment	12

1. PURPOSE

This Equipment Strategy specifies the arrangements required for the inspection and maintenance of drainage to ensure their integrity and meet the needs of PSM.

This may include one or more of the following:

An initial appraisal
A scheduled examination
A thorough examination
A scheme of examination
A fitness for purpose assessment
Deferment of examination
Dispensation from an examination
Examination of repairs and modifications to drainage.

Any drainage deemed PSM critical shall refer to the requirements of S21A/S24A and WSP 1611.

It is applicable to the Examination of all drainage owned or operated by INVISTA at Nylon, Wilton

Extensive reference is made to ABB document "Examination of Drainage Systems - EUT.711.04A" which specifies the requirements and standard forms to be adopted.

2. PROCEDURES

PRINCIPLES

An examination is required to determine any change in the condition of the drainage and to use such information in determining whether the drainage:

- May continue in service up to the next planned examination.
- Requires repair or remedial works.
- Needs to be replaced.
- Requires a more frequent examination.
- Requires a less frequent examination

Periodic Examination shall be established. Examinations shall ensure the continued fitness for purpose of the Drainage by identifying defects and necessary maintenance and improvement works.

Personnel authorised to establish, oversee and carry out Examinations at various levels shall be properly qualified, trained and have suitable experience.

New installations on developed or previously undeveloped sites shall be designed to prevent "Significant Environmental Harm " by use of a pumped overground system or a system in which leakage can be detected.

The design and construction standards traditionally applied to Drainage would not now be acceptable for many types of Wastewater drains because of the risk of Significant Environmental Harm caused by leakage. It is unrealistic to expect Drainage constructed to these standards to perform consistently to a much higher standard. Schemes of Examination should recognise this and site improvement plans should be developed using Critical Drainage assessment as a basis for prioritisation. (Appendix 1)

Deferment of Examinations

Under normal circumstances, drainage shall be subjected to Examination at intervals stated in the Scheme of Examination. Where experience in service indicates that an Examination is not essential, then it may be postponed for up to 24 months, subject to the written approval.

See ABB document "Examination of Drainage - :EUT.711.04A" 4.4 and INS/71

Dispensation from Examination

In circumstances where it is judged unnecessary to carry out regular Examinations of drainage, then a dispensation may be granted . In such situations, a technical supporting case shall be written.

A review date for the dispensation shall be stated which in no case shall exceed 72 months. The review shall take into account previous Examination Reports and experience of the operating conditions.

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See ABB document "Examination of Drainage - :EUT.711.04A" 4.5 and INS/91

Additional Examinations

If any drainage is likely to have been damaged through mal-operation, changed operating conditions or other incident, then consideration shall be given to the need for additional Examination for all or part of a drainage system.

Repairs

For all examinations, defects and associated repairs shall be incorporated into the maintenance system on SAP as equipment.

Defects and repairs that require rectification before the next scheduled / thorough examinations shall be recorded .

Such repairs shall also be recorded on the Plant Modification system.

See ABB document "Examination of Drainage - :EUT.711.04A" 4.8 and INS/90

Criteria for Critical Drainage

The following Drainage shall be classified as critical:

- Those where loss of containment could reasonably foreseeably cause an Unacceptable Situation. This includes Drainage with double containment and leakage monitoring.

- Wastewater Drainage that is located outside the Site boundary.

The following Drainage would not normally be classified as critical:

- Drainage leading to consented outfalls where leakage would be likely to travel to the same receiving water without contaminating the surrounding Ground or Groundwater.

- Stormwater Drainage unless infiltration of contaminated Groundwater is suspected which could affect another target.

Appendix 1 sets out detailed criteria and the procedure in a structured manner.

Existing Drainage

Layout / Location Drawings of all critical buried Drainage shall be compiled, and subsequently maintained, for each Area.
Each section of Drainage shall be given a unique reference .

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New Drainage

All Drainage shall be given a unique reference.

An appropriate team (e.g. Hazards Study Team) shall classify and assess which Drainage is to be Critical.

TYPES OF EXAMINATION

Drainage shall undergo three forms of periodic Examination:
- a routine Examination.
- a scheduled Examination.
- a thorough Examination.

An Examination is required to establish information relating to any change in the condition of the Drainage and to use such information in determining whether the Drainage:

- may continue in service up to the next Examination.
- requires repair;
- requires to be replaced;
- requires to be examined more frequently;
- may be examined less frequently.

All Examination reports shall be held in the appropriate File.

Routine Examination

The Examination shall check that Wastewater or storm water is entering and passing through the Drainage system with no evidence of blockage, leakage, rubbish in channels or ditches or other problems such as settlement. There is no requirement to remove manhole or Drainage channel covers and the inspection is therefore limited.

On most plants this inspection will be accomplished by a normal tour of the plant area, but it is recognised that there may be unmanned areas where special arrangements will have to be made.

Drainage with leak detection monitoring shall be checked on a regular basis at intervals agreed in the registration process.

Any significant findings shall be reported to the Competent Civil Engineer.

Scheduled Examination

The purpose of a scheduled examination is to inspect the drainage system in order to identify serious defects, potentially serious defects or required maintenance activities, and to recommend priorities for remedial work or further investigation (e.g. thorough examination, pressure testing, CCTV survey etc.).

The physical condition of the Drainage should be examined and any damage, deterioration, debris or deposition recorded. Any evidence of soil or Drainage backfill in the flow should be noted as possible evidence of infiltration;

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Scheduled examinations where specified should normally be undertaken at intervals not exceeding 36 months. Intervals may be adjusted based on evidence of routine examinations.

Not all Drainage will require a Scheduled Examination. It may be limited to specific Drainage where more frequent, but perhaps less detailed, formal examination is required.

See ABB document "Examination of Drainage - :EUT.711.04A" Appendix B.1.1 for Examination requirements and B.1.2 for reporting requirements.

Thorough Examination

The purpose of a thorough examination is to assess in detail the condition of the drainage system in order to identify defects that may affect the drainage containment or operational ability. A thorough examination may form part of a fitness for purpose assessment.

A thorough Examination shall be carried out at intervals not exceeding 72 months unless a deferment or dispensation is obtained.

See ABB document "Examination of Drainage - :EUT.711.04A" Appendix B.2.1 for Examination requirements and B.2.2 for reporting requirements.

SCHEME OF EXAMINATION

The purpose of a Scheme of Examination is to specify the minimum Examination to be carried out in order that an assessment whether, for the period up to the next Examination, the Drainage is fit to continue in service on its stated duty.

The following shall be included

- requirements for scheduled Examination,
- requirements for thorough Examination,.
- Examination intervals.

A system for planning and notifying the due date of examinations of drainage systems should exist.

Defects and associated repairs shall be incorporated into the maintenance SAP system. Repairs shall be signed off when complete

See ABB document "Examination of Drainage - :EUT.711.04A" Appendix B.3 for more details on purpose, examination preparation-3.1, requirements for scheduled examination form-3.2, requirements for thorough examination form -3.3,approval form-3.4 and amendments form – 3.5.

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FITNESS FOR PURPOSE ASSESSMENT

A fitness for purpose assessment should normally review:

The as-built drawings.
The original calculations.
Any modifications to the original design.
The surcharge loading on the drainage.
The current use of the drainage (normal and abnormal operation).
The results from an examination.
The ground and groundwater conditions
Consequences of leakage or structural failure.
Location.

If the information available is insufficient to determine the fitness for purpose of the drainage system then further investigation work shall be carried out.

3 REFERENCES

British Standards

BSEN 1610 : Construction & Testing of Drains & Sewers

Standard Forms.

See ABB document "Examination of Drainage - :EUT.711.04A"

INS/70 Report of Examination of Registered Drainage (STD/F/00941)
INS/71 Scheme of Examination of Registered Drainage (STD/F/00942)
INS/72 Drainage Registration Sheet (STD/F/00943)
INS/73 Drainage Registration Assessment Record (STD/F/00944)
INS/74 Selection of Drainage for Registration - Assessment Summary (STD/F/00945)
INS/75 Wastewater Data Sheet (STD/F/00946)

EC Directives

80/68/EC Protection of Groundwater
76/464/EC Discharge of Dangerous Substances to the Aquatic Environment
96/91 EC Integrated Prevention of Pollution and Control

UK Legislation

SI 472 Prescribed Processes and Substances Regulations 1991
SI 3246 Control of Substances Hazardous to Health Regulations 2002

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Environment Agency Website (NetRegs) www.environmentagency.gov.uk

Pollution of Surface Waters and Ground Water
WSP 1217 Prevention of Pollution to River
WSP 1710 Controlling Nylon Wilton Aqueous Effluents Flowing Directly to River Tees
WSP 1701 Managing of Site Drainage and Effluent Systems

Other Documents

Manual of Sewer Condition Classification (published by the Water Research Centre)

4 DEFINITIONS

For the purpose of this Procedure, the following definitions apply.

Drainage
Systems which convey Wastewater (including effluent) and storm water by gravity including trenches, channels, buried pipes, culverts, collection pits, sumps, chambers, gullies, manholes, ditches and land drains.

Examination
Examination means a careful and critical scrutiny of registered Drainage to assess its actual condition and whether it is fit for use for the period up to the next Examination. An Examination may be "routine", "scheduled" or "thorough".

Ground
Ground is any natural or imported fill material below the land surface.

Groundwater
Groundwater is all subsurface water contained in the Ground and geological formations.

Scheme of Examination
A Scheme of Examination defines the extent, nature, preparatory work and frequency of Examinations.

Significant Environmental Harm
Significant Environmental Harm means evident damage to plant or animal life or contamination of Ground, Groundwater or surface water to an extent that would impair the fitness of these media for beneficial use. (See Appendix 2)

Unacceptable Situation
An Unacceptable Situation is one in which there is a significant probability of serious harm to people or the environment. Within the above general definition the Responsible Civil Engineer or other appropriate persons are required to make the judgement based on the particular circumstances. At the Works discretion serious loss of production may be regarded as an Unacceptable Situation.

Wastewater
Liquid process effluent, spillages, washdown, overflows, cooling water, flows from toilets and shower facilities, canteens and offices.

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APPENDIX 1 Page 1 of 3

SELECTION OF DRAINAGE –CLASSED AS CRITICAL

Drainage shall be classed as Critical if leakage may cause an Unacceptable Situation.

An Unacceptable Situation may be one or more of the following:

-harm or serious nuisance to the public

-serious harm to people on site

-Significant Environmental Harm

-at the Works discretion, serious harm to the business

PROCEDURE FOR SELECTION OF DRAINAGE

Forms

Form INS/73 should be used to assist and record the selection process for each identified element of Drainage. Form INS/74 should be used to summarise the selection process for a Works/Site/Area.

To minimise effort the forms are structured such that the selection process may be halted once a requirement for Registration has been determined.

Step 1 - Identify Drainage (Form INS/74)

Ensure that a layout drawing is available showing all Drainage locations and routes on the Works/Site/Area. Identify and list all Drainage by item, line or section, as appropriate, on Form INS/74.

Step 2 - Location (Form INS/73 - Part 1)

Wastewater Drainage located outside the site boundary shall be registered.

Step 3 - Significant Environmental Harm (Form INS73 - Part 2)

Assess all Drainage whose failure would be likely to lead to Significant Environmental Harm.

A number of substances referred to as "Category 'A' chemicals" in this Procedure (see Appendix 2, 3.5) are known to result in a high hazard to human health and/or the environment and their release to Ground, Groundwater and/or surface water is strictly controlled by legislation. If the Drainage carries one or more Category 'A' chemicals then the Drainage shall be classed as Critical.

For other chemicals an assessment shall be made of the contamination potential and the likely consequences of release into the Ground, Groundwater or surface water. Potentially unacceptable consequences other than environmental damage such as noxious smells and/or

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visible evidence of contamination e.g. colour, foaming, etc should be recognised. The decision to class as Critical shall be based on the above assessment.

APPENDIX 1 Page 2 of 3

Appendix 2 of this Procedure provides further detailed guidance and a methodology for assessing the likelihood of Significant Environmental Harm.

Step 4 - Damage to Adjacent Critical Structures or Services (Form INS/73-Part3)

Consider whether the failure of the Drainage could damage critical structures, services or storage facilities that would lead to an Unacceptable Situation. This assessment should take into account pipe size, depth and Ground conditions.

Step 5 - Serious Business Harm (Form INS/73 - Part 4)

In consultation with and at the discretion of the Works, register the Drainage if failure would cause serious business harm. Examples of serious business harm include:

(a) significant loss of production

(b) unacceptably high repair costs

(c) high cost of a future clean-up of contaminated land

Step 6 - Registration (Form INS/73 - Part 5)

The decision whether or not to register the Drainage is stated, with reasons, and the form is signed by the Chairman of the Assessment Team and the Competent Civil Engineer.

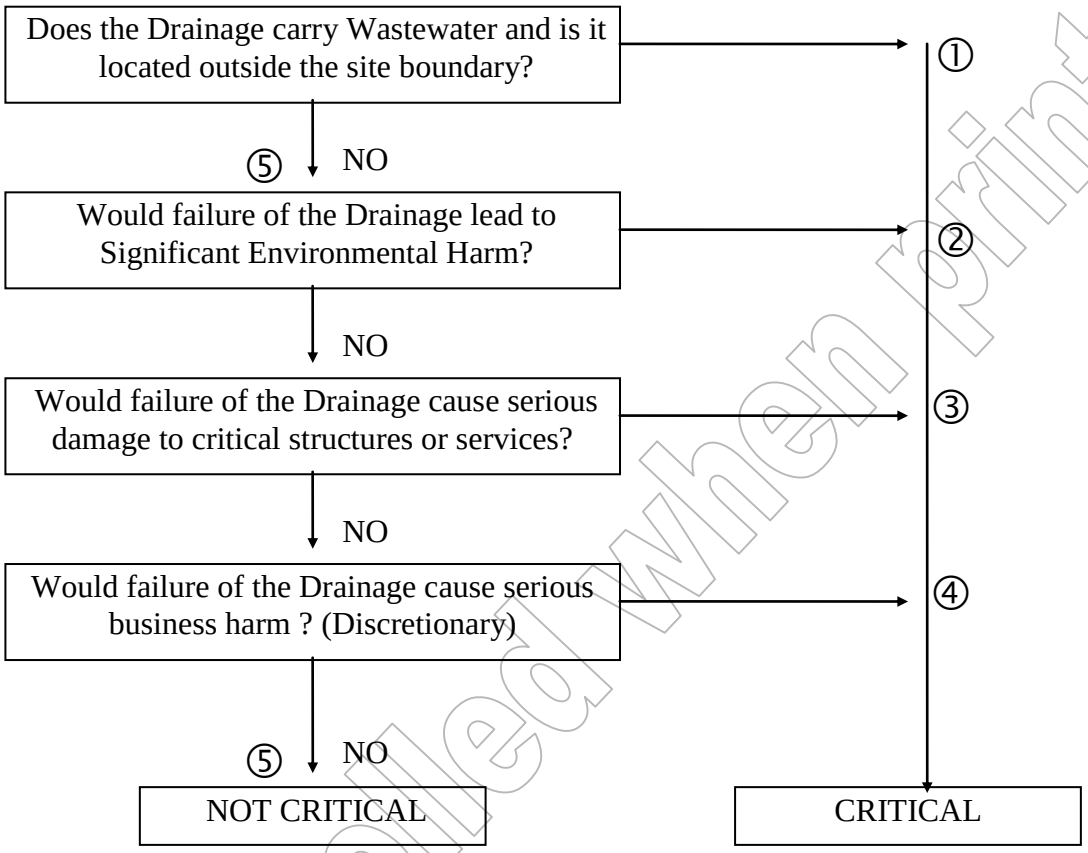
Step 7 - Summarise Assessment (Form INS/74)

The assessment shall be summarised on Form INS/74 in conjunction with the decision tree shown in Figure 1. The summary shall be approved by the Competent Civil Engineer. The layout drawing shall be marked up with all Critical Drainage.

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APPENDIX 1 Page 3 of 3

1: DECISION TREE



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APPENDIX 2 Page 1 of 1

REPORT OF EXAMINATION OF DRAINAGE CONDITION CATEGORIES

1. INTRODUCTION

Form INS/70 requires that visual defects are categorised V1, V2, V3 or V4 where the four condition categories have a meaning based on the descriptions contained within NEP 8405.

2. CONDITION CATEGORIES

Outline of Categories

The concept behind the four condition categories is:

V1 Near 'perfect' condition.

V2 No cause for concern or for any immediate action although some deterioration is evident.

V3 Action required to arrest deterioration or correct existing defects. However this would not normally impair the drainage system fitness for purpose.

V4 Defect identified, based on visual inspection, which is judged likely to impair the drainage system fitness for purpose or forms a safety risk. Early action required to investigate further or remedy fault. Integrity of drainage system in doubt.

V5 Severe deterioration. Or the drainage has failed or is in immediate danger of failure. Immediate action required to remedy fault. Drainage integrity lost or unable to fulfil its service duty.

The prefix 'V' is to indicate that the classification has been made on the basis of a visual inspection.

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APPENDIX 3 Page 1 of 1

Record of Amendment

Rev.	Section	Details
New	All	Total re-write incorporating MBM Principles. Replaces NEP8407

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Title	Issued	April 2007
Protection of Soil and Ground Water	Review	April 2010
	Effective	Immediate
Approved [redacted] Date: 26/4/04.		
Owning Manager - [redacted] Ext: 5489		

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11. Internal Transport 4
12. Bunds 4
13. Loading/Unloading of Tankers 5
14. Drum Handling and Storage 5
15. Pipework 5
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17. Spillage Remediation 5

APPENDIX

1 PPC Requirements from General Guidance 6

Record of Amendment

Rev	Section	Details
F	All	General update. DuPont references removed
		Appendix 1 removed and placed in WSP 1218
		Appendix 2 renumbered Appendix 1

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1. PURPOSE

To ensure that INVISTA Nylon, Wilton Site takes precautions to prevent soil and ground water pollution.

2. SCOPE

The WSP applies to the Wilton Nylon Site.

3. REFERENCES

3.1. URS Site Report 24th May 1993. (Nylon)

3.2. Contaminated Land Exposure Assessment Model (CLEA) – Environment Agency + DEFRA

3.3. PPG2 Above ground oil storage tanks – Environment Agency.

3.4. 'Guidance for the Large Volume Organic Chemicals Sector' – IPPC S4.01.Section 2.2.5

4. DEFINITIONS

None

5. PRINCIPLES

5.1. The site shall take action to prevent soil and groundwater bearing in mind the propensity of the ground to allow mitigation of pollutants.

5.2. PPC requires that plants control fugitive emissions surface water and ground water – Appendix 2.

6. GEOLOGY

6.1. The Site is built on a sequence of unconsolidated drift deposits comprising: glacial boulder clay, silty clay, locally black laminated clay. These reach a depth of 7-14m and overlay the Redcar Mudstone formation (lower Jurassic).
Permiability: Very Low.

7. STATUS

7.1. Nylon. 43 boreholes were sunk around the Site in 1993. The resulting investigation revealed that there were two sites of localised contamination within limited likelihood of lateral or vertical migration (Ref: 3.1)

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8. BOREHOLES

8.1. Nylon. 24 boreholes remain active on the Site. Samples of groundwater shall be taken at a maximum period of 6 months and analytical tests carried out in accordance with method W/EOH/37 in document NW/LAB/AM/007. Any deviation of bore hole results shall be investigated by the owning Area.

9. PLANT

9.1. All processing plant shall be located on a hard, impervious surface. Protected surfaces should be subject of regular inspection. Actions required following inspection shall be to a defined schedule. The plant shall prevent or reduce fugitive emissions to land and water through the application of measures outlined in the PPC Guidance (Appendix 1).

10. TANKS AND VESSELS

10.1. All storage tanks and vessels for liquids other than clean water shall be protected as defined in RASP study, bunded as per INVISTA Best Practice, and be in accordance with Environment Agency Guidance (Ref 3. 3)

11. INTERNAL TRANSPORT

11.1. All movements of liquids, other than clean water, around the Site shall be carried out in mobile drum bunds or bunded IBC's. Deminimis quantities: 200 litre drums.

12. BUNDS

12.1. All bunds, static and mobile shall be subject to a scheme of registration and subject to a scheme of inspection and maintenance. The maximum inspection period shall be one year. The actions required following inspections shall be followed up according to a firm schedule.

12.2. Bunds shall have no direct connection to the plant drainage system.

12.3. Plants shall have a routine inspection system to verify that tank leakage has not occurred and rainfall has not overly reduced the available bund volume. This system shall be recorded in the Plant Environment Dossier.

12.4. Plants shall have a system for analysing the contents of a bund before discharge and the details of any result shall be recorded. This system shall be recorded in the Plant Environment Dossier.

12.5. Bunds and Drains shall be subject of a scheme of inspection as defined in NEP 8410

12.6. Bunds shall be in compliance with the criteria outlined in the PPC Guidance (Appendix 1).

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13. LOADING/UNLOADING OF TANKERS

13.1. All tankers shall be loaded/unloaded only in dedicated tanker loading bays, which have a protected drainage system. Loading/unloading operations shall be controlled by a INVISTA operator in accordance with the relevant Operating Instructions. All tankers shall be subject to RHYTHM (Remember How You Treat Hazardous Materials) checks.

13.2. Contained tanker unloading areas shall be treated as a bunds and registered.

14. DRUM HANDLING AND STORAGE

14.1. All full drums shall be stored in bunded, internal buildings or, temporarily, on protected areas of hardstanding or in registered mobile bunds.

14.2. All empty drums shall be recycled by an approved drum recycling company. Smaller drums shall be washed and recycled or disposed of via a registered waste contractor.

15. PIPEWORK

15.1. All newly installed process pipework shall be installed above ground and subject to 'critical pipe' analysis.

15.2. Existing underground pipes, other than water or gravity drains, shall be relocated above surface, or exposed in double contained trenches as new construction work and business resource permits. All as per INVISTA Best Practice.

16. STORAGE TANKS

16.1. All newly installed storage tanks shall be sited above ground. Existing pits double lined as business resource permits.

17. SPILLAGE REMEDIATION

17.1. Spill kits are located around the Site and in areas where spills are most likely to occur.

17.2. Each area will have a Spill kit inspection rota to ensure Spill kits are complete and ready for use.

17.3. Spills shall be addressed as per local plant instructions.

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PPC Requirements from General Guidance. **Appendix 1 Page 1 of 1**

2.3.4. Control of Fugitive Emissions to Surface Water, Sewer and Groundwater.
(See also Section 2.3.1 of General Guidance).

Requirements for Applicants 2.3 (cont). BAT for Fugitive Emissions to Water is as follows:

The operator should describe the measures and procedures in place and proposed to prevent or reduce fugitive emissions to water and land. This should include, but is not limited to, the general measures described below and those in the **existing sector guidance**. The operator should justify where any of the measures are not employed.

General Techniques – Subsurface Structures.

- The sources, direction and destination of all installation drains should be established and recorded;
- The sources, direction and destination of all subsurface pipework should be established and recorded;
- All subsurface sumps and storage vessels should be identified;
- Systems should be engineered to ensure leakages from pipes etc, are minimised and where these occur, can be readily detected, particularly where hazardous (e.g. listed) substances are involved;
- In particular, secondary containment and/or leakage detection should be provided for such subsurface pipework, sumps and storage vessels;
- An inspection and maintenance programme should be established for all subsurface structures, e.g. pressure tests or (CCTV).

Surfacing.

- A description of the design, construction and condition of the surfacing of all operational areas should be provided;
- There should be an inspection and maintenance programme of all impervious surfaces and spill containment kerbs.

Bunds should be provided for all tanks containing liquids having a potential impact on the environment. Bunds should:

- Be impermeable and resistant to the stored materials;
- Have no outlet (i.e. no drains or taps) and drain to a blind collection point.
- Have pipework routed within bunded areas with no penetration of contained surfaces by pipes or ducts.
- Be designed to catch leaks from tanks, or fittings.
- Have a capacity of 110% of the largest tank or 25% of the total tankage, whichever is the greater.
- Be subject to regular visual inspection and any contents pumped out or otherwise removed under manual control after checking for contamination.
- Have fill points within the bund where possible or otherwise provide adequate containment.
- Have a routine programmed visual inspection of bunds including water testing where structural integrity is in doubt.

1. Relevant information may include as appropriate, capacities, thicknesses, falls, material, permeability, strength/reinforcement, resistance to chemical attack, inspection and maintenance procedures, and quality assurance procedures.

2. Further information on bund sizing and design can be found in Ref 3.5.

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Appendix E

Photographic Log

Appendix E - Pollution Prevention Photographic Log

CLIENT: Invista **PHOTOGRAPH #:** 1 **COMMENT:** An example of a kerb, internal drain leading to effluent sump and acid resistant tiling.	

CLIENT: Invista **PHOTOGRAPH #:** 2 **COMMENT:** Tanks were designed to facilitate visual detection of leaks. Most tanks were constructed on plinths with a clear break between the base of the tank and the top of the plinth.	

Appendix E - Pollution Prevention Photographic Log

CLIENT: Invista **PHOTOGRAPH #:** 3 **COMMENT:** Chemical transfers were carried out in contained zones with drains leading to containment sumps.	

CLIENT: Invista **PHOTOGRAPH #:** 4 **COMMENT:** Containment for drum storage.	

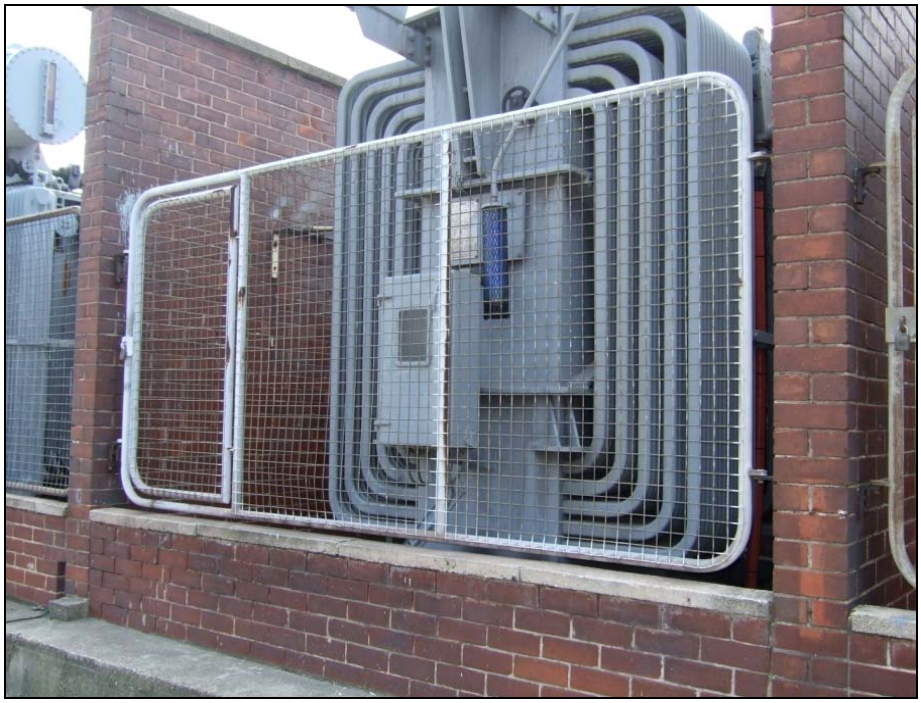
Appendix E - Pollution Prevention Photographic Log

CLIENT: Invista **PHOTOGRAPH #:** 5 **COMMENT:** Containment for IBC – note plug in discharge line.	

CLIENT: Invista **PHOTOGRAPH #:** 6 **COMMENT:** Water treatment chemicals were stored in double skinned containers as shown.	

Appendix E - Pollution Prevention Photographic Log

CLIENT: Invista **PHOTOGRAPH #:** 7 **COMMENT:** Water treatment chemicals stored in double skinned containers.	

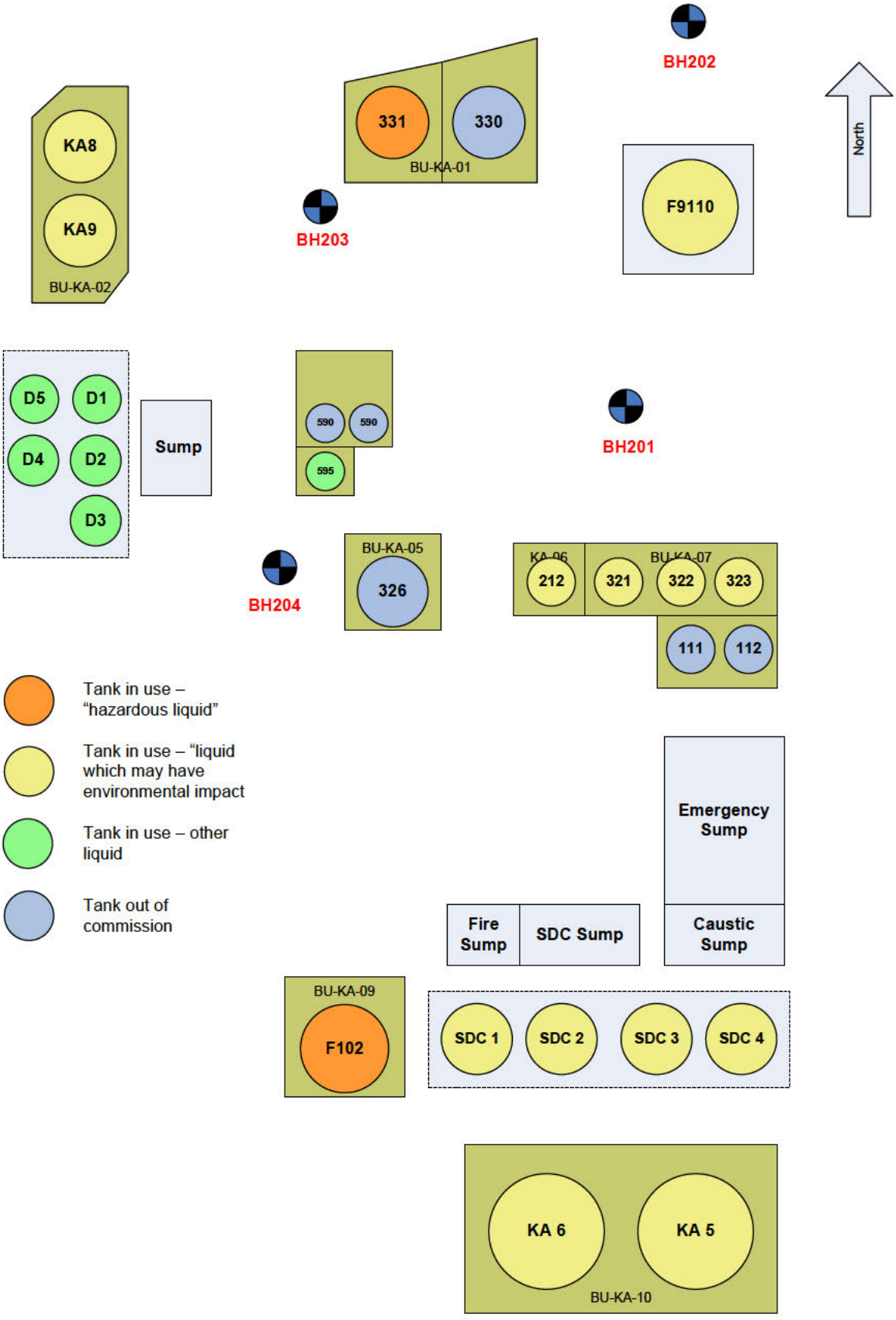
CLIENT: Invista **PHOTOGRAPH #:** 8 **COMMENT:** Transformers located in secure bunded compound	

Appendix F

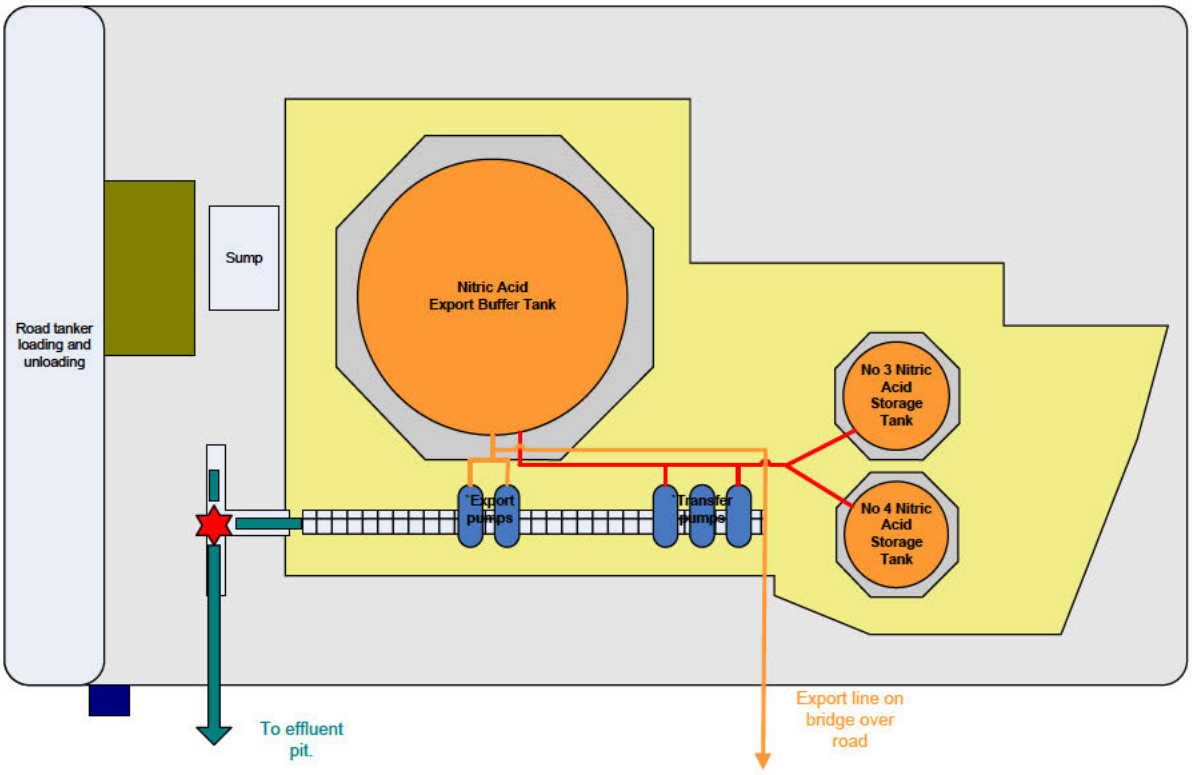
Plans of storage facilities

Plans of Storage Facilities

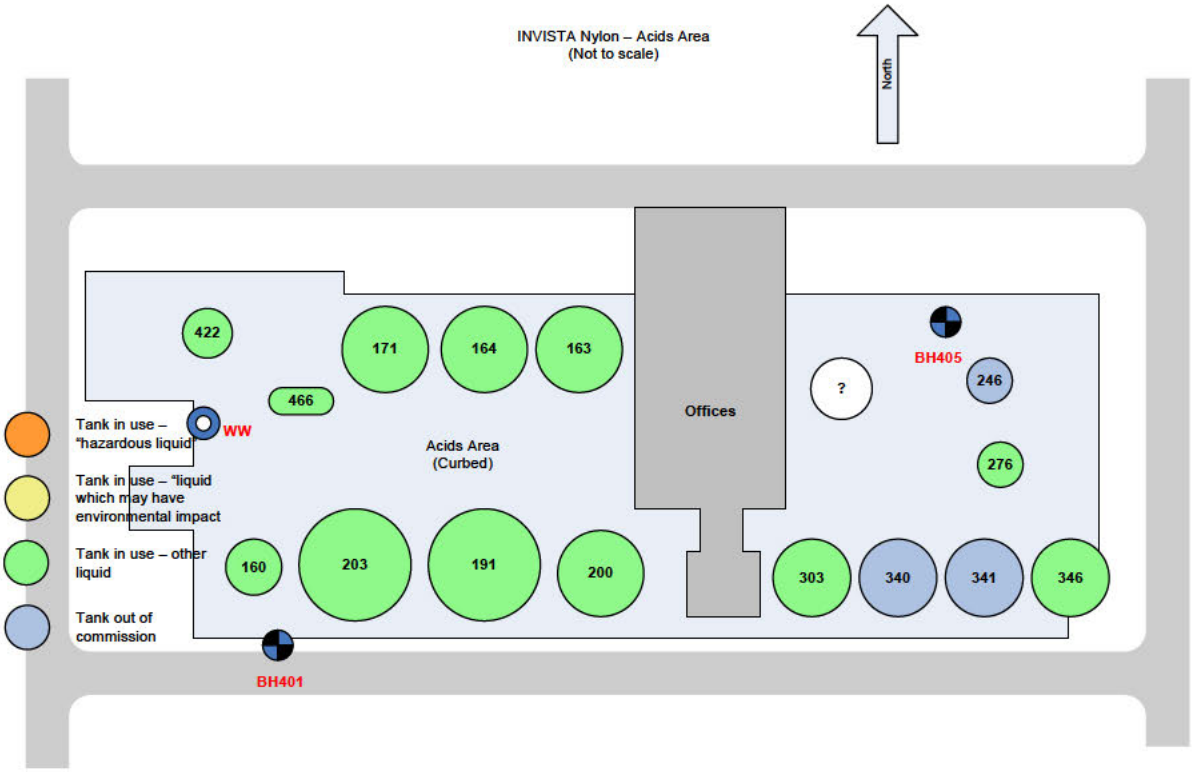
Zone 1 -
KA



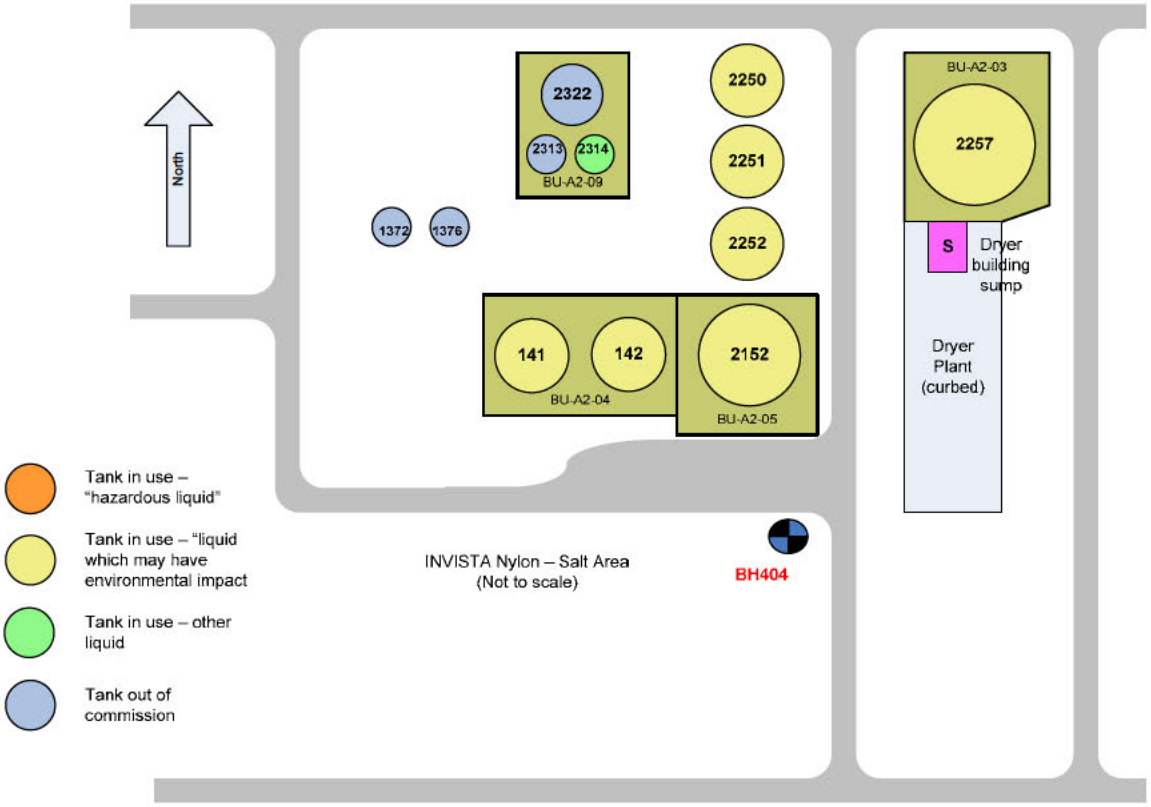
Zone 3 – Nitric Acid



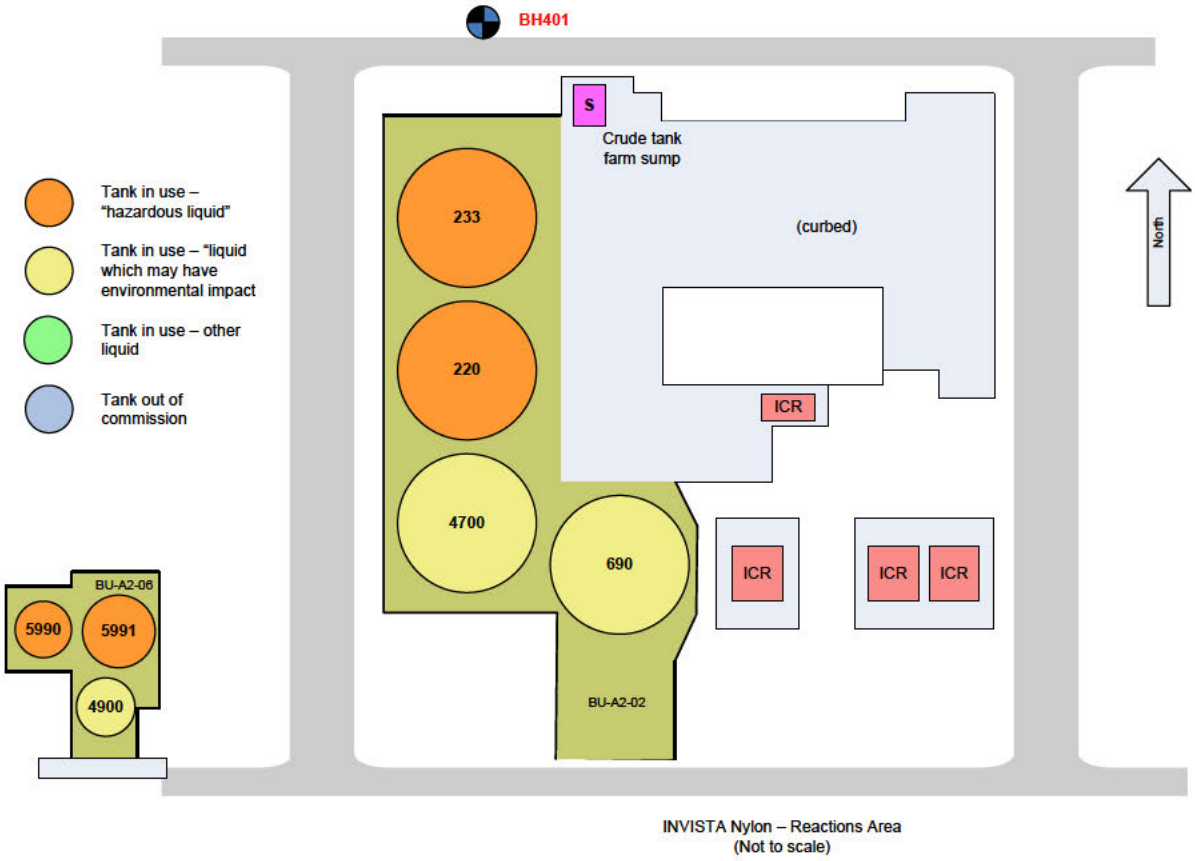
Zone 5 – Acids



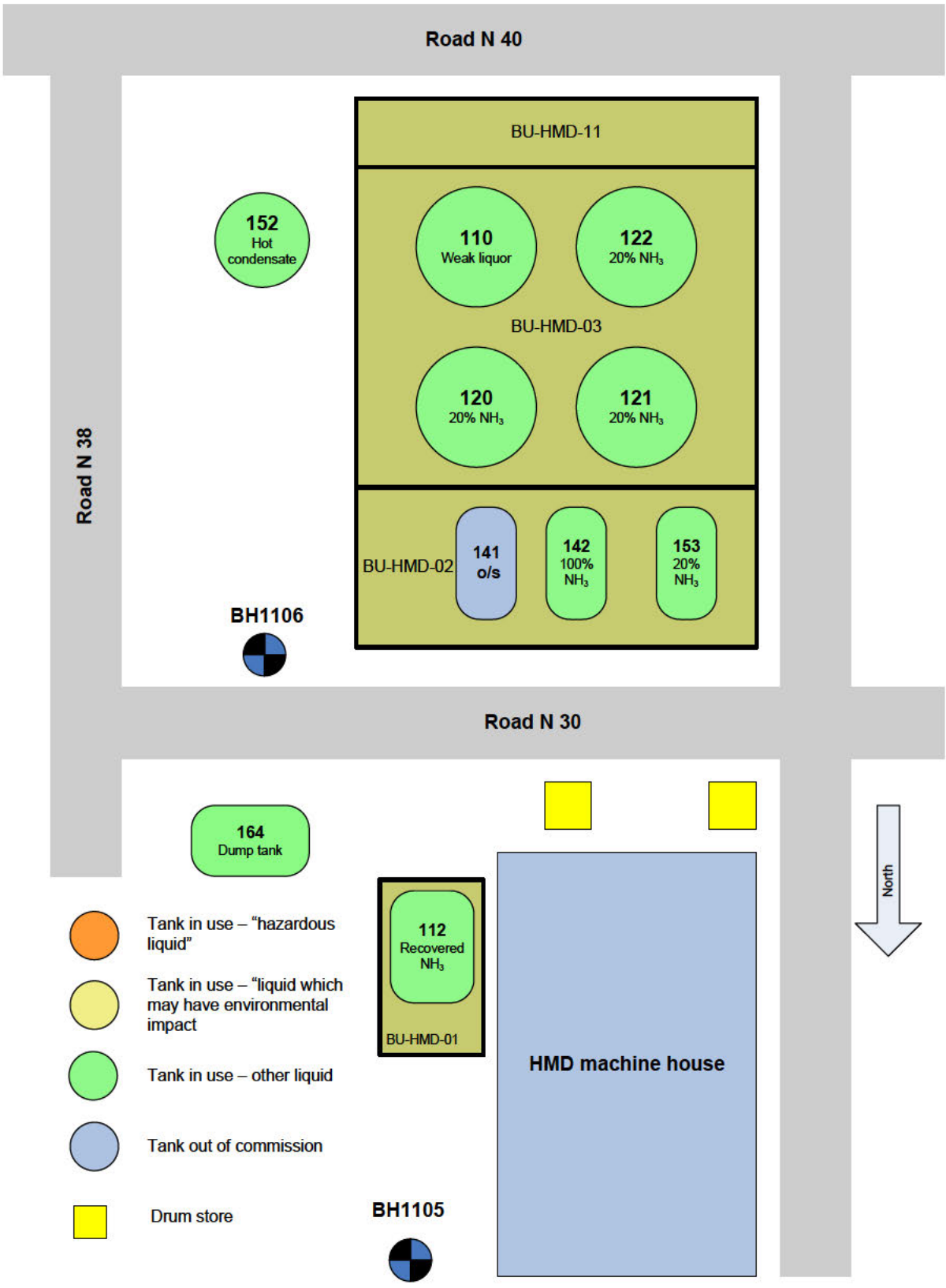
Zone 5 – Salt Plant



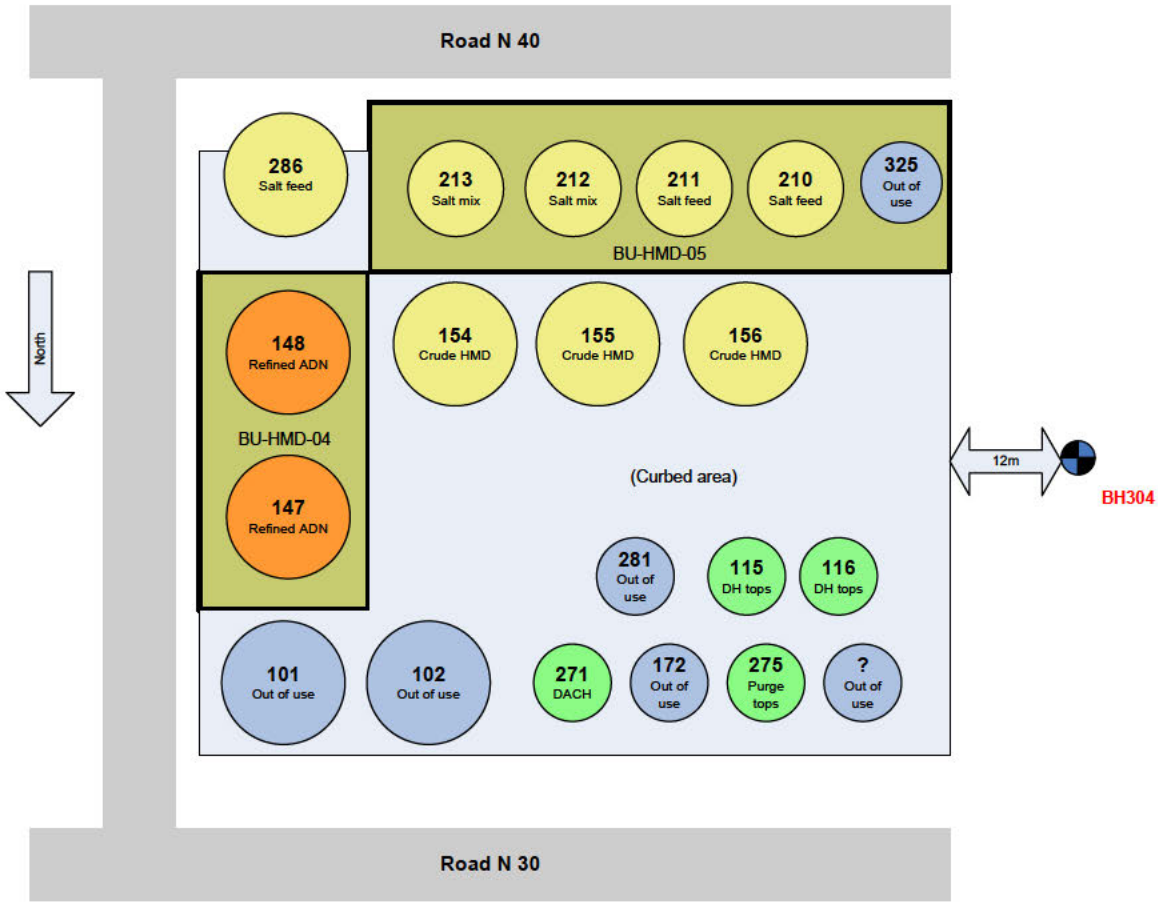
Zone 5 – Storage



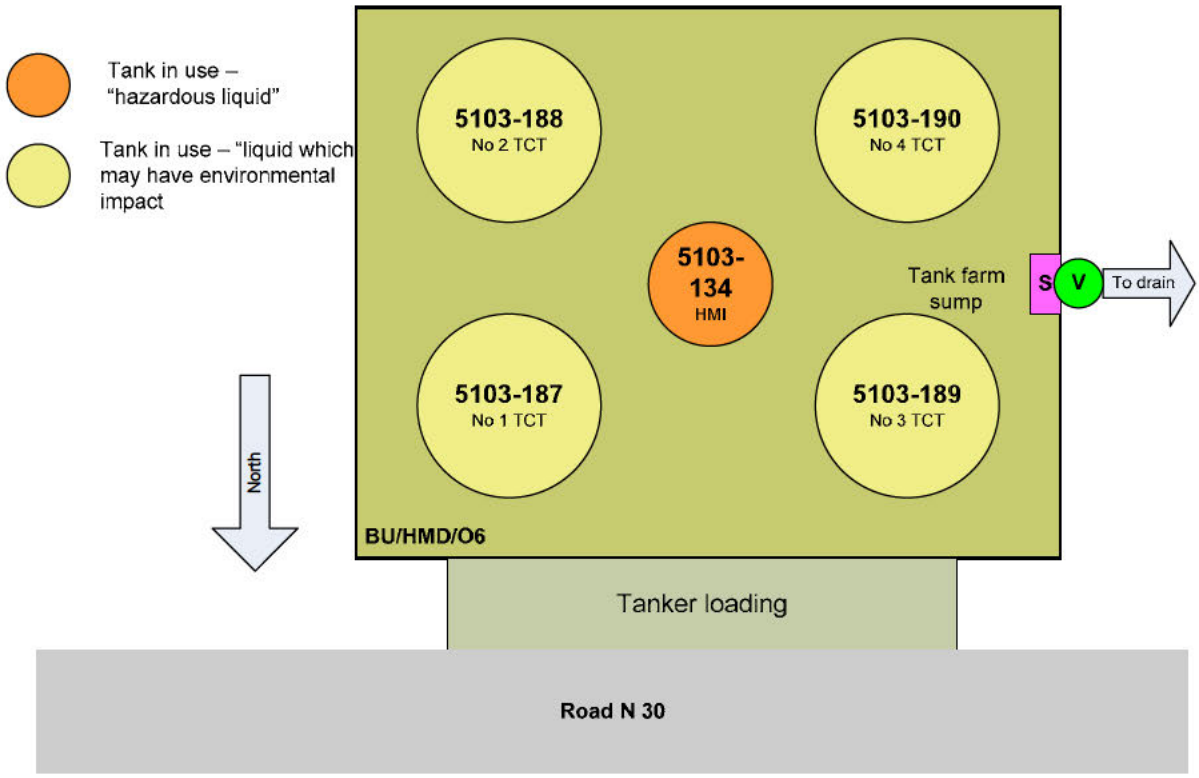
Zone 6 - HMD (East)



Zone 6 – HMD (West) – not to scale



Zone 6 – TCT storage – not to scale



Appendix G

Site closure plan

Closure Plan to achieve surrender of the Environmental Permit

Introduction

INVISTA Textiles (U.K.) Ltd provide the following Site Closure Plan (SCP) as required by sections 2.11.1 of Permit BM2063 namely:
"The Operator shall maintain and operate the Permitted Installation so as to prevent or minimise any pollution risk, including the generation of waste, on closure and decommissioning in particular by:-
2.11.1.1 attention to the design of new plant or equipment;
2.11.1.2 the maintenance of a record of any events which have, or might have, impacted on the condition of the site along with any further investigation or remediation work carried out; and
2.11.1.3 the maintenance of a site closure plan to demonstrate that the installation can be decommissioned avoiding any pollution risk and returning the site of operation to a satisfactory state."

This SCP follows these requirements and details how the Site will be decommissioned to return it to a satisfactory state on the cessation of activity on the Site. Relevant EA guidance [1,2,3] has been consulted in compiling this closure plan.

The following issues have been addressed as part of the plan:

- Criteria for successful decommissioning
- Continuation of EHS practices necessary to ensure compliance with the permit until surrendered
- Programme of activities including decontamination of equipment and facilities
- Permit surrender – H5 Surrender report

Objectives and criteria for successful decommissioning

Following permanent cessation of activities on all, or part, of the site for a period of six months or greater, INVISTA will decommission and render safe all, or part of the site as required. The company will submit all tests and investigations as necessary to confirm to the EA that there is no continuing risk to the environment.
The criteria that will determine the successful implementation of this plan will include:

- adequate planning for cessation of activities;
- adequate manpower and financial resources to execute the SCP; and
- adequate aftercare of the facility prior to determining its long-term future if necessary.

In the event that continued operation of part or all of the INVISTA manufacturing process at Wilton is no longer practicable, the company will activate this SCP to ensure that the site and facilities are rendered safe and pose no threat to the environment.
This plan encompasses a number of areas:

- Activities necessary to maintain compliance
- Manufacturing equipment and facilities

- Utilities equipment and facilities
- Wastewater system and interface with SembCorp Utilities Limited (SembCorp), the Wilton site management company, and Northumbrian Water Limited (NWL), the water water treatment plant operator
- Laboratory equipment and facilities
- Buildings

Continued Compliance with Permit conditions

Compliance with the requirements of the Environmental Permit must be demonstrated and assured until the Environment Agency has accepted the surrender of the Permit.

Monitoring

Monitoring of emissions to atmosphere will continue as long as the individual units continue to operate.

- **N1A** and **N1B** (NO_X analysers on nitric acid plants)
  P21 will be supported to allow times of nitric acid plant start-ups and the bringing on line of abatement systems to be reported.
- **P2**. (All analysers on the stack of Thermex heaters N^{os} 3 and 4)
  The Cemview package use for data processing will be supported.
- **S2**. (All analysers on COGA)
  IP 21 will be supported to allow COGA data to be accessed. In addition IP21 will be maintained for COGA, AA, HMD and KA to allow times of venting to local stacks (**N3**, **S3** and **S4**) to be determined.

Monitoring of emissions to water will continue until the Environment Agency has accepted the surrender of the Permit.

- **W1**, **W4** and **WALE. (**Flow meters, TOC, pH and other analysers and auto-samplers)
  IP21 will be supported to allow on line data to be accessed for reporting to the Environment Agency.
- Daily composite samples will continue to be taken and analysed for current analytical suites. It may be possible, if the contract with NWL is terminated before the surrender of the Permit is accepted, to cease monitoring of the discharge from **WALE** before **W1** and **W4**.

All sump monitors and alarms (level, Cu, TOC, pH and conductivity) must be maintained until the Environment Agency has accepted the surrender of the Permit.

Reporting

Routine reports will be required, these will include:

- The Environment Agency half yearly report to end of June 2009 (forms A1, S1 and CA1).
- The return to DEFRA for N_2O and NO_X for 2008.

Programme of Activities

Plant Process Shutdown of Manufacturing Equipment and Facilities

There is a general presumption that process plant and associated facilities, including storage tanks, cooling towers, utilities and power equipment, sumps, drains and waste water treatment plant, laboratory equipment and waste management facilities will be left in a satisfactory condition with no risk of pollution of the environment.
Risk assessments will be undertaken to determine the risks and risk control measures necessary to safely carry out the work necessary to return the plant and facilities to a satisfactory condition. Existing procedures and checklists will be used where possible to facilitate the risk assessment process.
Areas to be addressed will include:

- processes
- utilities
- equipment
- underground installations
- energy sources
- availability of waste treatment systems to handle additional levels of waste
- decontamination requirements and facilities e.g. wash bays etc.
- hazards from cutting and transportation
- potential contamination of concrete, soil and groundwater

Preparation for shutdown

The process shutdown will be planned to reduce chemical inventories to a minimum as far as possible. Specific consideration will be taken of hazardous materials such as cyclohexane, nitric acid, ammonia, methanol, copper nitrate and Thermex. Careful consideration will be taken of the sequencing of shut down to minimise the volume of residual materials.

The shutdown process will be carried out in a structured manner and all activities will be documented. Documentation will include marked up piping and instrumentation drawings (P&IDs) and, where appropriate, photographs showing the condition of lines, vessels and other process plant. Documentation may also include the results of sampling, previous reports from maintenance and inspection and the results of the Process Hazards Analysis (PHA) or risk assessments.
Detailed shutdown procedures and risk management control measures will be determined. Issues of potential environmental concern to be considered might include:

- Loose Lead-Based Paint.
- Mercury-Containing Devices (e.g., mercury switches, thermostats, thermometers, etc.).
- Batteries (e.g., lead-acid, nickel-cadmium, etc.).
- Potential Polychlorinated Biphenyl (PCB) Light Ballasts, transformers, capacitors, etc.
- Fluorescent Light Bulbs.
- Mercury Vapor Light Fixtures.

- Equipment which may contain ozone depleting substances (e.g., air conditioning units, refrigerators, water coolers, etc.).
- Oil-Containing Building Equipment (e.g., dock levellers, motors, fans, cranes, elevator pistons, etc.).
- Oil filled electrical equipment.
- Radioactive Elements (e.g., associated with emergency lighting, smoke alarms, level detectors etc.).
- Electrical Circuit Boards (may contain lead solder or other hazardous metals).
- Fire Extinguishers and Chemical Fire Suppression Systems.
- Debris/liquid in Pits, Sumps, Floor Drains, Trenches, and tank/line bottoms.
- Tanks and vessels
- Drum/Waste Storage Areas.
- Chemical Storage Areas.
- Specialty Gas Storage Areas,
- Areas of known historic spills or unknown floor staining.

Equipment cleaning

All manufacturing equipment will be emptied and cleaned of process / production materials. Appropriate cleaning procedures will be used to ensure that no residual product or process materials remain in the equipment that are likely to pose a threat to both personnel and the environment. Preferred methods of disposal and treatment for any residue will form part of the risk assessment process.

All storage tanks will be checked to ensure that they are clean. Storage tank bunds will be washed and inspected to ensure that there are no residual materials present. When all vessels within a bunded or kerbed area have been decontaminated, and the bund cleaned, necessary actions will be taken to ensure the facility is left in a safe condition and to avoid accumulation of rainwater.

Radioactive sources

All radioactive sources will be removed and stored or disposed of in accordance with regulatory requirements and under the guidance of the INVISTA Radiation Protection Adviser.

Materials Removal

The generic process used for the shutdown of each aspect of the site will be to de-burden, and dispose of the resulting materials and document the results. Materials will be processed where possible, where this is not possible attempts will be made to transfer these materials to other INVISTA sites or return them to their original suppliers. Disposal of such materials as waste will be used as a last resort. Wastes will be dealt with in accordance with all regulatory requirements, fully characterised and will only be sent to appropriately licensed facilities. .All work will be carried out using standard INVISTA safe work processes and documentation. Particular care will be

taken to avoid losses of containment during de-burdening, decontamination and waste disposal operations.

Discussions will be held with NWL to review the implications of varying effluent loads and component ratios on the Bran Sands waste water treatment plant during the decommissioning period. Regular performance reviews will be carried out with NWL during this period. While discharges to the C drain are not expected similar discussions will be held with Sembcorp Ltd.

Data retention, both paper and electronic, will be reviewed to ensure continued compliance with the regulatory requirements for duty of care documentation.

Utilities Equipment and Facilities

It may be necessary to maintain most of the utilities systems in operation until all of the remaining systems have been decommissioned. The utilities systems on site include:

- Compressed air system
- Steam system
- Electricity distribution and supply
- Chillers and air conditioning systems
- H&V systems
- Cooling towers
- Fire detection, firewater and fire suppression systems
- Water Supply for process and potable water.
- Communication systems e.g. radios and phone network

Compressed Air and Steam system

It is likely that the air and steam systems will be needed to allow continued operation and controlled shutdown of the plant. The phased shutdown of the systems will be determined in the risk assessment process which will determine when and how the system might be de-energised and left in a safe condition, or if there are parts of the system which will need to remain “live” in order to support ongoing activity.

Consideration will also be given to the need to drain the systems of water to prevent corrosion and frost damage. The provision of trace heating or alternative measures to ensure frost protection is effective will also be determined should the system need to remain live.

Electricity Distribution and Supply

If applicable, electrical equipment will be shutdown and stored as per the equipment manufacturers instructions. Electrical circuits that need to be made redundant to comply with regulatory requirements, will be isolated and effectively disconnected from the system. Consideration will be given to doing this from the SembCorp 11kV feeders & associated pilot cables however, any sump / drain pumps and any associated control / instrumentation likely to be required to maintain any future activity will be accounted for. Other equipment which will need to be considered and for which removal or maintenance plans may be required include:

- Batteries inside instrumentation, DCS, HIMA, UPS, Toxic & Fire alarm & detection systems, emergency lighting, switching systems, etc
- E & I Mercury switches - in older generation control panels
- Lighting especially outside – Phosphorus, mercury vapour, etc.
- HV Transformers – do not contain PCBs but may need oil draining
- Instrumentation - older generation, Pneumerstats or capillary tubes may have oil inside or contain process fluids
- Lifts should be restored to resting position and not suspended

Chillers, Air Conditioning Equipment and H&V

All ODS containing equipment should be identified and provisions made for proper evacuation, recovery and disposition of any refrigerants. Licensed contractors will be employed for this activity in accordance with regulatory requirements . If necessary, H&V cooling coils will be drained of water and ducts cleaned to remove possible fuel source. Measures will be taken to close off openings to prevent ingress of birds and vermin if necessary.

Cooling Towers

Measures that will be considered in shut down of cooling towers include:

- disposal of water treatment chemicals and decontamination of water treatment lines;
- the condition of the packing within the tower and possible pollution and fire risk;
- the removal of sludge from the cooling tower pond; and
- control of rainwater accumulation in sumps and ponds.

Notification will be made to the local authority when cooling towers have been decommissioned and brought to a satisfactory state.

Fire Detection, Fire Water and Fire Suppression Systems

It is envisaged that the fire detection and alarm systems will remain operational throughout the decommissioning period and until combustible materials have been removed from the site. Consideration will be given to continued operation of the systems where combustible materials may still remain. Plans for shutdown of the system will be determined by the risk assessment process.

Advice will be taken from fire protection experts and the fire authorities on the appropriate level of cover which will need to remain in place should the plant structures remain standing. This will include provision of frost protection if necessary. Collaboration with SembCorp will be required to consider the operation of the fire water system which is connected to the Wilton Site fire main

Water Supply for Process and Potable Water.

Risk control measures for the water supply system will be addressed once it has been determined that a water supply to a particular plant area or building is no longer necessary. Such measures may include isolating and draining the system to prevent legionella build up and frost damage. Discussion on isolation of the system from the Wilton Site distribution system will be done in consultation with SembCorp. Where it is deemed necessary that a continued water supply is essential for future activity and maintenance, or where it is not possible to isolate the system, a suitable management plan will be put in place.

Communication Systems

All communication systems will be maintained in support of decommissioning activities and for emergency response as required. The decommissioning reuse or disposal of the equipment itself and the surrender of any associated licences will be in accordance with regulatory requirements.

Waste Water Systems

All necessary controls and monitoring facilities will be retained and remain operational throughout the decommissioning period in order to maintain compliance with the permit requirements until the permit is surrendered.

The emptying of all storm water drains and drains and sumps for process wastewater will form part of the risk assessment process. The need for cleaning these to remove potentially polluting residues will be reviewed. Options such as sealing, or filling in these drains and any effluent pipes after cleaning will also be considered where appropriate. All materials generated from this work will be collected, analyzed as necessary and disposed of properly. The status of all drains, sumps, and pits, will be documented on the plans of the drains and underground piping.

Waste water treatment at NWL and effluent discharge to SembCorp will continue throughout the decommissioning and clean-up process. Once certain processes are shutdown the composition of the wastewater will shift and provisions will be made for neutralization and treatment. This will be discussed and agreed in advance with NWL and Sembcorp.

A strategy to deal with future storm water from the site post-closure will also be developed.

Laboratory Facilities and Equipment

Laboratory operations required for the ongoing monitoring in support of the permit will be maintained or arrangements will be made to have the necessary analysis for this or for waste characterisation carried out by an alternative service provider.
All laboratory instrumentation shall be sold, sent to another INVISTA plant for further use or disposed of according to any regulatory requirements. . Laboratory reagents (both hazardous and non-hazardous) that cannot be reused elsewhere, or returned to the supplier, will be disposed of in accordance with waste regulatory requirements..

Buildings

All buildings will either be left intact and secure, or totally, or partially, dismantled or demolished, depending on their condition or potential for future use. Following decommissioning of the facilities, all buildings that are not to be demolished will be secured to prevent unauthorised entry. A security program will be implemented to ensure that buildings remaining are regularly checked for unauthorized access.

A maintenance program will be put in place to ensure that remaining buildings do not decay or present an unacceptable nuisance in the area.

Asbestos

The site asbestos register will be reviewed to ensure it is up to date, recording the position and condition of the asbestos. Where necessary, asbestos in poor, or unstable condition, will be removed and disposed off in accordance with regulatory requirements.

If it is decided to leave in place that asbestos, which is secure and in good condition, then INVISTA will put in place a suitable inspection and maintenance plan to ensure integrity of the materials. This plan will include procedures for access; responsibilities for inspection and repairs; responsibilities for removal and disposal; updates to the asbestos register and issuance of any necessary reports required to keep records up to date.

All documents relating to asbestos will be retained and made available for any ongoing maintenance activity and any future demolition work.

Site Security

Following cessation of on site activities, the site will be secured against unauthorised entry. Roadways will be retained to enable movement by security or other site visitors. Actions will be undertaken to ensure that the site does not present an unacceptable nuisance in the area.
A security program will be implemented to ensure that the site is regularly patrolled and checked for unauthorised access.

Dismantling and Demolition

In the event that any dismantling and/or demolition work will be carried out, INVISTA will make all notifications necessary under the Construction Design and Management regulations.
Work will be carried out according to INVISTA safe work standards and the Wilton Site procedures including WSP 1406 – The Management of Demolition and Dismantling.
Prior to any demolition consideration will be given to the following:

- Provision of spill kits
- Provision of the site drainage plan to the contractors and posting around the site at key locations e.g. beneath spill kit lids
- Prevention of discharges to the surface water and site drainage systems. Particular reference will be made to the guidance given in IPPC Reference Document on Best Available Techniques in the Large Volume Organic Chemical Industry published by the European Commission.
- A Noise Management Plan will be formulated in order to ensure that noise levels arising from site decommissioning/ demolition works are minimised as far as practicable. Noise and vibration will be taken into account when considering best available working methods and selection of plant appropriate for the required works.
- A Dust Management Plan will be formulated in order to address any potential issues and establish mitigation measures, to include:
    - damping down on-site during periods of dry weather;
    - use of covered wagons and skips for transportation of materials to and from the site, which have the potential to cause dust or be deposited on public highways; and
    - wheel washing of all construction vehicles leaving the site and accessing the public highway, where necessary.

Surrender of the Permit

A Site Condition Report will be prepared to demonstrate that soil and groundwater below the site is not a pollution risk and is in a satisfactory state, taking into account the state of the site before the Environmental Permit was issued.
The Site Condition Report will contain:

a) A synopsis of the original condition reports which were prepared in 2002.
b) Records of the design, construction, inspection, monitoring and failure of pollution prevention measures including bunds, curbs, hardstands and drains.
c) A summary of any pollution incidents which have may have damaged land and /or groundwater and the results of any investigation and resulting remedial works
d) Results of any soil and water quality monitoring
e) A description of the decommissioning process and a demonstration that all sources of pollution have been removed.

f) A demonstration that the decommissioning process has not resulted in contamination of soil and groundwater.

g) The results, if deemed necessary, of any site investigations carried out to provide reference data in support of the Site Condition Report.

The Condition Report will be submitted using the template in the Environment Agency's H5 Guidance Document.

Surrender of the permit will also be in accordance with the DEFRA Regulatory Guidance Series No. EPR 9 – Demonstrating land and groundwater are protected to assist the surrender of an environmental permit.

References

1. Section 2.11 of the IPPC Guidance Note (IPPC S4.02, 2003)
2. EA – "How to comply with your environmental permit – Getting the Basics Right"
3. H5 – SCR Guide for Applicants v2

Appendix H

Acids Area - equipment list and decontamination tracker

EQUIPMENT DETAILS

Plant Area	Equipment Number (Per P&ID)	Item Name	P&ID	Scope Reviewed and in SAP	Equipment Inspections Complete	Instrumentation & Electrical Items Decommissioned	Rotating Equipment Decommissioned & Decontaminated	Decontamination Documentation Complete & Filed
Absorption	5031-080	Off Gas Cooler	W1605754					
Absorption	5031-081	Off Gas Cooler Circulation Pump No.1	W1605754					
Absorption	5031-082	Off Gas Cooler Circulation Pump No.2	W1605754					
Absorption	5031-083	Off Gas Cooler Acid Cooler	W1605754					
Absorption	5031-084	Off Gas Heater	W1605755					
Absorption	5031-090	Off Gas Compressor	W1605760/5					
Absorption	5031-091	Off Gas Compressor Lubrication System	W1605755					
Absorption	5031-095	Off Gas Recovery Heat Exchanger	W1605767					
Absorption	5031-096	Anti Surge Kickback Cooler	W1605756					
Absorption	5031-503	Cooler Condenser	W1605758					
Absorption	5031-505	Cooler Condenser Circulation Pump No.1	W1605758					
Absorption	5031-511	Cooler Condenser Recirculation Cooler	W1605758					
Absorption	5031-513	Off Gas Absorption Column	W1605759					
Absorption	5031-514	Lye Down Shoot	W1605761					
Absorption	5031-515	Off Gas Stack	W1605761					
Absorption	5031-516	Stack Air Extraction Fan	W1605762					
Absorption	5031-524	Nitric Acid Circulation Pump No.2	W1605763					
Absorption	5031-525	Nitric Acid Transfer Pump No.1	W1605763					
Absorption	5031-526	Nitric Acid Transfer Pump No.2	W1605763					
Absorption	5031-527	Off Gas Cooler Transfer Pump No.1	W1605764					
Absorption	5031-528	Off Gas Cooler Transfer Pump No.2	W1605764					
Absorption	5031-531	Absorber Support Pump No.1	W1605765					
Absorption	5031-532	Absorber Support Pump No.2	W1605765					
Absorption	5031-601	Cool ing Water Booster Pump No.1	W1605760					
Absorption	5031-602	Cool ing Water Booster Pump No.2	W1605760					
Absorption	5031-606	Cold Ol Water Booster Pump No.1	W1605759					
Absorption	5031-607	Cold Ol Water Booster Pump No.2	W1605759					
Reaction	5031-011	No.1 Off Gas Scrubber	W1605753					
Reaction	5031-121	No.1 Digester Feed Pump	W1605739					
Reaction	5031-122	No.2 Digester Feed Pump	W1605739					
Reaction	5031-124	No.1 Gensag Air Blower	W1605738					
Reaction	5031-127	No.2 Gensag Air Blower	W1605738					
Reaction	5031-128	Air Blower Stack	W1605738					
Reaction	5031-220	Recycled Acid Storage Tank	W1605735					
Reaction	5031-222	Recycled Acid Storage Tank Recirculation Pump	W1605785					
Reaction	5031-223	Purge Feed Pump	W1605785					
Reaction	5031-233	Blended Ac id Storage Tank	W1605786					
Reaction	5031-486	No.4 ICR Ol Water Recirculation Pump	W1605743					
Reaction	5031-487	No.3 ICR Cooling Water Recirculation Pump	W1605741					
Reaction	5031-488	No.4 ICR Cooling Water Recirculation Pump	W1605742					
Reaction	5031-489	No.5 ICR Cooling Water Recirculation Pump	W1605742					
Reaction	5031-490	No.6 ICR Cooling Water Recirculation Pump	W1605742					
Reaction	5031-701	No.1 Off Gas Scrubber	W1605733					
Reaction	5031-705	No.1 ICR Product Pump	W1605736					
Reaction	5031-711	No.3 ICR	W1605737					
Reaction	5031-712	No.4 ICR	W1605738					
Reaction	5031-713	No.2 ICR Product Pump	W1605738					
Reaction	5031-715	No.3 ICR Product Pump	W1605739					
Reaction	5031-720	No.1 Blended Acid Feed Pump	W1605731					
Reaction	5031-721	No.2 Blended Acid Feed Pump	W1605731					
Reaction	5031-723	No.2 ICR Ol Water Head Tank	W1605741					
Reaction	5031-724	No.3 ICR Ol Water Cooler	W1605741					
Reaction	5031-725	No.4 ICR	W1605740					
Reaction	5031-730	No.5 ICR Product Pump	W1605736					
Reaction	5031-740	Product Hold-Up Vessel	W1605736					
Reaction	5031-800	Digester Column	W1605736					
Reaction	5031-801	No.1 Digester Column Tails Pump	W1605736					
Reaction	5031-802	No.2 Digester Column Tails Pump	W1605736					
Reaction	5031-807	NACS Pre-Heater	W1605737					
Reaction	5031-808	Steam Desuperheater	W1605735					
Reaction	5031-509	Knot Drum	W1605735					
NACS	5031-4000	No.1 NACS Column	W1531223					
NACS	5031-4005	No.2 NACS Vapour Line	W1531223					
NACS	5031-4502	No.3 NACS Calandria	W1531222					
NACS	5031-4503	No.4 NACS Condensate Receiver	W1531223					
NACS	5031-4100	No.2 NACS Column	W1531223					
NACS	5031-4110	No.3 NACS Vapour Line	W1531224					
NACS	5031-4111	No.4 NACS No.1 Tail Pump	W1531224					
NACS	5031-4113	No.4 NACS No.2 Tail Pump	W1531225					
NACS	5031-4120	Interal Calandria Condensate Receiver No.1 Pump	W1531223					
NACS	5031-4121	Interal Calandria Condensate Receiver No.2 Pump	W1531223					
NACS	5031-4122	No.1 NACS Condenser	W1531226					
NACS	5031-4142	No.4 NACS Interal Calandria	W1531223					
NACS	5031-4151	No.5 NACS Interal Calandria Cond. Receiver	W1531224					
NACS	5031-4161	No.6 NACS 1st Stage Ejector Condensor	W1531228					
NACS	5031-4162	No.6 NACS 2nd Stage Ejector Condensor	W1531229					
NACS	5031-4251	No.6 NACS Condensate No.1 Pump	W1531226					
NACS	5031-4215	No.6 NACS Condensate No.2 Pump	W1531226					
NACS	5031-4241	Vent Condenser	W1531222					
NACS	5031-4242	Warsh Liquor Heater	W1531224					
NACS	5031-4250	Warsh Liquor Heater	W1531224					
NACS	5031-5700	NACS Tank Tank	W1531227					
NACS	5031-4711	NACS Tank Tank No.1 Transfer Pump	W1531227					
NACS	5031-4712	NACS Tank Tank No.2 Transfer Pump	W1531227					
EDGA	5031-7000	Primary Air Filter	W1535554					
EDGA	5031-7010	Primary Air Fan	W1535554					
EDGA	5031-7025	Burner	W1531556					
EDGA	5031-7030	Abatement unit	W1531556					
EDGA	5031-7035	Flue Gas Recycle Fan	W1531556					
EDGA	5031-7040	Heating Air Fan	W1531556					
EDGA	5031-7045	Heating Air Fan-H Fan	W1531556					
EDGA	5031-7050	Stack	W1531556					
EDGA	5031-7055	No.1 Boiler Feed Water Pump	W1533330					
EDGA	5031-7060	No.2 Boiler Feed Water Pump	W1533330					
EDGA	5031-7065	Blow Down Vessel	W1533332					
EDGA	5031-5075	Steam Drum	W1533332					
EDGA	5031-7080	No.1 Steam Drum Circulation Pump	W1533333					
EDGA	5031-7085	No.2 Steam Drum Circulation Pump	W1533333					
EDGA	5031-7090	Economiser	W1533333					
EDGA	5031-7095	Steam Generator	W1533333					
EDGA	5031-7100	Steam Sample Cooler	W1533332					
EDGA	5031-7135	Exhaust Stack	W1533333					
EDGA	5031-7120	Flash Vessel	W1533332					
EDGA	5031-7125	Generator Sample Cooler	W1533330					
EDGA	5031-7130	Economiser Sample Cooler	W1533333					
EDGA	5031-7140	Steam Drum Sample Cooler	W1533332					
EDGA	5031-7145	NACO Dosing Pump No.1	W1533330					
EDGA	5031-7150	NACO Dosing Pump No.2	W1533330					
EDGA	5031-7155	NACO Dosing Pump No.3	W1533330					
EDGA	5031-7160	NACO Dosing Pump No.4	W1533330					
EDGA	5031-7170	EDGA Boiler Feed Water Pot Heater	W1533330					
EDGA	5031-7080	Anti-Deflector Fan	W1533556					
Crudle	5031-4855	No.1 Crude Thickener	W1535775					
Crudle	5031-4904	No.1 Crude Centrifuge	W1535772					
Crudle	5031-4917	No.1 Crude Dissolver	W1535775					
Crudle	5031-4919	No.1 Crude Dissolver Pump	W1535775					
Crudle	5031-4920	No.1 Crude Dissolver Heater	W1535775					
Crudle	5031-4971	No.2 Crude Thickener	W1535776					
Crudle	5031-4976	No.2 Crude Centrifuge	W1535773					
Crudle	5031-4977	No.2 Crude Dissolver	W1535776					
Crudle	5031-4979	No.2 Crude Dissolver Pump	W1535776					
Crudle	5031-4811	No.2 Crude Dissolver Heater	W1535776					
Crudle	5031-4891	No.3 Crude Thickener	W1535771					
Crudle	5031-4896	No.3 Crude Centrifuge	W1535774					
Crudle	5031-4897	No.3 Crude Dissolver	W1535777					
Crudle	5031-4899	No.3 Crude Dissolver Pump	W1535777					
Crudle	5031-4811	No.3 Crude Dissolver Heater	W1535777					
Crudle	5031-5011	Crude Filtrate Receiver	W1535778					
Crudle	5031-5016	No.1 Crude Filtrate Recivver Pump	W1535778					
Crudle	5031-5017	No.2 Crude Filtrate Recivver Pump	W1535778					
Crudle	5031-4918	Crude Filtrate Recivver Heater	W1535778					
Crudle	5031-5031	Crude Wash Liquor Receiver	W1535779					
Crudle	5031-5036	No.1 Crude Wash Liquor Receiver Pump	W1535779					
Crudle	5031-5037	No.2 Crude Wash Liquor Receiver Pump	W1535779					
Crudle	5031-5038	Crude Wash Liquor Recivver Heater	W1535779					
Crudle	5031-5003	Crude Process Recovery Tank	W1535756					
Crudle	5031-4911	Crude Process Recovery Tank Pump	W1535758					
Crudle	5031-4857	No.1 Crude Vent Header Blower	W1535780					
Crudle	5031-4908	No.2 Crude Vent Header Blower	W1535781					
Crudle	5031-4964	Centrifugate Seal Flush Water Tank	W1535731					
Crudle	5031-4913	Crude Crystalizer	W1535730					
Crudle	5031-4914	Crude Crystalizer	W1535731					
Crudle	5031-5965	Crude Crystalizer 1st Stage Ejector	W1535733					
Crudle	5031-5965	Crude Crystalizer 1st Stage Ejector Condenser	W1535733					
Crudle	5031-5967	Crude Crystalizer 2nd Stage Ejector	W1535733					
Crudle	5031-5968	Crude Crystalizer 2nd Stage Ejector Condenser	W1535733					
Crudle	5031-5969	Crude Crystalizer 3rd Stage Ejector	W1535733					
Crudle	5031-5970	Crude Crystalizer 3rd Stage Ejector Condenser	W1535733					
Crudle	5031-5973	Crude Crystalizer Condenser	W1535732					
Crudle	5031-5975	Crude Crystalizer Condenser Receiver	W1535732					
Crudle	5031-5976	No.1 Crude Condensate Transfer Pump	W1535732					
Crudle	5031-4977	No.2 Crude Condensate Transfer Pump	W1535732					

EQUIPMENT DETAILS

Plant Area	Equipment Number (Per P&ID)	Item Name	P&ID	Scope Reviewed and in SAP	Equipment Inspections Complete	Instrumentation & Electrical Items Decommissioned	Rotating Equipment Decommissioned & Decontaminated	Decontamination Documentation Complete & Filed
Crude	5031-979	SW Steam Desuperheater	W1566953					
Crude	5031-980	Tempered Water Cooler	W1569705					
Crude	5031-981	No.1 Crude Slurry Pump	W1569701					
Crude	5031-982	No.2 Crude Slurry Pump	W1569701					
Crude	5031-983	Desintegrator	W1569703					
Crude	5031-990	Crude Atmospheric Flash Tank	W1569788					
Crude	5031-991	No.1 Crude Atmospheric Flash Tank Pump	W1569788					
Crude	5031-992	No.2 Crude Atmospheric Flash Tank Pump	W1569788					
Crude	5031-993	Crude Flash Steam Condenser	W1569789					
Crude	5031-994	Desintegrator Seal Flush Pump	W1569701					
Semi Refined	5031-109	Semi Refined Crystalliser Precooler	W1569794					
Semi Refined	5031-101	No.1 Semi Refined Crystal Jaar	W1569795					
Semi Refined	5031-101 (Agit)	No.1 Semi Refined Crystal Jaar Agitator	W1569795					
Semi Refined	5031-102	No.1 Semi Refined Crystal Jaar Condenser	W1569795					
Semi Refined	5031-103A	No.1A Semi Refined Crystal Jaar Condenser	W1569795					
Semi Refined	5031-103B	No.1B Semi Refined Crystal Jaar Ejector Condenser	W1569795					
Semi Refined	5031-104	No.2 Semi Refined Crystal Jaar	W1569796					
Semi Refined	5031-104 (Agit)	No.2 Semi Refined Crystal Jaar Agitator	W1569796					
Semi Refined	5031-105	No.2 Semi Refined Crystal Jaar Condenser	W1569796					
Semi Refined	5031-106	No.1 Semi Refined Crystalliser Ejector Seal Tank	W1569795					
Semi Refined	5031-107	No.1 Semi Refined Crystal Jaar Ejector Seal Tank	W1569795					
Semi Refined	5031-108	No.2 Semi Refined Crystal Jaar Ejector Seal Tank	W1569797					
Semi Refined	5031-109	No.2 Semi Refined Crystal Jaar Ejector Seal Tank	W1569798					
Semi Refined	5031-110A	No.2A Semi Refined Crystalliser Ejector Condenser	W1569796					
Semi Refined	5031-110B	No.2B Semi Refined Crystal Jaar Ejector Condenser	W1569796					
Semi Refined	5031-111	No.2 Semi Refined Crystal Jaar	W1569797					
Semi Refined	5031-111(Agit)	No.2 Semi Refined Crystal Jaar Agitator	W1569797					
Semi Refined	5031-112	No.2 Semi Refined Crystal Jaar Condenser	W1569797					
Semi Refined	5031-113A	No.1A Semi Refined Crystal Jaar Ejector Condenser	W1569797					
Semi Refined	5031-113B	No.1B Semi Refined Crystal Jaar Ejector Condenser	W1569797					
Semi Refined	5031-114	No.1 Semi Refined Slurry Feed Pump	W1569799					
Semi Refined	5031-115	No.2 Semi Refined Slurry Feed Pump	W1569799					
Semi Refined	5031-116	No.2 Semi Refined Crystal Jaar	W1569798					
Semi Refined	5031-116(Agit)	No.2 Semi Refined Crystal Jaar Agitator	W1569798					
Semi Refined	5031-117	No.2 Semi Refined Crystal Jaar Condenser	W1569798					
Semi Refined	5031-118A	No.2A Semi Refined Crystal Jaar Ejector Condenser	W1569798					
Semi Refined	5031-118B	No.2B Semi Refined Crystal Jaar Ejector Condenser	W1569798					
Semi Refined	5031-180	No.1 Spill Conditioners & Recycle Tank	W1569701					
Semi Refined	5031-181	No.1 Spill Conf/Recycle Tank Recirc. Pump No.2	W1569701					
Semi Refined	5031-182	No.2 Spill Conf/Recycle Tank Recirc. Pump No.2	W1569701					
Semi Refined	5031-183	No.2 Hot 2nd Mother Liquor Tank	W1569839					
Semi Refined	5031-184	No.2 Hot 2nd Mother Liquor Pump	W1569839					
Semi Refined	5031-185	No.2 2nd Mother Liquor Pump	W1569839					
Semi Refined	5031-186	2nd Mother Liquor Tank Heater	W1569839					
Semi Refined	5031-186B	2nd Mother Liquor Tank Heater Condensate Pkg	W1569839					
Semi Refined	5031-189	No.1 Semi Refined Dissolver Condensate Pkg	W1569809					
Semi Refined	5031-170	No.2 2nd Mother Liquor Pump	W1569830					
Semi Refined	5031-171	Dryer Liquor Storage Tank	W1569832					
Semi Refined	5031-172	No.1 Dryer Liquor Pump	W1569832					
Semi Refined	5031-173	No.2 Dryer Liquor Pump	W1569832					
Semi Refined	5031-174	Dryer Liquor Storage Tank Heater	W1569832					
Semi Refined	5031-175	No.2 Semi Refined Dissolver Condensate Pkg	W1569812					
Semi Refined	5031-176	No.3 Semi Refined Dissolver Condensate Pkg	W1569815					
Semi Refined	5031-177	No.4 Semi Refined Dissolver Condensate Pkg	W1569818					
Semi Refined	5031-178	No.5 Semi Refined Dissolver Condensate Pkg	W1569821					
Semi Refined	5031-181	Rework Pac Dry Hoist	W1569831					
Semi Refined	5031-185	1st Mother Liquor Circulation Pump	W1569828					
Semi Refined	5031-187	No.1 Semi Refined Slurry Thickener	W1569807					
Semi Refined	5031-188	No.2 Semi Refined Slurry Thickener	W1569810					
Semi Refined	5031-189	No.1 Semi Refined Centr Cage Drive	W1569808					
Semi Refined	5031-189A	No.1 Semi Refined Centr Cage Oil Pump	W1569808					
Semi Refined	5031-190	No.2 Semi Refined Centr Cage Drive	W1569811					
Semi Refined	5031-190A	No.2 Semi Refined Centr Cage Oil Pump	W1569811					
Semi Refined	5031-191	No.1 Semi Refined Centr Feed Pump	W1569813					
Semi Refined	5031-192	No.2 Semi Refined Centr Feed Pump	W1569814					
Semi Refined	5031-193	No.1 Semi Refined Centr Cage Drive	W1569816					
Semi Refined	5031-193A	No.1 Semi Refined Centr Cage Oil Pump	W1569816					
Semi Refined	5031-194	No.2 Semi Refined Centr Cage Drive	W1569817					
Semi Refined	5031-194A	No.2 Semi Refined Centr Cage Oil Pump	W1569817					
Semi Refined	5031-195	No.3 Semi Refined Centr Cage Drive	W1569820					
Semi Refined	5031-195A	No.3 Semi Refined Centr Cage Oil Pump	W1569820					
Semi Refined	5031-196	No.4 Semi Refined Dissolver	W1569819					
Semi Refined	5031-197	No.5 Semi Refined Dissolver	W1569822					
Semi Refined	5031-198	No.3 Semi Refined Dissolver	W1569821					
Semi Refined	5031-199	No.1 Semi Refined Dissolver Transfer Pump	W1569816					
Semi Refined	5031-200	No.2 Semi Refined Dissolver Transfer Pump	W1569818					
Semi Refined	5031-201	No.3 Semi Refined Dissolver Transfer Pump	W1569820					
Semi Refined	5031-202	No.4 Semi Refined Dissolver Heater	W1569815					
Semi Refined	5031-203	No.5 Semi Refined Dissolver Heater	W1569821					
Semi Refined	5031-204	No.3 Semi Refined Dissolver Heater	W1569821					
Semi Refined	5031-209	No.1 Semi Refined Solution Tank Heater	W1569830					
Semi Refined	5031-210	No.2 Semi Refined Solution Tank	W1569830					
Semi Refined	5031-211	No.1 Semi Refined Solution Tk Transfer Pump	W1569830					
Semi Refined	5031-212	No.2 Semi Refined Solution Tk Transfer Pump	W1569830					
Semi Refined	5031-213	No.3 Semi Refined Solution Tank Heater	W1569830					
Semi Refined	5031-222	Rework Drains Tank	W1569833					
Semi Refined	5031-223	Rework Drains Pump No.1	W1569833					
Semi Refined	5031-224	Rework Drains Pump No.2	W1569833					
Semi Refined	5031-225	2nd Mother Liquor Tank Heater	W1569830					
Semi Refined	5031-227	1st Mother Liquor Tank Heater Condensate Pkg	W1569828					
Semi Refined	5031-230	Rework Tank Solution Heater Bundle	W1569833					
Semi Refined	5031-231	Rework Tank Agitator	W1569833					
Semi Refined	5031-907	Mother Liquor Transfer Pump	W1569802					
Semi Refined	5031-977	No.1 Semi Refined Crystal Jaar Feed Pump	W1569797					
Semi Refined	5031-978	No.2 Semi Refined Crystal Jaar Feed Pump	W1569797					
Semi Refined	5031-979	Crude Solution Tank Heater	W1569787					
Semi Refined	5031-980	Crude Solution Tank	W1569787					
Semi Refined	5031-601	Deaerator Condensate Cooler	W1569791					
Semi Refined	5031-603	Condensate Head Tank	W1569791					
Semi Refined	5031-602	Deaerator Condensate Cooler Pump	W1569791					
Salt Refined	5031-2116	No.1 Salt Reactor Condenser	W1569771					
Salt Refined	5031-200	No.1 Salt Refined Crystalliser	W1569839					
Salt Refined	5031-200(Agit)	No.1 Salt Refined Crystalliser Agitator	W1569839					
Salt Refined	5031-201	No.1A Salt Refined Crystalliser Condenser	W1569839					
Salt Refined	5031-205	No.2 Salt Refined Crystalliser	W1569840					
Salt Refined	5031-205(Agit)	No.2 Salt Refined Crystalliser Agitator	W1569840					
Salt Refined	5031-207	No.2 Salt Refined Crystalliser Condenser	W1569841					
Salt Refined	5031-250	No.1A Salt Refined Crystalliser Condenser	W1569839					
Salt Refined	5031-251A	No.1A Salt Refined Crystalliser Ejector Condenser	W1569839					
Salt Refined	5031-253B	No.1B Salt Refined Crystalliser Ejector Condenser	W1569839					
Salt Refined	5031-252	No.2 Salt Refined Crystalliser	W1569841					
Salt Refined	5031-252(Agit)	No.2 Salt Refined Crystalliser Agitator	W1569841					
Salt Refined	5031-253	No.2 Salt Refined Crystalliser Condenser	W1569840					
Salt Refined	5031-254A	No.2A Salt Refined Crystalliser Ejector Condenser	W1569840					
Salt Refined	5031-254B	No.2B Salt Refined Crystalliser Ejector Condenser	W1569840					
Salt Refined	5031-256	Salt Refined Crystalliser Ejector Seal Tank	W1569840					
Salt Refined	5031-260	No.1 Salt Refined Crystalliser Feed Pump	W1569842					
Salt Refined	5031-261	No.2 Salt Refined Crystalliser Feed Pump	W1569842					
Salt Refined	5031-270	No.1 Salt Refined Centrifuge Drive	W1569838					
Salt Refined	5031-270A	No.1 Salt Refined Centrifuge Oil Pump	W1569838					
Salt Refined	5031-271	No.2 Salt Refined Centrifuge Drive	W1569839					
Salt Refined	5031-271A	No.2 Salt Refined Centrifuge Oil Pump	W1569839					
Salt Refined	5031-272	No.3 Salt Refined Centrifuge Drive	W1569840					
Salt Refined	5031-272A	No.3 Salt Refined Centrifuge Oil Pump	W1569840					
Salt Refined	5031-273	No.4 Salt Refined Centrifuge Drive	W1569841					
Salt Refined	5031-273A	No.4 Salt Refined Centrifuge Oil Pump	W1569841					
Salt Refined	5031-274	Salt Refined Cake Transfer Screw	W1569842					

EQUIPMENT DETAILS

Plant Area	Equipment Number (Per P&ID)	Item Name	P&ID	Scope Reviewed and in SAP	Equipment Inspections Complete	Instrumentation & Electrical Items Decommissioned	Rotating Equipment Decommissioned & Decontaminated	Decontamination Documentation Complete & Filed
Salt Refined	9201-276	Enrichedliter Liquor Collection Tank	W1609464					
Salt Refined	9201-277	No 2 And Mother Liquor Transfer Pump	W1609464					
Salt Refined	9201-278	No 2 And Mother Liquor Transfer Pump	W1609464					
Salt Refined	9201-288	No 1 Salt Refined Hydrocyclone	W1609898					
Salt Refined	9201-289	No 2 Salt Refined Hydrocyclone	W1609898					
Salt Refined	9201-290	No 3 Salt Refined Hydrocyclone	W1609898					
Salt Refined	9201-301	No 4 Salt Refined Hydrocyclone	W1609061					
Salt Refined	9201-303	No 2 Salt Reactor	W1609870					
Salt Refined	9210-9303(g)	No 2 Salt Reactor Agitator	W1609870					
Salt Refined	9200-9526	No 2 Salt Reactor Condenser	W1609870					
Salt Refined	9200-9535	No 2 Salt Reactor Ejector Condenser	W1609870					
Salt Refined	9201-9528	No 2 Salt Reactor Ejector Condenser	W1609870					
Salt Refined	9204-9303	No 3 Salt Reactor	W1609871					
Salt Refined	9210-9303(g)	No 3 Salt Reactor Agitator	W1609871					
Salt Refined	9201-9526	No 3 Salt Reactor Condenser	W1609871					
Salt Refined	9201-9508	No 3 Salt Reactor Ejector Condenser	W1609871					
Salt Refined	9201-9528	No 3 Salt Reactor Ejector Condenser	W1609871					
Salt Refined	9201-3401	No 1 Salt Reactor Feds Pump	W1609872					
Salt Refined	9201-3R1	No 2 Salt Reactor Feds Pump	W1609872					
Salt Refined	9201-3403	No 2 pH Analyser	W1609872					
Salt Refined	9201-3R5	No 2 pH Analyser	W1609872					
Salt Refined	9201-9602	No 1A Salt Refined Crystalliser Ejector Condenser	W1609893					
Salt Refined	9201-9608	No 1B Salt Refined Crystalliser Ejector Condenser	W1609893					
Salt Refined	9201-3T3	No 1 Hot Tank Dissolver	W1609892					
Salt Refined	9201-3T2	No 1 Hot Tank Dissolver Circulation Pump	W1609892					
Salt Refined	9202-3T3	No 2 Hot Tank Dissolver Circulation Pump	W1609892					
Salt Refined	9201-3R2	No 2 Salt Plant ID Water Filter	W1609727					
Salt Refined	9201-3R3	No 2 Salt Plant ID Water Filter	W1609727					
Salt Refined	9203-2156A	Salt Transfer Pump	W1609895					
Salt Refined	9201-2157A	Salt Transfer Pump	W1609895					
Salt Refined	9201-2141	No 2 60% HMD Storage Tank	W1609896					
Salt Refined	9201-2132	No 1 30% HMD Storage Tank	W1609896					
Salt Refined	9201-2143	No 1 60% HMD Solution Feed Pump	W1609896					
Salt Refined	9201-2132	No 2 30% HMD Solution Feed Pump	W1609896					
Salt Refined	9201-2146	HMD Cooler	W1609896					
Salt Refined	9201-2137	No 1 Lightbruce Vent (No 2 60% HMD Tank)	W1609896					
Salt Refined	9201-2138	No 2 Lightbruce Vent (No 2 60% HMD Tank)	W1609896					
Salt Refined	9204-9709	No 1 0% HMD Transfer Pump	W1609876					
Salt Refined	9201-2111	No 2 0% HMD Transfer Pump	W1609876					
Salt Refined	9201-2132	No 1 60% HMD Solution Tank	W1609876					
Salt Refined	9201-2133	No 1 Lightbruce Vent (No 1 60% HMD Tank)	W1609876					
Salt Refined	9201-2134	No 2 Lightbruce Vent	W1609876					
Salt Refined	9402-2201	No 1 Carbon Cabinet	W1609890					
Salt Refined	9201-2202	No 2 Carbon Cabinet	W1609890					
Salt Refined	9201-2203	No 3 Salt Solution Tank	W1609890					
Salt Refined	9201-2203(g)	No 3 Salt Solution Tank Agitator	W1609890					
Salt Refined	9201-2251	No 2 Salt Solution Tank	W1609878					
Salt Refined	9201-2251(g)	No 2 Salt Solution Tank Agitator	W1609878					
Salt Refined	9201-2252	No 1 Salt Solution Tank	W1609878					
Salt Refined	9201-2251(g)	No 1 Salt Solution Tank Agitator	W1609878					
Salt Refined	9202-2208	Mother Liquor Collection Tank	W1609894					
Salt Refined	9201-2209	Mother Liquor Collection Tank	W1609894					
Salt Refined	9201-2210	Mother Liquor Collection Tank	W1609894					
Salt Refined	9201-2211	Mother Liquor Collection Tank	W1609894					
Salt Refined

EQUIPMENT DETAILS

Plant Area	Equipment Number (for P&ID)	Item Name	P&ID	Scope Reviewed and in SAP	Equipment Inspections Complete	Instrumentation & Electrical Items Decommissioned	Rotating Equipment Decommissioned & Decontaminated	Decontamination Documentation Complete & Filed
No2 FBD	5001-1178	No.2 dry Refined Hydrocyclone	W1S66904					
No2 FBD	5001-1188	No.2 dry Refined Hydrocyclone	W1S66905					
No2 FBD	5001-5620	Centrifuge Scroll Conveyor	W1S66904					
No2 FBD	5001-9001	Metering Conveyor	W1S66907					
No2 FBD	5001-9004	Double Paddle Mixer	W1S66907					
No2 FBD	5001-9006	Nutrine	W1S66907					
No2 FBD	5001-9005	No.2 Fluidised Bed Dryer	W1S66907					
No2 FBD	5001-9006	No.2 Fluidised Bed Cooler	W1S66908 (N1N1-0605)					
No2 FBD	5001-9007	Grain Reliund Cyclone	W1S66909					
No2 FBD	5001-9008	Cooler Reliund Cyclone	W1S66909					
No2 FBD	5001-9009	Cyclone Discharge Conveyor	W1S66909					
No2 FBD	5001-9010	Dry Output Acid Mix	W1S66909					
No2 FBD	5004-9011	Dry Mix Rotary Valve	W1S66909					
No2 FBD	5001-9012	Dryer Cyclone Rotary Valve	W1S66909					
No2 FBD	5001-9018	Cooler Cyclone Rotary Valve	W1S66909					
No2 FBD	5001-9020	Dry Bed Dust Extraction Unit	W1S66909					
No2 FBD	5001-9021	Dryer Air Fan	W1S66909					
No2 FBD	5002-9021	Cooler Air Fan Silencer	W1S66909					
No2 FBD	5001-9022	Dryer Air Fan	W1S66909					
No2 FBD	5001-9023	Dryer Air Heater	W1S66909					
No2 FBD	5001-9033	Exhaust Monitor	W1S66909					
No2 FBD	5001-9036	Dryer Rotary Valve	W1S66907					
No2 FBD	5001-9030	Cooler Air Filter	W1S66909 (N1N1-0605)					
No2 FBD	5001-9031	Cooler Air Silencer	W1S66909 (N1N1-0605)					
No2 FBD	5001-9032	Cooler Air Fan	W1S66909 (N1N1-0605)					
No2 FBD	5001-9033	Cooler Rotary Valve	W1S66909 (N1N1-0605)					
No2 FBD	5001-9034	Cooler Air Outlet Silencer	W1S66909 (N1N1-0605)					
No2 FBD	5001-9040	Exhaust Air Scrubber	W1S66910					
No2 FBD	5001-9041	Exhaust Air Fan	W1S66910					
No2 FBD	5001-9044	Scrubber Recirculation Pump No.1	W1S66910					
No2 FBD	5001-9045	Scrubber Recirculation Pump No.2	W1S66910					
No2 FBD	5001-9036	Exhaust Air Silencer	W1S66910					
No2 FBD	5001-9070	Product Elevator	W1S66911					
No2 FBD	5001-9073	Product Storage Hopper	W1S66911					
No2 FBD	5001-9076	Bag T Sling Ex Ex. Shaker	W1S66911					
No2 FBD	5001-9085	Bag T Sling Ex Ex. Fan	W1S66911					
NAP Utilities	5001-4300	Low Pressure Steam Flash Tank	W1S51290					
NAP Utilities	5004-4305	CT Pig Streets Desuperheater	W1S51291					
NAP Utilities	5001-4308	Steam Desuperheater No.2 Water Pump	W1S51292					
NAP Utilities	5001-4309	Steam Desuperheater No.2 Water Pump	W1S51292					
NAP Utilities	5001-4310	CTs Pig Steam Desuperheater	W1S51292					
NAP Utilities	5001-4311	CTs Pig Steam Desuperheater Pump	W1S51292					
NAP Utilities	5002-4315	Low Pressure Flash Tank No.2 Pump	W1S51290					
NAP Utilities	5001-4315	Low Pressure Condensate Cooler	W1S51290					
NAP Utilities	5001-4400	Process Water Storage Tank	W1S51291					
NAP Utilities	5001-4415	Process Water Storage Tank No.1 Pump	W1S51291					
NAP Utilities	5001-4410	Process Water Storage Tank No.2 Pump	W1S51291					
NAP Utilities	5001-4417	Process Water Storage Tank No.3 Pump	W1S51291					
NAP Utilities	5001-4415	Process Water Storage Tank Heater	W1S51291					
NAP Utilities	5001-4430	Soot Flash Filter No.1	W1S51285					
NAP Utilities	5001-4435	Soot Flash Filter No.2	W1S51285					
NAP Utilities	5001-4531	Instrument Water Storage Tank No.1 Pump	W1S51291					
NAP Utilities	5001-4534	Instrument Water Storage Tank No.2 Pump	W1S51291					
NAP Utilities	5001-4541	Instrument Water Heater	W1S51291					
NAP Utilities	5001-4630	Sand Header No.1 Blower	W1S51298					
NAP Utilities	5001-4633	Sand Header No.2 Blower	W1S51298					
NAP Utilities	5001-4651	Sand Header Blower Separator	W1S51298					
NAP Utilities	5001-4660	Process Recovery Tank	W1S51510					
NAP Utilities	5001-4662	Process Recovery Tank Pump	W1S51510					
NAP Utilities	5001-4665	Safety Shower Water Filter	W1S51276					
NAP Utilities	5001-4666	Safety Shower Water Tank	W1S51276					
NAP Utilities	5001-4667	Safety Shower Water Tank Heater	W1S51276					
Purge	5004-4328	Methanol Feed Pump	W1S51255					
Purge	5001-4670	MeOH Methanol Storage Sump Pump	W1S51253					
Purge	5001-4900	Sulphuric Acid Storage Tank	W1S51242					
Purge	5001-4905	Sulphuric Acid Storage Tank No.1 Pump	W1S51242					
Purge	5001-4907	Sulphuric Acid Storage Tank No.2 Pump	W1S51242					
Purge	5002-4907	Circulating Sulphuric Pump	W1S51242					
Purge	5001-5000	DBK Separator	W1S51235					
Purge	5001-5001	DBK Separator Pump	W1S51241					
Duplex	5001-5031	AMX Catalyst Tank	W1S51231					
Duplex	5001-5032	AMX Catalyst Pump	W1S51231					
Purge	5001-5033	AMX Catalyst Heater	W1S51231					
Purge	5001-5035	DBK Evaporator	W1S51241					
Purge	5001-5041	DBK Evaporator Condensate Pot	W1S51241					
Purge	5001-5100	DBK Exhauster	W1S51242					
Purge	5001-5131	DBK Exhauster Pump	W1S51242					
Purge	5001-5133	DBK Exhauster Condensate Pot	W1S51243					
Purge	5001-5200	Purge Crystalliser	W1S51243					
Purge	5001-5201	Purge Crystalliser Feed Tank	W1S51254					
Purge	5001-5211	Purge Crystalliser Feed Tank Pump	W1S51254					
Purge	5001-5231	Purge Crystalliser Pump	W1S51243					
Purge	5001-5235	Hydraulic Oil System Supply Pump	W1S51243					
Purge	5001-5241	Purge Crystalliser Process Water Heater	W1S51243					
Purge	5001-5300	Purge Centrifuge	W1S51244					
Purge	5001-5301	Purge Centrifuge Acid Heater	W1S51244					
Purge	5001-5400	Purge Cake Solution Tank	W1S51235					
Purge	5004-5031	Purge Cake Solution Tank No.1 Pump	W1S51235					
Purge	5001-5035	Purge Cake Solution Tank No.2 Pump	W1S51235					
Purge	5001-5035	Purge Cake Solution Tank Heater	W1S51235					
Purge	5001-5500	No.2 PWL Filter	W1S51237					
Purge	5001-5600	No.2 PWL Filter	W1S51238					
Purge	5001-5605	PWL Reservoir	W1S51238					
Purge	5001-5605	PWL Reservoir Agitator	W1S51238					
Purge	5001-5613	PWL Reservoir Pump	W1S51238					
Duplex	5001-5601A	PWL Reservoir Heater	W1S51238					
Duplex	5001-5601B	PWL Reservoir Heater	W1S51238					
Purge	5001-5602C	PWL Reservoir Heater	W1S51238					
Purge	5001-5700	BSP Make Valve Drain	W1 P11 0167F					
Purge	5001-5700-01	BSP Demand Drain	W1 P11 0167F					
Purge	5001-5700A	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700B	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700C	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700D	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700R	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700P	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700G	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700H	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700J	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700K	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700L	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700M	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700N	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700P	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700Q	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700R	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700S	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700T	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700U	BSP Ion Exchanger	W1 P11 0168 F					
Purge	5001-5700V	BSP Ion Exchanger	W1 P11 0168 F					
Duplex	5001-5710	BSP Stripper Vent Receiver	W1S51239					
Duplex	5001-5711	BSP Stripper Vent Receiver Pump	W1S51239					
Purge	5001-5715	Regenerate Acid Mix Tank Pump	W1S51232					
Purge	5001-5720	BSP Absorption Water Exchanger	W1S51238					
Purge	5001-5730A	Regenerate Acid Cooler 'A'	W1S51232					
Purge	5001-5730B	Regenerate Acid Cooler 'B'	W1S51232					
Purge	5001-5751	Regenerate Acid Mix Tank	W1S51232					
Duplex	5001-5720	DBK Feed Tank	W1S51238					
Purge	5001-5800	DBK Separator	W1S51231					
Purge	5001-5811	DBK Separator Pump	W1S51231					
Purge	5001-5816	DBK Make Condenser Hotwell Pump	W1S51238					
Purge	5001-5817	DBK Exhauster	W1S51252					
Purge	5001-5831	DBK Evaporator	W1S51251					
Purge	5001-5832	DBK Make Condenser	W1S51252					
Purge	5001-5833	DBK Exhauster	W1S51252					
Purge	5001-5851	DBK Evaporator Condensate Pot	W1S51251					
Purge	5001-5852	DBK Exhauster Condensate Pot	W1S51252					
Purge	5004-5860	Purge Crystalliser Vacuum System Hotwell Pump	W1S51256					
Purge	5001-5870	Purge Crystalliser Vacuum System Hotwell	W1S51256					
Purge	5001-5877	Purge Crystalliser 1st Stage Ejector Condenser	W1S51256					
Purge	5001-5880	Purge Crystalliser 2nd Stage Ejector Condenser	W1S51257					
Purge	5001-5887	Purge Crystalliser Vacuum Hotwell Pump	W1S51257					
Purge	5002-5898	DBK Ejector Condenser	W1S51259					
Purge	5001-5900	Recovered Catalyst Storage Tank	W1S51240					
Purge	5001-5910	Recovered Catalyst Storage Tank No.1 Pump	W1S51240					
Duplex	5001-5915	Recovered Catalyst Storage Tank No.2 Pump	W1S51240					
Purge	5001-5951	MEC / Methanol Storage Tank	W1S51253					
Purge	5001-5961	MEC/Methanol Storage Tank Pump(DBK)	W1S51253					
Purge	5001-5965	MEC / Methanol Cooler	W1S51253					
Purge	5001-5990	Methanol Tank	W1S51255					
Redundant	5001-310	No.1 AIR	W1B00743					
Redundant	5001-311	No.2 AIR	W1B00744					

EQUIPMENT DETAILS

Plant Area	Equipment Number (Per P&ID)	Item Name	P&ID	Scope Reviewed and in SAP	Equipment Inspections Complete	Instrumentation & Electrical Items Decommissioned	Rotating Equipment Decommissioned & Decontaminated	Decontamination Documentation Complete & Filed
Redundant	5201-120	No.3 ADK	W1650735	1	1	1	1	1
Redundant	5201-130	NACS 1	N1W14597	1	1	1	1	1
Redundant	5201-210	NACS 2	N1W14598	1	1	1	1	1
Redundant	5201-211	NACS 2 Calandria	N1W14598	1	1	1	1	1
Redundant	5201-212	NACS 2 Condenser	N1W14598	1	1	1	1	1
Redundant	5201-213	NACS 2 Ejector	N1W14598	1	1	1	1	1
Redundant	5201-2131	NACS 2 Additional Ejector	N1W14598	1	1	1	1	1
Redundant	5201-266	Spillage Skimmer	W1650834	1	1	1	1	1
Redundant	5610-266(Sig)	Spillage Skimpit Agitator	W1650834	1	1	1	1	1
Redundant	5202-403	No.1 Purge Evaporator & Calandria	N1W16560	1	1	1	1	1
Redundant	5202-401	No.2 Purge Evaporator & Calandria	N1W16560	1	1	1	1	1
Redundant	5202-402	No.1 Evaporator Tails Crystalliser - ETC	N1W16565	1	1	1	1	1
Redundant	5202-403	No.2 Evaporator Tails Crystalliser - ETC	N1W16565	1	1	1	1	1
Redundant	5202-404	No.1 ETC Condenser	N1W14565	1	1	1	1	1
Redundant	5202-405	No.2 ETC Condenser	N1W14565	1	1	1	1	1
Redundant	5202-406	Water Off Vessel	N1W14565	1	1	1	1	1
Redundant	5202-407	No.1 ETC Pot Tank	N1W14565	1	1	1	1	1
Redundant	5202-409	No.1 ETC PLC Pipe Ejector	N1W14565	1	1	1	1	1
Redundant	5202-410	No.2 ETC PLC Steam Ejector	N1W14565	1	1	1	1	1
Redundant	5202-411	No.1 ETC Ejector	N1W14565	1	1	1	1	1
Redundant	5202-412	No.2 ETC Ejector	N1W14565	1	1	1	1	1
Redundant	5202-1206	No.1 Hot Flash Dissolver Transfer Pump	W1650877	1	1	1	1	1
Redundant	5202-1506	No.2 Hot Flash Dissolver Transfer Pump	W1650877	1	1	1	1	1
Redundant	5202-1207	No.1 Hot Flash Dissolver Tank	W1650577	1	1	1	1	1
Redundant	5202-1207(Sig)	No.1 Hot Flash Dissolver Tank Agitator	W1650577	1	1	1	1	1
Redundant	5202-1623	Centrifuge Acrid Conveyor	W1650577	1	1	1	1	1
Redundant	5202-2120	1st Reactor Vessel	W1650890	1	1	1	1	1
Redundant	5202-2121	1st Reactor Condenser	W1650890	1	1	1	1	1
Redundant	5202-2122	Ejector	W1650890	1	1	1	1	1
Redundant	5202-2122	1st Reactor Ejectors A & B	W1650890	1	1	1	1	1
Redundant	5202-2123	2nd Reactor Vessel	W1650890	1	1	1	1	1
Redundant	5202-2125	2nd Reactor Condenser	W1650890	1	1	1	1	1
Redundant	5202-2130	2nd Reactor Ejectors A & B	W1650890	1	1	1	1	1
Redundant	5202-2131	50% HMD Vessel	W1650876	1	1	1	1	1
Redundant	5202-2132	No.1 Reactor Tank Pump	W1650890	1	1	1	1	1
Redundant	5202-2135	No.2 Reactor Tank Pump	W1650890	1	1	1	1	1
Redundant	5202-2252	Large HMD Adjustment Tank		1	1	1	1	1
Redundant	5202-2280A	Small HMD Adjustment Tank		1	1	1	1	1
Redundant	5202-2280B	Small HMD Adjustment Tank		1	1	1	1	1
Redundant	5202-2197	Mini Feed Hopper		1	1	1	1	1
Redundant	5202-2202	Final Feed Hopper		1	1	1	1	1
Redundant	5202-2203	Final Feed Screw Pump		1	1	1	1	1
Redundant	5202-2242	Feed Distribution Pump		1	1	1	1	28
Redundant	5202-2243	No.1 Reactor Tank Pump		1	1	1	1	1
Redundant	5202-2245	No.2 Reactor Tank Pump		1	1	1	1	1
Redundant	5202-2252	No.1 Split Centrifuge & Chute		1	1	1	1	1
Redundant	5202-2253	No.2 Split Centrifuge & Chute		1	1	1	1	1
Redundant	5202-2254	No.3 Split Centrifuge & Chute		1	1	1	1	1
Redundant	5202-2255	No.4 Split Centrifuge & Chute		1	1	1	1	1
Redundant	5202-2259	Split Conveyor		1	1	1	1	1
Redundant	5202-2260	Split Conveyor		1	1	1	1	1
Redundant	5202-2262	Split Dryer		1	1	1	1	1
Redundant	5202-2263	Primary Dryer Cyclone		1	1	1	1	1
Redundant	5202-2264	Secondary Dryer Cyclone		1	1	1	1	1
Redundant	5202-2265	Secondary Dryer Cyclone		1	1	1	1	1
Redundant	5202-2266	Secondary Dryer Cyclone		1	1	1	1	1
Redundant	5202-2271	Gas Scrubber		1	1	1	1	1
Redundant	5202-2272	North Scrubber Draw Off Pump		1	1	1	1	1
Redundant	5202-2273	South Scrubber Draw Off Pump		1	1	1	1	1
Redundant	5202-2275	Gas Blower		1	1	1	1	1
Redundant	5202-2280	Gas Heater		1	1	1	1	1
Redundant	5202-2281	Acetate Liquid Reservoir		1	1	1	1	1
Redundant	5202-2282	Mechanical Rectifying Still		1	1	1	1	1
Redundant	5202-2283	Methanol Night Box		1	1	1	1	1
Redundant	5202-2102	Insulation Cooler		1	1	1	1	1
Redundant	5202-2103	Insulation Cooler		1	1	1	1	1
Redundant	5202-2292	North Scrubber Cooler		1	1	1	1	1
Redundant	5202-2293	North Scrubber Spray Pump		1	1	1	1	1
Redundant	5202-2303	South Scrubber Spray Pump		1	1	1	1	1
Redundant	5202-2305	Cyclone Screw Conveyor		1	1	1	1	1
Redundant	5202-2713	No.1 Split Thickener		1	1	1	1	1
Redundant	5202-2714	No.2 Split Thickener		1	1	1	1	1
Redundant	5202-2715	Centrifuge Wash Tank		1	1	1	1	1
Redundant	5202-2271	Split Slurry Tank		1	1	1	1	1
Redundant	5202-2512	Mixer Feed Conveyor		1	1	1	1	1
Redundant	5202-2513	Dryer Injection Conveyor		1	1	1	1	1
Redundant	5202-2514	Split Dry Recycle Conveyor		1	1	1	1	1
Redundant	5202-2515	Split Distribution Conveyor		1	1	1	1	1
Redundant	5202-2602	Fore Arc Feed Conveyor		1	1	1	1	1
Redundant	5202-2613	Scrubber Seal Pot		1	1	1	1	1
Redundant	5210-(78 -79)2	Arc Interlocutors		1	1	1	1	1
Redundant	5202-622	Secondary Dryer Cyclone Screw		1	1	1	1	1
Redundant	5202-623	Secondary Dryer Cyclone Screw		1	1	1	1	1
Redundant	5202-624	Secondary Dryer Cyclone Outlet Rotary Valve		1	1	1	1	1
Redundant	5202-625	Secondary Dryer Cyclone Outlet Rotary Valve		1	1	1	1	1
Redundant	5202-626	Secondary Dryer Cyclone Outlet Rotary Valve		1	1	1	1	1
Redundant	5202-627	Secondary Dryer Cyclone Outlet Rotary Valve		1	1	1	1	1
Redundant	5202-628	Diversion Secondary Dryer Cyclone Screw		1	1	1	1	1
Redundant	5202-975	Mini Type Feed Trolley Set (Pkg 7345)		1	1	1	1	1
		Small Vessel - 4 Floor - Dissolver (Pkg 7280)		1	1	1	1	1
		Small Vessel - 4 Floor - Dissolver (Pkg 7990)		1	1	1	1	1
Redundant	5202-1015	Powder Sanitiser Feed Tank		1	1	1	1	1
Redundant	5202-151	Sludge Hold Up Tank		1	1	1	1	1
		WHOLE AREA TOTAL		**700**	**700**	**700**	**700**	**700**
		WHOLE AREA PERCENTAGE		**119.86%**	**119.86%**	**119.86%**	**119.86%**	**119.86%**
		ABSORPTION		**27**	**27**	**27**	**27**	**27**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		REACTION		**34**	**34**	**34**	**34**	**34**
				103.03%	**103.03%**	**103.03%**	**103.03%**	**103.03%**
		NACS		**23**	**23**	**23**	**23**	**23**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		COGA		**28**	**28**	**28**	**28**	**28**
				103.70%	**103.70%**	**103.70%**	**103.70%**	**103.70%**
		CRUDE		**50**	**50**	**50**	**50**	**50**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		SEMI REFINED		**115**	**115**	**115**	**115**	**115**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		SALT REFINED		**106**	**106**	**106**	**106**	**106**
				99.07%	**99.07%**	**99.07%**	**99.07%**	**99.07%**
		DRY REFINED		**65**	**65**	**65**	**65**	**65**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		No.2 FBD		**44**	**44**	**44**	**44**	**44**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		NP UTILITIES		**26**	**26**	**26**	**26**	**26**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		PURGE		**88**	**88**	**88**	**88**	**88**
				100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**
		SERVICES						
		REDUNDANT		**96**	**96**	**96**	**96**	**96**
				102.13%	**102.13%**	**102.13%**	**102.13%**	**102.13%**
		BIO TREATMENT						
					Electrical Decommissoning Requested.			
No.3 Cooling Tower	5222-101	Cooling Tower Pond	101922/00/12/00003	1	1	1	1	1
No.3 Cooling Tower	5222-111	No.1 Cooling Tower Pump	DW/B/7261	1	1	1	1	1
No.3 Cooling Tower	5222-112	No.2 Cooling Tower Pump	DW/B/7261	1	1	1	1	1
No.3 Cooling Tower	5222-113	No.3 Cooling Tower Pump	DW/B/7261	1	1	1	1	1
No.3 Cooling Tower	5222-114	No.4 Cooling Tower Pump	DW/B/7261	1	1	1	1	1
No.3 Cooling Tower	5222-115	No.5 Cooling Tower Pump	DW/B/7261	1	1	1	1	1
No.3 Cooling Tower	5222-116	No.6 Cooling Tower Pump	DW/B/7261	1	1	1	1	1

EQUIPMENT DETAILS

Plant Area	Equipment Number (Per P&ID)	Item Name	P&ID	Scope Reviewed and in SAP	Equipment Inspections Complete	Instrumentation & Electrical Items Decommissioned	Rotating Equipment Decommissioned & Decontaminated	Decontamination Documentation Complete & Filed
No.3 Cooling Tower	5222-117	No.7 Cooling Tower Pump	DW/B/7261					
No.3 Cooling Tower	5222-118	No.8 Cooling Tower Pump	DW/B/7261					
No.3 Cooling Tower	5222-250	Sulphuric Acid Tank	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-253	East Sulphuric Acid Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-254	West Sulphuric Acid Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-258	No.1 7396 Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-259	No.2 7396 Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-260	Sodium Hypochlorite Tank	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-261	North Sodium Hypochlorite Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-262	South Sodium Hypochlorite Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-282	No.1 23203 Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-283	No.2 23203 Dosing Pump	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-285	Nalco Dosing Tank	10/10/22/00/12/00003					
No.3 Cooling Tower	5222-286	Nalco Dosing Tank	10/10/22/00/12/00003					

Appendix I

Decontamination pack

Plant System: **Bio Treatment**

	Equipment Name	Equipment Number	P&ID for Linework Decommissioning
	No.1 Spill Containment & Recycle Tank	5031-160	W1408751
	No.1 Spill Cont/Recycle Tank Recirc. Pump No.1	5031-161	W1408751
	No.1 Spill Cont/Recycle Tank Recirc. Pump No.2	5031-162	W1408751
	Acids Area Sump	5031-571	W1365948
	Acids Area Sump Pump No.1	5031-598	W1365948
	Acids Area Sump Pump No.2	5031-599	W1365948
	Water And Equalisation Tank	5031-600	W1408752
	No.1 Effluent Transfer Pump	5031-601	W1408752
	No.2 Effluent Transfer Pump	5031-602	W1408752
	No.1 Water And Liquor Equalisation Jet Mix Pump	5031-603	W1408752
	No.2 Water And Liquor Equalisation Jet Mix Pump	5031-604	W1408752
	Effluent Dump Tank	5031-605	W1365942
	Dump Tank Jet Mix & Transfer Pump	5031-606	W1365942
	Crude Building Sump		W1365706
	No.1 Crude Building Sump Pump	5031-935	W1365706
	No.2 Crude Building Sump Pump	5031-936	W1365706
	Salt Loading Sump		W1365899
	No.1 Salt Loading Sump Pump	5031-2255	W1365899
	No.2 Salt Loading Sump Pump	5031-2256	W1365899
	Salt Building Sump		W1408729
	No.1 Salt Building Sump Pump	5031-2394	W1408729
	No.2 Salt Building Sump Pump	5031-2395	W1408729
	Analyser House Sample Pump (Copper Analyser)	5031-4621	W1351279
	NACS/Purge Building Sump		W1351310
	No.1 NACS/Purge Building Sump Pump	5031-4631	W1351310
	No.2 NACS/Purge Building Sump Pump	5031-4641	W1351310
	Ags/Methanol Storage Sump		W1351253
	Ags/Methanol Storage Sump Pump	5031-4670	W1351253
	Tank Farm Sump		W1351274
	Tank Farm Sump No.1 Pump	5031-4811	W1351274
	Tank Farm Sump No.2 Pump	5031-4813	W1351274

BIO TREATMENT ANALYSER SYSTEM SHUT DOWN PLAN SHEET 1

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
AA2 NACS O/HEADS TOC QT95402	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid. Isolate sample supply to analyser from sample cabinet - check if disconnection and blank is needed.	[redacted]	14/09/09
	Flush sample / reagent / standard / lines with water for a few hours (remove reagents and standard solutions)		14/09/09
	Isolate power from analyser using approved isolator (next to analyser) and MCB in DB.		14/09/09
	Purge the analyser reactor / sample / reagent lines / glassware with air to remove all liquids from the analyser		14/09/09
	Remove mercury filled UV lamps and bring back to labs for disposal		14/09/09
AA2 NACS O/HEADS CU QT95403	Isolate sample supply to analyser from sample cabinet.		14/09/09
	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid.		14/09/09
	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents and standard solutions)		14/09/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		14/09/09
	Isolate power from analyser using approved isolator (next to analyser) and MCB in DB.		14/09/09
AA2 NACS O/HEADS Cond/ity QT 95404	Isolate sample supply to probe and drain sample line / probe housing.		14/09/09
	Isolate Power Supply to Instrument via house MCB in DB		14/09/09

[redacted]

BIO TREATMENT ANALYSER SYSTEM SHUT DOWN PLAN SHEET 2

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
HMD EFFLUENT TOC QT95400	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid. Isolate sample supply to analyser from sample cabinet - check if disconnection and blank is needed.	[redacted]	02/10/09
	Flush sample / reagent / standard / lines with water for a few hours (remove reagents and standard solutions)		02/10/09
	Isolate power from analyser using approved isolator (next to analyser) and MCB in DB.		02/10/09
	Purge the analyser reactor / sample / reagent lines / glassware with air to remove all liquids from the analyser		02/10/09
	Remove mercury filled UV lamps and bring back to labs for disposal		02/10/09
HMD EFFLUENT AMMONIA QT95403	Isolate sample supply to analyser from sample cabinet.		02/10/09
	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid.		02/10/09
	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents and standard solutions)		02/10/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		02/10/09
	Isolate power from analyser using approved isolator (next to analyser) and MCB in DB.		02/10/09

[redacted]

BIO TREATMENT ANALYSER SYSTEM SHUT DOWN PLAN SHEET 3

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
EXPORT TO NWL TOC QT95406	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid. Isolate sample supply to analyser from sample cabinet - check if disconnection and blank is needed.	[redacted]	9/10/09
	Flush sample / reagent / standard / lines with water for a few hours (remove reagents and standard solutions)		9/10/09
	Isolate power from analyser using approved isolator (next to analyser) and MCB in DB.		9/10/09
	Purge the analyser reactor / sample / reagent lines / glassware with air to remove all liquids from the analyser		9/10/09
	Remove mercury filled UV lamps and bring back to labs for disposal		9/10/09
EXPORT TO NWL CU QT95407	Isolate sample supply to analyser from sample cabinet - check if disconnection and blank is needed.		9/10/09
	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid.		9/10/09
	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents and standard solutions)		9/10/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		9/10/09
	Isolate power from analyser using approved isolator (next to analyser) and MCB in DB.		9/10/09
EXPORT TO NWL pH QT 95405	Isolate sample supply to probe and drain sample line / probe housing.		9/10/09
	Isolate Power Supply to Instrument via MCB in DB.		9/10/09
EXPORT TO NWL AUTOSAMPLER	Isolate sample supply to autosampler pump via an isolation valve within the sample cabinet.		9/10/09
	Flush out sample line with water using a lab syringe then compressed air.		9/10/09
	Isolate Power Supply to Instrument via MCB in DB.		9/10/09
UTILITIES	Isolate water supply to analyser house at nearest available isolation valve.		9/10/09
	Drain down the DI water tank.		8/10/09
	Isolate instrument air to analyser house if able		9/10/09
	Isolate the electricity supply to entire analyser house at RCD/main isolator		9/10/09

[redacted]

AA1 & 2 REFINED EFF ANALYSER SYSTEM SHUT DOWN PLAN

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
FPA 800 Copper XT95480	Isolate sample inlet to overflow pot	[redacted]	02/10/09
	Drain down sample line and remove dirty filter from sample pot		02/10/09
	Isolate power to sample peristaltic pump by removing 3 pin plug from wall socket. Open drain valve on sample de-bubbler/u-tube to drain off.		02/10/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		02/10/09
	Isolate power from analyser by removing 3 pin plug from wall socket.		02/10/09
PPM Protoc TOC XT95479	Flush sample / reagent / standard lines with water for a couple of hours (remove reagent and standard)		02/10/09
	Isolate power from analyser by removing 3 pin plug from wall socket.		02/10/09
	Purge the analyser reactor / sample / reagent lines / glassware with air to remove all liquids from the analyser		02/10/09
	Remove mercury filled UV lamps and bring back to labs for disposal		02/10/09
Yokogawa Cond/ity XT41653	Isolate sample supply to probe and drain sample line / probe housing.		02/10/09
	Isolate Power Supply to Instrument via house RCD.		02/10/09
UTILITIES	Isolate and lock off Instrument air supply to analyser house – determine if line disconnection and blanking is required		02/10/09
	Isolate power to all equipment within the analyser house using the main power breakers - determine if able to lock off supply or if securing isolation enclosure is satisfactory		02/10/09
	Isolate water supply to analyser house.		02/10/09

[redacted]

CRUDE TF SUMP ANALYSER SYSTEM SHUT DOWN PLAN

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
TYTRONIC SENTINEL CU XT44290	Isolate main sample supply valve (may require permission/help from operations)	[redacted]	05/10/09
	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid.		05/10/09
	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents and standard solutions)		05/10/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		05/10/09
	Isolate power from analyser by switching off at MCB in DB.		05/10/09
PPM PROTOC 300 XT41643	Isolate sample supply sample cabinet.		05/10/09
	Open filter enclosure in sample cabinet to drain down sample line – leave open clean/remove filter if required		05/10/09
	Flush sample / reagent / standard lines with water for a couple of hours (remove reagent and standard)		05/10/09
	Isolate power from analyser by switching off at MCB in DB.		05/10/09
	Purge the analyser reactor / sample / reagent lines / glassware with air to remove all liquids from the analyser		05/10/09
	Remove mercury filled UV lamps and bring back to labs for disposal		05/10/09
YOKOGAWA CONDUCTIVITY XT41653	Isolate sample supply to probe and drain sample line / probe housing.		05/10/09
	Isolate power from analyser by switching off at MCB in DB.		05/10/09
DIONEX DX 800 LC	Isolate all sample valves and drain down sample system via drain line in sample cabinet		05/10/09
	Remove reagents and standards - also remove 1/8" lines from underside of analyser		05/10/09
	Isolate power from analyser by switching off at MCB in DB.		05/10/09
UTILITIES	Isolate water supply to analyser house at nearest available isolation valve.		05/10/09
	Drain down the DI water tank.		05/10/09
	Isolate instrument air to analyser house.		05/10/09
	Isolate the electricity supply to entire analyser house at RCD/main isolator.		05/10/09

[redacted]

CRUDE BUILDING SUMP ANALYSER SYSTEM SHUT DOWN PLAN

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
TYTRONIC SENTINEL CU XT44290	Isolate sample supply valve (may require permission/help from operations)	[redacted]	30/09/09
	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid.		30/09/09
	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents and standard solutions)		30/09/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		30/09/09
	Isolate power from analyser by switching off at MCB in DB.		30/09/09
UTILITIES	Isolate water supply to analyser house at nearest available isolation valve.		30/09/09
	Drain down the DI water tank.		30/09/09
	Isolate the electricity supply to entire analyser house at RCD/main isolator.		30/09/09

[redacted]

NACS/PURGE BUILDING SUMP ANALYSER SYSTEM SHUT DOWN PLAN

EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
TYTRONIC SENTINEL CU XT41639	Isolate power to sample supply pump (may require permission/help from operations)	[redacted]	30/09/09
	Isolate valves in sample cabinet and remove filter. Then drain down sample system of liquid.		30/09/09
	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents and standard solutions)		30/09/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		30/09/09
	Isolate power from analyser by switching off at MCB in DB.		30/09/09
UTILITIES	Isolate water supply to analyser house at nearest available isolation valve.		30/09/09
	Drain down the DI water tank.		30/09/09
	Isolate the electricity supply to entire analyser house at RCD/main isolator.		30/09/09

[redacted]

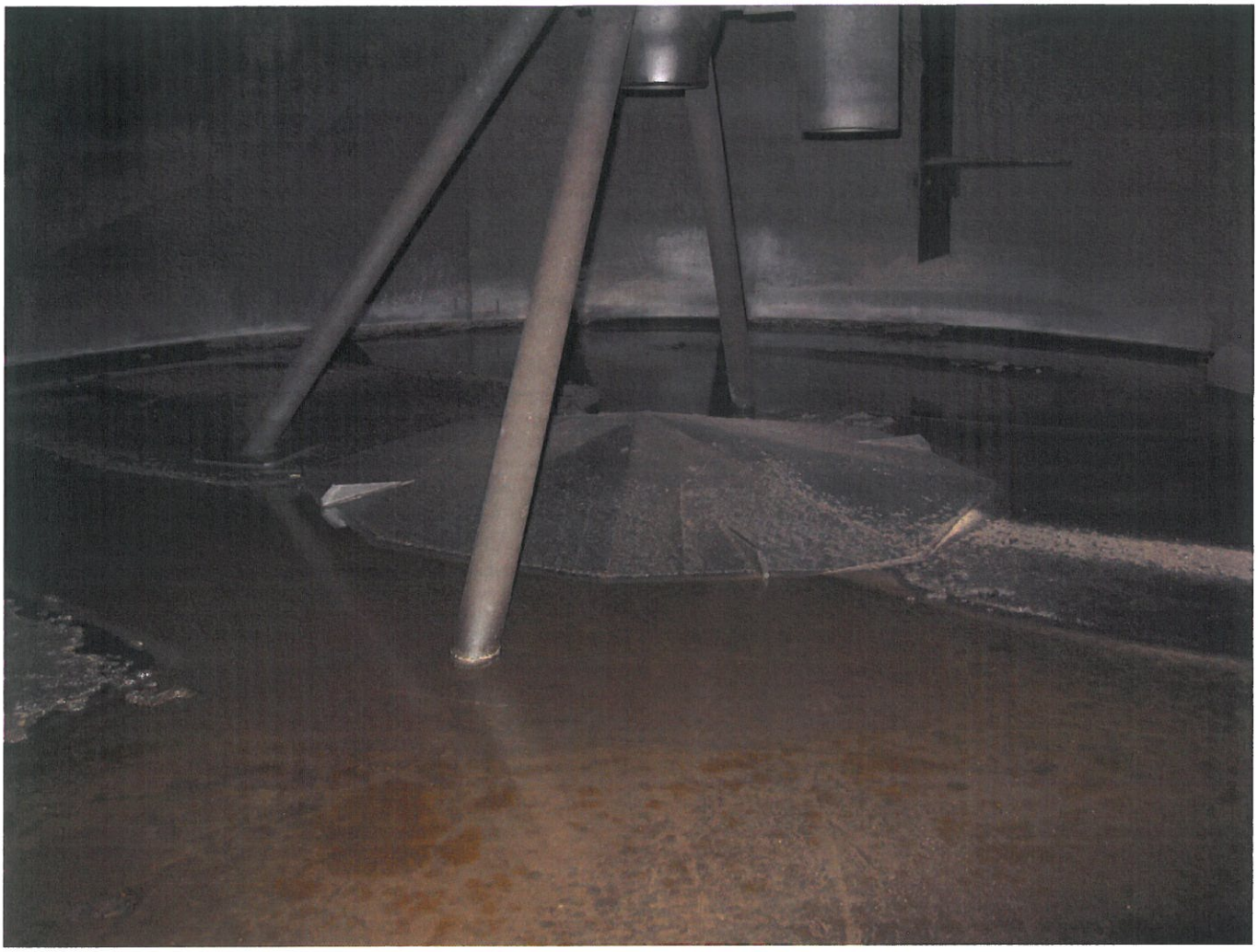
AA2 AT-PLANT COPPER ANALYSER SHUT DOWN PLAN

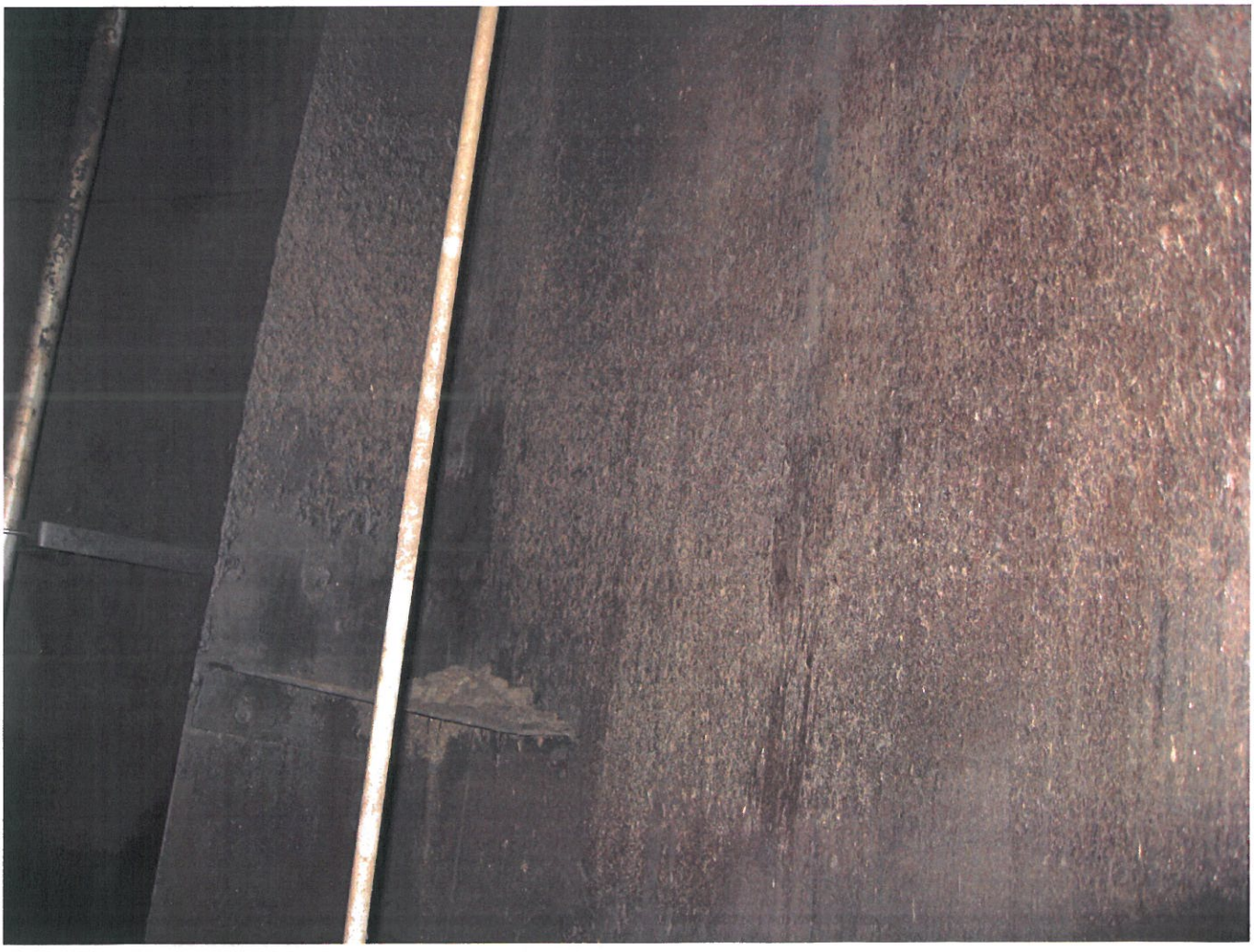
EQUIPMENT	TASK	COMPLETE (SIGN OFF)	DATE
TYTRONIC SENTINEL CU (NO TAG)	Flush sample / reagent / standard / lines with water using a standard 50ml lab syringe (remove reagents, waste solution under analyser and standard solutions)	[redacted]	7/10/09
	Remove and dry the analyser reaction cup then purge sample / reagent / Standard lines with air to remove all liquids from the analyser. Replace cup.		7/10/09
	Isolate power from analyser by unplugging 3 pin plug from wall socket.		7/10/09

[redacted]

5031-160 Spill Containment Tank







Equipment Decontamination Record

Equipment Name	Spill Containment Tank
Equipment Number	5031-160
Plant	Acids
System	Bio Treatment
P&ID	**W1408751**

Final State of Cleanliness (including description of any remaining materials)	VESSEL BOILED, STEAMED OUT AND DRAINED. STILL EVIDENCE OF SMALL AMOUNT OF OIL RESIDUE ON VESSEL BASE AND WALLS.		
Description of Cleaning Methods Used (Include operating instruction numbers)	VESSEL AND ASSOCIATED LINEWORK BOILED OUT AND DRAINED DURING SHUTDOWN OPERATIONS.		
Potential Residual Hazards (include results of any water flush etc)	VESSEL STILL HAS OIL RESIDUE ON WALLS AND BASE.		
Details of Inspections Carried Out	FINAL INSPECTION CARRIED OUT THROUGH REMOVED MANWAY AND PHOTOS.		
Vessel Mechanical Status (e.g. PD'd, Manhole removed etc)	SUCTION PIPEWORK REMOVED.		
Gas Testing Results	O_2	20.92	Name: [redacted]
	Exp	N/D	Signed:
	Other	—	Date: 28.10.09

Status of Ancillary Equipment

Instrumentation Loop No's and Status	N/A
Internal equipment (agitators / spargers / trays / packing etc)	SUPPORTS & BAFFLE PLATES.
Radioactive Sources	N/A
Electrical Isolation	N/A
Gearbox Oil	N/A
Connecting Pipework	INLET / EXIT PIPEWORK.
Lubrication Systems	N/A
Mechanical Seals	N/A

Documentation Attached

Photographs of Internal / Externals	
P&ID	
ECL	
SAP Job History	
Signed Operating Instructions detailing Clean Out	

	PRINT	SIGNED	DATE:
Equipment decontaminated, ready for handover (System Owner)	[redacted]		28.10.09
Equipment Sufficiently Decontaminated (Production Manager)			
Other Relevant personnel (if applicable)			

Equipment Decontamination Record

Equipment Name	Spill Containment Tank Recirculation Pumps
Equipment Number	5031-161 & 162
Plant	Acids
System	Bio Treatment
P&ID	**W1408751**

Final State of Cleanliness (including description of any remaining materials)	TRANSFER PUMPS WASHED AND DRAINED ON COMPLETION OF SHUTDOWN – NO REMAINING MATERIALS.		
Description of Cleaning Methods Used (Include operating instruction numbers)	TRANSFER PUMPS – SUCTION & DELIVERY LINEWORK DRAINED DURING SHUTDOWN OPERATIONS.		
Potential Residual Hazards (include results of any water flush etc)	TRANSFER PUMPS DRAINED AND FREE FROM RESIDUAL HAZARDS.		
Details of Inspections Carried Out	PUMPS WASHED AND DRAINED BOILINGS FREE FROM PROCESS MATERIALS.		
Vessel Mechanical Status (e.g. PD'd, Manhole removed etc)	DRAIN POINTS OPEN.		
Gas Testing Results	O_2	N/A	Name:
	Exp	N/A	Signed:
	Other	—	Date:

Status of Ancillary Equipment

Instrumentation Loop No's and Status	N/A
Internal equipment (agitators / spargers / trays / packing etc)	N/A
Radioactive Sources	N/A
Electrical Isolation	DRIVES DECOMMISSIONED
Gearbox Oil	N/A
Connecting Pipework	SUCTION & DELIVERY PIPEWORK.
Lubrication Systems	N/A
Mechanical Seals	SEAL IN SITU

Documentation Attached

Photographs of Internal / Externals	
P&ID	
ECL	
SAP Job History	
Signed Operating Instructions detailing Clean Out	

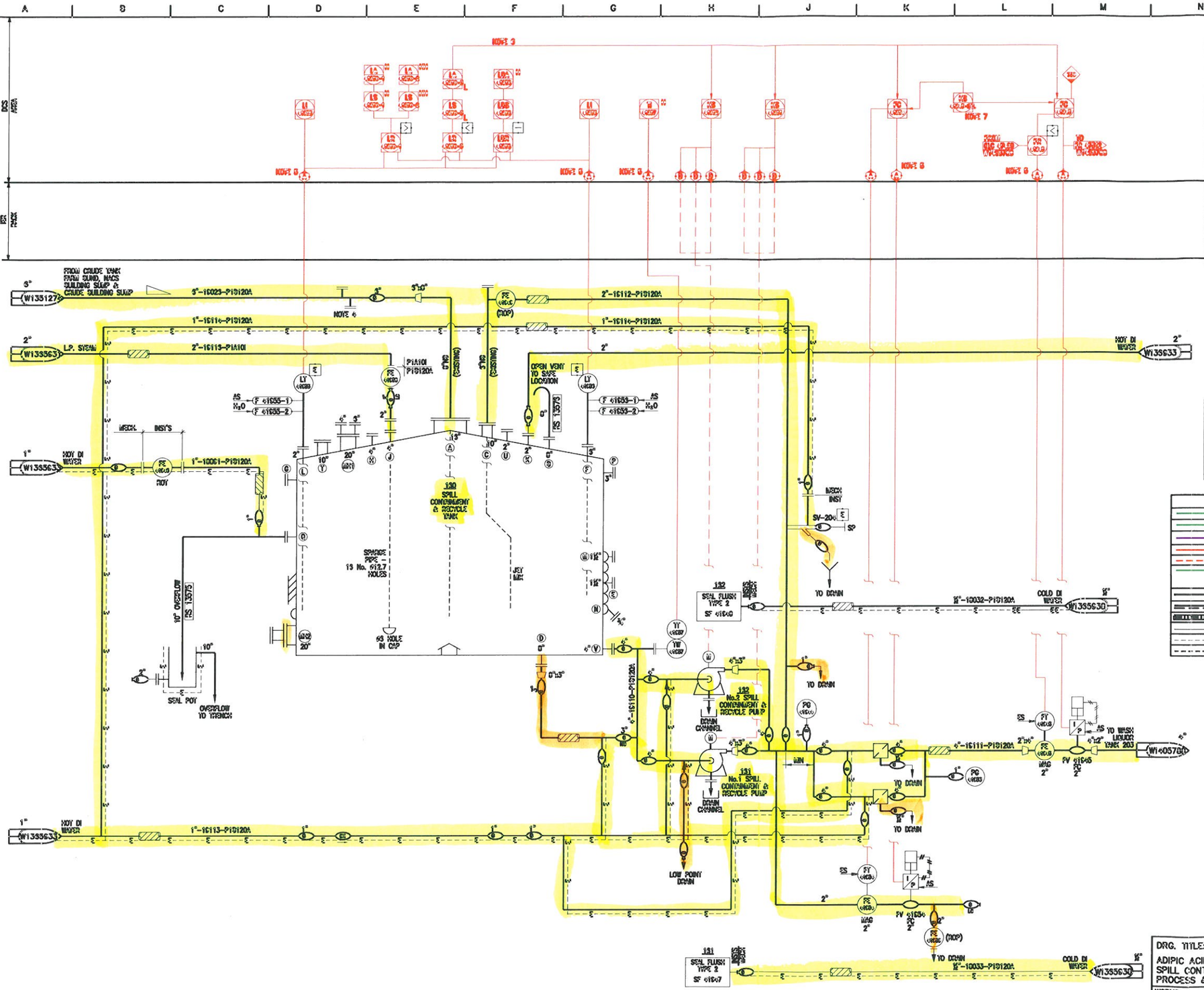
	PRINT	SIGNED	DATE:
Equipment decontaminated, ready for handover (System Owner)	[redacted]		28.10.09
Equipment Sufficiently Decontaminated (Production Manager)			
Other Relevant personnel (if applicable)			

Pipework Decontamination Record

P&ID Number: W1408751

Plant systems covered on P&ID (name & number): SPILL CONTAINMENT AND RECYCLE TANK – 5031-160

Line Notation (ref number on attached P&ID)	Line highlight colour (on attached P&ID)	Line Decontaminated through procedure	Procedure location in Decontamination records	Sign & date to confirm line drained - low points & lutes all checked (mark up on line checks if possible)	Description of line final state (broken joints etc – mark-up on P&ID/line checks, attach photos if appropriate)
160 – SPILL CONTAINMENT TANK	MANWAY/IV	TANK BOILED OUT AND DRAINED		[redacted] 7-10-09	MANWAY REFITTED WITH SPACERS 3" BASE VALVE REMOVED.
19113 - 19114 HOT DI WATER LINES	DRAIN OPEN	ISOLATED AND DRAINED			
161 & 162 – SCT PUMPS	DRAIN OPEN	WASHED WITH HOT DI WATER AND DRAINED			
19033 COLD DI WATER LINE TO PUMP SEALS	DRAIN OPEN	ISOLATED AND DRAINED			
19110 - 19111 LINES PUMP SUCTIONS & DELIVERIES	DRAIN OPEN	WASHED WITH HOT DI WATER AND DRAINED THROUGH PUMP LINEWORK			CONDUCTIVITY LEVELS LOW, DRAIN POINTS OPEN ON SUCTION
19112 LINE PUMP CIRC TO SCT	DRAIN OPEN	WASHED WITH HOT DI WATER AND DRAINED THROUGH PUMP LINEWORK			CONDUCTIVITY LEVELS LOW, DRAIN POINTS OPEN ON SUCTION
19023 LINE INLET FROM SUMPS	DRAIN OPEN	WASHED WITH HOT DI WATER AND DRAINED THROUGH PUMP LINEWORK			CONDUCTIVITY LEVELS LOW, DRAIN POINTS OPEN ON SUCTION
19116 LINE LP STEAM		ISOLATED AND DRAINED			



EQUIPMENT TABULATION

PROJ	DA	UNIT	ITEM	PART	NAME	REMARKS
		130			SPILL CONTAINMENT & RECYCLE TANK	
		131			CRUDE SLURRY PUMP	(REDUNDANT)
		132			CRUDE SLURRY PUMP	(REDUNDANT)
		175			SLURRY DETENTION VESSEL	(REDUNDANT)
		131			No.1 SPILL CONTAINMENT & RECYCLE PUMP	
		132			No.2 SPILL CONTAINMENT & RECYCLE PUMP	
		-			SEAL POT	

HS DENOTES RELIEF STREAM REGISTRATION NUMBER

NOTES:

1. FOR GENERAL NOTES & SYMBOLS, SEE LEAD SHEET W139393.
2. SCOPE OF REDUNDANT PIPEWORK & EQUIPMENT REMOVAL TO BE DETERMINED.
3. EXISTING LAGGING TO BE REMOVED & TANK RE-LAGGED UP TO ROOF LEVEL.
4. CLEAN OUT PORTS.
5. NEW CRUDE DCS I/O.
6. SCRV LOW LEVEL PULSES OFF PUMPS & CLOSES VALVES FV 41645 & FV 41636.
7. HS 41645-SEL ACCESS VIA (HS 41637) KEYSWITCH PERMISSIVE ONLY.

LINE NUMBERS

PROJ	DA	TYPE	ALLOTTED	LASTNO.	NO.CANCELLED
		LINE NO.(PKL1)	N/A		
		LINE NO.(PKL2)	16110 to 16116	16113	16115
		INSY. TAG	41644 to 41636	41656	41650

COLOUR LEGEND

	PSM-CRITICAL VESSELS ,MACHINES,CONTROL EQUIPMENT & UTILITIES
	PSM CRITICAL PIPELINES (THESE ARE TO INCLUDE PACK NUMBERS)
	REGISTERED VESSELS,MACHINES & PIPELINES THAT ARE NOT PSM CRITICAL
	ANALOGUE DCS LOGIC
	DIGITAL DCS LOGIC
	DCS LOGIC FOR PSM CRITICAL CONTROL

LINE LEGEND

	PROCESS LINES
	TRACED
	JACKETED
	INSTRUMENT & ELECTRICAL
	ELECTRICAL
	SERVICE LINES

THIS DRAWING CONTAINS PSM-CRITICAL AND /OR REGISTERED EQUIPMENT SHOWN IN COLOUR

ISSUE	REVISION	GRD	DRN	CHK	APP	DATE
C2	UPDATED SYMBOLOGY & INCORPORATED RED LINE MARK UPS		DY	PS		01.12.05
C1	ANNUAL UPDATE		SC	CF	DS	31.5.05
200	AS-BUILT		CR	JW	DM	02-6-02

NOTES:

DRG. TITLE:
ADIPIC ACID
SPILL CONTAINMENT & RECYCLE TANK
PROCESS & INSTRUMENT DIAGRAM

WORKS:	BUILDING:	PLANT:	SECTION:
GEOG.AREA	SYSTEM No:		
P.L.C.'S:			
SCALES:			
DRG.TYPE:	DO LOC:		
DRAWN BY: CR	DATE: 02/06/02		
CHECKED: SM/DW	DATE: 02/06/02		
APPROVED:	SECTION	DATE:	

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DRG. SIZE A1

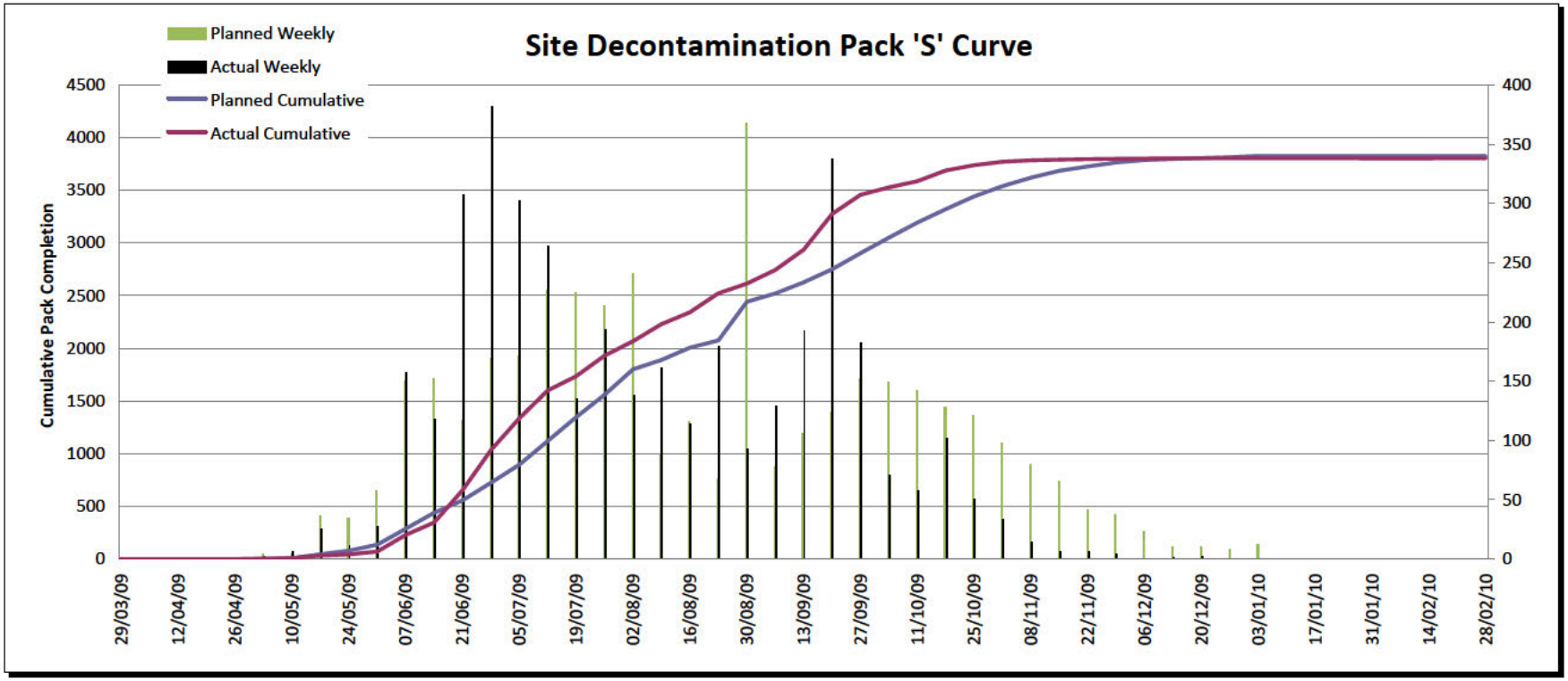
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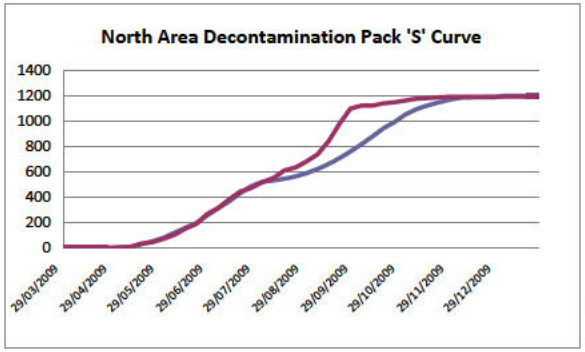
REV. C2

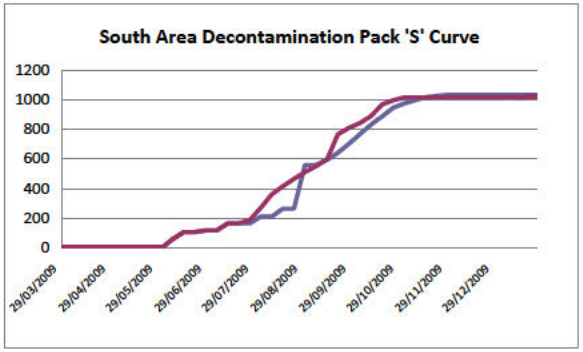
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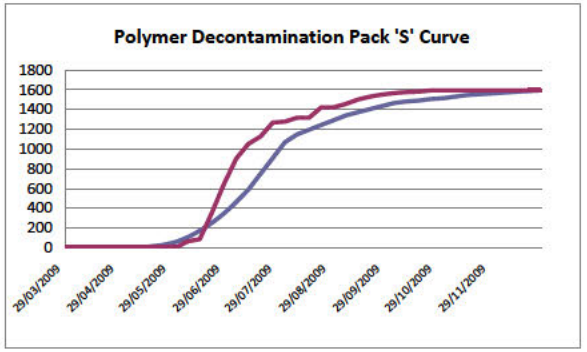
Appendix J

Decontamination works plan


Site Decontamination Pack 'S' Curve
Planned Weekly
Actual Weekly
Planned Cumulative
Actual Cumulative
Cumulative Pack Completion
4500
4000
3500
3000
2500
2000
1500
1000
500
0
400
350
300
250
200
150
100
50
0
29/03/09
12/04/09
26/04/09
10/05/09
24/05/09
07/06/09
21/06/09
05/07/09
19/07/09
02/08/09
16/08/09
30/08/09
13/09/09
27/09/09
11/10/09
25/10/09
08/11/09
22/11/09
06/12/09
20/12/09
03/01/10
17/01/10
31/01/10
14/02/10
28/02/10


North Area Decontamination Pack 'S' Curve
1400
1200
1000
800
600
400
200
0
29/03/2009
29/04/2009
29/05/2009
29/06/2009
29/07/2009
29/08/2009
29/09/2009
29/10/2009
29/11/2009
29/12/2009


South Area Decontamination Pack 'S' Curve
1200
1000
800
600
400
200
0
29/03/2009
29/04/2009
29/05/2009
29/06/2009
29/07/2009
29/08/2009
29/09/2009
29/10/2009
29/11/2009
29/12/2009


Polymer Decontamination Pack 'S' Curve
1800
1600
1400
1200
1000
800
600
400
200
0
29/03/2009
29/04/2009
29/05/2009
29/06/2009
29/07/2009
29/08/2009
29/09/2009
29/10/2009
29/11/2009

Appendix K

Transformer decontamination records

Oil Cooled Transformer Decontamination Record

Transformer Identity	**'M'**
Circuit Reference	Nylon Switch House, Panel 07
Voltage	11000/415
Plant	Services
Location	No.1 Cooling Tower

Final State of Cleanliness	Oil drained & disposed of. Drain valve closed.
Potential Residual Hazards	Residual oil remaining in tank, containing PCBs.
Oil P.C.B. content (based on last known analysis)	1 ppm.
Physical Disconnections	All power cables removed from transformer.

	PRINT	SIGNED	DATE:
Equipment decontaminated, ready for handover (System Owner)	[redacted]		10/05/2010
Equipment Sufficiently Decontaminated (Production Manager)			
Other Relevant personnel (if applicable)			

Oil Cooled Transformer Decontamination Record

Transformer Identity	**'D'**
Circuit Reference	N/A (Previously redundant)
Voltage	11000/415
Plant	Acids 1
Location	North-South Service Road

Final State of Cleanliness	Oil drained & disposed of. Drain valve closed.
Potential Residual Hazards	Residual oil remaining in tank, containing PCBs.
Oil P.C.B. content (based on last known analysis)	15 ppm.
Physical Disconnections	All power cables removed from transformer.

	PRINT	SIGNED	DATE:
Equipment decontaminated, ready for handover (System Owner)	[redacted]		10/05/2010
Equipment Sufficiently Decontaminated (Production Manager)			
Other Relevant personnel (if applicable)			

Appendix L

Removal of mercury

ACIDS 1 AREA								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter To Do**	**No. of Hg Devices Found**
ADN	Control room door	Elect socket	?	?	OK	04/09/2009		1
ADN	Control room ducting above panel	Temp controller Hg bottle ? No Hg switch.	?	?	Ladder	04/09/2009		1
ADN	Demin Head Tank	Hg/Steel	N & Z	T7790	OK	02/09/2009		1
GROUND FLOOR								
Acids	Metafilters	HG/Steel	N&Z	?	OK	26/08/2009		1
	West wall adj door	HG/Steel	Taylor	?	Scaffold	03/12/2009		1
	Vessel W of Col 79	HG/Steel	N&Z	?	OK	26/08/2009		1
	East end Col C1	HG/Steel	N&Z	?	OK	26/08/2009		1
				?				1
Reaction	N2 Hot condt Tank	HG/Steel	N&Z	?	OK	04/09/2009		1
Reaction	Boric Disolver	HG/Steel	Taylor	?	OK	04/09/2009		1
Reaction	Semi-glazed room Adj PIC 7860, North wall	HG/Steel	?	?	OK	04/09/2009		1
Service Trench	Inst Cabinet behind E transformer	Elect socket			OK	13/08/2009		1
Service Trench	Inst Cabinet behind E transformer	HG/Steel	3 HG/Steel lines necked off in cabinet.			02/12/2009		3
Wet Melt	West side of concrete plinth	HG/Steel	N&Z	?	OK	08/09/2009		1
Wet Melt	No 1 80% HMD Tank	HG/Steel	N&Z	TIC 8801	OK	08/09/2009		1
Wet Melt	No 2 80% HMD Tank	HG/Steel	N&Z		OK	08/09/2009		1
Wet Melt	Filtered Salt Storage.	HG/Steel	N&Z	TIC 8804	OK	08/09/2009		1
Wet Melt	2 Million Storgage	HG/Steel	?	?	OK	07/09/2009		1
1st FLOOR								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
Salt	1st Salt Blend Tank	HG/Steel	N&Z	TIC 1802	OK	27/08/2009		1
Salt	2nd Salt Blend Tank	HG/Steel	N&Z	TIC 1803	OK	27/08/2009		1
	Tx and as much cappilary removed as possible. Capillary crushed and remnant tagged as containing Hg.							
Salt	3rd Salt Blend Tank	HG/Steel	N&Z	TIC 1804	OK	27/08/2009		1
Salt	4th Salt Blend Tank	HG/Steel	N&Z	TIC 1805	OK	27/08/2009		1
Salt	West wall, No1 MSR Vessel	HG/Steel	Taylor	?		01/12/2009		1
Salt	No2 MSR Vessel	HG/Steel	N&Z	?		01/12/2009		1
Salt	Filtered Feed Tank	HG/Steel	N&Z	?	No, Bulb on vessel on G/F.	01/12/2009		1
Crude 2	Crude Filtrate Tk (381)	HG/Steel	N & Z	?		01/12/2009		1
Crude 2	NW Staircase	Hg Manometer type	Kent	?	OK	01/12/2009		1
Crude 1	Control Room	Fire Alarm Relay box	Hg switches	?	OK	13/08/2009		1
Crude 1	Demin Hot Water Tank	Hg/Steel	N & Z	Tic 1807	Ladder	03/12/2009		1
2nd FLOOR								
Crude 1	E Wall Adj Ptr 1840	Hg Switches	PSW	?	OK	13/08/2009		1
Crude 1	E Wall Adj Ptr 1840	Hg Switches	PSW	?	OK	13/08/2009		1
3rd FLOOR								
Crude 1	N of Cu dissolvers	Run of capillary	?	?	OK	03/12/2009		1
Wet Melt	E Wall adj Control Panel	Hg/Steel	Taylor	?	OK	02/09/2009		1
4th FLOOR								
5th FLOOR								

TTE TRAINING SCHOOL								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
TTE	Process Training Rig	Hg/Steel	Foxboro Tx		OK	01/09/2009		1
TTE	Process Training Rig	Hg/Steel	Cambridge		OK	01/09/2009		1
TTE	Process Training Rig	Hg/Steel	Foxboro Tx		OK	01/09/2009		1
TTE	Process Training Rig	Hg/Steel	Taylor		OK	01/09/2009		1
NORTH AREA Hg FILLED INSTRUMENTS TRACKER								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
KA	No.1 Dycal Storage	HG/Steel	Taylor	TIC 593	OK	27/07/2009		1
KA	No.2 Dycal Storage	HG/Steel	Taylor		OK	28/07/2009		1
KA	No.3 Dycal Storage	HG/Steel	Taylor		OK	27/07/2009		1
KA	No.8 KA Storage	HG/Steel	N & Z		OK	27/07/2009		1
KA	No.9 KA Storage	HG/Steel	N & Z		OK	27/07/2009		1
KA	Nth Anal. House Duct	Thermo. Valve			Step ladder	23/07/2009		1
KA	Sth Anal. House Duct	Thermo. Valve			Step ladder	23/07/2009		1
KA	Nth Econ. Cond.	HG/Steel	Taylor	TIC 312-1	Scaff. Req.	05/08/2009		1
KA	No.1 Cryst Cond.	HG/Steel	Taylor	TIC 436-1	OK	28/07/2009		1
KA	Centrifuge House	HG/Steel	Taylor	TIC 446	Step ladder	04/08/2009		1
HMD Stor.	No.4 HMD Solution Tk.	Temp Ind. Controller			OK	22/07/2009		1
SERVICES								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
TTE	NW Corner, car park	Manometer	Foxboro	?	OK	15/06/2009		1
North Area	E of H2 compressors	Hg Switch	?	?	OK	15/06/2009		1
North Area	No.7 & No.8 Air Comp.	Hg Switches	Londex relays	?	OK	27/08/2009		4
Water Treatment	Control Panel	Electrical H/g switched sockets	?	?	OK	01/07/2009		1
Water Treatment	North H1 Unit	Possible Hg Lute.	?	?	OK	No Hg in lute 09/07/09		1
Water Treatment	W wall N of access door	Hg Manometer	?	?	OK	03/08/2009		1
Water Treatment	Blue vessel W side of building	Temp Indicator	Rototherm	?	OK	04/08/2009		1
Water Treatment	No 2 Storage Demin/Deionised	Temp Indicator	Rototherm	?	OK	03/08/2009		1
Water Treatment	No 3 Storage Cooled Condy	Temp Indicator	Rototherm	?	OK	03/08/2009		1
Water Treatment	E wall treatment tank	Hg Manometer	?	?	OK	03/12/2009		1
								1
HMD Tank farm	#4 HMD TK	Temp Cont	Taylor 440	?	OK	22/07/2009		1
HMD Tank farm	#4 HMD TK	Manometer	?	?	OK	22/07/2009		1
HMD Tank farm	85% Stge TK	Manometer	?	?	OK	22/07/2009		1
Pipe Trench	Adjacent to #1 gateKA	Temp Indicator	Rototherm	?	OK	23/07/2009		1
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.1 LL Pump Heater Relay	OK	29/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.1 HL Pump Heater Relay	OK	29/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.2 LL Pump Heater Relay	OK	29/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.2 HL Pump Heater Relay	OK	29/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.3 LL Pump Heater Relay	OK	29/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.3 HL Pump Heater Relay	OK	29/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.4 LL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.4 HL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.5 LL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.5 HL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.6 LL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.6 HL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	2 Relay switches	Hg in Glass	No.7 LL Pump Heater Relay	OK	30/07/2009		2
No1 Cooling Tower	Control Room Rear Panel	1 Relay switch	Hg in Glass	Spare	OK	30/07/2009		1

OLD NYLON OFFICES & LABS								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
Polymer Reseach Lab.	South end of lab in fume cupboard	Stop/Start:- Hg Switch			OK	20/08/2009		1
Polymer Reseach Lab.	South end of lab in fume cupboard	Stop/Start:- Hg Switch			OK	20/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	Rototherm		OK	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	Rototherm		OK	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	temperature ind.	N & Z		Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	Thermo. Valve			Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 1	Thermo. Valve			Step Ladder	19/08/2009		1
Nylon Offices	Calorifier Room 2	temperature ind.	N & Z		Step Ladder	07/08/2009		1
Nylon Offices	Calorifier Room 2	temperature ind.	N & Z		Step Ladder	07/08/2009		1
Nylon Offices	Calorifier Room 2	temperature ind.	N & Z		Step Ladder	07/08/2009		1
Nylon Offices	Calorifier Room 2	temperature ind.	N & Z		Step Ladder	07/08/2009		1
Nylon Offices	Calorifier Room 2	temperature ind.	N & Z		Step Ladder	07/08/2009		1
DEN Offices	Calorifier Room 3	temperature ind.	N & Z		Step Ladder	07/08/2009		1
DEN Offices	Calorifier Room 3	temperature ind.	N & Z		Step Ladder	07/08/2009		1
DEN Offices	Calorifier Room 3	temperature ind.	N & Z		Step Ladder	07/08/2009		1
DEN Offices	Calorifier Room 3	Temp Cont	N & Z		OK	06/08/2009		1
DEN Offices	Calorifier Room 3	Temp Cont	Taylor 440		OK	06/08/2009		1
DEN Offices	Calorifier Room 3	Temp Cont	Taylor 440		OK	17/02/2010		1
DEN Offices	Calorifier Room 3	temperature ind.	Rototherm		OK	17/02/2010		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	17/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	17/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	17/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	17/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	17/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	18/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	18/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	18/08/2009		1
Nylon Offices	Calorifier Room 4	temperature ind.	N & Z		Scaff-Tag Req	18/08/2009		1
	Calorifier Room 4	Temp Cont. Valve	N/A		OK	18/08/2009		1
	Calorifier Room 4	Temp Cont. Valve	N/A		OK	18/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	N & Z		Step Ladder	20/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	N & Z		Step Ladder	20/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	N & Z		Step Ladder	20/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	N & Z		Step Ladder	20/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	N & Z		Step Ladder	20/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	N & Z		Step Ladder	20/08/2009		1
Nylon Offices	Calorifier Room 5	temperature ind.	Ascroft		OK	20/08/2009		1
Nylon Offices	Calorifier Room 6	temperature ind.	N & Z		Step Ladder	21/08/2009		1
Nylon Offices	Calorifier Room 6	temperature ind.	N & Z		Step Ladder	21/08/2009		1
Nylon Offices	Calorifier Room 6	temperature ind.	N & Z		Step Ladder	21/08/2009		1
Nylon Offices	Calorifier Room 6	temperature ind.	Rototherm		OK	18/08/2009		1
Nylon Offices	Calorifier Room 6	temperature ind.	Brentford		OK	18/08/2009		1
NCC	Calorifier Room 7	CLEAR						
KA	Calorifier Room 8	HG/Steel	N & Z	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8	HG/Steel	N & Z	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8	HG/Steel	N & Z	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8	HG/Steel	N & Z	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8	Thermo. Valve	Spirex Sparco(Red)	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8	Thermo. Valve	Spirex Sparco(Blue)	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8	Thermo. Valve	Drayton Regulator	?	Step ladder	21/07/2009		1
KA	Calorifier Room 8A	temperature ind.	BSS		OK	06/08/2009		1
KA	Calorifier Room 8A	temperature ind.	BSS		OK	06/08/2009		1
Acids 1	Calorifier Room 9	CLEAR						
Nitrics	Calorifier Room 10	CLEAR						
Salt 2	Calorifier Room 11	CLEAR						1
Acids 2	Calorifier Room 12	CLEAR						1
HMD	Calorifier Room 13	CLEAR						1
								1
NITRIC								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
Nitric 3	Filter House Wall	Manometer	?	?	OK	31/07/2009		1
Nitric 3	NH3 Vaporiser	temperature ind x 2	Rototherm	53704	OK	31/07/2009		1
Nitric 3	NH3 Vaporiser	temperature ind x 2	Rototherm	53716	OK	31/07/2009		1
Nitric 3	NH3 Compressor	temperature indicators x 8	Rototherm	?	OK	31/07/2009		8
Nitric 3	N2/Air pre-heater	Manometer	?	53147	OK	N/A Water		
Nitric 3	Ground fl R1 Cooler	Temp Indicators	Rototherm	53154	Scaff. Req	17/08/2009		1
Nitric 3	Ground fl R1 Cooler	Temp Indicators	Rototherm	53155	Scaff. Req	17/08/2009		1
Nitric 3	Ground fl R1 Cooler	Temp Indicators	Rototherm	53156	Scaff. Req	17/08/2009		1
Nitric 2	NH3 Vaporiser	temperature ind x 2	Rototherm	52704	OK	03/08/2009		1
Nitric 2	NH3 Vaporiser	temperature ind x 2	Rototherm	52716	OK	03/08/2009		1
Nitric 2	N2/Air pre-heater	Manometer	?	52417	OK	N/A Water		1
Nitric 2	NH3 Compressor	temperature indicators x 8	Rototherm	?	OK	03/08/2009		8

POLYMER								
Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
Polymer	East Tx Storage	Hg/Steel	N & Z	?	N/A	16/07/2009		1
Polymer	Contam Tx Stge	Hg/Steel	N & Z	?	N/A	16/07/2009		1
Polymer	20 Vapouriser	Hg/Steel	Rototherm	TG60158	N/A	16/07/2009		1
Polymer	22 Vapouriser	Hg/Steel	N & Z	?	N/A	22/07/2009		1
Polymer	23 Vapouriser	Hg/Steel	N & Z	TG61158	N/A	16/07/2009		1
Polymer	24 Vapouriser	Hg/Steel	Rototherm	TG61258	N/A	16/07/2009		1
Polymer	25 Vapouriser	Hg/Steel	N & Z	?	N/A	16/07/2009		1
Polymer	26 Vapouriser	Hg/Steel	Rototherm	TG62158	N/A	22/07/2009		1
Polymer	28 Vapouriser	Hg/Steel	Rototherm	?	N/A	16/07/2009		1
Polymer	29 Vapouriser	Hg/Steel	Rototherm	TG63158	N/A	16/07/2009		1
Polymer	30 Vapouriser	Hg/Steel	Rototherm	TG63258	N/A	16/07/2009		1
Polymer	31 Vapouriser	Hg/Steel	Rototherm	TG63358	N/A	16/07/2009		1
Polymer	32 Vapouriser	Hg/Steel	Rototherm	?	N/A	16/07/2009		1
Polymer	33 Vapouriser	Hg/Steel	Rototherm	TG64258	N/A	20/07/2009		1
Polymer	34 Vapouriser	Hg/Steel	N & Z	?	N/A	27/07/2009		1
Polymer	35 Vapouriser	Hg/Steel	N & Z	TG65158	N/A	20/07/2009		1
Polymer	36 Vapouriser	Hg/Steel	Rototherm	TG65258	N/A	24/07/2009		1
Polymer	37 Vapouriser	Hg/Steel	Rototherm	?	N/A	11/08/2009		1
Polymer	38 Vapouriser	Hg/Steel	N & Z	?	N/A	16/07/2009		1
Polymer	39 Vapouriser	Hg/Steel	Rototherm	TG66258	N/A	16/07/2009		1
Polymer	40 Vapouriser	Hg/Steel	Rototherm	TG66358	N/A	23/07/2009		1
Polymer	42 Vapouriser	Hg/Steel	Rototherm	TG67158	N/A	16/07/2009		1
Polymer	42 Vap Bay West Wall	Hg/Steel	Rototherm	TG68640	N/A	23/07/2009		1
Experimental	4th Floor	Hg/Steel	N & Z (4 off)			14/07/2009		4
Experimental	3rd Floor	Hg/steel	N & Z			14/07/2009		1
Experimental	2nd Floor	Hg/Steel	N & Z (3 off)			15/07/2009		3
Experimental	2nd Floor East end panel		Honeywell Brown			15/07/2009		1
Experimental	1st Floor	Hg/Steel	N & Z (2 off)			15/07/2009		2
Thermex	2nd Floor	Hg/Steel	N & Z	TIC25	OK	25/08/2009		1
Polymer	No3 Switch room	Hg switches	Sockets	?	OK	13/08/2009		1
Polymer	2nd floor north wall	Hg switches	Sockets	?	OK	13/08/2009		1

SOUTH AREA

HMD PLANT

Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
~~Synthesis~~	~~1st Floor N~~	~~Pad Cell, Not Sure~~	~~Moore~~	~~LT 1445~~	~~OK~~			1
	1st Floor W Col G	Not Sure	Rototherm	?	OK	14/08/2009		1
Tank Farm	Base No1 HMD rec Tk	Hg/Steel	N&Z	TIC 1518	OK	12/08/2009		1
	Base No2 HMD rec Tk	Hg/Steel	N&Z	TIC 1519	OK	12/08/2009		1
Old Catalyst	Control room	Hg switch	Londex	?	OK	15/06/2009		1
Refinery	Clear							
NH3 Recovery	Clear							

ACIDS 2 PLANT

Plant	**Location**	**Type**	**Make**	**Tag**	**Access**	**Date removed**	**Counter**	
No 2 Salt	BSS Tank	Hg/Steel	N&Z	Adj to TT 47991	OK	28/07/2009		1
	Gnd floor	Hg/Steel	N&Z	TIC 1824	OK	24/07/2009		1
	Gnd,1 Salt TT	Hg/Steel	N&Z	TIC ??	OK	22/07/2009		1
	Gnd,2 Salt TT	Hg/Steel	N&Z	TIC 1819	OK	22/07/2009		1
	1st, Salt Slurry Tank	Hg/Steel	N&Z	TIC 1840	OK	04/08/2009		1
	1st, Base H/W Tank	Hg/Steel	N&Z	TIC 1821	OK	29/06/2009		1
	Control Room	HG/switch	Taylor 90 J	TR 1801/9	OK	06/07/2009		1
	Control Room	HG/switch	Taylor 90 J	An 1800	OK	06/07/2009		1
	Control Room	HG/switch	Taylor 90 J	LRC 1824	OK	06/07/2009		1
	Control Room	HG/switch	Relay box	Fume Alarm	OK	28/07/2009		1
	Elect Sockets 2nd Floor Adj salt dryer	HG/switch		ATI-1B-5	OK	11/08/2009		3
	3rd Roof, Demin Water head tank	Hg/Steel	N&Z	TIC 1817	OK	04/08/2009		1
	5th, Salt Reactor	Hg/Steel	N&Z	TIC 1802	OK	10/08/2009		1
	5th, Salt Reactor	Hg/Steel	N&Z	TIC 1803	OK	10/08/2009		1
	Switch Room	HG/switch	Londex	Panel 410	OK	11/08/2009		1
	Switch Room	HG/switch	Londex	Panel 411	OK	11/08/2009		1
Warehouse	N End, office roof	Hg/Steel	?	?		14/08/2009		1
DRAA	Clear							
Compressor	Clear							
Nacs Purge	Clear							
Crude	Clear							
COGA	Clear							
Semi	Clear							
Reaction	Clear							
Absorbtion	Clear							

Total	0	242

Appendix L

Removal of mercury – Wilton nylon Laboratory Decommissioning

Wilton Nylon Laboratory Decommissioning Report

23rd December 2009

SCOPE

The report covers all laboratories, offices, other work areas, stores, wash rooms and mess rooms within the Nylon Laboratory building and its external storage areas.

The report documents the safe removal of all laboratory chemicals, reagents, samples, cleaning materials and waste streams in the 'Removal checklist' section of this report. Soap and hand cream dispensers and their contents are not included and these remain in situ.

The report also documents the safe removal of portable electrical equipment, analytical equipment and spares, safety equipment, IT equipment, other general non-fixed equipment and documentation in the 'Removal checklist' section of this report. In cases where it has not be practicable to remove equipment it has been detailed in the 'Exceptions' section of this report.

EHS

Invista corporate and site procedures were followed during the decommissioning to ensure that all work was carried out in a safe manner and that chemicals and wastes were disposed via the most appropriate route.

In order to reduce the impact on the environment and the volume of waste, unused chemicals and reagents were transferred to other Invista laboratories and in some cases chemicals were transferred to a chemical supplier.

Mercury and mercury containing equipment have been disposed of via an approved route organised by the site waste officer. A mercury survey of the laboratories was carried out to determine the location of residual mercury. Details and results of the survey and results are included in this report.

Where decontamination was not safe or practicable to carry out then the real or potential remaining hazards have been identified in the 'Fume cupboard' and 'Mercury' sections of this report.

SERVICES

All services have been isolated and made safe by the site electricians and services group as appropriate.

Compressed gas cylinders have been returned to BOC and Gaffneys have removed all regulators and hoses from systems.

FUME CUPBOARDS

Electrical supply to the fume cupboards has been isolated via the main isolation to the laboratory.

Fume cupboards were cleaned internally to remove obvious chemical contamination from surfaces. Fume cupboard ducts were not cleaned and it should be noted that there may be toxic, corrosive and organic residues within these ducts.

There is a known issue with condensate/water ingress from the ducts dripping into the some of the fume cupboards leaving a brown liquid. It is expected that this will continue after exiting the building.

MERCURY SURVEY

A mercury survey of the laboratory was carried out using a rented Jerome model 405 portable mercury analyser. The analyser was regenerated before each area was surveyed. The zero was checked with a zero filter before each survey with results typically 0.5 to 0.7ug/m3. Background levels in the general lab areas were typically 0.6 to 0.8ug/m3.

The analyser was very sensitive - a 10ml volume of mercury under approximately 200ml water in a 500ml poly sample bottle gave high readings of >800ug/m3 up to the saturation point of 999ug/m3 at the neck of the bottle. Insertion into the bottle gave saturated results.

All of the working areas in the laboratory building have been surveyed including storage areas. The laboratories were surveyed on a bench by bench basis taking 4 readings across the top of the bench and at floor level focussing on any areas of broken surface.

Storage areas were surveyed around the edges of the room plus under shelves etc. were a visual check was not possible.

Each sink was surveyed by inserting the analyser probe 30 to 40cm into the plug hole plus a reading below the sink. The same approach was used for fume cupboards with 3 readings at bench level and floor level. The circular water and steam ‘collectors’ located in fume cupboards, on side benches and in the centre of main benches are referred to as ‘basins’ in the survey results. There is a wide range of plumbing throughout the building from the relatively straightforward plastic screw-type to a glass type which are connected and sealed with bolted flanges (generally very rusty). Some areas do not have any obvious access.

The results of the survey can be found below. Only readings above 5ug/m3 have been recorded, typically readings were <1ug/m3 in unaffected areas. When readings were detected >5ug/m3 a further 2 repeats were carried out to give a total of 3 recorded readings. Results greater than the HSE EH40 limits of 25ug/m3 have been recorded in red.

There were no positive visual evidence of mercury found during the survey.

The mercury ‘hot spots’ have been physically tagged so that the locations of the residual mercury can be identified. Tag identifications are included in the results table

Location	Tag Reference	Reading 1 (ug/m3)	Reading 2 (ug/m3)	Reading 3 (ug/m3)
Laboratory 1 (Shift Lab)				
Bench 11A/B east sink	LAB1-11A/B-EAST SINK	26.7	17.4	16.7
Bench 11A/B west sink	LAB1-11A/B-WEST SINK	394.0	279.4	252.6
Bench 10A/B west sink	LAB1-10A/B-WEST SINK	43.3	44.1	42.6
Centre bench drain	LAB1-CENTRE-DRAIN	21.7	20.4	22.1
East side bench north DM water sink	LAB1-EAST-NORTH DM SINK	241.2	367.1	234.9
East side bench south DM water sink	LAB1-EAST-SOUTH DM SINK	80.8	104.2	109.3
East side bench basin (north)	LAB1-EAST-NORTH BASIN	104.6	199.1	175.5
Fume cupboard I south basin	LAB1-FC I-SOUTH BASIN	9.0	13.2	10.6
Solutions Laboratory				
Bench 1A/B sink	SOL-1A/B SINK	11.0	11.1	9.2
Bench 2A/B sink	SOL-2A/B SINK	139.0	131.1	130.5
East end bench (distillation area) north basin	SOL-EAST-NORTH BASIN	348.5	341.0	427.5
Fume cupboard A TV water basin	SOL-FC A-TV BASIN	5.0	4.1	5.2
Fume cupboard A TV steam basin	SOL-FC A-STEAM BASIN	7.4	6.5	6.1
Fume cupboard B	SOL-FC B	5.4	6.3	4.7
Fume cupboard B TV water basin	SOL-FC B-TV BASIN	932.5	271.0	589.6
Fume cupboard B TV steam basin	SOL-FC B-STEAM BASIN	506.7	617.0	489.5
Laboratory 2 (redundant intermediates lab)				
West end bench south sink	LAB2-WEST-SOUTH SINK	19.1	19.0	19.1
Bench 2A/B sink	LAB2-2A/B-SINK	11.5	7.5	12.6
Bench 3A/B sink	LAB2-3A/B-SINK	329.2	466.5	644.1
Bench 4A/B sink	LAB2-4A/B-SINK	576.5	551.1	401.3
Bench 5A/B sink	LAB2-5A/B-SINK	7.2	6.5	6.4
Fume cupboard B centre glass basin	LAB2-FC B-CENTRE BASIN	41.8	48.8	47.1
Fume cupboard E glass basin	LAB2-FC E-BASIN	897.2	857.4	967.1
Fume cupboard I LHS glass basin	LAB2-FC I-LHS BASIN	159.1	235.2	327.4
Fume cupboard I RHS glass basin	LAB2-FC I RHS BASIN	54.1	62.1	58.1
Polymer Research Laboratory South				
South bench east basin	POLY S-SOUTH-EAST BASIN	32.7	34.1	36.2
South bench west sink	POLY S-SOUTH-WEST SINK	10.1	10.7	11.1
Bench 2 east basin	POLY S-2-EAST BASIN	12.3	12.9	11.9
Bench 2 west basin	POLY S-2-WEST BASIN	377.2	243.5	446.2
Bench 2 west sink	POLY S-2-WEST SINK	15.1	6.2	5.3
Bench 3 west sink	POLY S-3-WEST SINK	35.8	27.5	20.2
Fume cupboard I 2nd basin	POLY S-FC I-2ND BASIN	33.2	34.1	54.2
Fume cupboard I 4th basin	POLY S-FC I-4TH BASIN	55.2	62.8	65.4
Polymer Research Laboratory North				
Bench 1 east basin	POLY N-1-EAST BASIN	14.8	14.2	14.9
Bench 1 west basin	POLY N-1-WEST BASIN	55.5	47.8	48.2
Bench 1 east sink	POLY N-1-EAST SINK	57.2	35.0	42.0
Bench 2 east basin	POLY N-2-EAST BASIN	14.2	16.1	15.2
Bench 2 west basin	POLY N-2-WEST BASIN	7.3	7.7	8.2
Bench 2 west sink	POLY N-2-WEST SINK	55.2	55.1	57.0
Bench 3 east sink	POLY N-3-EAST SINK	70.1	50.3	48.2
Bench 5 east sink	POLY N-5-EAST SINK	10.2	11.7	12.1
Laboratory room 265				
Bench 2 (north) sink	RM 265-2-SINK	24.4	17.8	10.9

REMOVAL CHECKLIST

The check lists below details and confirms the removal of the specified items from each area of the building. Fume cupboards and mercury are not included as they are detailed in their own specific sections.

Key:

'Y' indicates removal
'N' indicates still present
'?' indicated under another work groups control
'N/A' indicates item not applicable to that area

Lab building first floor	Chemicals	Gas Cylinders	Aersols	Analytical Equipment	Portable electrical equipment	IT equipment	General Equipment/Tools	Fire extinguishers & BA	Eye wash bottles	Documents
Polymer Research Lab North	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Polymer Research Lab South	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Room 265 (lab)	Y	Y	Y	Y	Y	Y	Y	N/A	Y	Y
Room 253 (DCS store)	N/A	N/A	?	N/A	?	?	?	N/A	N/A	?
Offices	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	Y
Corridors	N/A	N/A	N/A	N/A	Y	N/A	Y	Y	N/A	Y
ICP Room	Y	Y	Y	N	Y	Y	Y	N/A	Y	Y
Conference Rooms 1 & 2	N/A	Y	Y	Y	Y	Y	Y	N/A	N/A	Y
Intermediates R&D Lab	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Lab Building ground floor	Chemicals (lab, sample, analyser, cleaning)	Gas Cylinders & Regulators	Aerosols	Analytical Equipment	Portable electrical equipment	IT equipment	General Equipment/Tools	Fire extinguishers, BA & FA boxes	Eye wash bottles	Documents
Analyser Team Office	Y	N/A	Y	N/A	Y	Y	Y	N/A	N/A	Y
Analyser Team Workshop gas cylinder area	N/A	Y	N/A	N/A	N/A	N/A	Y	N/A	N/A	N/A
Analyser Team Workshop	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ground floor retention area	Y	Y	Y	Y	Y	N/A	Y	Y	Y	Y
Lab 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
GC lab	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mess Room	Y	N/A	Y	N/A	Y	N/A	Y	Y	N/A	Y
Cylinder compound	N/A	Y	Y	Y	Y	N/A	Y	Y	N/A	N/A
Corridor adjacent to GC lab	N/A	N/A	Y	N/A	Y	N/A	Y	Y	N/A	Y
Offices	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	Y
Store 17	Y	N/A	Y	N/A	Y	N/A	Y	Y	Y	N/A
Store 19	Y	N/A	Y	N/A	Y	N/A	Y	Y	Y	N/A
Toilets near lab store	Y	N/A	Y	Y	Y	Y	Y	Y	N/A	Y
Lab store	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bottle store	Y	N/A	Y	Y	Y	Y	Y	N/A	N/A	N/A
Back Store	Y	N/A	Y	Y	Y	Y	Y	N/A	N/A	N/A
Equipment Store	N/A	N/A	Y	Y	Y	Y	Y	N/A	N/A	N/A
Lab 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Annex	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Toilets between Lab 2 & Annex	Y	N/A	Y	Y	Y	Y	Y	Y	N/A	Y
Solutions Lab & consumables cupboards	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Drum store	Y	N/A	Y	N/A	N/A	N/A	N	N/A	N/A	N/A
Waste compound area	Y	N/A	Y	N/A	N/A	N/A	Y	Y	N/A	N/A

EXCEPTIONS

Room 253

This room is used by DCS team for storage of DCS related items. Items have not been removed at the request of the DCS team as they may be needed for DCS asset transfer in 2010.

ICP Room

This room still contains the ICP instrument plus some peripheral equipment. The instrument has been decontaminated and all associated chemicals and wastes have been removed. The associated IT equipment has also been removed.

Drum store

The drum store external to the laboratory contains empty 45 gallon steel drums and empty 25L polythene kegs.

Appendix M

List of equipment which contains residual contamination

Contaminated equipment - bulk							
Area	Plant	Item No.	Equipment name	Location	Process material	Estimated quantity	Comments
1	KA	F-540	Organics Recovery Column	Central area of plant old ICI KA structure West side of plant.	Solids from boric process: boric acid, sodium hydroxide, polymeric cyclo compounds and trace chromium.	~50kgs	Estimate from decommissioning photo. May not be representative of other trays, (10?),in column.
	KA	5021-237	Mother Liquor tank	West of 'Quad', ground floor below centrifuges. Long horizontal, cylindrical vessel.	Solids from boric process: boric acid, sodium hydroxide, polymeric cyclo compounds and trace chromium.	~200kgs	Estimate from visual inspection from top of vessel.
	KA	7100-F7100-10	North WWR Hotwell	Inside plant West of Mother liquor tank.	Solid tarry material containing organic acids, aka Cop Acid.	~50kgs	Estimate from small nozzle
	KA	7100-F7100-20	South WWR Hotwell	Inside plant West of Mother liquor tank.	Solid tarry material containing organic acids, aka Cop Acid.	~50kgs	Estimate from small nozzle
	KA	7100-E7050-00	Wash Water Storage	Centre of KA structure SW of 'Quad'.	Recycle internal 'pan; has cyclo oligomer material, polymeric dark solid	~500kgs	Visual estimate. No access to base of vessel to determine quantity of any further residual material.
	KA	8500-F8500 & F8501	Nos, 1 & 2 Dycal storages	Tank area to NW of KA plant	Organic acid material, COP acid formerly known as Dycal 66	~2m3/stge	Calculated volume based on 4" heel in tanks
	KA	8500-F8520, E8550 & E8560	Nos 3, 4 & 5 Dycal 75 storages	Tank area to NW of KA plant	Non volatile residues from KA separation process, polymeric hydrocarbons	No.3 stge ~3m3. nos 4 & 5 stges~5m3/stge	Calculated volume based on 4" heel in tanks
	KA	9300-F9380	No.4 General storage	Bunded tank in centre of old ICI section	General material from both boric and non-boric processes	~100kgs	Estimated quantity. Material will contain, traces of chromium, caustic soda, and bulk boric acid and polymeric cyclo compounds
	KA	5021-370, 371 & 372	Oil Wash settlers, 1, 2 & 3.	Central to KA plant E side.	Coffee grounds' dark tarry substance caked on settling trays and floor of vessel	~150kgs/vesssel	Estimate from decommissioning photographs
	KA	5021- 373, 374 & 375	Oil Wash Mixers, 1, 2 & 3.	Adjacent to Oil Wash Settlers on 2nd flr	Coffee grounds' dark tarry substance caked on floor of vessel	~50kgs/vessel	Estimate from decommissioning photographs
	KA	9300-F9350-00, 9300-F9360-00 & 9300-F9370-00	1, 2 & 3 Used Oil Storages	Bunded tanks in centre of old ICI section	Residual oil on vessel base and 'boot', remaining from vent gas absorption section, contaminated with cyclohexane and cyclo compounds.	~200litres/tank	Estimate from decommissioning photographs
	KA	6100-E6030 - A, B, & C. 6100-E6040- A & B. 6100-E6060	Oil heaters and coolers associated with Vent gas absorption	Bunded area E side of KA plant .	Oil contaminated with cyclo compounds from vent gas absorptio. System has been drained but material will remain in interconnecting pipe work at low points.	~100litres/vessel	Etimate
Contaminated equipment - residue							
	KA	7100-7060-00	Wash Water Stage 2 Evaporator, aka No.1 Crystalliser	North East end of main KA structure	Small amount of residue on internal pan. Drainings from base pipe is a thick tarry substance, consisting of polymeric acidic cyclo material.	Unknown	No visual access to base.
	KA	5020-595	Mineral oil storage	NW side of old KA structure in bund	Residual mineral oil following tank draining.	~30ltrs	Estimate from decommissioning
	KA	5020-590A & 590B.	Chromate tanks, (2).	NW side of old KA structure in bund	Residual additive material containing chromate, dark deposit on floor and part of side walls.	~40ltrs	Estimate
	KA	4300-D3100-0B	Primary Cyane Stripper	Centre of E side of KA plant	Residual oligomers of cyclo compounds	Small	Packed sections in this column. Decommissioning photos shown staining not deposits.
	KA	4300-F3110-00	Primary Cyane Stripper Separator	Central section of KA plant	Solid deposits of polymeric material	~20kgs	Orange coloured deposits
	KA	9100-F9110-00	Caustic effluent tank	NE side of plant boundary	Residue on low areas in base of tank, solid 'coffee grounds' type material.	<25kgs	Small amount of material.
	KA		SDC Switchroom lighting control switches	E side of old office block, N6 road.	Mercury filled electrical switches		Switches removed to safe location until waste disposal arranged. Further checks of Site switchrooms to be completed.

Contaminated equipment - bulk							
Area	**Plant**	**Item No.**	**Equipment name**	**Location**	**Process material**	**Estimated quantity**	**Comments**
3	Acids 1		Dryer hopper, aka 'bunker'	Drying and Handling building above 2nd floor	Adipic acid powder deposits on discharge chutes	~100kgs	No access to clean out. Quantity estimated.
Contaminated equipment - residue							
3	Acids 1		Nos 1 & 2 Chalk Slurry bays	West side of Acids 1 plant adjacent to neutralisation pits.	Chalk / doloflour. Chalk is calcium carbonate, doloflour is calcium magnesium carbonate, both used for neutralisation of acidic effluent.	Residue only	This material has not been used since ~1998.
3	Acids 1		No.2 Salt Blend Tank	1st Floor top of tank	Mercury filled thermocouple	Small	Thermocouple identified by red tag
3	Acids 2		Scrubber liquor ringmain	Ground floor 5 metres above ground	Mercury filled capillary tubing	Small	Pressure pad removed to stores 24-05-2010, red tagged.

Contaminated equipment - residue							
Area	**Plant**	**Item No.**	**Equipment name**	**Location**	**Process material**	**Estimated quantity**	**Comments**
4	Nitric acid	5052 / 104	Ammonia Gas holder	Centre of plant area	Rusty / Sludge deposit	150kgs	Bulk of material has been removed. Small amount remains against side walls in annular space.
4	Nitric acid		Recovery heat exchangers	Removed from plant and on road side near Absorption unit.	Potential for residual nitric acid and/or ammonium nitrate to be trapped in plugged tubes	Small	There is potential for release of nitrous fume if trapped nitric acid is heated and for explosion if ammonium nitrate is heated. Note: all heat exchangers have potential to have residual product trapped in plugged tubes.

Contaminated equipment - residue							
Area	**Plant**	**Item No.**	**Equipment name**	**Location**	**Process material**	**Estimated quantity**	**Comments**
6	Nylon Polymer		Nos 3 & 4 Thermex heater stacks and convection sections	Thermex plant N side	Deposits on walls of chromium VI	Unknown	Fuel from KA plant, NVRs, contained chromium prior to non-boric operation
6	Nylon Polymer		Nos 1,2,3 & 4 heaters, radiant section tube hangers	Thermex plant N side	RCF insulation	~20kgs	
6	Nylon Polymer		Thermex vent and vapour lines	Thermex plant N side	Thermex - diphenyl salt	Unknown	Line work has been steamed out.
6	Nylon Polymer		Caprolactum duct		Caprolactum baked on walls of duct	~20kgs	
6	Nylon Polymer		Water treatment Alum tank	South of Polymer plant	Alum, (aluminium sulphate)	~25kgs	Redundant plant section. Small Im Id x 1m Ht tank on platform. Pipework associated with this system fouled with alum.

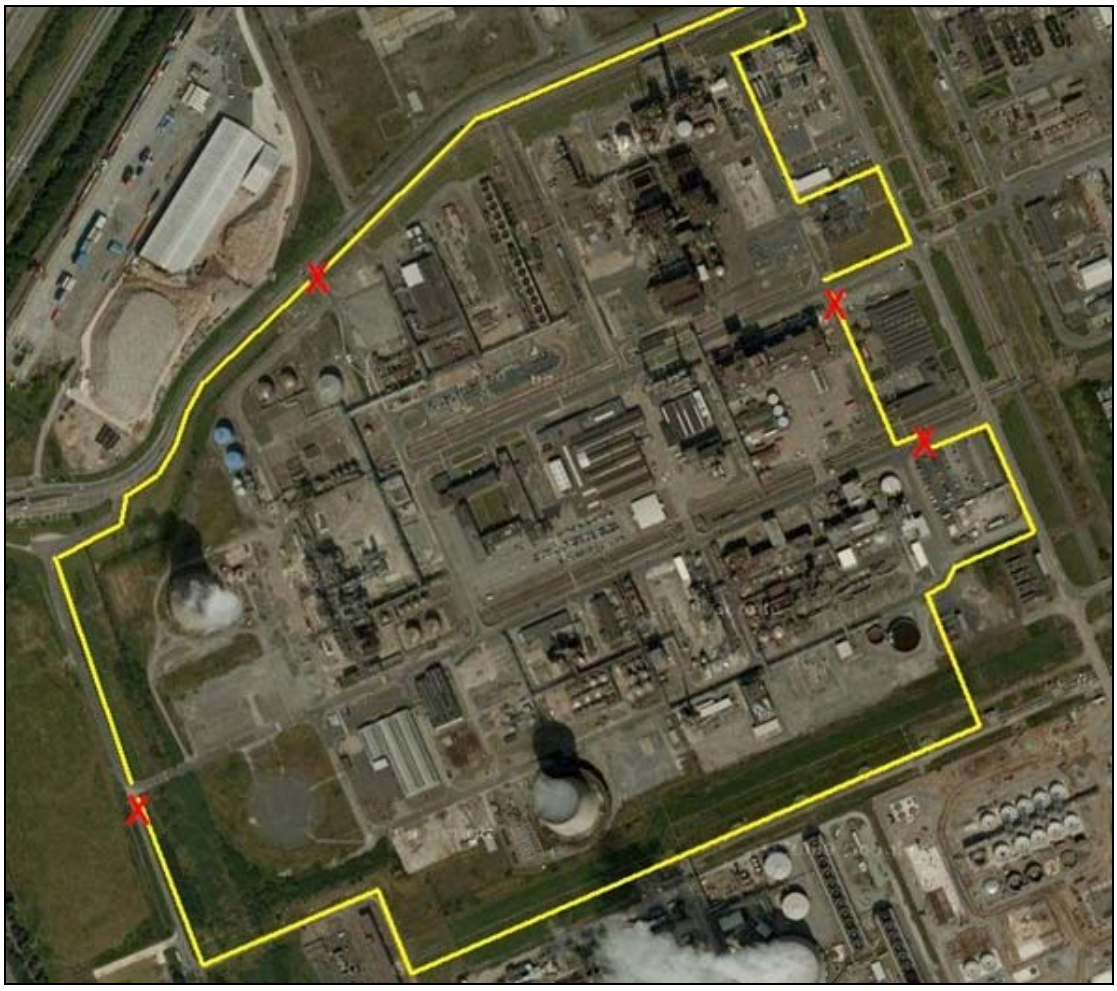
Contaminated equipment - bulk							
Area	**Plant**	**Item No.**	**Equipment name**	**Location**	**Process material**	**Estimated quantity**	**Comments**
9	Acids 2	5031-2322	Salt Prefiter tank	Salt Section adjacent to N3 road	Filter medium, Celite, some carbon and residual nylon salt	~1m3	Non hazardous material, solid deposit across base of tank. Estimate based on even layer at 25mm.
	Acids 3		Small Adipic acid adjustment tank	1st floor Salt Aqueous section	Unknown material possibly insulation cement type, insoluble in hot water	<25kgs	Non - hazardous material
	Acids 4	5031-7025 - Burner unit. 5031-7030 - Abatement unit. 5031-7090 - Economiser. 5031-7095 - Steam generator. 5031-7110 - mixing section	COGA unit	South side of N40 road	Refractory brick and ceramic fibre	Several tonnes	Material has been heated above 800ºC and removal is subject to Asbestos removal procedures. The Abatement unit has a mix of refractory brick and ceramic fibre at temperatures from 1300 to 950C. The steam generators, (3 evaporators) and the economiser has temperature range of 950 to 150C.
	Acids 5	5031/503	Cooler Condenser	Absorption section	Refractory brickwork in base section	~2tes	Material has been subject to temperatures of <250C

Contaminated equipment - bulk							
Area	**Plant**	**Item No.**	**Equipment name**	**Location**	**Process material**	**Estimated quantity**	**Comments**
12	Cooling Tower		No.2 Cooling Tower	West side of site near boundary	Tower packing is internal and plastic with tannalised wood support framework. The wood may contain residual arsenic and chromium		
13	Cooling Tower		No.3 Cooling Tower	South side of site near boundary	Tower packing is external and tannalised wood may contain residual arsenic and chromium	Total packed volume ~11000m3	Note: the packed volume is area of packing not quantity of wood.

Appendix N

Plan of security fence

Plan of Security Fence



Appendix O

Environmental Assessment Report (2010)

Invista Textiles (UK) Ltd
Wilton
Redcar
TS10 4XY

Environmental Assessment Report
Invista Textiles (UK) Ltd
Wilton
Redcar

February 2010

960100203

Prepared by:

ARCADIS (UK) Ltd
2 Craven Court
Newmarket
CB8 7FA
Tel: 01638 674767
Fax: 01638 668191
www.arcadis-uk.com

Report Details

Client	Invista Textiles (UK) Ltd
Address	Invista Textiles (UK) Ltd Wilton Redcar TS10 4XY
Report Title	Environmental Assessment Report
Report Number	960100203
Report Date	February 2010

Quality Assurance

Issue Number /Status	Date	Prepared By	Technical Review	Authorised by
02 Report re-issue				
		[redacted] Consultant	[redacted] Principal	[redacted] Director
01 Draft for comment				
		[redacted] Consultant	[redacted] Principal	[redacted] Director

If you have any queries regarding this project, please contact [redacted]

Executive Summary

ARCADIS was commissioned by Invista Textiles (UK) Ltd to undertake two phases of work at the facility located in Wilton, Redcar, TS6 8JJ (the site) to aid with the IPPC licence surrender. The first phase of work included groundwater well development and groundwater sampling as part of the environmental permit surrender Site Condition Report. The second phase of work included additional groundwater monitoring and limited intrusive investigation.

Phase 1
The objectives of the work were to provide an assessment of the environmental condition of the site and to detail any variations from the initial baseline survey in line with the Environmental Permit conditions. The scope of works included a site reconnaissance, rehabilitation of existing monitoring wells, sampling and analysis; and reporting.

The first stage in compiling the surrender Site Condition Report was the re-sampling and analysis of the existing site groundwater monitoring wells, tested as part of the IPPC permit submissions in 2002. The aim of this phase of work was to sample and analyse groundwater samples from as many of the original boreholes sampled as part of the permit application. A number of these boreholes could not be located or were found to be damaged.

Groundwater samples were collected using a low-flow sampling technique, where possible, and sent to an accredited laboratory for the following analysis: Volatile Organic Compounds (VOC) inc Tentatively Identified Compounds (TIC), Semi-Volatile Organic Compounds (SVOC) inc TIC, Total Petroleum Hydrocarbons (TPH), Metals, Ammonia, Acids, Methanol, PCBs, Cyclohexane and TOC. QA/QC samples were also submitted for analysis for the same suite of determinands.

The most notable variations between the baseline survey undertaken in 2002 and the monitoring round undertaken in July 2009 were found in groundwater sampled from boreholes BH1101, 1104 and 304. Elevated concentrations of acids detected in BH1101; a concentration of 595μg/l was recorded in the baseline survey (described as C6-9 acid) and 101,920μg/l recorded in the 2009 survey (described as Carboxylic Acid Group and Dicarboxylic acid (ranging from Propanoic Acid to Heptanoic Acid also Decanedioic acid and Octanedioic acid)). It should be noted that these acids were recorded as tentatively identified compounds on both occasions and as such are indicative only.

Some variations of TPH DRO and TPH GRO were also recorded; however, these are thought to be a result of differing sampling techniques, with the TPH – DRO consistently lower in 2009. The low-flow monitoring technique, utilised in 2009, is considered to provide the most representative sample of groundwater quality.

The metals analysis recorded generally consistent results, except for boron, which recorded an increase from 590 µg/l to 15,000 µg/l in groundwater sampled from BH1104. Boron is a naturally occurring element and is commonly present in groundwater. The concentration increase observed in monitoring well BH1104 may be due natural variations and is not thought to be of concern.

Ammonia analysis also recorded an increase in BH304 between 2002 and 2009.

The TOC concentration in BH304 has recorded an increase from 10,000 µg/l to 580,000 µg/l over the life of the permit and slight increases in the total VOC and SVOC concentrations were observed at this location.

The analysis of the samples collected from the LDPs (WALE and Dump Tank) did not identify any elevated concentrations of target compounds.

After the first phase of monitoring it was found that the results were generally consistent between the baseline (2002) and closure monitoring programme (July 2009), except for boreholes BH304 and BH1101, where the analysis suggested some impacts of SVOC compounds, ammonium and possibly an unquantified source of TOC over the lifetime of the permit.

Phase 2

The second phase of works included additional groundwater monitoring and a limited intrusive investigation which was undertaken to collect additional data from the area around the three boreholes identified in phase one as having increased levels of contamination.

The objectives of the additional work were to confirm the groundwater quality in the selected monitoring wells (BH304, BH1101 and BH1104); to delineate the extent of the impacts near to those wells. The scope of works comprised the re-sampling of four existing boreholes, BH304, BH1101, BH501 (between BH1101 and the potential source) and BH1104; the drilling of 10 new boreholes to delineate the impacts around the existing boreholes; and the sampling of the newly installed wells on two occasions.

Based on the elevated Contaminants of Concern (CoC) identified in phase one and discussions with Invista, the soil and groundwater samples were submitted for analysis for some or all of the following, ammonium, Total Organic Carbon (TOC), Total Petroleum Hydrocarbons (TPH), Volatile Organic Compounds (VOC), Semi-Volatile Organic Compounds (SVOC), metals, pH, boron and borate.

A total of 10 boreholes were drilled at the site between 2nd and 3rd November 2009. Boreholes were drilled to depths of between 2.5 metres (m) and 6m below ground level (bgl). Four boreholes were drilled around BH304, three boreholes were drilled around BH1101 and three boreholes were drilled around BH1104.

The geology encountered generally comprised Made Ground comprising of reinforced concrete encountered to depths of between 0.2m and 0.3m bgl. The concrete was underlain in places by a grey-brown clayey slightly sandy coarse gravel. A firm to stiff red brown clay was encountered in all of the boreholes. All the boreholes were terminated in this clay deposit at depths of between 2.4m bgl and 6m bgl.

BH1101 Area

The re-sampling of BH1101 recorded elevated concentrations of acids in the TIC, with concentrations rising from 595µg/l in the 2002 baseline survey to 101,920µg/l in the September 2009 monitoring and 487,753µg/l in the November 2009 monitoring. Elevated concentrations of comparable acids were also detected in soil samples taken from BH1101-1 and in groundwater sampled from BH1101-1, BH1101-2, and BH1101-3.

The re-sampling of BH1101 also recorded elevated Gasoline Range Organics, however, although above the 2002 baseline survey the concentrations had reduced since the July 2009 monitoring from 931µg/l to 190µg/l. Elevated TPH was also recorded in soil sampled from BH1101-1 (350mg/kg) and in groundwater (3,600µg/l).

BH501, located between the potential source and BH1101, recorded no SVOC TIC or TPH concentrations above the MDL.

Based on the findings of the additional environmental assessment it is evident that the soil and groundwater have been impacted with acids. Given the location in the Acid Plant area it is likely that these impacts are associated with site activities. The lack of impact in BH501 indicates the source is not to the north east of BH1101.

BH304 Area

The re-sampling of BH304 recorded elevated concentrations of VOC and SVOC above the 2002 baseline survey, although slightly lower than those recorded in September 2009. A number of VOC and SVOC TIC were recorded with VOC TIC being recorded for the first time.

Ammonium concentrations which recorded a significant increase in BH304 between 2002 and 2009 also record a continued increasing trend with concentrations rising from 260,000µg/l in September 2009 to 390,000µg/l in November 2009.

None of the delineation boreholes showed elevated concentrations of the COC.

Based on the findings of the additional environmental assessment it is evident that the groundwater impacts in BH304 of VOC, SVOC and ammonium are still elevated above the 2002 baseline survey. The delineation boreholes show none of the COC above the MRL as such BH304 represents a isolated hotspot.

BH1104 Area

The re-sampling of BH1104 recorded elevated boron concentrations above the 2002 baseline survey (590µg/l), although it has reduced from 15,000µg/l in September 2009 to 1,100µg/l in November 2009. Comparable concentrations were also recorded in the three delineation boreholes.

Borate levels, not previously analysed, were recorded at 9,000µg/l in BH1104 and between 1,000µg/l and 1,300µg/l in BH1104-1, BH1104-2 and BH1104-3.

The boron levels are generally elevated above those recorded across the site in the September 2009 monitoring, although lower than the high recorded in September 2009. It is not clear whether this represents natural levels in this area or whether this is from a site derived source.

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List of abbreviations that may be used in this report

ARCADIS	ARCADIS (UK) Ltd
bgl	below ground level
CAT	Cable Avoidance Tool
CoC	Contaminants of Concern
DNAPL	Dense Non-Aqueous Phase Liquid
GPR	Ground Penetrating Radar
IPPC	Integrated Pollution Prevention and Control
LDPs	Leak Detection Point
LNAPL	Light Non-Aqueous Phase Liquid
m	Metres
mm	Millimetre
mbgl	metres below ground level
MTBE	Methyl Tertiary Butyl Ether
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Poly Chlorinated Biphenyls
SCR	Site Condition Report
SVOCs	Semi-Volatile Organic Compounds
TICs	Tentatively Identified Compounds
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
VOCs	Volatile Organic Compounds

List of Abbreviations that may be used in this report

ARCADIS	Arcadis Geraghty & Miller International Ltd
bgl	Below ground level
CAT	Cable Avoidance Tool
CoC	Contaminant of Concern
HDPE	High Density Polyethylene
IPPC	Integrated Pollution Prevention and Control
PID	Photo Ionisation Detector
PPC	Pollution Prevention and Control
SCR	Site Condition Report
SVOC	Semi Volatile Organic Compounds
TIC	Tentatively Identified Compounds
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compounds

1 INTRODUCTION

ARCADIS was commissioned by Invista Textiles (UK) Ltd to undertake two phases of work at their facility located in Wilton, Redcar, TS6 8JJ (the site). The works were undertaken to provide information for the environmental permit surrender site condition report.

The first phase of work undertaken was groundwater well development and groundwater sampling as detailed in the ARCADIS proposal, *Proposal For Groundwater Monitoring Services – Invista Textiles (UK) Ltd, Wilton, referenced 55800.00.01, and dated 15 June 2009*.

The second phase of work included additional groundwater monitoring and limited intrusive investigation to delineate the identified impacts around a number of boreholes of concern at the site. The works undertaken are as detailed in the ARCADIS proposal, *Proposal Additional Environmental Works associated with the Environmental Permit Surrender – Invista Textiles (UK) Ltd, Wilton, referenced 55991.00.01, and dated 8th October 2009.*

A site location plan is presented as Figure 1.

1.1 Background

The site is in the process of closure, and as part of this there is a requirement to surrender the Environmental Permit (PPC Permit), in line with the Site Closure Plan for the facility.

As part of the closure strategy, a surrender Site Condition Report (SCR) is required. This report describes the condition of the land and groundwater at the point at which the Environmental Permit is surrendered. The Environment Agency require that this report must provide the evidence necessary to demonstrate that the site does not pose a pollution risk and is in a satisfactory state.

The SCR must contain statements that summarise the information that has been recorded during the life of the permit, and the evidence must demonstrate that:

- Measures to protect land and groundwater quality have been effective;
- Any pollution incidents that may have affected the land have been investigated and remediated;
- Soil, gas or water quality have been monitored, and that any deterioration in quality has been investigated and remediated; and
- Pollution risks caused by decommissioning have been managed and remedied.

The first step in compiling the SCR is the re-sampling and analysis of the site groundwater monitoring wells tested as part of the IPPC permit submissions in 2002.

1.2 Objectives

The objectives of the two phases of work were to:

- Provide an assessment of the environmental condition of the site;
- Detail any variations from the initial baseline survey in line with the Environmental Permit conditions;
- To delineate the extent of any identified impacts near to selected monitoring wells; and
- Prepare a report to support Invista in surrendering the site's Environmental Permit.

1.3 Scope of Works

1.3.1 Phase 1

As part of the environmental permit surrender Invista undertook to collect and analyse groundwater samples from all of the available boreholes which were originally sampled as part of the PPC permit application in 2002.

Prior to undertaking the groundwater sampling, a site reconnaissance visit was undertaken. The objective of the task was to undertake a detailed site inspection with the aim of locating and inspecting all available and existing groundwater monitoring wells. Leak detection monitoring wells located around the WALE and dump tanks were inspected for their suitability for sampling.

Monitoring wells were located and inspected for integrity and suitability for the proposed groundwater monitoring. The monitoring wells were then purged and rehabilitated prior to sampling to ensure that groundwater samples would be representative of the water bearing strata beneath the site. Groundwater samples were submitted for the analysis of a range of contaminants of concern (CoC) in line with the analysis undertaken for the PPC permit application.

Water samples were also collected from leak detection points (LDPs) DUMP 5, WALE 1 and WALE 6 and submitted for a reduced range of analysis.

1.3.2 Phase 2

Additional Groundwater Sampling and Analysis

Based on the findings of the first phase of works and discussions with Invista, four of the monitoring wells were identified as having elevated Chemicals of Concern (CoC). As such groundwater samples were collected and subsequently submitted for laboratory analysis for a selected number of analytes. The wells identified to be re-sampled were BH304, BH501, BH1101 and BH1104.

Characterisation of Ground Conditions Near to Impacted Monitoring Wells

Limited intrusive investigation was undertaken around those monitoring wells where elevated COC in groundwater were recorded. The drilling works were undertaken to further characterise the extent of the impacts. Based on discussions with Invista the intrusive works comprised the drilling of three boreholes in the vicinity of BH1101 and four boreholes in the vicinity of BH304.

In addition to the above ARCADIS recommended that the elevated boron concentration, identified in groundwater sampled from monitoring well BH1104, be investigated further. Boron is a naturally occurring element and in some cases elevated concentrations can be attributed to natural sources. However, it is understood that the site has handled boronated compounds. An additional three monitoring wells were installed in the vicinity of BH1104.

Soil and groundwater samples collected for Laboratory analysis. Monitoring wells were installed in all of the boreholes drilled in order to facilitate subsequent groundwater sampling.

1.4 Study Limitations

This section should be read before reliance is placed on any of the information, opinions, advice, recommendations or conclusions contained in this report.

1. This report has been prepared by ARCADIS, with all reasonable skill, care and diligence within the terms of the contract, resources and manpower agreed with Invista Textiles (UK) Ltd (the 'Client'). ARCADIS does not accept responsibility for any matters outside the agreed scope.

2. This report has been prepared for the sole benefit of the Client.

3. Unless stated otherwise, no consultations external to Invista Textiles (UK) Ltd have been carried out. ARCADIS are unable to give categorical assurance that the findings of this work will be accepted by regulatory bodies prior to consultation with these bodies.

4. All work carried out in preparing this report has used, and is based on, ARCADIS' professional knowledge and understanding of current relevant legislation. Changes in legislation or regulatory guidance may cause the opinion or advice contained in this report to become inappropriate or incorrect. Following delivery of the report ARCADIS have no obligation to advise the Client or any other party of such changes or their repercussions.

5. This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report.

6. Whilst this report and the opinions made are accurate to the best of ARCADIS' belief, ARCADIS cannot guarantee the accuracy or completeness of any information provided by third parties.

7. This report has been prepared based on the information reasonably available during the project programme.

8. This report refers, within the limitations stated, to the condition of the site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the site.

9. The content of this report represents the professional opinion of experienced environmental consultants. ARCADIS does not provide specialist legal or other professional advice. The advice of other professionals may be required.

10. Where intrusive investigation techniques have been employed they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature of sampling, no investigation technique is capable of identifying all conditions present in all areas. In some cases the investigation is further limited by site operations, underground obstructions and above ground structures. Unless otherwise stated, areas beyond the boundary of the site have not been investigated.

11. If below ground intrusive investigations have been conducted as part of the scope, service tracing for safe location of exploratory holes has been carried out. The location of underground services shown on any drawing in this report has been determined by visual observations and electromagnetic techniques. No guarantee can be given that all services have been identified. Additional services, structures or other below ground obstructions, not indicated on the drawing, may be present on site.

12. Unless otherwise stated the report provides no comment on the nature of building materials, operational integrity of the facility or on any regulatory compliance issues.

1.5 Reliability of Information

ARCADIS warrants that the services performed were conducted in a competent and professional manner in accordance with sound consulting practices and procedures, and based on the project brief defined in consultation with Invista Textiles (UK) Ltd.

During preliminary discussions with Invista Textiles (UK) Ltd, prior to undertaking this environmental review, it was agreed that ARCADIS should not contact any persons outside the Invista Textiles (UK) Ltd organisation and hence opinions stated here relating to legislative drivers are based on ARCADIS' experience and professional judgement. This report is based on currently available data, if further information is forthcoming, it may be necessary to update this report.

2 METHODOLOGY

2.1 Phase 1

2.1.1 Site Reconnaissance

The site reconnaissance was undertaken between the 14th and 17th July 2009. Monitoring wells were located, inspected and checked for integrity for groundwater monitoring sampling. Each location was:

- Located using a variety of techniques, including metal detector, and positioned using a portable hand held GPS device;
- Photographed;
- Assessed for the condition of the well head;
- Recorded for well construction details (diameter, method of construction);
- Measured for water level and bottom of borehole;
- Recorded for presence and thickness of any Light Non-Aqueous Phase Liquid (LNAPL) or Dense Non-Aqueous Phase Liquid (DNAPL); and
- Logged with a summary of any rehabilitation actions required (e.g. new well covers / well-head maintenance).

A summary of well construction, installation and location is provided in Table 1.

2.1.2 Well Development

Each well was purged using a combination of techniques, including dedicated Waterra tubing to clean and rehabilitate the wells such that they would provide representative groundwater samples. Where possible approximately five wetted volumes of water were purged from the wells, however this was not possible at all locations due to the low permeability of the geology beneath the site. In these cases, the wells were purged dry three times.

Table 1 contains details of the quantities of water purged from the monitoring wells.

2.1.3 Reinstatement Works

During the site reconnaissance a number of wells and well covers were noted to be in a state of disrepair and required to be reinstated. Eight existing well covers were broken out by hand and reinstated with new covers; seven flush to the ground and one top hat cover.

2.1.4 Groundwater Sampling

Following well development, groundwater samples were collected using a low-flow technique. The use of low-flow techniques typically results in the collection of a water sample without entrained particulate material or surface sheen that may lead to an overestimation in dissolved contaminant concentrations. Low flow sampling also enabled the collection of hydrogeochemical data (pH, Redox, dissolved oxygen, conductivity and temperature) at the well head.

Samples were collected using dedicated tubing attached to a peristaltic pump and passed through the flow cell equipped with a YSI 556 multi-parameter hydrochemical probe. During low flow sampling groundwater is abstracted at a low rate (typically < 0.5 litres/min) until the hydrogeochemical parameters have stabilised within 10% of the previous reading.

Where the recharge of the well was too poor to enable sampling using low-flow techniques a grab sample was collected from the well using the peristaltic pump.

2.1.5 Leak Detection Points

Hydrochemical data was collected from three of the Leak Detection Points (LDPs) around the WALE and dump tanks using a YSI 556 multi-parameter probe. Water was also sampled from the LDPs using a peristaltic pump.

2.1.6 Laboratory Analysis

Groundwater samples were tested for the following suites:

- Volatile Organic Compounds including tentatively identified compounds (VOC including TICs);
- Semi-volatile Organic Compounds including tentatively identified compounds (SVOC including TICs);
- Total Petroleum Hydrocarbons by the total petroleum hydrocarbon criteria working group (TPHCWG) methodology;
- Metals (arsenic, water soluble boron, cadmium, chromium, copper, mercury, nickel, lead, selenium, vanadium, zinc);
- Ammonium as NH_4;
- Acids (pH and acids identified in the VOC and SVOC TICs);
- Methanol;
- Poly Chlorinated Biphenyls (PCBs);
- Cyclohexane Extract; and
- Total Organic Carbon (TOC).

A schedule of the groundwater laboratory analysis is presented in Table 2.

Samples collected from LDPs were submitted for the following analysis:

- VOC including TICs;
- SVOC including TICs;
- TPHCWG;
- Metals (arsenic, water soluble boron, cadmium, chromium, copper, mercury, nickel, lead, selenium, vanadium, zinc);
- Alcohols and acetates;
- Cyclohexane extract;
- Ammonium as NH4; and,
- TOC.

2.2 Phase 2

2.2.1 Additional Groundwater Sampling and Analysis

The groundwater sampling was carried out in the first and third week in November 2009. The site layout and monitoring well locations are presented on Figure 2. The existing wells identified to be re-sampled were monitoring wells BH304, BH1101, BH1104 and BH501. The table below details the rationale for the proposed sampling:

Monitoring Well	Justification for Re-sampling
BH304	Total Organic Carbon (TOC), Semi-Volatile Organic Compounds (SVOC) and ammonium concentrations noted to be elevated relative to baseline survey.
BH1101	SVOC Tentatively Identified Compounds (TICs), Total Petroleum Hydrocarbons (TPH) and ammonium concentrations noted to be elevated relative to baseline survey.
BH501	Monitoring well located between potential source area and BH1101.
BH1104	Boron concentration noted to be elevated relative to baseline survey.

Groundwater samples were intended to be collected using low-flow techniques as in phase 1 However, due to the nature of the ground conditions and the very low recharge of groundwater it was not possible to take true low flow samples from the wells other than BH1101 and BH501.

2.2.2 Characterisation of Ground Conditions Near to Impacted Monitoring Wells

The intrusive site investigation was carried out on 2nd and 3rd November 2009. The intrusive works comprised the drilling of three boreholes in the vicinity of BH1101 and four boreholes in the vicinity of BH304. Three boreholes were also drilled around BH1104 to further investigate elevated boron concentrations identified in groundwater sampled from the monitoring well in July 2009. The site layout and existing monitoring well locations are presented on Figure 2. Figures 3, 4 and 5 show the locations of the new wells.

The first stage of the intrusive investigation included underground utility clearance at each borehole location. The borehole clearance survey utilised both electromagnetic (CAT and generator) and ground penetrating radar (GPR) techniques.

Intrusive drilling works were undertaken using ARCADIS' in-house drilling capabilities, utilising our tracked Geoprobe 6610 drilling rig. A total of ten boreholes were drilled at the site and advanced to facilitate soil sampling to a maximum depth of six metres (m) below ground level (bgl). Borehole positioning was agreed with the site. Monitoring wells were installed in all ten boreholes with installation design based on the ground conditions and previously installed monitoring wells, constructed from 50mm diameter threaded HDPE well screen and blank casing. Construction details are presented on the borehole logs in Appendix A.

Soil samples were collected at approximate 0.5m intervals, placed into polythene bags and sealed to enclose as much air as possible around the soil sample. The soil sample was gently broken up and left for approximately fifteen minutes. Following this, the polythene bag was pierced and the MiniRAE 2000 PID fitted with a 10.6eV UV lamp and was inserted to test for ionisable volatile contaminants. Field headspace screening of soil samples was conducted to enable selection of samples for independent laboratory analysis. These screening methods allow for identification of 'down hole' trends in contaminant distribution. PID readings are presented on the borehole logs in Appendix A.

All soil samples recovered were logged in accordance with BS 5930:1999 to provide information on the sequence of strata observed at each position. Soil samples were selected for laboratory analysis from the boreholes based on PID headspace reading, visible or olfactory evidence of impact and/or representative of different lithologies or depths.

2.2.3 Laboratory Analysis

Based on the elevated CoC identified in the previous monitoring and discussions with Invista, the soil and groundwater samples were submitted for the following analysis:

Borehole	NH4 – N	TOC	TPH	VOC	SVOC	Metals	pH	Boron /Borate
BH304	✓	✓	✓	✓	✓	-	-	-
BH501	✓	✓	✓	-	✓	-	-	-
BH1101	✓	✓	✓	-	✓	-	-	-
BH1104	-	-	-	-	-	✓	✓	✓

- Not tested

All samples were forwarded to Alcontrol Laboratories with the exception of Boron which was analysed by Jones Environmental Laboratories. A schedule of the laboratory analysis is presented in Table 3.

2.3 Collection, Preservation and Transport of Samples

All samples from both phases of work were decanted into dedicated laboratory supplied containers. Glass bottles and vials were used for samples to be analysed for organic species and plastic bottles were used for samples to be analysed for inorganic species. Containers for volatile analysis were filled so that no air space remained in the container prior to sealing.

All samples were stored in dedicated cool boxes, at a target temperature of 4^{o}C. All samples and analytical requests were recorded on the laboratory chain of custody form, prior to dispatching for analysis, on the day of sampling, where possible.

2.4 Quality Assurance and Quality Control

All samples were submitted to ALcontrol Laboratories a certified United Kingdom Accreditation Services (UKAS) accredited laboratory. All samples were sent with a full chain of custody identifying ARCADIS as the client, the ARCADIS project reference, the consultant/project manager, the nature of the sample and the parameters to be tested. Where possible samples were analysed using the EA Monitoring Certification Scheme (MCerts) accredited methodologies.

3 RESULTS – PHASE 1

3.1 Introduction

The results of the monitoring visit and water analysis undertaken in July 2009 are presented within this section. Field data collected during the groundwater monitoring visit is presented in Table 4 and laboratory analysis results are presented in Tables 5 to 9

3.2 Groundwater

3.2.1 Hydrogeological Results

Groundwater was encountered at depths of between 0.15m bgl (BH1106) and 2.78m bgl (BH1103) during the groundwater monitoring visit. Given the nature of the geology beneath the site, the slow rates of groundwater recharge observed, the variability noted in the measured depths to groundwater, and the relatively flat topography, it is considered that groundwater is likely to exist in localised perched bodies rather than in one laterally continuous body beneath the site.

3.2.2 Hydrogeochemical Parameters

The hydrogeochemical parameters were monitored during low flow sampling at the well head and are presented in Table 4 and are summarised below:

Temperature
Groundwater temperature was measured in the range of 14.54°C (BH501) to 17.9°C (BH606).

Conductivity
Groundwater conductivity was measured in the range of 251 mS (BH606) to 1,342 mS (BH112), however the majority of the results were less than 1,000 mS.

pH
All of the field pH values were recorded in the range of between 6.58 (BH401) and 8.35 (BH105).

Oxidation/Reduction Potential (ORP)
ORP readings ranged between -114.6 mV (BH105) and 133.7 mV (BH605). The ORP results record a good correlation with the dissolved oxygen results (see below) and indicate that the groundwater conditions are generally aerobic beneath the site.

Dissolved Oxygen
The dissolved oxygen concentrations were generally recorded between 3% (BH105) and 71.4% (BH504).

Appearance
Most samples were clear and colourless with the exception of BH304 (suspended black sediment), BH401 (suspended sediment) and BH1102 (orangey brown and cloudy). None of the samples were noted to have odours which may be associated with potential groundwater impacts.

3.2.3 Laboratory Analysis

As part of this task, a total of 20 of the original 24 boreholes sampled during the PPC permit application (Reference BM 2063) were sampled. The following PPC permit boreholes were sampled: BH105, BH112, BH201, BH202, BH203, BH204, BH304, BH401, BH404, BH405, BH501, BH504, BH601B, BH605, BH606 and BH1101, BH1102, BH1103, BH1104 and BH1107.

The results of the analysis of these samples is summarised below:

Volatile Organic Compounds (including Tentatively Identified Compounds)
VOC were identified at concentrations greater than laboratory method detection limits (MDL) in groundwater sampled from monitoring wells BH105 and BH304. The highest recorded concentration was 53 µg/l naphthalene in the field duplicate sampled from BH304.

VOC TIC were not recorded in any of the samples analysed.

Semi Volatile Organic Compounds (including Tentatively Identified Compounds)
SVOC were identified in groundwater sampled from monitoring well BH304 and comprised phenolic and polycyclic aromatic hydrocarbons (PAH) compounds with the highest measured concentration being 140 µg/l 2,4-dimethylphenol.

SVOC TIC were identified in groundwater sampled from BH605 (16 µg/l unknown – 60% match ethyl isothiocyanate) and BH1101 (101,920 µg/l – carboxylic acid group). The unknown compound detected in BH605 is at a low concentration and could not be identified.

Total Petroleum Hydrocarbons
Sixteen groundwater samples were submitted for TPHCWG analysis. Petroleum hydrocarbons were identified in five of the samples with TPH concentrations between 55 µg/l (BH1102) and 1,000 µg/l (BH304).

Metals
Groundwater samples were collected from twenty locations. Measured metal concentrations are broadly inline with those expected for groundwater. Of note, elevated boron concentrations of 1,400 µg/l, 1,700 µg/l and 15,000 µg/l were recorded in the samples collected from monitoring wells BH201, BH1103 and BH1104.

Ammonium
Twenty samples were submitted for ammonium analysis and ammonium was identified in fifteen samples; concentrations were generally in the range of 500 µg/l to 5,000 µg/l, however a concentration of 260,000 µg/l was recorded in groundwater sampled from BH1101.

Total Organic Carbon (TOC)
All samples were submitted for TOC analysis and TOC was identified in twenty samples. Measured TOC concentrations were generally in the range 3,000 µg/l to 8,000 µg/l, however high concentrations of 5,900,000 µg/l and 580,000 µg/l were measured in groundwater sampled from monitoring wells BH1101 and BH304 respectively.

Alcohols and Acetates
Samples from fourteen monitoring wells were submitted for alcohols and acetates analysis. No alcohol or acetate species were identified at concentrations >MDL in any of the samples tested.

Poly Chlorinated Biphenyls
PCBs were not identified in any of the eighteen groundwater samples tested.

3.3 Leak Detection Points

Three samples were collected from Leak Detection Points, referred to as WALE 1, WALE 6 and DUMP 5. No detections of VOCs and TICs, SVOCs and TICs, or TPH were recorded in the LDP sampling above the relevant method detection limits.

Metal concentrations were within the ranges observed for groundwater.

3.4 Quality Assurance / Quality Check

Two blind field duplicates were collected BH105 and BH304 and one blank were also submitted to the laboratory as part of the QA/QC control to provide an indication of the reproducibility of the field sampling and laboratory analytical methods. Comparison of the field duplicate results shows a

good level of agreement between the duplicate samples across all of the analytical suites indicating a good degree of reproducibility in the results between the samples. One laboratory prepared travel blank was also submitted for analysis and no CoC were identified with the exception of low concentrations of chloroform and bromodichloromethane in the VOC suite.

4 RESULTS – PHASE 2

This section presents the results of the intrusive investigation, and the groundwater sampling conducted in November 2009. Borehole locations are presented on Figures 2 to 5.

4.1 Intrusive Investigation

A total of 10 boreholes were drilled at the site between 2nd and 3rd November 2009. Boreholes were drilled to depths of between 2.5m and 6m bgl. Four boreholes were drilled around BH304, three boreholes were drilled around BH1101 and three boreholes were drilled around BH1104. Detailed borehole logs are presented in Appendix A and the ground conditions are summarised below.

4.1.1 Ground Conditions

BH304 Area

Made Ground

Reinforced concrete was encountered in three of the four boreholes to depths of between 0.2m (BH304-1) and 0.3m bgl (BH304-2 / 4).

Topsoil was encountered to a depth of 0.3m bgl in BH304-3.

Gravels

The made ground was underlain by a grey-brown clayey slightly sandy coarse gravel 0.2m thick in BH304-3. No gravel was encountered in any of the other boreholes.

Clay

A firm to stiff red brown clay was encountered in all of the boreholes at depths of between 0.2m bgl (BH304-1), and 0.5m bgl (BH304-3). All the boreholes were terminated in this clay deposit at depths of between 2.4m bgl (BH304-4) and 6m bgl (BH304-1).

BH1101 Area

Made Ground

Reinforced concrete was encountered in all of the boreholes proven to 0.3m bgl.

Brown and black stained slightly sandy, clayey fine to medium gravel was encountered in BH1101-1 and BH1101-2 proven to depths of 0.5m bgl and 0.8m bgl respectively.

Clay

A firm to stiff red brown clay was encountered in all of the boreholes at depths of between 0.3m bgl (BH1101-3), and 0.8m bgl (BH1101-2). All the boreholes were terminated in this clay deposit at depths of 5m bgl.

BH1104 Area

Made Ground

Reinforced concrete was encountered in two of the three boreholes at a depth of 0.3m bgl (BH1104-1 / 2). Bituminous macadam was encountered in BH1104-3 to a depth of 0.2m bgl.

Light brown with occasional black staining, slightly clayey, slightly sandy gravel was encountered in BH1104-1 and BH1104-3 to depths of 1.7m bgl and 0.7m bgl respectively.

Clay

A firm to stiff red brown clay was encountered in all of the boreholes at depths of between 0.3m bgl (BH1104-2), and 1.3m bgl (BH1104-1). All the boreholes were terminated in this clay deposit at depths of 6m bgl.

4.1.2 Groundwater Occurrence

A groundwater strike was recorded in BH1101-1 at 0.5m bgl. All other boreholes remained dry throughout drilling.

Groundwater was encountered in all boreholes during subsequent monitoring, however, due to the perched nature of the groundwater no flow direction could be inferred. Table 10 details the groundwater monitoring data.

- BH304 Area – Groundwater encountered between 0.322m and 3.103m bgl.
- BH1101 Area – Groundwater encountered between 0.405m and 2.775m bgl.
- BH1104 Area – Groundwater encountered between 0.512m and 4.338m bgl.

4.1.3 Field Readings

Field samples were screened using a PID. Readings were generally below 5ppm with the exception of those recorded for BH1101-1, BH1101-4, and BH304-3 which are displayed in the table below.

PID Readings		
Borehole	**Depth m bgl**	**PID Reading ppm**
BH1101-1	0.4 – 0.5	9
	1.4 – 1.6	1
	2.0 – 2.2	2
	3.2 – 3.4	4
	3.7 – 3.8	5
	4.1 – 4.2	1
	4.5 – 4.6	2
BH1101-4	1.2 – 1.3	11
	2.5 – 2.7	1
	3.0 – 3.1	0
	3.9 – 4.0	0
	5.0 – 5.1	0
	5.5 – 5.6	0
BH304-3	0.2 – 0.5	21
	0.9 – 1.1	1
	1.3 – 1.4	1
	2.0 – 2.2	1
	2.5 – 2.6	1
	3.0 – 3.1	0

A full dataset of PID readings are presented on the borehole logs in Appendix A.

4.2 Laboratory Analysis – Soil

Two soil samples, one shallow and one deep, from each of the newly drilled boreholes were submitted for laboratory analysis. The results of the analysis of the samples are presented in tables

12 to 16 and are summarised below. The summary is split into the three areas investigated, namely BH304, BH1101, BH1104.

4.2.1 BH304 Area

VOC were identified at concentrations above laboratory method detection limits (MDL) in soil samples BH304-3 (0.2-0.5m) and BH304-4 (0.3-0.5m). The highest recorded concentration was 0.095mg/kg of m/p-xylene in the sample from BH304-3 (0.2-0.5m).

A number of VOC TIC were recorded in BH304-3 (0.2-0.5m), namely, methyl-cyclohexane (0.117 mg/kg), ethyl-cyclohexane (0.065 mg/kg), ethyl-methyl-benzene isomer (0.059mg/kg) and an unknown compound at 0.055 mg/kg.

No SVOC and SVOC TIC were detected in any of the soil samples.

Total petroleum hydrocarbons were identified in all eight of the soil samples submitted with the highest TPH concentration recorded in 304-4 (0.3-0.5m) at 250mg/kg. Gasoline Range Organics were detected in two of the eight samples at 0.28mg/kg in BH304-2 (0.3-0.6m) and 0.1mg/kg in BH304-1 (0.2-0.5m).

All eight samples submitted for TOC analysis recorded concentrations greater than method detection limits with concentrations ranging from 0.6% to 1.1%.

Ammonia was detected in two of the eight samples submitted for analysis; BH304-1 (0.2-0.3m) at 52mg/kg and in BH304-3 (2.2-2.4m) at 52mg/kg.

4.2.2 BH1101 Area

VOC were identified at concentrations above laboratory MDL in soil samples BH1101-1 (0.4-0.5m) and BH1101-1 (1.2-1.5m). The highest recorded concentration was 0.4mg/kg of 1,3,5-trimethylbenzene in the sample from BH1101-1 (0.4-0.5m).

VOC TIC were encountered in BH1101, namely C6-9 aliphatic hydrocarbons (5.4mg/kg) and C9-10 aromatic hydrocarbons (6.8mg/kg).

SVOC were identified in soil samples from boreholes BH1101-1 (0.4-0.5m), BH1101-1 (1.2-1.5m) and BH1101-2 (0.3-0.8m) and comprised phthalates, phenolic and polycyclic aromatic hydrocarbons (PAH) compounds with the highest measured concentration being 3.4 mg/kg 4-nitrophenol.

SVOC TIC were identified in soil samples from BH1101-1 (0.4-0.5m), BH1101-1 (1.2-1.5m), and BH1101-2 (0.3-0.8m) and comprised hexanoic acid (23.841mg/kg), 2-methyl-hexanoic acid (3.469mg/kg), , 4-oxo-pentanoic acid (2.857mg/kg), ethyl ester pentanoic acid (2.765mg/kg), ethyl ester 4-methyl-pentanoic acid (11.988mg/kg) and pentanedioic acid (21.215mg/kg).

Total petroleum hydrocarbons were identified in all samples with highest TPH concentrations recorded in BH1101-1 (0.4-0.5m) at 350mg/kg and the highest GRO concentration also in BH1101-1 (0.4-0.5m) at 9.6mg/kg.

Six samples were submitted for ammonium analysis which was identified in two samples; BH1101-1 (0.4-0.5m) at 47mg/kg and in BH1101-1 (1.2-1.5m) at 49mg/kg.

Of the six samples submitted for TOC analysis all samples measured TOC concentrations above MDL, concentration ranged from 0.8% to 1.7%.

4.2.3 BH1104 Area

Soils samples in the boreholes drilled around monitoring well BH1104 were submitted for laboratory analysis for a suite of metal compounds, boron, borate and pH testing.

Six soil samples were collected and submitted for analysis. Metal compounds of note were barium (ranging from 140mg/kg to 270mg/kg), chromium (29mg/kg to 160mg/kg) nickel (32mg/kg to 290mg/kg), Vanadium (27mg/kg to 76mg/kg) and Zinc (6.7mg/kg to 86mg/kg).

Borate was identified in all samples ranging from 16mg/kg in BH1104-2 (1.3-1.5m) to 6mg/kg in BH1104-3 (0.3-0.7m). Boron was identified in one monitoring well, BH1104-3 (0.3-0.7m), at 12mg/kg.

pH values ranged from 7.95 in sample BH1104-2 (0.3-0.6m) to 8.88 in BH1104-3 (0.3-0.7m).

4.3 Laboratory Analysis – Groundwater

As part of this task, a total of four of the original 24 boreholes sampled during the PPC permit application (Reference BM 2063) were re-sampled; BH304, BH501, BH1101 and BH1104. In addition new boreholes were drilled around the existing boreholes and were subsequently monitored where there was sufficient water.

Given the reported nature of the geology beneath the site, the slow rates of groundwater recharge observed, the variability noted in the measured depths to groundwater, and the relatively flat topography, it is considered that groundwater is likely to exist in localised perched bodies rather than in one laterally continuous body beneath the site.

The results of the analysis of the samples are presented in tables 17 to 22 and are summarised below.

4.3.1 BH304 Area

4th November 2009

VOC were identified at concentrations above laboratory method detection limits (MDL) in groundwater sampled from monitoring wells BH304 and BH304-2. The highest recorded concentration was 39µg/l naphthalene in BH304.

VOC TIC were identified in groundwater sampled from BH304; Tetrahydro-Naphthlene Isomer (52 µg/l), Cyclopentylcyclopentene Isomer (48µg/l), Limonene (28µg/l), Cyclopentylcyclopentene Isomer (20µg/l), Ethenyl-ethyl-Benzene Isomer (20µg/l), and an unknown compound (28 µg/l).

SVOC were identified in groundwater sampled from monitoring well BH304 with the highest recorded compound 4-Methylphenol at 250µg/l. No SVOC were identified above MDL in samples from the other boreholes.

SVOC TIC were identified in BH304 and comprised Methyl Hexanoic Acid (20µg/l), Cyclopentylcyclopentene isomer (12µg/l), Dimethylstyrene Isomer (45µg/l), Phenylacetic acid (50µg/l), Caprolactam Isomer (160µg/l), Oxindole (32µg/l) and Phenazine (430µg/l). Caffeine was identified in BH304-2 at 33µg/l.

Petroleum hydrocarbons were identified in BH304 with a concentration of 1,100µg/l. No petroleum hydrocarbons were identified above MDL in samples from the other boreholes.

Ammonium (as NH4) was identified in monitoring well BH304 at 390,000µg/l. No ammonium was identified above MDL in samples from the other boreholes.

TOC analysis identified concentrations greater than MDL in all samples. Measured TOC concentrations were 160,000µg/l (BH304), 10,000µg/l (BH304-4 and 6,000µg/l (BH304-2).

18th November 2009

No VOC, VOC TIC, SVOC and SVOC TIC were identified above MDL in samples from any of the boreholes.

No petroleum hydrocarbons were identified above MDL in samples from any of the boreholes.

No ammonium was identified above MDL in samples from any of the boreholes.

TOC analysis identified concentrations greater than MDL in all samples. Measured TOC concentrations were 10,000µg/l (BH304-1), 4,000µg/l (BH304-2), 8,000µg/l (BH304-3) and 6,000µg/l (BH304-4).

4.3.2 BH1101 Area

4th November 2009

No SVOC were recorded above the laboratory MDL.

A number of SVOC TIC were recorded comprising alkyl acids including pentanoic, hexanoic and octanoic acids with the highest concentration indentified as Methtyl pentanoic acid Isomer (287,150 µg/l) in BH1101. A range of unknown compounds were also indentified ranging from 14µg/l to 451,841µg/l.

Petroleum hydrocarbons were identified in BH1101 (190µg/l) and BH1101-1 (1,700).

Ammonium concentrations ranged from 300µg/l (BH1101-3) to 13,000µg/l (BH1101-1).

Five samples were submitted for TOC analysis which was identified in all samples. Measured TOC concentrations ranged from 8,000µg/l (BH1101-3) to 3,000,000µg/l (BH1101).

18th November 2009

A single SVOC was recorded above the laboratory MDL, 4 methyphenol (27µg/l) in BH1101-1.

A number of SVOC TIC were recorded comprising unknown organic acids (263,147µg/l) in BH1101-1.

Petroleum hydrocarbons were identified in BH1101-1 (1,800).

Ammonium concentrations ranged from 200µg/l (BH1101-2/3) to 9,100µg/l (BH1101-1).

Three samples were submitted for TOC analysis which was identified in all samples. Measured TOC concentrations ranged from 10,000µg/l (BH1101-2) to 480,000µg/l (BH1101-1).

4.3.3 BH1104 Area

4th November 2009

Boron was identified in all samples, concentrations were recorded at 1,100µg/l (BH1104), 1,200µg/l (BH1104-1), 1,500µg/l (BH1104-2) and 1,800µg/l (BH1104-3).

Borate was identified in all samples; concentrations were recorded at 9,000µg/l (BH1104), 1,000µg/l (BH1104-2), 1,100µg/l (BH1104-1) and 1,400µg/l (BH1104-3).

The pH of the groundwater in the monitoring wells around BH1104 ranged from 8.28 (BH1104-1) to 8.43 (BH1104-3).

18th November 2009

Boron was identified in all samples, concentrations were recorded at 1,100µg/l (BH1104-1), 1,000µg/l (BH1104-2) and 1,500µg/l (BH1104-3).

Borate was identified in all samples; concentrations were recorded at 1,000µg/l (BH1104-2), 1,000µg/l (BH1104-1) and 1,300µg/l (BH1104-3).

The pH of the groundwater in the monitoring wells around BH1104 ranged from 8.34 (BH1104-1) to 8.51 (BH1104-3).

4.4 QA / QC

As part of the monitoring works a blind duplicate sample was submitted to the laboratory. The laboratory results are presented in Table 23 and summarised below:

Analyte	BH1101	BH1101-A
Aliphatics C5-C6	43	36
Aliphatics >C6-C8	530	470
Aliphatics >C8-C10	290	240
Aliphatics >C10-C12	180	170
Aromatics >EC8-EC10	440	360
Aromatics >EC10-EC12	270	250
Aromatics >EC12-EC16	16	34
Total Ammonium as NH4	9,100	9,200
Total Organic Carbon	480,000	430,000
4-Methylphenol	27	52
Naphthalene	<MDL	18

The comparison between the duplicate samples is good.

5 PHASE 1 COMPARISON - BASELINE AND CLOSURE DATA

A comparison between groundwater data collected, as part of the baseline, in October 2002 and the data collected as part of the closure, during July 2009 monitoring visit is presented below.

Data of the 2002 monitoring is presented as Appendix B.

5.1.1 Volatile Organic Compounds

The following table provides a summary of total VOCs measured above the MDL:

Total Volatile Organic Compounds (µg/l)		
Borehole	**Baseline (2002)**	**Closure (2009)**
BH1105	14	nt
BH1109	11	nt
BH304	7	56
BH405	2	-
BHWW	1	nt
BH105	nt	2

nt not tested
- Below MDL

The following VOC TIC were identified during the baseline survey, of note no concentration data was provided.

VOC TIC	
Baseline (2002)	**Borehole**
Cyclohexanone	BH1102, BH1104, BH1105, BH1106, BH1107, BH1108, BH1109, BH201, BH202, BH203, BH204, BH207, BH504, BH601, BH605
Cyclohexane	BH105, BH112, BH113, BH201, BH404, BH405, BHWW, BH501
Cyclohexanol	BH606

5.1.2 Semi-Volatile Organic Compounds

The following table provides a summary of total VOC measured above MDL:

Total Semi-Volatile Organic Compounds (µg/l)		
Borehole	**Baseline (2002)**	**Closure (2009)**
BH304	-	311

- Below MDL

The following table provides a summary of SVOC TIC identified in 2002 and 2009:

Borehole	TIC (Concentration µg/l)	
	Baseline (2002)	Closure (2009)
BH304	*Unresolved complex matter including some terpene* (**940**)	-
BH1101	C6-9 Acids (**595**)	Carboxylic Acid Group and Dicarboxylic acid (ranging from Propanoic Acid to Heptanoic Acid also Decanedioic acid and Octanedioic acid) (**101,920**)
BH405	C9-22 hydrocarbons: 20% aromatic (**205**)	
BH605	-	Unknown (60% match Ethyl isothiocyanate) (**16**)
BH1109	molecular sulphur (**29**)	-
	unknown compound (**8**)	-
BH401	molecular sulphur (**6**)	-
BH204	unknown compound (**2**)	-

5.1.3 Total Petroleum Hydrocarbons

The following table provides a comparison of petroleum hydrocarbons, where measured above MDL, in groundwater samples collected in 2002 and 2009:

Borehole	Total Petroleum Hydrocarbons (µg/l)			
	Gasoline Range Organics		Diesel Range Organics (C12 – C35)	
	Baseline (2002) *	Closure (2009) **	Baseline (2002)	Closure (2009) ***
BH304	770	370	2,026	643
BH1105	292	nt	568	nt
BH401	-	-	292	490
BH1101	-	931	10,016	-
BH1102	-	55	-	-
BH1103	-	-	1,151	-

* Sum C4 – C13
** Sum C5 – C12
*** Sum C12 – C35
- Below MDL

5.1.4 Metals

A summary of the maximum metal concentrations values identified during the 2002 and 2009 assessment is presented in the following table.

Compound	Baseline (2002)	Closure (2009)
	Max (µg/l)	Max (µg/l)
Arsenic	12	7.5
Boron	1,010	15,000
Cadmium	-	2.7
Chromium	19	36
Copper	16	22
Lead	-	18
Mercury	-	-
Nickel	19	38
Selenium	-	12
Zinc	80	160

- Below MDL

5.1.5 Ammonium

A summary of the ammonium concentrations measured in groundwater samples collected the 2002 and 2009 assessment are presented in the following table:

Borehole	Ammonium as NH4-N (µg/l)	
	Baseline (2002)	Closure (2009)
BH1101	1,000	4,000
BH1106	300	1,100
BH112	3,500	300
BH202	-	400
BH203	800	400
BH204	300	800
BH304	1,200	260,000
BH401	11,700	6,900
BH405	900	1,600
BH501	-	800
BH504	-	300

- Below MDL
nt not tested

5.1.6 Methanol

Eight samples were submitted in 2002 for methanol analysis and methanol was not identified in any of the samples. ARCADIS submitted five samples from the available locations for the alcohols analysis and methyl alcohol (methanol) was not identified in any of the samples.

5.1.7 Polychlorinated biphenyls (PCBs)

PCBs were tested for in nine samples in 2002 and eight in 2009. No PCBs were identified at concentrations above the MDL in any of the samples tested during the 2002 and 2009 assessments.

5.1.8 Cyclohexane

Cyclohexane was detected as a VOC TIC in groundwater samples collected from monitoring wells BH105, BH112, BH113 BH404 and BH405 during the baseline survey undertaken in 2002

ARCADIS submitted 20 samples for cyclohexane analysis which identified elevated concentrations above MDL across the site, and in particular in BH404 3,000µg/l.

5.1.9 Total Organic Carbon (TOC)

TOC was not tested for in 2002 in the groundwater samples. The site has however, undertaken six-monthly sampling and analysis since June 1997. The analysis broadly indicates that there are levels of TOC greater than MDL across the site, in particular in BH304.

ARCADIS submitted 25 samples for TOC analysis which identified TOC above MDL across the site, and in particular in BH304 with a measured concentration of 580,000µg/l.

5.1.10 Summary

In general, where repeat samples and analysis have been possible, similar results have been recorded between the 2002 baseline assessment and the 2009 closure monitoring. The only notable exceptions are:

Analysis	Borehole	Baseline – 2002 (µg/l)	Closure – 2009 (µg/l)
VOC	Non noted		
VOC TIC	Site wide	Not quantified	-
SVOC	BH304	-	311
SVOC TIC	BH1101	595 (C6-C9 Acids)	101,920 (Carboxylic Acid Group and Dicarboxylic acid)
TPH – GRO	BH1101	-	931
TPH – DRO	BH304	2,026	643
	BH1101	10,016	-
	BH1103	1,151	-
Metals	Boron - Max Values	1,010	15,000
Ammonium as NH_4	BH1101	1,000	4,000
	BH1106	300	1,100
	BH112	3,500	300
	BH304	1,200	260,00
	BH401	11,700	6,900
TOC	BH105	25,000*	4,000
	BH304	10,000*	580,000
	BH605	70,000*	3,000

- Below MDL
nt not tested
* December 2002 data used for comparison

The results to note from the above table are:

Borehole	Analysis	Trend
BH1011	SVOC TIC	Increased
	TPH – GRO	Increased
	TPH – DRO	Decreased
	Ammonia	Increased
BH304	SVOC	Increased
	TPH-DRO	Decreased
	Ammonia	Increased
	TOC	Increased

6 PHASE 2 COMPARISON – BASELINE, CLOSURE AND ADDITIONAL INVISTIGATION DATA

6.1 Groundwater Results

A comparison between groundwater data collected in July 2009 and the two monitoring visits in November 2009 is presented below. The baseline data from 2002 has been included for reference.

6.1.1 BH304 Area

Volatile Organic Compounds

The following table provides a summary comparison of analytes measured:

Total Volatile Organic Compounds (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	7	56	47	nt
BH304-1			Dry	<MDL
BH304-2			1	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

The VOC concentrations recorded in BH304 are still recorded in excess of the 2002 baseline. Only one VOC (toluene) was recorded at low levels (1µg/l) in the delineation borehole BH304-2.

Total Volatile Organic Compounds TICS (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	-	-	Limonene (28), Cyclopentylcyclopentene Isomer (48) and (20), Ethenyl-ethyl-Benzene Isomer (20), Unknown (20), Tetrahydro-Naphthlene Isomer (52)	nt
BH304-1			Dry	<MDL
BH304-2			<MDL	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

nt not tested

A number of VOC TIC were identified in BH304 in the first of the November 2009 monitoring. None of the delineation boreholes recorded any TIC.

Semi-Volatile Organic Compounds

The following table provides a summary comparison of analytes measured:

Total Semi-Volatile Organic Compounds (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	<MDL	311	244	nt
BH304-1			Dry	<MDL
BH304-2			<MDL	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

nt not tested

The SVOC concentrations recorded in BH304 are still recorded in excess of the 2002 baseline. None of the delineation boreholes recorded any VOC in excess of the MDL.

Total Semi-Volatile Organic Compounds TICS (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	Unresolved complex matter including some terpene (940)	<MDL	Methyl Hexanoic Acid (20) Cyclopentylcyclopentene isomer (12), Dimethylstyrene Isomer (45), Phenylacetic acid (50) Caprolactam Isomer (160) Oxindole (32), Phenazine (430), Nine unknown compounds (584)	nt
BH304-1			Dry	<MDL
BH304-2			Caffine (33)	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

A number of SVOC TIC were identified in BH304 in the first of the November 2009 monitoring. The TIC recorded are different from those recorded in the baseline. Only one TIC, caffine at 33µg/l, was recorded in any of the delineation boreholes (BH304-2).

Total Petroleum Hydrocarbons

The following table provides a summary comparison of analytes measured:

Total Petroleum Hydrocarbons - GRO (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	770*	370**	470**	nt
BH304-1			Dry	<MDL
BH304-2			<MDL	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

Total Petroleum Hydrocarbons - DRO (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	2,026	643***	1,100**	nt
BH304-1			Dry	<MDL
BH304-2			<MDL	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

- Below MDL, nt not tested, * Sum C4 – C13, ** Sum C5 – C12, *** Sum C12 – C35

Total Petroleum Hydrocarbons (GRO and DRO) are recorded in borehole BH304, although below the 2002 baseline. None of the delineation boreholes recorded TPH concentrations in excess of the MDL.

Ammonium

Ammonium as NH_4-N (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	1,200	260,000	390,000	nt
BH304-1			Dry	<MDL
BH304-2			<MDL	<MDL
BH304-3			Dry	<MDL
BH304-4			<MDL	<MDL

- Below MDL, nt not tested

Ammonium concentrations are recorded above the 2002 baseline in BH304. None of the delineation boreholes recorded ammonium in excess of the MDL

Total Organic Carbon

Total Organic Carbon (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH304	nt	580,000	160,000	nt
BH304-1			Dry	<MDL
BH304-2			6,000	4,000
BH304-3			Dry	8,000
BH304-4			10,000	6,000

- Below MDL, nt not tested

6.1.2 BH1101 Area

Semi-Volatile Organic Compounds

The following table provides a summary comparison of analytes measured:

Total Semi-Volatile Organic Compounds (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH1101	<MDL	<MDL	<MDL	nt
BH1101-1			<MDL	27
BH1101-2			<MDL	-
BH1101-3			<MDL	-
BH501	<MDL	<MDL	<MDL	nt

The SVOC 4-methylphenol was recorded in the delineation borehole BH1101-1 at 27 µg/l. None of the other boreholes recorded any SVOC above the MDL.

Total Semi-Volatile Organic Compounds TICS (µg/l)				
Borehole	**Baseline (2002)**	**Closure (2009)**	**First Monitoring (Nov 2009)**	**Second Monitoring (Nov 2009)**
BH1101	C6-9 Acids (595)	Carboxylic Acid Group and Dicarboxylic acid (ranging from Propanoic Acid to Heptanoic Acid also Decanedioic acid and Octanedioic acid) (101,920)	Pentanoic Acid (21,424), Methtyl pentanoic acid Isomer (287,150), Hexanoic Acid (14,454), Methyl Hexanoic acid Isomer (155,640), Heptanoic Acid (3,494), Ethyl Hexanoic acid Isomer (485), Cyclohexanecarboxilic Acid (2,841), Methyl Hexanoic acid Isomer (478), Octanoic Acid (1,787)	Nt
BH1101-1			Unknown Organic Acids (451,841)	Unknown Organic Acids (263,147), Unknown compounds, total (11,849)
BH1101-2			Four unknown organic acids (413), Trimethyl Hexanoic Acid (15)	<MDL
BH1101-3			Four unknown organic acids (144)	<MDL
BH501	<MDL	<MDL	<MDL	Nt

- Below MDL, nt not tested

A number of SVOC TIC were identified in BH1101 in the first of the November 2009 monitoring rounds, the closure monitoring and the 2002 baseline monitoring. The number of compounds identified and concentrations have increased during each monitoring. Similar TICs have been recorded in the three delineation boreholes (BH1101-1, 2 & 3) in at least one of the two November monitoring events.

Total Petroleum Hydrocarbons

The following table provides a summary comparison of analytes measured:

Total Petroleum Hydrocarbons - GRO (µg/l)				
Borehole	**Baseline (2002)**	**Closure (2009)**	**First Monitoring (Nov 2009)**	**Second Monitoring (Nov 2009)**
BH1101	<MDL	931	190	nt
BH1101-1			1,600	1,800
BH1101-2			nt	<MDL
BH1101-3			nt	<MDL
BH501	<MDL	<MDL	<MDL	nt

Total Petroleum Hydrocarbons - DRO (µg/l)				
Borehole	**Baseline (2002)**	**Closure (2009)**	**First Monitoring (Nov 2009)**	**Second Monitoring (Nov 2009)**
BH1101	10,016	<MDL	190	nt
BH1101-1			1,700	1,800
BH1101-2			<MDL	<MDL
BH1101-3			<MDL	<MDL
BH501	<MDL	<MDL	<MDL	nt

- Below MDL, nt not tested, * Sum C4 – C13, ** Sum C5 – C12, *** Sum C12 – C35

Total Petroleum Hydrocarbons (GRO) are recorded in borehole BH1101 above the 2002 baseline. Elevated concentrations of GRO and DRO were also recorded in the delineation borehole BH1101-1.

Ammonium

Ammonium as NH_4-N (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH1101	1,000	4,000	500	nt
BH1101-1			13,000	9,100
BH1101-2			600	200
BH1101-3			300	200
BH501	<MDL	800	400	<MDL

- Below MDL, nt not tested

Ammonium concentrations have been recorded in BH1101 and all the delineation boreholes. The highest concentrations have been recorded in BH1101-1.

Total Organic Carbon

Total Organic Carbon (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH1101	nt	5,900,000	3,000,000	nt
BH1101-1			560,000	480,000
BH1101-2			11,000	10,000
BH1101-3			8,000	10,000
BH501	nt	8,000	6,000	nt

- Below MDL, nt not tested

6.1.3 BH1104 Area

The following table provides a summary comparison of analytes measured:

Boron (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH1104	590	15,000	1,100	nt
BH1104-1			1,200	1,100
BH1104-2			1,500	1,000
BH1104-3			1,800	1,500

Borate (µg/l)

Borehole	Baseline (2002)	Closure (2009)	First Monitoring (Nov 2009)	Second Monitoring (Nov 2009)
BH1104	nt	nt	9,000	nt
BH1104-1			1,100	1,000
BH1104-2			1,000	1,000
BH1104-3			1,400	1,300

Boron is recorded at concentrations above the 2002 baseline in BH1104, although the concentrations have reduced since the closure monitoring. Comparable concentrations are recorded in the delineation boreholes. The highest concentrations are recorded in BH1104-3.

Borate is recorded at elevated concentrations in BH1104 and all the delineation boreholes. The highest concentrations are recorded in BH1104.

7 CONCLUSIONS

7.1 Phase 1

The baseline survey undertaken in 2002 provided a summary of the groundwater quality beneath the site at the start of the PPC permit. The assessment undertaken by ARCADIS in July 2009 provided an indication of the groundwater quality, and identified impacts to groundwater that were likely to be associated with historical activities at the site. Monitoring undertaken by Invista, over the life of the permit, has recorded fluctuations in concentrations of chemicals of concern over time.

In general, both the 2002 baseline, and the phase 1 closure monitoring recorded low to moderate levels of contamination associated with the industrial activities at the site. The majority of samples collected in 2009 were of similar magnitude to the 2002 monitoring, except BH1101 in the Acids area and BH304 in the old drum storage area. In both sampling events BH304 has recorded levels of VOC, SVOC, TPH and TOC greater than laboratory MDL. BH1101 has recorded levels of SVOC and TPH above MDL in both sampling events.

The most notable variations between the two rounds of monitoring were the elevated concentrations of acids detected in BH1101 in the baseline survey at 595µg/l and identified as C6-9 Acid and in 2009 described as Carboxylic Acid Group and Dicarboxylic acid (ranging from Propanoic Acid to Heptanoic Acid also Decanedioic acid and Octanedioic acid) at 101,920µg/l. It should be noted that these acids were recorded as tentatively identified compounds on both occasions and as such are indicative only.

Some variations of TPH DRO and TPH GRO were also recorded, however, these are thought to be a result of differing sampling techniques, with the TPH – DRO consistently lower in 2009. The low-flow monitoring technique, utilised in 2009, is considered to provide the most representative sample of groundwater quality.

The metals analysis recorded generally consistent results, except for boron, which recorded an increase from 590 µg/l to 15,000 µg/l in groundwater sampled from BH1104. Boron is a naturally occurring element and is commonly present in groundwater and the concentration increase observed in monitoring well BH1104 may be due natural variations and is not thought to be of concern.

Ammonium analysis also recorded significant increase in BH304 between 2002 and 2009.

The TOC concentration in BH304 has increased from 10,000 µg/l to 580,000 µg/l between 2002 and 2009 and slight increases in the total VOC and SVOC concentrations were observed at this location; the variation between the VOC and SVOC results and the TOC results may indicate unidentified / unquantified impacts, which may need further consideration.

The analysis of the samples collected from the LDPs (WALE and Dump Tank) did not identify any elevated concentrations of target compounds.

In summary, the results are generally consistent between the baseline (2002) and closure monitoring programme (2009), except for boreholes BH304 and BH1101, where the analysis suggests some impacts of SVOC compounds, ammonium and possibly an unquantified source of TOC have occurred.

7.2 Phase 2

The additional environmental assessment was undertaken to collect additional data from the area around three boreholes, namely BH304, BH1101 and BH1104, based on the findings of the phase 1 monitoring undertaken by ARCADIS in September 2009. The boreholes recorded CoC above the concentrations recorded in the IPPC baseline survey undertaken in 2002.

The works comprised the re-sampling of four existing boreholes, BH304, BH1101, BH501 and BH1104; the drilling of 10 new boreholes to delineate the impacts around the existing boreholes; and the sampling of the newly installed wells on two occasions.

BH1101 Area

The re-sampling of BH1101 recorded elevated concentrations of acids in the SVOC TIC, with concentrations rising from 595µg/l in the 2002 baseline survey to 101,920µg/l in the September 2009 monitoring and 487,753µg/l in the November 2009 monitoring. Elevated concentrations of comparable acids were also detected in soil samples taken from BH1101-1 and in groundwater sampled from BH1101-1, BH1101-2, and BH1101-3.

The re-sampling of BH1101 also recorded elevated Gasoline Range Organics, however, although above the 2002 baseline survey the concentrations had reduced since the September 2009 monitoring from 931µg/l to 190µg/l. Elevated TPH was also recorded in soil sampled from BH1101-1 (350mg/kg) and in groundwater (3,600µg/l).

BH501, located between the potential source and BH1101, recorded no SVOC TIC or TPH concentrations above the MDL.

Based on the findings of the additional environmental assessment it is evident that the soil and groundwater in this area have been locally impacted with acids, although it should be noted that these were only tentatively identified. Given the location in the Acid Plant area it is likely that these impacts are associated with historical site activities. The lack of impact in BH501 indicates the source is not to the north east of BH1101 and is likely to be a localised hot spot of contamination. Also given the geology at the site and the likelihood of localised perched water bodies the source area is potentially constrained to a small area.

BH304 Area

The re-sampling of BH304 recorded elevated concentrations of VOC and SVOC above the 2002 baseline survey, although slightly lower than those recorded in September 2009. A number of VOC and SVOC TIC were recorded with VOC TIC being recorded for the first time.

Ammonium concentrations which recorded a significant increase in BH304 between 2002 and 2009 also record a continued increasing trend with concentrations rising from 260,000µg/l in September 2009 to 390,000µg/l in November 2009.

None of the delineation boreholes showed elevated concentrations of the COC.

Based on the findings of the additional environmental assessment it is evident that the groundwater impacts in BH304 of VOC, SVOC and ammonium are still elevated above the 2002 baseline survey. The delineation boreholes show none of the COC above the MRL as such BH304 represents an isolated hotspot.

BH1104 Area

The re-sampling of BH1104 recorded elevated boron concentrations above the 2002 baseline survey (590µg/l), although it has reduced from 15,000µg/l in September 2009 to 1,100µg/l in November 2009. Comparable concentrations were also recorded in the three delineation boreholes.

Borate levels, not previously analysed, were recorded at 9,000µg/l in BH1104 and between 1,000µg/l and 1,300µg/l in BH1104-1, BH1104-2 and BH1104-3.

The boron levels are generally elevated above those recorded across the site in the September 2009 monitoring, although lower than the high recorded in September 2009. It is not clear whether this represents natural levels in this area or whether this is from a site derived source.

TABLES

Table 1 - Borehole Inspection Log and Purge Volume Details

	Borehole	Location	Well Construction	Installation Date	Easting	Northing	PPC	INVISTA sampled	Comment	Purged Water (litres)			
										15/07/2009	16/07/2009	17/07/2009	Total
Boreholes Found	105	Boundary - east of CT No 3	75mm	1993	456525	520616	Yes	Yes	Rusty top hat	30	-	-	30
	112	Boundary - north of corner of Road N15	75mm	1993	456288	521212	Yes	Yes	Rusty blue top hat	20 - dry	18	-	28
	201	KA Plant - north of Tanks 321/2/3	50mm	1993	456208	520953	Yes	Yes	Rusty blue top hat	-	-	-	-
	202	KA Plant - north of Effluent Tank	50mm	1993	456172	521060	Yes	Yes	Rusty blue top hat	-	-	35	35
	203	KA Plant - south of CT Tank 331	50mm	1993	456113	520989	Yes	Yes	Rusty blue top hat	-	-	20	20
	204	KA Plant - west of Tank 326	50mm	1993	456140	520921	Yes	Yes	Rusty blue top hat	-	-	16	16
	304	HMD Plant - west of storage bund	75mm	1993	456422	520714	Yes	Yes	Manhole cover. Water at ground level.	12 - dry	4 - dry	-	16
	401	Acids 2 Plant - Road N36	75mm	1993	456621	520815	Yes	Yes	Manhole cover, required reinstatement	14 - dry	18 - dry	-	32
	404	Acids 2 Plant - near neutralisation plant	75mm	1993	456660	520886	Yes	Yes	Rusty top hat	22 - dry	3 - dry	18	43
	405	Acids 2 Plant - north of re-crystalisation area	75mm	1993	456575	520792	Yes	Yes	Rusty blue top hat	35	-	-	35
	501	Acids 1 Plant - west by Road N43	75mm	1993	456516	521103	No	Yes	Rusty yellow top hat. Roots & soil collected in base of well	18 - dry	15 - dry	35	68
	504	Acids 1 Plant - south-east	75mm	1993	456326	521129	Yes	Yes	Rusty top hat	16 - dry	8 - dry	18 - dry	42
	601b	Inters 1 - west of No 1 CT	75mm	1993	456254	520985	Yes	Yes	Rusty blue top hat	10 - dry	12 - dry	-	22
	605	Inters 1 - south of HMD tank farm	75mm	1993	456244	521061	Yes	Yes	Rusty blue top hat	15 - dry	20 - dry	-	35
	606	Inters 1 - north of HMD tank farm	75mm	1993	456472	521181	Yes	Yes	Flush to ground	35 - dry	20	-	55
	1101	Inters 1 - west of Acids 1 Plant	50mm	2003	456462	521012	Yes	No	Flush to ground - cover rusted and screws damaged	7 - dry	2 - dry	2 - dry	11
	1102	Nylon Main Offices - Road N2	50mm	2003	456543	521035	Yes	No	Flush to ground	10 - dry	8 - dry	12 - dry	30
	1103	Thermex heaters - Road N2	50mm	2003	456325	520743	Yes	No	Flush to ground	5 - dry	2 - dry	1 - dry	8
	1104	HMD Plant - east of ABP catalyst plant	50mm	2003	456508	520777	Yes	No	Flush to ground, cover rusted shut	9 - dry	3 - dry	15 - dry	27
	1106	HMD Plant - north of ammonia storage	75mm	2003	456525	520616	Yes	No	Flush to ground	10 - dry	10 - dry	-	20
Boreholes not found	104	Boundary - south-west corner	unknown	1993	na	na	No	No	Not found				
	109	Not shown on plan	unknown	1993	na	na	No	No	Not found				
	113	Boundary - north of N9	unknown	1993	na	na	No		Not found				
	207	KA Plant - on site of CDC sump	unknown	1993	na	na	Yes	To 17/12/2002	Lost due to construction				
	402	Acids 2 Plant - south of reactor compound	unknown	1993	na	na	No	To 10/06/98	Lost due to construction				
	702	Polymer plant - north	unknown	1993	na	na	No	To 10/01/01	Lost due to construction				
	1105	No.2 HMD Crude	50mm	2003	na	na	Yes		Full of bentonite				
	1107	Acids - crude building	unknown	2003	na	na	Yes	No	Lost due to construction				
	1108	Near WALE	unknown	2003	na	na	Yes	No	Not found				
Boreholes drilled but no installation	101	Boundary - north of CH Tank 331	unknown	1993	na	na	No						
	103	Boundary - near Kettle Beck	unknown	1993	na	na	No						
	106	Boundary - east of WALE tank	unknown	1993	na	na	No						
	107	Boundary - corner of Roads N3 and N42	unknown	1993	na	na	No						
	110	Boundary - north of Nitric 3 Plant	unknown	1993	na	na	No						
	111	Boundary - north of nitirc adsorption	unknown	1993	na	na	No						
	301	HMD Plant - south of ABP catalyst plant	unknown	1993	na	na	No						
	302	HMD Plant - south of office buidling	unknown	1993	na	na	No						
	303	HMD Plant - west of office building	unknown	1993	na	na	No						
	305	HMD Plant - corner of Roads N30 and N38	unknown	1993	na	na	No						
	503	Acids 1 Plant - east	unknown	1993	na	na	No						
	602	Inters 1 - west of No 1 CT	unknown	1993	na	na	No						
	603	Not shown on plan	unknown	1993	na	na	No						
	604	Not shown on plan	unknown	1993	na	na	No						
	701	Polymer plant - south	unknown	1993	na	na	No						
	703	Polymer plant - experimental building	unknown	1993	na	na	No						

Table 2 - Phase 1 Laboratory Testing Schedule

Borehole	VOCs inc TICs	SVOC inc TICs	TPH	Metals	Ammonium	Methanol	PCBs	Cyclohexane	Alcohol & Acetate	TOC	pH
105	✓	✓		✓	✓			✓		✓	
112	✓	✓		✓	✓			✓		✓	
201	✓	✓	✓	✓	✓			✓	✓	✓	
202	✓	✓	✓	✓	✓			✓	✓	✓	
203	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
204	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
304	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
401	✓	✓	✓	✓	✓		✓	✓		✓	
404	✓	✓		✓	✓		✓	✓		✓	
405	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
501	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
504	✓	✓	✓	✓	✓		✓	✓	✓	✓	
601b	✓	✓		✓	✓	✓	✓	✓		✓	
605	✓	✓		✓	✓		✓	✓		✓	
606	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
1101	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1102	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
1103	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
1104	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1106	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
QA/QC Samples											
Duplicate 1 (BH105)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Duplicate 2 (BH304)	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Field Blank	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Leak Detection Points											
WALE 1	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
WALE 2	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
DUMP5	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓

Notes

VOC	Volatile organic compounds
SVOC	Semi-volatile organic compounds
TICs	Tentatively identifed compounds
Metals	As, B, Cd, Cr, Cu, Pb, Ni, Se, Zn and Hg.
PCBs	Poly chlorinated biphenyls
TOC	Total organic carbon

Table 3 - Phase 2 Laboratory Testing Schedule

	Borehole ID	NH4-N	TOC	TPH	VOC	SVOC	Metals	pH	Boron/Borate
BH304 Area	304	✓	✓	✓	✓	✓	*	*	*
	304-1	✓	✓	✓	✓	✓	*	*	*
	304-2	✓	✓	✓	✓	✓	*	*	*
	304-3	✓	✓	✓	✓	✓	*	*	*
	304-4	✓	✓	✓	✓	✓	*	*	*
BH1101 Area	501	✓	✓	✓	*	✓	*	*	*
	1101	✓	✓	✓	*	✓	*	*	*
	1101-1	✓	✓	✓	*	✓	*	*	*
	1101-2	✓	✓	✓	*	✓	*	*	*
	1101-3	✓	✓	✓	*	✓	*	*	*
BH1104 Area	1104	*	*	*	*	*	✓	✓	✓
	1104-1	*	*	*	*	*	✓	✓	✓
	1104-2	*	*	*	*	*	✓	✓	✓
	1104-3	*	*	*	*	*	✓	✓	✓

Notes:
* = Not Tested

Table 4 - Field Data

Borehole ID	Water Level (mbgl)	Base of Well (mbgl)	Measuring Point	Temperature (°C)	Conductivity (mS)	Salinity	Dissolved Oxygen (%)	pH	pH Lab	Redox (mV)	Comment
Groundwater Montoring Wells											
105	0.72	2.63	well pipe	14.64	361	0.22	3	8.35	nt	-114.60	Clear and colourless
112	1.42	3.79	casing	14.78	1342	0.85	3.6	7.09	nt	-24.10	Clear and colourless
201	1.32	3.50	well pipe	15.89	494	0.29	18.2	6.93	nt	26.60	Clear and colourless
202	1.08	3.64	casing	15.46	509	0.3	44	7.19	nt	12.40	Clear and colourless
203	0.68	3.61	casing	15.82	297	0.17	76.1	7.85	nt	-8.50	Clear and colourless
204	0.52	3.56	casing	15.25	368	0.21	23.8	7.43	nt	-44.80	Clear and colourless
304	2.18	3.19	casing	-	-	-	-	-	nt	-	GRAB SAMPLE. Colourless, some suspended black sediment
401	0.53	3.11	well pipe	16.33	1148	0.69	6.4	6.58	6.62	-80.1	Colourless, some suspended sediment, oily sheen on surface
404	0.73	2.59	well pipe	16.9	520	0.3	66.6	7.93	nt	33.8	Clear and colourless
405	0.76	3.73	casing	14.74	594	0.36	3.3	6.96	nt	15.5	Clear and colourless
501	1.62	3.99	casing	14.54	717	0.44	11.6	7.16	nt	135	Clear and colourless
504	0.72	2.61	casing	16.87	381	0.22	71.4	7.8	nt	132.4	Clear and colourless
601b	1.65	3.42	casing	16.44	932	0.56	15	7.15	nt	-30.7	Clear and colourless
605	1.29	3.49	casing	15.82	1118	0.68	19	6.98	nt	133.7	Clear and colourless
606	0.51	3.74	well pipe	17.9	251	0.14	3.9	7.39	nt	-36.9	Clear and colourless
1101	1.14	4.82	well pipe	-	-	-	-	-	6.69	-	Clear and colourless
1102	0.48	4.90	well pipe	15.26	841	0.51	19.9	7.36	7.61	17.7	GRAB SAMPLE. Light orangey brown, cloudy
1103	2.78	4.90	well pipe	-	-	-	-	-	7.22	-	GRAB SAMPLE. Clear and colourless
1104	0.91	4.91	well pipe	-	-	-	-	-	7.52	-	GRAB SAMPLE. Clear and colourless
1106	0.15	4.90	well pipe	-	-	-	-	-	7.37	-	GRAB SAMPLE. Clear and colourless
Leak Detaection Points											
WALE 1	ground level	-	well pipe	17.73	539	0.31	61.1	7.72	8.05	35.2	Clear and colourless
WALE 6	ground level	-	well pipe	18.99	535	0.29	63.7	7.84	8.09	5.8	Clear and colourless
DUMP 5	ground level	-	well pipe	16.66	869	0.52	73.7	7.86	8.24	20.5	Clear and colourless

Notes
- no data collected

Table 5 - Volatile Organic Compounds in Groundwater and LDPs (µg/l)

Analytes	MDL	GROUNDWATER										
		BH105	BH105 Duplicate	BH112	BH401	BH404	BH601B	BH605	BH1101	BH1102	BH1103	BH1106
		29/07/2009	29/07/2009	28/07/2009	29/07/2009	29/07/2009	28/07/2009	28/07/2009	28/07/2009	29/07/2009	28/07/2009	29/07/2009
Dichlorodifluoromethane	<1	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	<1	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	<1	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	<2	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	<2	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	<2	-	-	-	-	-	-	-	-	-	-	-
trans-1-2-Dichloroethene	<2	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	<3	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulphide	<2	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloroethene	<1	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloroethane	<1	-	-	-	-	-	-	-	-	-	-	-
Methyl Tertiary Butyl Ether	<2	-	-	-	-	-	-	-	-	-	-	-
cis-1-2-Dichloroethene	<2	-	-	-	-	-	-	-	-	-	-	-
Bromochloromethane	<2	-	-	-	-	-	-	-	-	-	-	-
Chloroform	<2	-	2	-	-	-	-	-	-	-	-	-
2.2-Dichloropropane	<1	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichloroethane	<4	-	-	-	-	-	-	-	-	-	-	-
1.1.1-Trichloroethane	<1	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloropropene	<1	-	-	-	-	-	-	-	-	-	-	-
Benzene	<1	-	-	-	-	-	-	-	-	-	-	-
Carbontetrachloride	<1	-	-	-	-	-	-	-	-	-	-	-
Dibromomethane	<3	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichloropropane	<3	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	<1	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	<2	-	-	-	-	-	-	-	-	-	-	-
cis-1-3-Dichloropropene	<2	-	-	-	-	-	-	-	-	-	-	-
trans-1-3-Dichloropropene	<3	-	-	-	-	-	-	-	-	-	-	-
1.1.2-Trichloroethane	<2	-	-	-	-	-	-	-	-	-	-	-
Toluene	<1	-	-	-	-	-	-	-	-	-	-	-
1.3-Dichloropropane	<2	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	<2	-	-	-	-	-	-	-	-	-	-	-
1.2-Dibromoethane	<2	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	<2	-	-	-	-	-	-	-	-	-	-	-
1.1.1.2-Tetrachloroethane	<1	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	<4	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-
p/m-Xylene	<2	-	-	-	-	-	-	-	-	-	-	-
Bromoform	<3	-	-	-	-	-	-	-	-	-	-	-
Styrene	<1	-	-	-	-	-	-	-	-	-	-	-
1.1.2.2-Tetrachloroethane	<5	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	<1	-	-	-	-	-	-	-	-	-	-	-
1.2.3-Trichloropropane	<9	-	-	-	-	-	-	-	-	-	-	-
Isopropylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-
Bromobenzene	<1	-	-	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	<2	-	-	-	-	-	-	-	-	-	-	-
Propylbenzene	<3	-	-	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	<2	-	-	-	-	-	-	-	-	-	-	-
1.2.4-Trimethylbenzene	<1	-	-	-	-	-	-	-	-	-	-	-
4-Isopropyltoluene	<3	-	-	-	-	-	-	-	-	-	-	-
1.3.5-Trimethylbenzene	<1	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichlorobenzene	<3	-	-	-	-	-	-	-	-	-	-	-
1.4-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	<1	-	-	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-
1.3-Dichlorobenzene	<2	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-
1.2-Dibromo-3-chloroprops	<10	-	-	-	-	-	-	-	-	-	-	-
1.2.4-Trichlorobenzene	<2	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	<4	-	-	-	-	-	-	-	-	-	-	-
1.2.3-Trichlorobenzene	<3	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<3	-	-	-	-	-	-	-	-	-	-	-
TIC's	<10	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL, TICs = Tentatively identifed compounds

Table 5 - Volatile Organic Compounds in Groundwater and LDPs (µg/l)

Analytes	MDL	GROUNDWATER												LEAK DETECTION POINTS		
		BH201	BH202	BH203	BH204	BH304	BH304 Duplicate	BH405	BH501	BH504	BH606	BH1104	BHFB1	DUMP 5	WALE 1	WALE 6
		30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	31/07/2009	31/07/2009	30/07/2009	31/07/2009	31/07/2009	29/07/2009	29/07/2009	29/07/2009
Dichlorodifluoromethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1-2-Dichloroethene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulphide	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloroethene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloroethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Tertiary Butyl Ether	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1-2-Dichloroethene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromochloromethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	<2	-	-	-	-	-	-	-	-	-	-	-	38	-	-	-
2.2-Dichloropropane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichloroethane	<4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.1-Trichloroethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloropropene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	<1	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-
Carbontetrachloride	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromomethane	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichloropropane	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	<1	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-
Trichloroethene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1-3-Dichloropropene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1-3-Dichloropropene	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.2-Trichloroethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	<1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
1.3-Dichloropropane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-Dibromoethane	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.1.2-Tetrachloroethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	<4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
p/m-Xylene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.2.2-Tetrachloroethane	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.3-Trichloropropane	<9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isopropylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Propylbenzene	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.4-Trimethylbenzene	<1	-	-	-	-	3	3	-	-	-	-	-	-	-	-	-
4-Isopropyltoluene	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.3.5-Trimethylbenzene	<1	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-
1.2-Dichlorobenzene	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.4-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.3-Dichlorobenzene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-Dibromo-3-chloropropane	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.4-Trichlorobenzene	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	<4	-	-	-	-	49	53	-	-	-	-	-	-	-	-	-
1.2.3-Trichlorobenzene	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIC's	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL, TICs = Tentatively identifed compounds

Table 6 - Semi Volatile Organic Compounds in Groundwater and LDPs (µg/l)

Analytes	MDL	GROUNDWATER								
		BH105	BH105 Duplicate	BH112	BH401	BH404	BH601B	BH605	BH1101	BH1102
		29/07/2009	29/07/2009	28/07/2009	29/07/2009	29/07/2009	28/07/2009	28/07/2009	28/07/2009	29/07/2009
Phenols										
2-Chlorophenol	<1	-	-	-	-	-	-	-	-	-
2-Methylphenol	<1	-	-	-	-	-	-	-	-	-
2-Nitrophenol	<1	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	<1	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	<1	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	<1	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	<1	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	<1	-	-	-	-	-	-	-	-	-
4-Methylphenol	<1	-	-	-	-	-	-	-	-	-
4-Nitrophenol	<1	-	-	-	-	-	-	-	-	-
Pentachlorophenol	<1	-	-	-	-	-	-	-	-	-
Phenol	<1	-	-	-	-	-	-	-	-	-
PAHs										
2-Chloronaphthalene	<1	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	<1	-	-	-	-	-	-	-	-	-
Acenaphthene	<1	-	-	-	-	-	-	-	-	-
Acenaphthylene	<1	-	-	-	-	-	-	-	-	-
Anthracene	<1	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	<1	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	<1	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	<1	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	<1	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	<1	-	-	-	-	-	-	-	-	-
Chrysene	<1	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	<1	-	-	-	-	-	-	-	-	-
Fluoranthene	<1	-	-	-	-	-	-	-	-	-
Fluorene	<1	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	<1	-	-	-	-	-	-	-	-	-
Naphthalene	<1	-	-	-	-	-	-	-	-	-
Phenanthrene	<1	-	-	-	-	-	-	-	-	-
Pyrene	<1	-	-	-	-	-	-	-	-	-
Phthalates										
Bis(2-ethylhexyl) phthalate	<2	-	-	-	-	-	-	-	-	-
Butylbenzyl phthalate	<1	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	<1	-	-	-	-	-	-	-	-	-
Di-n-Octyl phthalate	<5	-	-	-	-	-	-	-	-	-
Diethyl phthalate	<1	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	<1	-	-	-	-	-	-	-	-	-
Other Semi-volatiles										
1,2-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	<1	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-
2-Nitroaniline	<1	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	<1	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	<1	-	-	-	-	-	-	-	-	-
3-Nitroaniline	<1	-	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	<1	-	-	-	-	-	-	-	-	-
4-Chloroaniline	<1	-	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	<1	-	-	-	-	-	-	-	-	-
4-Nitroaniline	<1	-	-	-	-	-	-	-	-	-
Azobenzene	<1	-	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	<1	-	-	-	-	-	-	-	-	-
Bis(2-chloroethyl)ether	<1	-	-	-	-	-	-	-	-	-
Carbazole	<1	-	-	-	-	-	-	-	-	-
Dibenzofuran	<1	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	<1	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<1	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	<1	-	-	-	-	-	-	-	-	-
Hexachloroethane	<1	-	-	-	-	-	-	-	-	-
Isophorone	<1	-	-	-	-	-	-	-	-	-
N-nitrosodi-n-propylamine	<1	-	-	-	-	-	-	-	-	-
Nitrobenzene	<1	-	-	-	-	-	-	-	-	-
TIC's	<10	-	-	-	-	-	-	16	101,920	-
Unknown(60% match Ethyl isothiocyanate)	-	-	-	-	-	-	-	16	-	-
Carboxylic Acid Group and Dicarboxylic acid (ranging from Propanoic Acid to Heptanoic Acid also Decanedioic acid andOctanedioic acid)	-	-	-	-	-	-	-	-	101,920	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL, TICs = Tentatively identfied compounds

Table 6 - Semi Volatile Organic Compounds in Groundwater and LDPs (µg/l)

Analytes	MDL	GROUNDWATER														LEAK DETECTION POINTS		
		BH1103	BH1106	BH201	BH202	BH203	BH204	BH304	BH304 Duplicate	BH405	BH501	BH504	BH606	BH1104	BHFB1	DUMP 5	WALE 1	WALE 6
		28/07/2009	29/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	31/07/2009	31/07/2009	30/07/2009	31/07/2009	31/07/2009	29/07/2009	29/07/2009	29/07/2009
Phenols																		
2-Chlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylphenol	<1	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-
2-Nitrophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	<1	-	-	-	-	-	-	140	130	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	<1	-	-	-	-	-	-	82	76	-	-	-	-	-	-	-	-	-
4-Nitrophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	<1	-	-	-	-	-	-	18	12	-	-	-	-	-	-	-	-	-
PAHs																		
2-Chloronaphthalene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	<1	-	-	-	-	-	-	27	20	-	-	-	-	-	-	-	-	-
Acenaphthene	<1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-
Acenaphthylene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	<1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	<1	-	-	-	-	-	-	42	36	-	-	-	-	-	-	-	-	-
Phenanthrene	<1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Pyrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phthalates																		
Bis(2-ethylhexyl) phthalate	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-Octyl phthalate	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Semi-volatiles																		
1,2-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-Nitroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Azobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-chloroethyl)ether	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isophorone	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N-nitrosodi-n-propylamine	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TIC's	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown(60% match Ethyl isothiocyanate)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carboxylic Acid Group and Dicarboxylic acid (ranging from Propanoic Acid to Heptanoic Acid also Decanedioic acid andOctanedioic acid)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL, TICs = Tentatively identfied compounds

Table 7 - Total Petroleum Hydrocarbons including BTEX and MTBE (µg/l) in Groundwater and LDPs

Analytes	MDL	GROUNDWATER									GROUNDWATER								LEAK DETECTION POINTS		
		BH401	BH1101	BH1102	BH1103	BH1106	BH201	BH202	BH203	BH204	BH304	BH304 Duplicate	BH405	BH501	BH504	BH606	BH1104	BHFB1	DUMP 5	WALE 1	WALE 6
		29/07/2009	28/07/2009	29/07/2009	28/07/2009	29/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	31/07/2009	31/07/2009	30/07/2009	31/07/2009	31/07/2009	29/07/2009	29/07/2009	29/07/2009
Aliphatics C5-C6	<10	-	90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatics >C6-C8	<10	-	260	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatics >C8-C10	<10	-	140	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatics >C10-C12	<10	-	91	12	-	-	-	-	-	-	150	120	-	-	-	-	-	-	-	-	-
Aliphatics >C12-C16 Aqueous	<10	-	-	-	-	-	-	-	-	-	22	-	-	-	-	-	-	-	-	-	-
Aliphatics >C16-C21 Aqueous	<10	-	-	-	-	-	-	-	-	-	110	-	-	-	-	-	-	-	-	-	-
Aliphatics >C21-C35 Aqueous	<10	490	-	-	-	-	-	-	-	-	57	-	-	-	-	-	-	-	-	-	-
Total Aliphatics C5-C35 Aqueous	<10	490	570	22	-	-	-	-	-	-	330	120	-	-	-	-	-	-	-	-	-
Aromatics C6-C7	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >C7-C8	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >EC8-EC10	<10	-	210	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >EC10-EC12	<10	-	140	17	-	-	-	-	-	-	220	180	-	-	-	-	-	-	-	-	-
Aromatics >EC12-EC16 Aqueous	<10	-	-	-	-	-	-	-	-	-	230	150	-	-	-	-	-	-	-	-	-
Aromatics >EC16-EC21 Aqueous	<10	-	-	-	-	-	-	-	-	-	180	64	-	-	-	-	-	-	-	-	-
Aromatics >EC21-EC35 Aqueous	<10	-	-	-	-	-	-	-	-	-	44	23	-	-	-	-	-	-	-	-	-
Total Aromatics C5-C35 Aqueous	<10	-	340	33	-	-	-	-	-	-	670	420	-	-	-	-	-	-	-	-	-
TPH (Aliphatics and Aromatics C5-C35) Aqueous	<10	490	920	55	-	-	-	-	-	-	1000	550	-	-	-	-	-	-	-	-	-
GRO (C4-C12)	<10	-	920	55	-	-	-	-	-	-	360	310	-	-	-	-	-	-	-	-	-
MTBE	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p Xylene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o Xylene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

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Table 8 - Metals, Inorganic Compounds, TOC and Cyclohexane in Groundwater and LDPs (µg/l)

Analytes	MDL	GROUNDWATER												
		BH105	BH105 Duplicate	BH112	BH401	BH404	BH601B	BH605	BH1101	BH1102	BH1103	BH1106	BH1104	BHFB1
		29/07/2009	29/07/2009	28/07/2009	29/07/2009	29/07/2009	28/07/2009	28/07/2009	28/07/2009	29/07/2009	28/07/2009	29/07/2009	31/07/2009	31/07/2009
Arsenic Dissolved (ICP-MS)	<0.75	1.5	1.5	0.88	nt	2.3	nt	1.1	5.1	1.6	7.5	1.3	4.5	-
Boron Dissolved (ICP-MS)	<20	24	-	280	nt	110	nt	250	980	240	1,700	330	15,000	110
Cadmium Dissolved (ICP-MS)	<0.22	-	-	-	nt	-	nt	-	-	-	0.27	-	2.7	-
Chromium Dissolved (ICP-MS)	<1	4	4	7	nt	9	nt	9	36	6	11	7	5	-
Copper Dissolved (ICP-MS)	<1.6	9.4	8.8	9.3	nt	22	nt	8.3	11	7.7	12	9.2	-	-
Lead Dissolved (ICP-MS)	<0.4	3.9	3.0	3.2	nt	2.9	nt	3.5	3.1	3.8	4.8	3.1	18	-
Nickel Dissolved (ICP-MS)	<1.5	4.1	1.8	5.4	nt	2.4	nt	5.0	42	-	22	12	-	5.3
Selenium Dissolved (ICP-MS)	<1	2	3	3	nt	2	nt	1	6	2	12	3	7	-
Zinc Dissolved (ICP-MS)	<5	23	11	15	nt	12	nt	18	27	40	160	16	-	-
Mercury Dissolved (CVAF)	<0.01	-	-	-	nt	-	nt	-	-	-	-	-	-	-
Ammonia as NH3	<200	-	-	300	6500	-	-	-	3800	-	-	1000	200	300
Ammonium as NH4	<300	-	-	300	6,900	-	-	-	4,000	-	-	1,100	-	300
Total Organic Carbon	<3000	4,000	3,000	6,000	6,000	3,000	4,000	3,000	5,900,000	NDP	7,000	7,000	5,000	-
Cyclohexane Extract	<1000	-	-	-	NDP	3,000	NDP	NDP	NDP	NDP	NDP	NDP	-	-
pH Value	<1.00	nt	nt	nt	nt	nt	nt	nt	6.69	7.61	7.22	7.37	7.52	6.74

Analytes	MDL	GROUNDWATER									LEAK DETECTION POINTS			
		BH201	BH202	BH203	BH204	BH304	BH304 Duplicate	BH405	BH501	BH504	BH606	DUMP 5	WALE 1	WALE 6
		30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	31/07/2009	31/07/2009	30/07/2009	29/07/2009	29/07/2009	29/07/2009
Arsenic Dissolved (ICP-MS)	<0.75	-	-	-	-	14	9.8	-	-	6.4	-	2.4	-	-
Boron Dissolved (ICP-MS)	<20	1,400	-	92	-	330	350	-	630	240	-	520	58	62
Cadmium Dissolved (ICP-MS)	<0.22	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium Dissolved (ICP-MS)	<1	3	-	-	-	24	25	-	4	14	-	7	4	5
Copper Dissolved (ICP-MS)	<1.6	-	-	-	-	-	-	-	-	-	-	8.3	8.3	9.1
Lead Dissolved (ICP-MS)	<0.4	-	-	-	-	-	-	-	-	-	-	2.9	3.0	3.1
Nickel Dissolved (ICP-MS)	<1.5	2.5	-	6.0	-	35	38	-	4.1	6.7	-	2.8	3.2	2.0
Selenium Dissolved (ICP-MS)	<1	-	-	-	-	-	-	-	-	1	-	4	1	1
Zinc Dissolved (ICP-MS)	<5	-	-	-	-	-	-	-	-	12	-	16	17	13
Mercury Dissolved (CVAF)	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia as NH3	<200	300	400	400	800	250,000	250,000	1500	800	300	400	-	-	-
Ammonium as NH4	<300	300	400	400	800	260,000	270,000	1,600	800	300	400	-	-	-
Total Organic Carbon	<3000	4,000	-	-	3,000	580,000	540,000	8,000	8,000	3,000	-	6,000	7,000	6,000
Cyclohexane Extract	<1000	-	-	-	-	1,000	1,000	1,000	-	-	-	NDP	NDP	NDP
pH Value	<1.00	-	-	-	-	-	-	-	-	-	-	8.24	8.05	8.09

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 9 - Alcohols, Acetates and Total Polychlorinated Biphenyls in Groundwater and LDPs (µg/l)

		GROUNDWATER																				LEAK DETECTION POINTS		
Analytes	MDL	BH401	BH404	BH601B	BH605	BH1101	BH1102	BH1103	BH1106	BH201	BH202	BH203	BH204	BH304	BH304 Duplicate	BH405	BH501	BH504	BH606	BH1104	BHFB1	DUMP 5	WALE 1	WALE 6
		29/07/2009	29/07/2009	28/07/2009	28/07/2009	28/07/2009	29/07/2009	28/07/2009	29/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	30/07/2009	31/07/2009	31/07/2009	30/07/2009	31/07/2009	31/07/2009	29/07/2009	29/07/2009	29/07/2009
Methyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
i-Propyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Pentyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Hexyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Heptyl Alcohol	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Acetate	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl Acetate	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
i-Propyl Acetate	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Propyl Acetate	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butyl Acetate	<100	nt	nt	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PCBs	<1	-	-	-	-	-	nt	nt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 10 - Groundwater Monitoring Data

	Borehole ID	Measuring Point (mASD)	First Monitoring				First Monitoring			
			Water Level (mbgl)	Water Level (mASD)	Base of Well (mbgl)	Comment	Water Level (mbgl)	Water Level (mASD)	Base of Well (mbgl)	Comment
BH304 Area	BH304	100.00	2.565	97.44	3.14	Grab sample, grey cloudy.	2.285	97.72	3.19	Black sediment and cloudy
	BH304-1	99.99	3.014	96.97	3.22	Insufficient water to sample.	2.679	97.31	3.23	Clear
	BH304-2	100.10	3.188	96.91	3.632	Low flow grab sample. Clear & colourless, purged dry after approx 1.5lts	3.103	96.99	3.64	Low flow grab sample. Clear
	BH304-3	100.06	2.842	97.22	2.426	Insufficient water to sample.	2.269	97.79	2.87	Low flow grab sample. Clear
	BH304-4	100.08	1.735	98.35	2.863	Low flow grab sample. Clear & colourless, purged dry after approx 1.5lts	0.322	99.76	2.428	Low flow grab sample. Cloudy
BH1101 Area	BH1101	100.00	1.701	98.30	4.865	Low flow grab sample. Colourless, slightly cloudy.	1.264	98.74	4.75	Low flow grab sample. Slightly cloudy
	BH1101-1	100.05	0.431	99.62	4.035	Purged 80 litres. Brown & Cloudy.	0.405	99.64	4.674	Clear
	BH1101-2	99.95	2.015	97.93	4.645	Low flow grab sample, drawdown >10% after 1 min. Clear & colourless.	0.795	99.15	4.875	Low flow grab sample. Clear
	BH1101-3	99.95	3.432	96.52	4.75	Low flow grab sample, drawdown >10% after 1 min. Brown & cloudy.	2.775	97.18	4.859	Low flow grab sample. Slightly cloudy
	BH501	100.24	1.626	98.62	3.96	Low flow sample	1.274	98.97	3.98	Low flow sample. Clear
BH1104 Area	BH1104	100.00	0.668	99.33	4.94		0.512	99.49	4.93	
	BH1104-1	99.82	5.886	93.93	6.035	Low flow grab sample, drawdown >10% after 1 min. Clear & colourless.	1.303	98.52	5.954	
	BH1104-2	99.78	5.695	94.08	5.835	Low flow grab sample, drawdown >10% after 1 min. Clear & colourless.	2.742	97.03	5.825	
	BH1104-3	99.76	6.058	93.70	6.110	Low flow grab sample. Clear & colourless, purged dry after approx 1.5lts	4.338	95.42	6.11	

Notes

* could not get dip meter down well pipe
- no data collected

ASD above site datum

Table 11 - Soil Data Volatile Organic Compounds (mg/kg)

Analytes	MDL	BH304 Area								BH1101 Area					
		BH304-1	BH304-1	BH304-2	BH304-2	BH304-3	BH304-3	BH304-4	BH304-4	BH1101-1	BH1101-1	BH1101-2	BH1101-2	BH1101-3	BH1101-3
		0.20-0.50	2.10-2.40	0.30-0.60	1.40-1.80	0.20-0.50	2.20-2.40	0.30-0.50	1.80-2.10	0.40-0.50	1.20-1.50	0.30-0.80	2.20-2.30	0.40-0.50	1.20-1.40
Dichlorodifluoromethane	<0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloromethane	<0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromomethane	<0.013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane	<0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1-2-Dichloroethene	<0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloromethane	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Disulphide	<0.007	-	-	-	-	-	-	0.009	-	0.034	0.011	-	-	-	-
1.1-Dichloroethene	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloroethane	<0.008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Tertiary Butyl Ether	<0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1-2-Dichloroethene	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromochloromethane	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform	<0.008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.2-Dichloropropane	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichloroethane	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.1-Trichloroethane	<0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1-Dichloropropene	<0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	<0.009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbontetrachloride	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromomethane	<0.009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-Dichloropropane	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromodichloromethane	<0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	<0.009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1-3-Dichloropropene	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1-3-Dichloropropene	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.2-Trichloroethane	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	<0.005	-	-	-	-	0.021	-	-	-	0.012	-	-	-	-	-
1.3-Dichloropropane	<0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibromochloromethane	<0.013	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2-D bromoethane	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.1.2-Tetrachloroethane	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	<0.004	-	-	-	-	0.051	-	-	-	0.033	-	-	-	-	-
p/m-Xylene	<0.014	-	-	-	-	0.095	-	-	-	0.088	-	-	-	-	-
Bromoform	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.1.2.2-Tetrachloroethane	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	<0.01	-	-	-	-	0.05	-	-	-	0.06	-	-	-	-	-
1.2.3-Trichloropropane	<0.017	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isopropy benzene	<0.005	-	-	-	-	0.025	-	-	-	0.036	-	-	-	-	-
Bromobenzene	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	<0.009	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Propylbenzene	<0.011	-	-	-	-	0.03	-	-	-	0.13	-	-	-	-	-
4-Chlorotoluene	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.4-Trimethylbenzene	<0.009	-	-	-	-	0.05	-	-	-	1.1	-	-	-	-	-
4-Isopropyltoluene	<0.011	-	-	-	-	-	-	-	-	0.025	-	-	-	-	-
1.3.5-Trimethylbenzene	<0.008	-	-	-	-	0.021	-	-	-	0.4	-	-	-	-	-
1.2-Dichlorobenzene	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.4-Dichlorobenzene	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	<0.01	-	-	-	-	0.01	-	-	-	0.04	-	-	-	-	-
tert-Butylbenzene	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.3-Dichlorobenzene	<0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n-Butylbenzene	<0.01	-	-	-	-	0.03	-	-	-	-	-	-	-	-	-
1.2-D bromo-3-chloropropane	<0.014	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.2.4-Trichlorobenzene	<0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	<0.013	-	-	-	-	0.075	-	-	-	0.13	-	-	-	-	-
1.2.3-Trichlorobenzene	<0.011	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 12 - Soil Data
Volatile Organic Compounds Tentatively Identified Compounds (mg/kg)

	Borehole ID	Depth	Analytes	Retention Times (min)	Concentration
BH1101 Area	1101-1	1.20-1.50	-		-
	1101-1	0.4-0.5	C6-9 Aliphatic Hydrocarbons		5.393
			C9-10 Aromatic Hydrocarbons		6.768
	BH1101-2	0.3-0.8	-		-
	BH1101-2	2.2-2.3	-		-
	BH1101-3	0.4-0.5	-		-
	BH1101-3	1.2-1.4	-		-
BH304 Area	BH304-1	0.2-0.5	-		-
	BH304-1	2.1-2.4	-		-
	BH304-2	0.3-0.6	-		-
	BH304-2	1.4-1.8	-		-
	BH304-3	0.2-0.5	Unknown		0.055
			methyl-Cyclohexane		0.117
			ethyl-Cyclohexane		0.065
			ethyl-methyl-Benzene Isomer		0.059
	BH304-3	2.2-2.4	-		-
	BH304-4	0.3-0.5	-		-
	BH304-4	1.8-2.1	-		-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 13 - Soil Data Semi-Volatile Organic Compounds (mg/kg)

Analytes	MDL	BH304 Area								BH1101 Area					
		BH304-1	BH304-1	BH304-2	BH304-2	BH304-3	BH304-3	BH304-4	BH304-4	BH1101-1	BH1101-1	BH1101-2	BH1101-2	BH1101-3	BH1101-3
		0.20-0.50	2.10-2.40	0.30-0.60	1.40-1.80	0.20-0.50	2.20-2.40	0.30-0.50	1.80-2.10	0.40-0.50	1.20-1.50	0.30-0.80	2.20-2.30	0.40-0.50	1.20-1.40
Phenols															
2-Chlorophenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylphenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitrophenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitrophenol	<0.1	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-
Pentachlorophenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PAHs															
2-Chloronaphthalene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	<0.1	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-
Acenaphthene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	<0.1	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-
Benzo(a)pyrene	<0.1	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-
Benzo(b)fluoranthene	<0.1	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-
Benzo(ghi)perylene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	<0.1	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-
Chrysene	<0.1	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-
Dibenzo(a,h)anthracene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	<0.1	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-
Phenanthrene	<0.1	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-
Pyrene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phthalates															
Bis(2-ethylhexyl) phthalate	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzyl phthalate	<0.1	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-
Di-n-butyl phthalate	<0.1	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-
Di-n-Octyl phthalate	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Semi-volatiles															
1,2-Dichlorobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitroaniline	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-Nitroaniline	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloroaniline	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitroaniline	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Azobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-chloroethyl)ether	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isophorone	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N-nitrosodi-n-propylamine	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 14 - Soil Data Semi-Volatile Organic Compounds Tentatively Identified Compounds (mg/kg)

	Borehole ID	Depth	Analytes	Retention Times (min)	Concentration
BH1101 Area	1101-1	1.20-1.50	Hexanoic acid		23.841
			Pentanoic acid, 2-methyl		11.111
			Hexanoic acid, 2-methyl		3.469
			Pentanoic acid, 4-oxo		2.857
			Pentanoic acid, ethyl ester		2.765
			unknown		18.416
			unknown		5.366
			unknown		13.069
			unknown		6.365
			Pentanedioic acid		21.251
			unknown		4.509
	1101-1	0.4-0.5	Pentanoic acid, 4-methyl-, methyl ester		11.988
			unknown		9.276
			unknown		19.784
			unknown		41.077
			unknown		27.176
			unknown		11.437
			unknown		15.174
			unknown		9.039
			unknown		8.004
			unknown		9.440
			unknown		16.881
	BH1101-2	0.3-0.8	unknown		1.124
	BH1101-2	2.2-2.3	-		-
	BH1101-3	0.4-0.5	-		-
	BH1101-3	1.2-1.4	-		-
BH304 Area	BH304-1	0.2-0.5	-		-
	BH304-1	2.1-2.4	-		-
	BH304-2	0.3-0.6	-		-
	BH304-2	1.4-1.8	-		-
	BH304-3	0.2-0.5	-		-
	BH304-3	2.2-2.4	-		-
	BH304-4	0.3-0.5	-		-
	BH304-4	1.8-2.1	-		-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 15 - Soil Data
TPH including BTEX MTBE (mg/kg)

Analytes	MDL	BH304 Area								BH1101 Area					
		BH304-1	BH304-1	BH304-2	BH304-2	BH304-3	BH304-3	BH304-4	BH304-4	BH1101-1	BH1101-1	BH1101-2	BH1101-2	BH1101-3	BH1101-3
		0.20-0.50	2.10-2.40	0.30-0.60	1.40-1.80	0.20-0.50	2.20-2.40	0.30-0.50	1.80-2.10	0.40-0.50	1.20-1.50	0.30-0.80	2.20-2.30	0.40-0.50	1.20-1.40
Aliphatics C5-C6	<0.01	-	-	-	-	-	-	-	-	0.68	0.16	0.04	-	-	-
Aliphatics >C6-C8	<0.01	-	-	0.05	-	-	-	-	-	1.7	0.14	0.16	-	-	-
Aliphatics >C8-C10	<0.01	0.03	-	0.05	-	-	-	-	-	1.9	0.1	0.09	-	-	-
Aliphatics >C10-C12	<0.01	0.01	-	0.04	-	-	-	-	-	0.95	0.07	0.06	-	-	-
Aliphatics >C12-C16	<0.01	29	7.8	5.8	2.8	7.5	7	30	-	27	3.1	24	8.8	3.6	5.8
Aliphatics >C16-C21	<0.01	42	5	3	2.3	7	5.1	50	1.7	46	2.9	19	3.6	7.5	5.1
Aliphatics >C21-C35	<0.01	56	-	-	1.7	7.2	3.7	85	0.7	110	2.6	28	2.3	17	5.8
Total Aliphatics C5-C35	<0.01	130	13	8.9	6.8	22	16	160	2.4	190	9	71	15	28	17
Aromatics C6-C7	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >C7-C8	<0.01	-	-	-	-	-	-	-	-	0.02	-	-	-	-	-
Aromatics >EC8-EC10	<0.01	0.04	-	0.07	-	-	-	-	-	2.9	0.14	0.13	-	-	-
Aromatics >EC10-EC12	<0.1	0.02	-	0.06	-	-	-	-	-	1.4	0.1	0.08	-	-	-
Aromatics >EC12-EC16	<0.1	8.2	3.7	3.4	0.4	3.8	3.8	8.3	-	8.9	-	7.6	1.5	1.1	-
Aromatics >EC16-EC21	<0.1	13	2.5	2.7	0.8	4	3.8	17	0.7	58	-	6.4	-	0.8	-
Aromatics >EC21-EC35	<0.1	34	-	-	-	-	12	60	0.8	93	3.5	5.7	-	8.5	-
Total Aromatics C6-C35	<0.01	56	6.2	6.2	1.2	7.8	20	85	1.5	160	3.7	20	1.5	10	-
TPH (Aliphatics and Aromatics C5-C35)	<0.01	180	19	15	8.1	30	36	250	3.9	350	13	91	16	38	17
GRO (C4-C12)	<0.01	0.1	-	0.28	-	-	-	-	-	9.6	0.71	0.56	-	-	-
MTBE	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	<0.1	-	-	-	-	-	-	-	-	0.02	-	-	-	-	-
Toluene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p Xylene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o Xylene	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 16 - Soil Data
Metals and Inorganic Compounds (mg/kg)

Analytes	MDL	BH1104 Area						BH304 Area								BH1101 Area					
		BH1104-1	BH1104-1	BH1104-2	BH1104-2	BH1104-3	BH1104-3	BH304-1	BH304-1	BH304-2	BH304-2	BH304-3	BH304-3	BH304-4	BH304-4	BH1101-1	BH1101-1	BH1101-2	BH1101-2	BH1101-3	BH1101-3
		1.20-1.30	2.50-2.70	0.30-0.60	1.30-1.50	0.30-0.70	1.60-1.80	0.20-0.50	2.10-2.40	0.30-0.60	1.40-1.80	0.20-0.50	2.20-2.40	0.30-0.50	1.80-2.10	0.40-0.50	1.20-1.50	0.30-0.80	2.20-2.30	0.40-0.50	1.20-1.40
Borate	<1	2	2	5	1	6	2	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Boron Water Soluble	<3.5	-	-	-	-	12	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Arsenic	<3.0	6	-	33	-	-	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Barium	<6.0	270	140	210	160	320	140	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Beryllium	<0.4	-	-	0.7	-	7.8	0.5	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Cadmium	<0.2	-	-	0.3	-	-	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Chromium	<4.5	33	29	43	29	160	31	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Copper	<6	20	17	13	15	-	18	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Lead	<2	13	15	19	13	-	15	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Mercury	<0.4	-	-	-	-	-	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Nickel	<0.9	42	34	47	32	290	40	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Selenium	<3	6	-	-	-	-	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Vanadium	<1.5	34	29	58	29	76	27	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Zinc	<2.5	55	86	68	57	6.7	68	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Organic Carbon	<0.2	nt	nt	nt	nt	nt	nt	0.7	0.7	0.6	0.6	0.7	1.0	1.1	1.1	0.8	1.7	0.8	1.4	1.7	1.0
Ammoniacal Nitrogen as N	<15	nt	nt	nt	nt	nt	nt	52	-	-	-	31	-	-	-	47	49	-	-	-	-
pH Value	<1.00	8.04	8.31	7.95	8.12	8.88	8.27	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 17 - Groundwater Monitoring Data Volatile Organic Compound (µg/l)

Analytes	MDL	BH304 Area							
		BH304		BH304-1	BH304-2		BH304-3	BH304-4	
		03/11/09	18/11/09	18/11/09	09/11/09	18/11/09	18/11/09	09/11/09	18/11/09
Dichlorodifluoromethane	<1	-	-	-	-	-	-	-	-
Chloromethane	<1	-	-	-	-	-	-	-	-
Vinyl Chloride	<1	-	-	-	-	-	-	-	-
Bromomethane	<2	-	-	-	-	-	-	-	-
Chloroethane	<2	-	-	-	-	-	-	-	-
Trichlorofluoromethane	<2	-	-	-	-	-	-	-	-
trans-1-2-Dichloroethene	<2	-	-	-	-	-	-	-	-
Dichloromethane	<3	-	-	-	-	-	-	-	-
Carbon Disulphide	<2	-	-	-	-	-	-	-	-
1.1-Dichloroethene	<1	-	-	-	-	-	-	-	-
1.1-Dichloroethane	<1	-	-	-	-	-	-	-	-
Methyl Tertiary Butyl Ether	<2	-	-	-	-	-	-	-	-
cis-1-2-Dichloroethene	<2	-	-	-	-	-	-	-	-
Bromochloromethane	<2	-	-	-	-	-	-	-	-
Chloroform	<2	-	-	-	-	-	-	-	-
2.2-Dichloropropane	<1	-	-	-	-	-	-	-	-
1.2-Dichloroethane	<4	-	-	-	-	-	-	-	-
1.1.1-Trichloroethane	<1	-	-	-	-	-	-	-	-
1.1-Dichloropropene	<1	-	-	-	-	-	-	-	-
Benzene	<1	2	-	-	-	-	-	-	-
Carbontetrachloride	<1	-	-	-	-	-	-	-	-
Dibromomethane	<3	-	-	-	-	-	-	-	-
1.2-Dichloropropane	<3	-	-	-	-	-	-	-	-
Bromodichloromethane	<1	-	-	-	-	-	-	-	-
Trichloroethene	<2	-	-	-	-	-	-	-	-
cis-1-3-Dichloropropene	<2	-	-	-	-	-	-	-	-
trans-1-3-Dichloropropene	<3	-	-	-	-	-	-	-	-
1.1.2-Trichloroethane	<2	-	-	-	-	-	-	-	-
Toluene	<1	2	-	-	1	-	-	-	-
1.3-Dichloropropane	<2	-	-	-	-	-	-	-	-
Dibromochloromethane	<2	-	-	-	-	-	-	-	-
1.2-Dibromoethane	<2	-	-	-	-	-	-	-	-
Tetrachloroethene	<2	-	-	-	-	-	-	-	-
1.1.1.2-Tetrachloroethane	<1	-	-	-	-	-	-	-	-
Chlorobenzene	<4	-	-	-	-	-	-	-	-
Ethylbenzene	<2	-	-	-	-	-	-	-	-
p/m-Xylene	<2	-	-	-	-	-	-	-	-
Bromoform	<3	-	-	-	-	-	-	-	-
Styrene	<1	-	-	-	-	-	-	-	-
1.1.2.2-Tetrachloroethane	<5	-	-	-	-	-	-	-	-
o-Xylene	<1	-	-	-	-	-	-	-	-
1.2.3-Trichloropropane	<9	-	-	-	-	-	-	-	-
Isopropylbenzene	<2	-	-	-	-	-	-	-	-
Bromobenzene	<1	-	-	-	-	-	-	-	-
2-Chlorotoluene	<2	-	-	-	-	-	-	-	-
Propylbenzene	<3	-	-	-	-	-	-	-	-
4-Chlorotoluene	<2	2	-	-	-	-	-	-	-
1.2.4-Trimethylbenzene	<1	-	-	-	-	-	-	-	-
4-Isopropyltoluene	<3	-	-	-	-	-	-	-	-
1.3.5-Trimethylbenzene	<1	-	-	-	-	-	-	-	-
1.2-Dichlorobenzene	<3	-	-	-	-	-	-	-	-
1.4-Dichlorobenzene	<1	-	-	-	-	-	-	-	-
sec-Butylbenzene	<1	-	-	-	-	-	-	-	-
tert-Butylbenzene	<2	-	-	-	-	-	-	-	-
1.3-Dichlorobenzene	<2	-	-	-	-	-	-	-	-
n-Butylbenzene	<2	2	-	-	-	-	-	-	-
1.2-Dibromo-3-chloropropan	<10	-	-	-	-	-	-	-	-
1.2.4-Trichlorobenzene	<2	-	-	-	-	-	-	-	-
Naphthalene	<4	39	-	-	-	-	-	-	-
1.2.3-Trichlorobenzene	<3	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<3	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 18 - Groundwater Monitoring Data Volatile Organic Compound Tentitively Idendified Compounds (µg/l)

	Borehole ID	Analytes	Retention Times (min)	Concentration	
				03/11/09	18/11/09
BH304 Area	BH304	Limonene		28	nt
		Cyclopentylcyclopentene Isomer		48	
		Cyclopentylcyclopentene Isomer		20	
		ethenyl-ethyl-Benzene Isomer		20	
		Unknown		28	
		Tetrahydro-Naphthlene Isomer		52	
	BH304-1	-		ns	-
	BH304-2	-		-	-
	BH304-3	-		ns	-
	BH304-4	-		-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 19 - Groundwater Monitoring Data Semi-Volatile Organic Compound (µg/l)

Analytes	MDL	BH304 Area							BH1101 Area							
		BH304	BH304-1	BH304-2		BH304-3	BH304-4		BH1101	BH1101-1		BH1101-2		BH1101-3		BH501
		03/11/09	18/11/09	09/11/09	18/11/09	18/11/09	09/11/09	18/11/09	04/11/09	04/11/09	18/11/09	09/11/09	18/11/09	09/11/09	18/11/09	04/11/09
Phenols																
2-Chlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylphenol	<1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitrophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dichlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dimethylphenol	<1	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	<1	120	-	-	-	-	-	-	-	-	27	-	-	-	-	-
4-Nitrophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenol	<1	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PAHs																
2-Chloronaphthalene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	<1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anthracene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(ghi)perylene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	<1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenanthrene	<1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phthalates																
Bis(2-ethylhexyl) phthalate	<21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	<1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-Octyl phthalate	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Semi-volatiles																
1,2-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Nitroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,4-Dinitrotoluene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3-Nitroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Bromophenylphenylether	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chloroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Chlorophenylphenylether	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-Nitroaniline	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Azobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis(2-chloroethyl)ether	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isophorone	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
N-nitrosodi-n-propylamine	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	<1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 20 - Groundwater Monitoring Data Semi-Volatile Organic Compound Tentitively Idendified Compounds (µg/l)

	Borehole ID	Analytes	Retention Times (min)	Concentration µg/l	
				03/11/09	18/11/09
BH304 Area	BH304	Methyl Hexanoic Acid		20	nt
		Unknown		11	
		Cyclopentylcyclopentene isomer		12	
		Dimethylstyrene Isomer		45	
		Phenylacetic acid		50	
		Caprolactam Isomer		160	
		Unknown		30	
		Unknown		40	
		Unknown		15	
		Oxindole		32	
		Unknown		88	
		Phenazine		430	
		Unknown		125	
		Unknown		80	
		Unknown		140	
		Unknown		55	
	BH304-1	-		ns	-
	BH304-2	Caffeine		33	-
	BH304-3	-		ns	-
	BH304-4	-		-	-
BH1101 Area	BH1101	Pentanoic Acid		21,424	nt
		Methtyl pentanoic acid Isomer		287,150	
		Hexanoic Acid		14,454	
		Methyl Hexanoic acid Isomer		155,640	
		Heptanoic Acid		3,494	
		Ethyl Hexanoic acid Isomer		485	
		Cyclohexanecarboxilic Acid		2,841	
		Methyl Hexanoic acid Isomer		478	
		Octanoic Acid		1,787	
	BH1101-1	Unknown Organic Acids	4.7-6.2	451,841	263,147
		Unknown	6.292		2,527
		Unknown	6.317		1,785
		Unknown	6.369		978
		Unknown	6.397		834
		Unknown	6.647		836
		Unknown	6.707		1,335
		Unknown	6.811		1,050
		Unknown	6.831		1,382
		Unknown	6.959		1,122
	BH1101-2	Unknown Organic Acid		140	-
		Unknown Organic Acid		45	
		Unknown Organic Acid		80	
		Unknown Organic Acid		148	
		Trimethyl Hexanoic Acid		15	
	BH1101-3	Unknown Organic Acid		40	-
		Unknown Organic Acid		14	
		Unknown Organic Acid		38	
		Unknown Organic Acid		52	
	BH501	-		-	nt

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 21 - Groundwater Monitoring Data Total Petroleum including BTEX MTBE (µg/l)

Analytes	MDL	BH304 Area							BH1101 Area							
		BH304	304-1	BH304-2		BH304-3	BH304-4		BH1101	BH1101-1		BH1101-2		BH1101-3		BH501
		18/11/09	18/11/09	09/11/09	18/11/09	18/11/09	09/11/09	18/11/09	04/11/09	04/11/09	18/11/09	09/11/09	18/11/09	09/11/09	18/11/09	04/11/09
Aliphatics C5-C6	<10	-	-	-	-	-	-	-	48	70	43	-	-	-	-	-
Aliphatics >C6-C8	<10	-	-	-	-	-	-	-	64	450	530	-	-	-	-	-
Aliphatics >C8-C10	<10	28	-	-	-	-	-	-	18	270	290	-	-	-	-	-
Aliphatics >C10-C12	<10	160	-	-	-	-	-	-	12	150	180	-	-	-	-	-
Aliphatics >C12-C16	<10	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatics >C16-C21	<10	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aliphatics >C21-C35	<10	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Aliphatics C5-C35	<10	510	-	-	-	-	-	-	140	940	1,000	-	-	-	-	-
Aromatics C6-C7	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >C7-C8	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >EC8-EC10	<10	43	-	-	-	-	-	-	26	410	440	-	-	-	-	-
Aromatics >EC10-EC12	<10	240	-	-	-	-	-	-	18	230	270	-	-	-	-	-
Aromatics >EC12-EC16	<10	130	-	-	-	-	-	-	-	82	16	-	-	-	-	-
Aromatics >EC16-EC21	<10	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aromatics >EC21-EC35	<10	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Aromatics C6-C35	<10	610	-	-	-	-	-	-	44	720	730	-	-	-	-	-
TPH (Aliphatics and Aromatics C5-C35)	<10	1100	-	-	-	-	-	-	190	1,700	1,800	-	-	-	-	-
GRO (C4-C12)	<10	470	-	-	-	-	-	-	190	1,600	1,800	-	-	-	-	-
MTBE	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl benzene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
m & p Xylene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o Xylene	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 22-Groundwater Monitoring Data Metals and Inorganics (µg/l)

Analytes	MDL	BH1104 Area							BH304 Area							BH1101 Area							
		BH1104	BH1104-1		BH1104-2		BH1104-3		BH304	BH304-1	BH304-2		BH304-3	BH304-4		BH1101	BH1101-1		BH1101-2		BH1101-3		BH501
		09/11/09	04/11/09	18/11/09	09/11/09	18/11/09	09/11/09	18/11/09	03/11/08	18/11/09	09/11/09	18/11/09	18/11/09	09/11/09	18/11/09	04/11/09	04/11/09	18/11/09	09/11/09	18/11/09	09/11/09	18/11/09	04/11/09
Borate	<1000µg/l	9,000	1,100	1,000	1,000	1,000	1,400	1,300	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Arsenic Dissolved (ICP-MS)	<0.75	1.4	3.7	1	1.2	1.5	1.9	1.1	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Barium Dissolved (ICP-MS)	<1	4.1	57	41	25	20	26	16	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Beryllium Dissolved (ICP-MS)	<1	-	-	-	-	-	-	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Boron Dissolved (ICP-MS)	<20	1,100	1,200	1,100	1,500	1,000	1,800	1,500	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Cadmium Dissolved (ICP-MS)	<0.22	-	-	-	0.3	0.4	0.62	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Chromium Dissolved (ICP-MS)	<1	2	7	2	8	10	11	5	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Copper Dissolved (ICP-MS)	<1.6	7.2	19	7.2	15	13	8.8	6.5	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Lead Dissolved (ICP-MS)	<0.4	0.8	4.7	0.8	8	9.9	11	6.1	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Nickel Dissolved (ICP-MS)	<1.5	4.5	12	4.5	18	13	14	9.3	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Selenium Dissolved (ICP-MS)	<1	2	3	2	4	6	8	7	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Vanadium Dissolved (ICP-MS)	<1	2	2	2	2	3	5	3	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Zinc Dissolved (ICP-MS)	<5	7	10	7	20	41	22	10	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Mercury Dissolved (CVAF)	<0.01	nt	-	-	-	-	-	-	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
Total Ammonium as NH4	<200	nt	nt	nt	nt	nt	nt	nt	390,000	-	-	-	-	-	-	500	13,000	9,100	600	200	300	200	400
Total Organic Carbon	<3000	nt	nt	nt	nt	nt	nt	nt	160,000	10,000	6,000	4,000	8,000	10,000	6,000	3,000,000	560,000	480,000	11,000	10,000	8,000	15,000	6,000
pH Value	<1.00	8.34	8.28	8.34	8.41	8.46	8.43	8.51	nt	nt	nt	nt	nt	nt	nt	nt	7.49	nt	nt	nt	nt	nt	nt

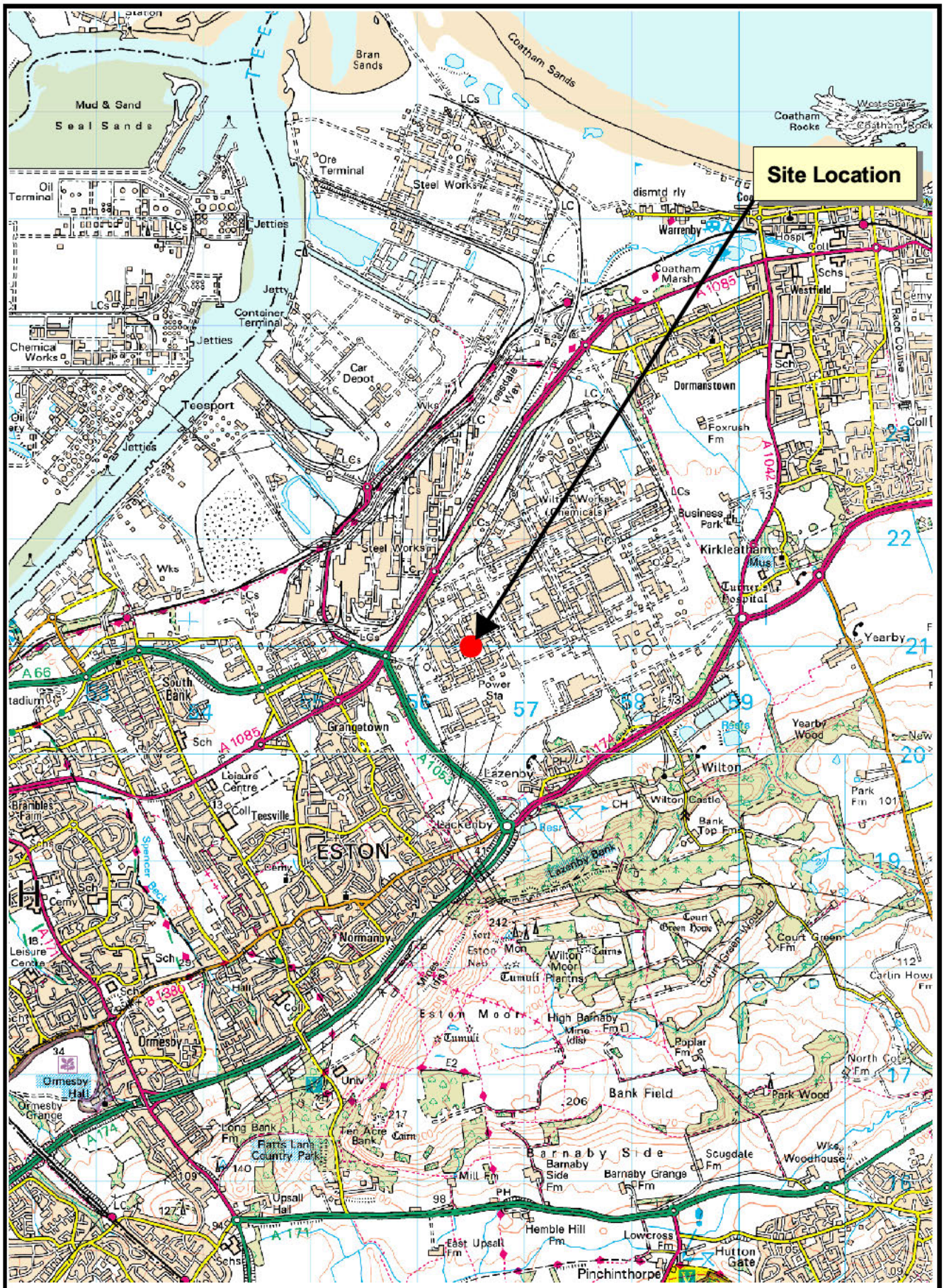
Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

Table 23 - Groundwater Monitoring QA/QC (µg/l)

Analytes	MDL	BH1101 18/11/09	BH1101-A 18/11/09
Aliphatics C5-C6	<10	43	36
Aliphatics >C6-C8	<10	530	470
Aliphatics >C8-C10	<10	290	240
Aliphatics >C10-C12	<10	180	170
Aliphatics >C12-C16	<10	-	-
Aliphatics >C16-C21	<10	-	-
Aliphatics >C21-C35	<10	-	-
Total Aliphatics C5-C35	<10	1,000	910
Aromatics C6-C7	<10	-	-
Aromatics >C7-C8	<10	-	-
Aromatics >EC8-EC10	<10	440	360
Aromatics >EC10-EC12	<10	270	250
Aromatics >EC12-EC16	<10	16	34
Aromatics >EC16-EC21	<10	-	-
Aromatics >EC21-EC35	<10	-	-
Total Aromatics C6-C35	<10	730	640
TPH (Aliphatics and Aromatics C5-C35)	<10	1,800	1,600
GRO (C4-C12)	<10	1,800	1,500
MTBE	<10	-	-
Benzene	<10	-	-
Toluene	<10	-	-
Ethyl benzene	<10	-	-
m & p Xylene	<10	-	-
o Xylene	<10	-	-
Total Ammonium as NH4	<200	9,100	9,200
Total Organic Carbon	<3000	480,000	430,000
Phenols			
2-Chlorophenol	<1	-	-
2-Methylphenol	<1	-	-
2-Nitrophenol	<1	-	-
2,4-Dichlorophenol	<1	-	-
2,4-Dimethylphenol	<1	-	-
2,4,5-Trichlorophenol	<1	-	-
2,4,6-Trichlorophenol	<1	-	-
4-Chloro-3-methylphenol	<1	-	-
4-Methylphenol	<1	27	52
4-Nitrophenol	<1	-	-
Pentachlorophenol	<1	-	-
Phenol	<1	-	-
PAHs			
2-Chloronaphthalene	<1	-	-
2-Methylnaphthalene	<1	-	-
Acenaphthene	<1	-	-
Acenaphthylene	<1	-	-
Anthracene	<1	-	-
Benzo(a)anthracene	<1	-	-
Benzo(a)pyrene	<1	-	-
Benzo(b)fluoranthene	<1	-	-
Benzo(ghi)perylene	<1	-	-
Benzo(k)fluoranthene	<1	-	-
Chrysene	<1	-	-
Dibenzo(a,h)anthracene	<1	-	-
Fluoranthene	<1	-	-
Fluorene	<1	-	-
Indeno(1,2,3-cd)pyrene	<1	-	-
Naphthalene	<1	-	18
Phenanthrene	<1	-	-
Pyrene	<1	-	-
Phthalates			
Bis(2-ethylhexyl) phthalate	<21	-	-
Butylbenzyl phthalate	<1	-	-
Di-n-butyl phthalate	<1	-	-
Di-n-Octyl phthalate	<5	-	-
Diethyl phthalate	<1	-	-
Dimethyl phthalate	<1	-	-
Other Semi-volatiles			
1,2-Dichlorobenzene	<1	-	-
1,2,4-Trichlorobenzene	<1	-	-
1,3-Dichlorobenzene	<1	-	-
1,4-Dichlorobenzene	<1	-	-
2-Nitroaniline	<1	-	-
2,4-Dinitrotoluene	<1	-	-
2,6-Dinitrotoluene	<1	-	-
3-Nitroaniline	<1	-	-
4-Bromophenylphenylether	<1	-	-
4-Chloroaniline	<1	-	-
4-Chlorophenylphenylether	<1	-	-
4-Nitroaniline	<1	-	-
Azobenzene	<1	-	-
Bis(2-chloroethoxy)methane	<1	-	-
Bis(2-chloroethyl)ether	<1	-	-
Carbazole	<1	-	-
Dibenzofuran	<1	-	-
Hexachlorobenzene	<1	-	-
Hexachlorobutadiene	<1	-	-
Hexachlorocyclopentadiene	<1	-	-
Hexachloroethane	<1	-	-
Isophorone	<1	-	-
N-nitrosodi-n-propylamine	<1	-	-
Nitrobenzene	<1	-	-

Notes:
NDP = No detection possible, nt = Not tested, MDL = Method detection limit, - = below MDL

FIGURES



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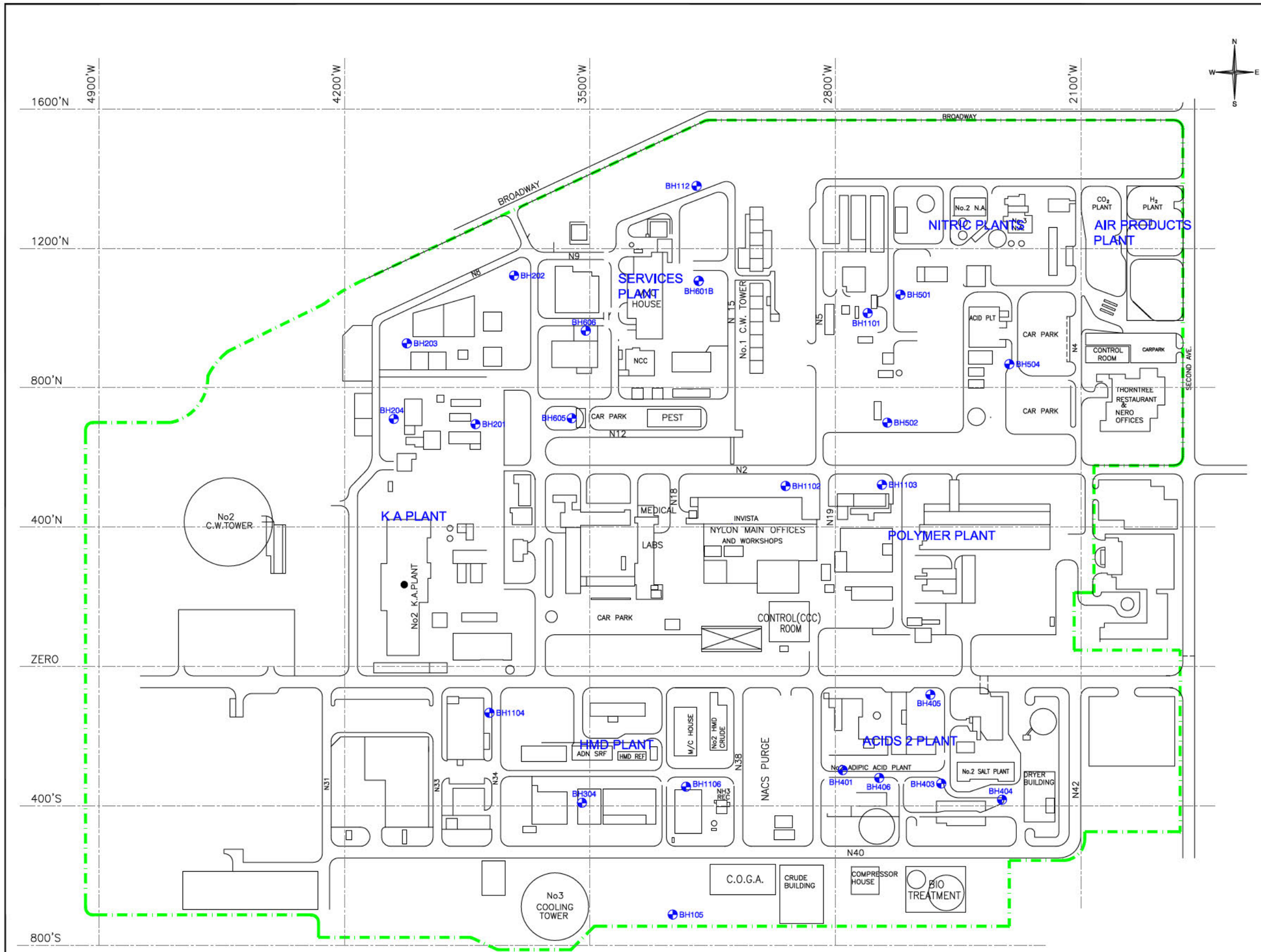
Legend :

- Site Location

Client : Invista
Project : 96010.00
Site : Invista Wilton
Date : 14/09/09
Scale : 1:50,000 Drawn By : ASZ
DRG No : 960100004.apr / SLP

Figure 1 :
Site Location Plan

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KEY

APPROXIMATE BOREHOLE LOCATION

PROPERTY BOUNDARY

NOTES

BASED ON DRAWING BY INVISTA UK LTD.
DRAWING No: E5004526 Rev.P3
DATE: 02/09/04

REV	DATE	COMMENT	CAD
P1	12.11.09	BOREHOLE LOCATIONS UPDATED	MC

TITLE: SAMPLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA

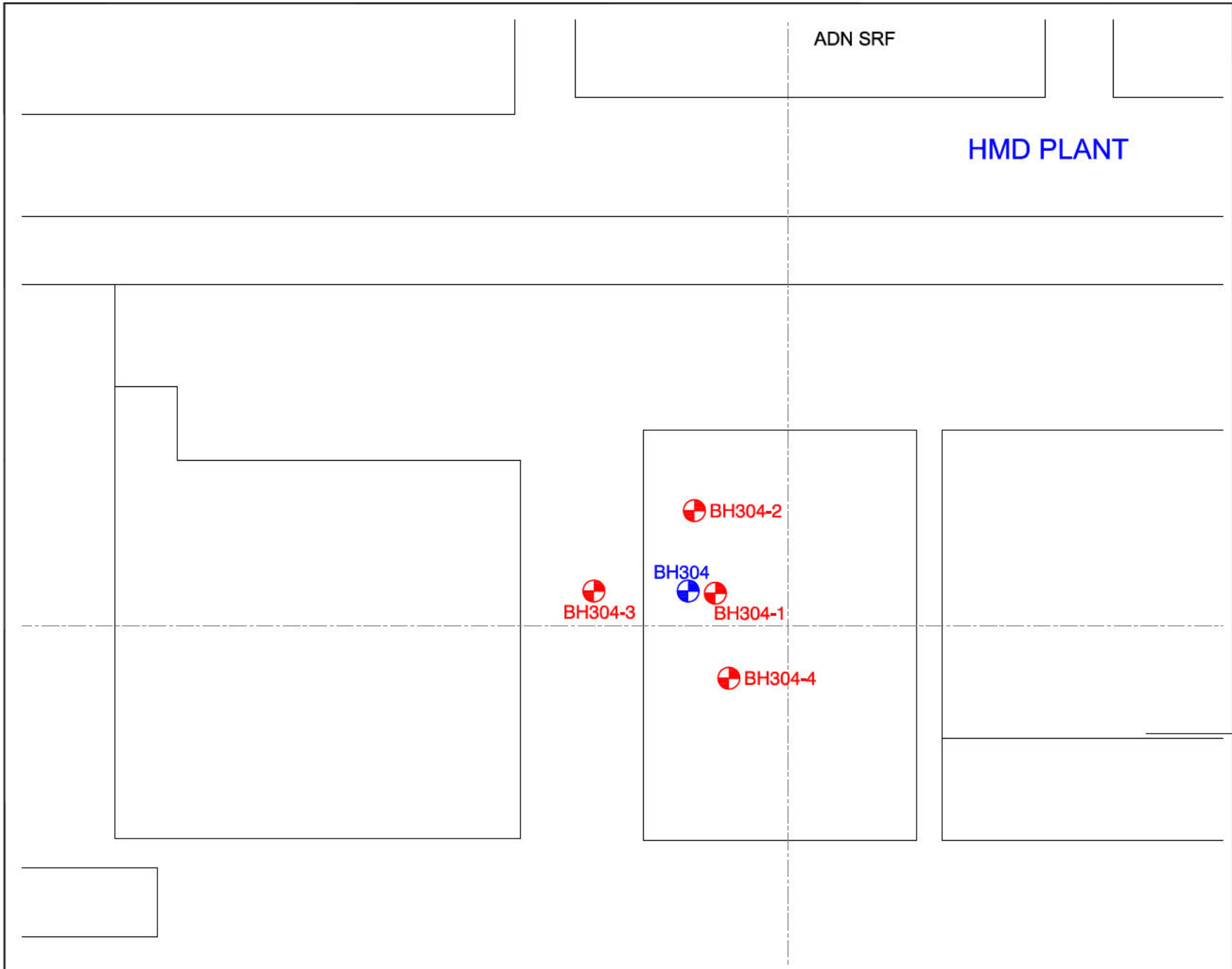
PROJECT: 96010.00 | FIGURE 2

DATE: 18/09/09 | DRAWN: BNB | REV: P1

DRG.No.: 960100005-CAD | PRINT: A3

NOTE: THE LOCATIONS OF ANY UNDERGROUND SERVICES SHOWN ON THIS DRAWING HAVE BEEN DETERMINED USING ELECTRO-MAGNETIC TECHNIQUES AND VISUAL OBSERVATIONS. THE LIMITATIONS OF THIS DRAWING SHOULD BE REALISED AND NO GUARANTEE CAN BE GIVEN THAT ALL SERVICES HAVE BEEN IDENTIFIED. ANY AMENDMENTS TO THE SITE LAYOUT AFTER THE ISSUE OF THIS DRAWING WILL MAKE THIS DRAWING INVALID. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS IN CASE OF ANY QUERY

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KEY

ORIGINAL BOREHOLE LOCATION

ADDITIONAL BOREHOLE LOCATION (Nov 09)

REV	DATE	COMMENT	CAD

TITLE: 304 BOREHOLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA

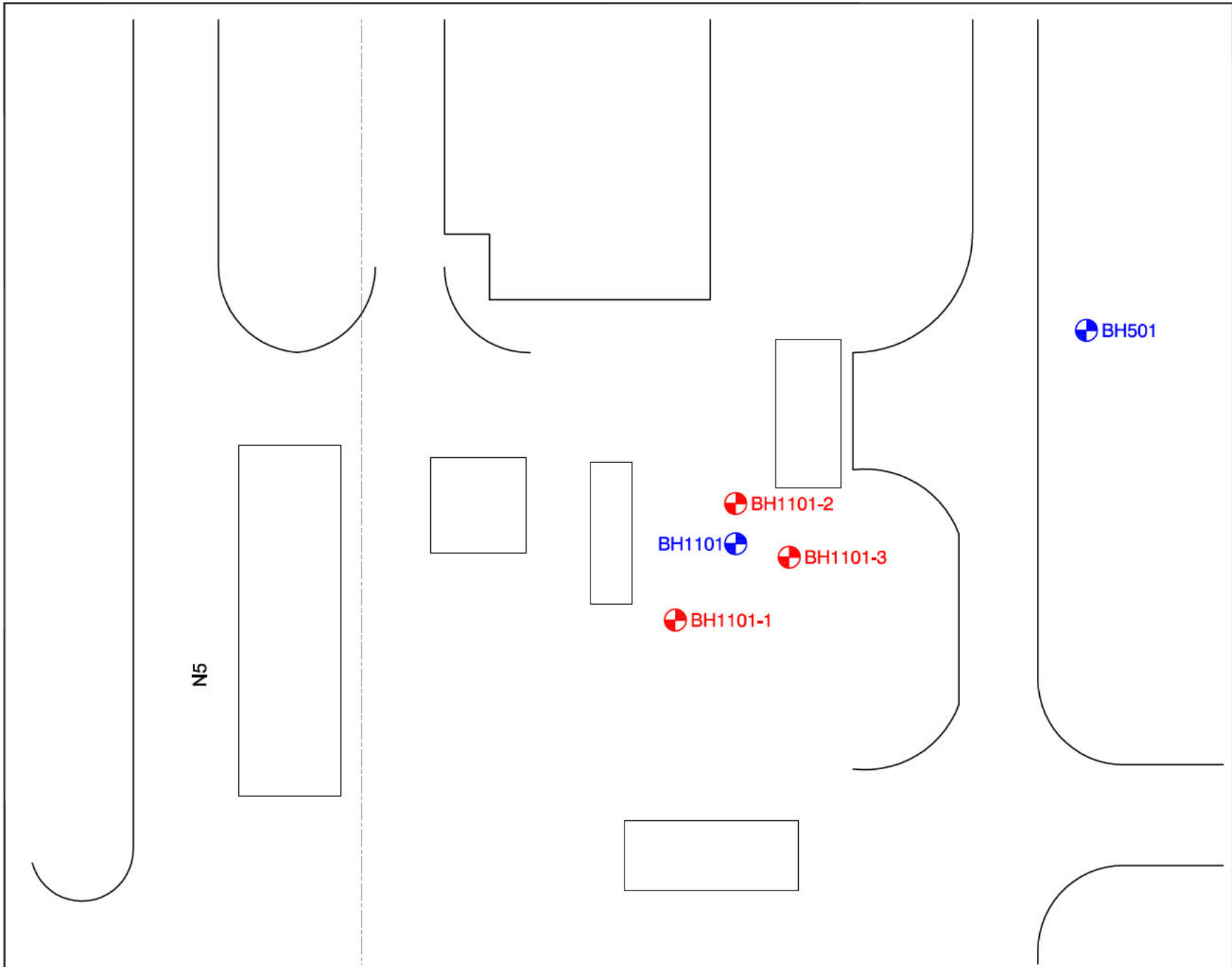
PROJECT: 96010.01 FIGURE 3

DATE: 12/11/09 DRAWN: MC REV: -

DRG.No.: 9601001.304-CAD PRINT: A4

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KEY

ORIGINAL BOREHOLE LOCATION

ADDITIONAL BOREHOLE LOCATION (Nov 09)

REV	DATE	COMMENT	CAD

TITLE: 1101 BOREHOLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA

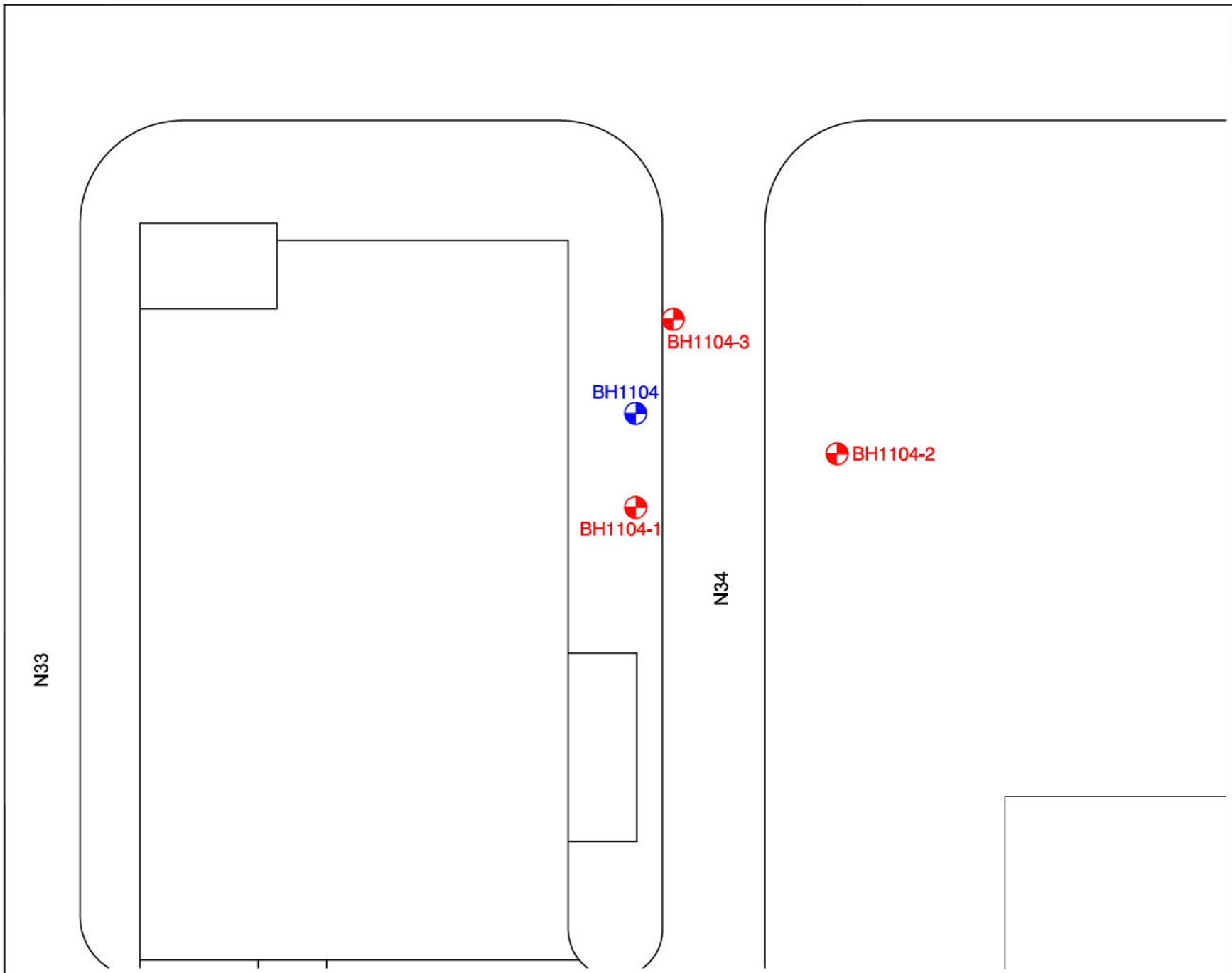
PROJECT: 96010.01 | FIGURE 4

DATE: 12/11/09 | DRAWN: MC | REV: -

DRG.No.: 9601001.1101-CAD | PRINT: A4

NOTE: ALL ENTITIES SHOWN ON THIS DRAWING ARE TO BE REGARDED AS APPROXIMATE AND ARE INDICATIVE ONLY. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS IN CASE OF ANY QUERY

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KEY

ORIGINAL BOREHOLE LOCATION

ADDITIONAL BOREHOLE LOCATION (Nov 09)

REV	DATE	COMMENT	CAD

TITLE: 1104 BOREHOLE LOCATIONS

SITE: INVISTA WILTON

CLIENT: INVISTA

PROJECT: 96010.01 FIGURE 5

DATE: 12/11/09 DRAWN: MC REV: -

DRG.No.: 9601001.1104-CAD PRINT: A4

NOTE: ALL ENTITIES SHOWN ON THIS DRAWING ARE TO BE REGARDED AS APPROXIMATE AND ARE INDICATIVE ONLY. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS IN CASE OF ANY QUERY

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APPENDICES

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Borehole Number
BH1101-1

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: / Northing:	Well Diameter (mm): 50 / Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 03/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)		0.30								
Brown and Black stained, slightly sandy, clayey, fine to medium, angular to sub-angular GRAVEL. (MADE GROUND)		0.50		D	0.40-0.50	9				
No recovery, Liner blocked by coarse gravel.		1.20								
(Poor Recovery 30%) Brown red, very clayey SAND.		1.40		D	1.40-1.60	1				
(Poor Recovery 30%) Soft, red brown, slightly sandy CLAY				D	2.00-2.20	2				
(Poor Recovery 40%) Soft, red brown, sandy CLAY.		2.40								
(Poor Recovery 40%) Firm, red brown, gravelly CLAY. Gravel is fine to medium, angular to sub-rounded red and yellow sandstone gravels.		2.80		D	3.20-3.40	4				
				D	3.70-3.80	5				
				D	4.10-4.20	1				
				D	4.50-4.60	2				
End of Borehole at 5.00 m		5.00								

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: Groundwater encountered in well

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Borehole Number
BH1101-2

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 03/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)										
Brown and Black stained, sandy, clayey, fine to medium, angular to sub-rounded GRAVEL. (MADE GROUND)		0.30		D	0.30-0.80	2				
Firm, grey brown, slightly gravelly CLAY. Gravels are fine to medium, sub-angular to sub-rounded red and yellow sandstone gravels.		0.80		D	1.30-1.40	0				
				D	2.20-2.30	0				
				D	2.80-2.90	0				
Firm, red brown, slightly gravelly CLAY. Gravels are fine to medium, sub-angular to sub-rounded red and yellow sandstone gravels.		3.00		D	3.30-3.40	0				
				D	3.80-3.90	0				
				D	4.50-4.60	0				
End of Borehole at 5.00 m		5.00								

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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Borehole Number
BH1101-3

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by:
Project: 96010.01	Date: 03/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)		0.30								
Firm, grey brown, slightly sandy CLAY.				D	0.40-0.50	0				
				D	1.00-1.10	0				
		1.40		D	1.40-1.50	0				
Firm, red brown, slightly gravelly CLAY. Gravels are fine to medium, angular to sub-rounded red and yellow sandstone gravels with occasional grey coarse, rounded, shaley mudstone gravels.				D	2.10-2.20	0				
				D	2.80-2.90	0				
				D	3.40-3.50	0				
No Recovery.		3.60								
End of Borehole at 5.00 m		5.00								

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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Borehole Number
BH1104-1

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 03/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)		0.30								
No Recovery. Liner blocked by coarse gravel.		1.20		D	1.20-1.30	11				
Firm, red brown, with grey mottling, gravelly CLAY. Gravel is fine to medium, angular to sub-rounded red, brown and yellow sandstone gravels.		2.40		D	2.50-2.70	1				
Firm, red brown, gravelly CLAY. Gravel is fine to medium, angular to sub-rounded red, brown and yellow sandstone gravels with occasional grey coarse, rounded, shaley mudstone gravels.				D	3.00-3.10	0				
				D	3.90-4.00	0				
				D	4.40-4.50	0				
				D	5.00-5.10	0				
				D	5.50-5.60	0				
End of Borehole at 6.00 m		6.00								

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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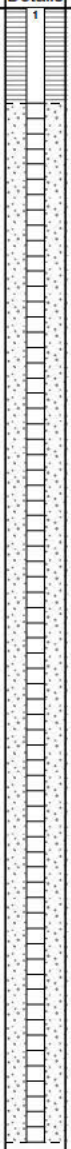
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Borehole Number **BH1104-2**

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 03/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)										
(Poor recovery 50%) Soft brown, very sandy CLAY.		0.30		D	0.30-0.60	2				
Firm, red brown, slightly gravelly CLAY. Gravel is fine to medium, angular to rounded red and yellow sandstone gravels.		1.30		D	1.30-1.50	0				
				D	2.00-2.10	0				
				D	2.60-2.70	0				
				D	3.10-3.20	0				
				D	3.80-3.90	0				
				D	4.50-4.60	0				
				D	5.10-5.20	0				
				D	5.80-5.90	0				
End of Borehole at 6.00 m		6.00								



Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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Borehole Number
BH1104-3

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 03/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value
Bituminous surface (MADE GROUND)	0.20						
Road Fill. Angular coarse GRAVEL (MADE GROUND)	0.30		D	0.30-0.50	0		
Light brown, slightly clayey, slightly sandy GRAVEL (MADE GROUND)	0.50		D	0.50-0.60	0		
			D	0.60-0.70	0		
Black stained, slightly clayey, slightly sandy GRAVEL (MADE GROUND)	0.70						
			D	1.00-1.10	0		
Firm, dark red brown, gravelly CLAY. Gravel is fine to medium, angular to rounded red and yellow sandstone gravels.	1.20						
Poor recovery 1.2m to 2.4m (40%). Firm red brown, with grey mottling, gravelly CLAY. Gravels are fine to medium, angular to sub-rounded red and yellow sandstone gravels with occasional grey coarse, rounded, shaley mudstone gravels. Below 2.5m occasional c			D	1.60-1.70	0		
			D	2.10-2.20	0		
			D	2.60-2.70	0		
			D	3.30-3.40	0		
			D	3.80-3.90	0		
			D	4.40-4.50	0		
			D	5.00-5.10	0		
			D	5.50-5.60	0		
End of Borehole at 6.00 m	6.00						

Well Details: 1

Water Level: 1, 2, 3, 4, 5, 6, 7

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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Borehole Number
BH304-1

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting:	Well Diameter (mm): 50	Logged by: [redacted]
		Northing:	Well Type: SPIE	
Project: 96010.01	Date: 02/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)		0.20		D	0.20-0.50	2				
Soft, brown grey, sandy, gravelly CLAY. Gravel is angular to rounded, fine to medium, red and yellow sandstone and grey coarse, rounded, shaley mudstone gravels		0.70								
Soft to firm, red brown with occasional grey mottling, slightly sandy CLAY.				D	1.00-1.10	0				
				D	1.60-1.70	0				
				D	2.00-2.20	1				
Soft to firm, grey and red brown, slightly gravelly CLAY. Gravel is fine to medium, angular to rounded red and yellow sandstone gravels.		2.10								
Firm, red brown, slightly gravelly CLAY. Gravels are fine to medium, sub-angular to rounded red and yellow sandstone gravels with grey coarse, rounded, shaley mudstone gravels.		2.60		D	2.80-3.00	0				
				D	3.30-3.50	0				
		3.80								
Red brown, slightly clayey, gravelly SAND. Gravel is fine to coarse, angular to sub-rounded red and yellow sandstone gravels.		3.90		D	3.90-4.00	0				
Firm, red brown, slightly gravelly CLAY. Gravels are fine to medium, sub-angular to rounded red and yellow sandstone gravels with grey coarse, rounded, shaley mudstone gravels.				D	4.50-4.60	0				
				D	5.10-5.20	0				
End of Borehole at 6.00 m		6.00								

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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Borehole Number **BH304-2**

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: / Northing:	Well Diameter (mm): 50 / Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 02/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)		0.30		D	0.30-0.60	1				
Poor recovery (50%) Stiff, brown with grey mottling, slightly gravelly CLAY. Gravel is fine, angular to rounded red and yellow sandstone gravels.				D	0.90-1.20	1				
				D	1.60-1.80	1				
				D	2.10-2.30	1				
Stiff, red brown, slightly gravelly CLAY. Gravel is red, brown and yellow, sub-angular to rounded, fine to medium sandstone gravels.		2.40		D	2.80-2.90	1				
Stiff, red brown, slightly gravelly CLAY. Gravel is brown sub-angular to rounded, fine to medium sandstone gravels.		3.20		D	3.30-3.40	1				
End of Borehole at 3.60 m		3.60								



Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

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Borehole Number
BH304-3

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 02/11/2009	Method: Geoprobe- Percussive		Checked by:

STRATA RECORD | IN SITU TESTS / SAMPLES | Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
TOPSOIL mixed with medium, angular, limestone gravels.				D	0.20-0.50	21				
		0.30								
Grey brown, clayey, slightly sandy, angular, coarse GRAVEL.		0.50								
Firm to stiff, red brown and grey slightly gravelly CLAY. Gravel is fine, angular to rounded, red, orange, yellow and black/brown sandstone gravels.				D	0.90-1.10	1				
				D	1.30-1.40	1				
Firm, red with grey mottling, CLAY.		1.50								
Firm, red brown, slightly gravelly CLAY. Gravel is fine to medium, angular to rounded sandstone gravels.		1.90		D	2.00-2.20	1				
Firm, red brown, gravelly CLAY. Gravel is fine to medium, angular to rounded sandstone gravels.		2.40		D	2.50-2.60	1				
				D	3.00-3.10	0				
End of Borehole at 3.60 m		3.60								

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

ARCADIS
Infrastructure, environment, buildings

2 Craven Court, Newmarket, Suffolk CB8 7FA
Tel: +44(0)1638 674767
Fax: +44(0)1638 668191
www.arcadisgmi.com

Borehole Number
BH304-4

Site: Invista Wilton	Location: Wilton Site, Redcar	Ground Level (mASD):	Hole Diameter (mm): 50	Scale 1:40
Client: Invista		Easting: Northing:	Well Diameter (mm): 50 Well Type: SPIE	Logged by: [redacted]
Project: 96010.01	Date: 02/11/2009	Method: Geoprobe- Percussive		Checked by:

Sheet 1 of 1

Description	Legend	Depth (m)	Level (mASD)	Sample Type	Sample Depth (m)	PID (ppm)	Vane/PPT (kPa)	SPT N Value	Well Details	Water Level
Re-enforced Concrete (MADE GROUND)										
		0.30		D	0.30-0.60	2				
Poor recovery (75%) Soft brown and grey, sandy, gravelly, CLAY. Gravel is fine to coarse, angular to sub-rounded sandstone.				D	0.70-0.80	1				
		0.80								
Firm, red brown, gravelly CLAY. Gravel is fine to coarse, angular to sub-rounded, red, black/brown, yellow, orange sandstone gravels.				D	1.00-1.10	1				
		1.20		D	1.20-1.30	0				
Firm, red brown, gravelly CLAY. Gravel is fine to medium, sub-angular to rounded, red, brown and yellow sandstone gravels.				D	2.00-2.10	1				
		2.40								
End of Borehole at 2.50 m										

Key:
- D Disturbed Sample
- B Bulk Sample
- U Undisturbed Sample
- J Jar Sample
- ▽ Water Strike
- ▼ Standing Water Level

Remarks: No Groundwater Encountered

Appendix P

Remediation of BH304

ARCADIS
Infrastructure, environment, buildings

INVISTA Textiles (UK) Ltd
73 Queen's Highland
Kepplestone
Aberdeen
AB15 4AR

Remediation of BH304
INVISTA Wilton
INVISTA Textiles (UK) Ltd
P.O. Box 401
Wilton
Redcar
TS10 4XY

September 2010
960100403

Prepared by:

ARCADIS (UK) Ltd
2 Craven Court
Newmarket
CB8 7FA
Tel: 01638 674767
Fax: 01638 668191
www.arcadis-uk.com

Report Details

Client	INVISTA Textiles (UK) Ltd
Address	P.O. Box 401 Wilton Redcar TS10 4XY
Report Title	Remediation of BH304
Report Number	960100403
Report Date	September 2010

Quality Assurance

Issue Number /Status	Date	Prepared By	Technical Review	Authorised by
01 First Issue		[redacted] Consultant	[redacted] Senior Consultant	[redacted] Director

If you have any queries regarding this project, please contact [redacted]

ARCADIS

Executive Summary

ARCADIS (UK) Ltd (ARCADIS) was commissioned by INVISTA Textiles (UK) Ltd (INVISTA) to undertake soil remediation in the immediate vicinity of borehole BH304 for the INVISTA manufacturing site located at Wilton, Redcar, TS10 4XY (the site).

As part of the Environmental Permit surrender ARCADIS was contracted by INVISTA to collect data for comparison against the baseline survey, undertaken in 2002. The groundwater sampling and intrusive investigation works previously undertaken identified an isolated hotspot of ammonium centred on BH304. It was proposed that the most appropriate course of action was to undertake soil remediation.

The ground conditions below the site consists of unconsolidated drift deposits overlying mudstone. The drift deposits comprise of silty clay overlying glacial Boulder Clay. The mudstone is approximately 300m thick and is generally considered to be impermeable. The mudstone formation overlies the Sherwood Sandstone Group.

The intrusive ground investigation undertaken in the area of BH304 by ARCADIS in November 2009 (Environmental Assessment report ref: 960100201, February 2010) encountered Made Ground underlain by a firm to stiff, red brown clay at depths of between 0.2m bgl, and 0.5m bgl. All boreholes were terminated within the clay.

The Environment Agency's Groundwater Vulnerability Map shows the Wilton Site to be an area classified as a "non-aquifer (negligibly permeable)", this has since been reclassified as Secondary (class B) Aquifer (April 2010).

The majority of the groundwater detected at the site during past investigations comprises of localised perched water bodies. Groundwater levels have been found to vary widely over short distances and it has not been possible to infer any shallow groundwater flow direction.

ARCADIS attended site on 16th August 2010 and a limited excavation of the immediate area surrounding BH304 was undertaken, the monitoring well decommissioned and the excavation backfilled with clean imported material. Validation soil samples from the base and side walls of the excavation were submitted for ammonium and pH analysis and asbestos screen.

Ammonium was not detected at concentrations above the laboratory method detection limit (MDL) in any of the samples from the excavation. Following the excavation around BH304, and the decommissioning of the well, it is the opinion of ARCADIS that the area has been successfully remediated and requires no further action.

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List of Abbreviations that may be used in this report

ARCADIS	ARCADIS (UK) Ltd
bgl	below ground level
CAT	Cable Avoidance Tool
INVISTA	INVISTA TEXTILES (UK) Ltd
m	metres
MDL	Method Detection Limit
the site	INVISTA - Wilton

1 INTRODUCTION

ARCADIS (UK) Ltd (ARCADIS) was commissioned by INVISTA Textiles (UK) Ltd (INVISTA) to undertake limited soil remediation in the immediate vicinity of borehole BH304 for the INVISTA manufacturing site located at Wilton, Redcar, TS10 4XY (the site). Figure 1 presents the site location and the site boundary.

1.1 Background Information

ARCADIS was contracted by INVISTA to collect data for comparison against the baseline survey, undertaken in 2002, as part of the Environmental Permit surrender. An initial round of groundwater monitoring was undertaken in July 2009 followed by an intrusive investigation and groundwater monitoring in November 2009. Following this, an additional two rounds of groundwater monitoring, of selected boreholes, was undertaken in June 2010. As part of the work a number of areas of concern were identified, in particular elevated concentrations of ammonium were recorded in BH304. Based on the findings of ARCADIS' previous investigations the impact in BH304 was identified to be an isolated hotspot.

Given the site environmental setting and isolated nature of the impact ARCADIS considered the most appropriate course of action to assist the Environmental Permit surrender was to undertake soil remediation in the immediate vicinity of BH304.

1.2 Scope of Works

The works included the remediation of the area around BH304 via excavation and disposal techniques, decommissioning of the monitoring well and reinstatement of the excavation area to a suitable condition to allow surrender of the Environmental Permit.

2 GROUND CONDITIONS

2.1 Geology

A review of the BGS 1:50,000 Geology Map for the area (Sheet No. 33, Guisborough, solid and drift geology) indicates the site is underlain by unconsolidated drift deposits overlying mudstone. The drift deposits comprise of silty clay overlying glacial Boulder Clay with localised occurrences of a black laminated clay. The mudstone is approximately 300m thick and is generally considered to be impermeable. The mudstone formation overlies the Sherwood Sandstone Group. The characteristics of the drift deposits have been determined through site investigations carried out at the site since 1993.

The following ground conditions were encountered during the intrusive investigation undertaken by ARCADIS in November 2009 when four additional boreholes were drilled around BH304 (Environmental Assessment Report, report ref: 960100201, February 2010).

Made Ground
Reinforced concrete was encountered in three of the four boreholes to depths of between 0.2m (BH304-1) and 0.3m bgl (BH304-2 / 4). Topsoil was encountered to a depth of 0.3m bgl in BH304-3.

Gravels
The made ground was underlain by a grey-brown clayey slightly sandy coarse gravel 0.2m thick in BH304-3. No gravel was encountered in any of the other boreholes.

Clay
A firm to stiff red brown clay was encountered in all of the boreholes at depths of between 0.2m bgl (BH304-1), and 0.5m bgl (BH304-3). All the boreholes were terminated in this clay deposit at depths of between 2.4m bgl (BH304-4) and 6m bgl (BH304-1).

2.2 Hydrogeology

The Environment Agency's Groundwater Vulnerability Map shows the Wilton Site to be an area classified as a "non-aquifer (negligibly permeable)", this has since been reclassified as Secondary (class B) Aquifer (April 2010).

Shallow groundwater monitoring wells have been installed in thirty two of the boreholes drilled across the site. In summary:

- Little or no shallow groundwater inflow has been observed from either the black laminated clay or the Boulder Clay;
- Inflow of shallow groundwater into the boreholes occurs from the sand and silt horizons in the brown silty clay and, in particular, the more granular types of made ground;
- The clay is relatively impermeable and the sand and silt horizons which occur with in it are discontinuous; and
- Groundwater levels have been found to vary widely over short distances and it has not been possible to infer any shallow groundwater flow direction.

It has therefore been concluded that the majority of the groundwater detected comprises of localised perched water bodies.

3 METHODOLOGY

Due to the nature of the site geology, which comprises of made ground over clay with pockets of discontinuous sand lenses, and the limited area of impact, monitoring well BH304 was decommissioned and a small excavation of the immediate area (approximately six cubic metres) was undertaken to assist with the surrender of the Environmental Permit.

The excavation material was sampled to enable the appropriate disposal route to be identified.

The excavation was backfilled with clean imported material, the backfill was not placed to any specific engineering specification and no formal reinstatement of the hard standing was undertaken.

There was no baseline for ammonium levels in the soil for borehole BH304. The soil within the BH304 area has been shown to have been historically impacted, prior to the Environmental Permit application, therefore ARCADIS did not define specific remedial targets for this work. Instead, the aim was to improve ground conditions, from those identified during the previous investigation works, so that the land immediately around BH304 was in a suitable condition for the surrender of the Environmental Permit.

3.1 Site Preparation

ARCADIS attended site on 16th August 2010. Initially ARCADIS, accompanied by a representative from INVISTA, carried out a visual inspection of the location of the proposed excavation works. Utility clearance of the area was undertaken by an INVISTA representative. ARCADIS performed further utility clearance using a Cable Avoidance Tool (CAT) prior to commencing the excavation. The excavation area was located on a concrete surface to the south of a roadway. The remediation excavation location is shown on Figure 2.

The excavation area was separated from the site using mesh panel HERAS fencing (Photo 1, Appendix A).

3.2 Excavation Works

Excavation works took place on 17th August 2010 using a Backhoe Excavator. A $2m^2$ area of concrete (centred over BH304) was broken out using a hydraulic hammer (Photo 2, Appendix A). The concrete was visually inspected and deemed suitable for re-use as backfill.

BH304 was decommissioned by removing the well cover and well pipe. The well pipe extended 2m bgl; therefore there was no requirement for the use of bentonite to seal the well at a lower depth than the base of the excavation. During the excavation works there was no visual evidence of BH304 extending deeper than its base.

As the soil was removed the excavation was logged and sampled in accordance with BS 5930:1999. The excavation log is presented in Appendix B. Four soil samples were taken from the excavation; two from the sides and two from the base. Approximately 16 tonnes of material was excavated from an area that was $6m^3$ and was disposed to landfill by a specialist haulage sub-contractor.

The excavation was backfilled with the concrete removed from the surface and clean imported backfill material.

3.3 Laboratory Analysis

Based on the elevated concentration of the contaminant of concern identified in the previous monitoring and discussions with INVISTA, the soil samples were submitted for ammonium and pH analysis and asbestos screen only. As with all previous investigations at the site, samples were forwarded to ALcontrol Laboratories.

All samples were decanted into dedicated laboratory supplied containers and stored in dedicated cool boxes, at a target temperature of 4^{o}C. All sample IDs and analytical requests were recorded on the laboratory chain of custody form, prior to dispatching for analysis, on the day of sampling, where possible.

All samples were submitted to ALcontrol Laboratories, a certified United Kingdom Accreditation Services (UKAS) accredited laboratory. All samples were sent with a full chain of custody identifying ARCADIS as the client, the ARCADIS project reference, the consultant/project manager, the nature of the sample and the parameters to be tested.

4 RESULTS

The following table presents the results of the laboratory analysis.

	MDL (mg/kg)	ES1 0.60mbgl	ES2 1.35mbgl	ES3 2.00mbgl	ES4 2.00mbgl
Ammonium (as NH4)	<15	<15	<15	<15	<15
pH	-	7.8	8.6	8.7	8.7
Asbestos	-	No ACM	No ACM	No ACM	No ACM

Ammonium was not detected in any of the samples from the excavation at concentrations above the laboratory method detection limit. pH was recorded in the range of 7.8 to 8.7. No asbestos containing materials were identified in any of the samples.

5 CONCLUSION

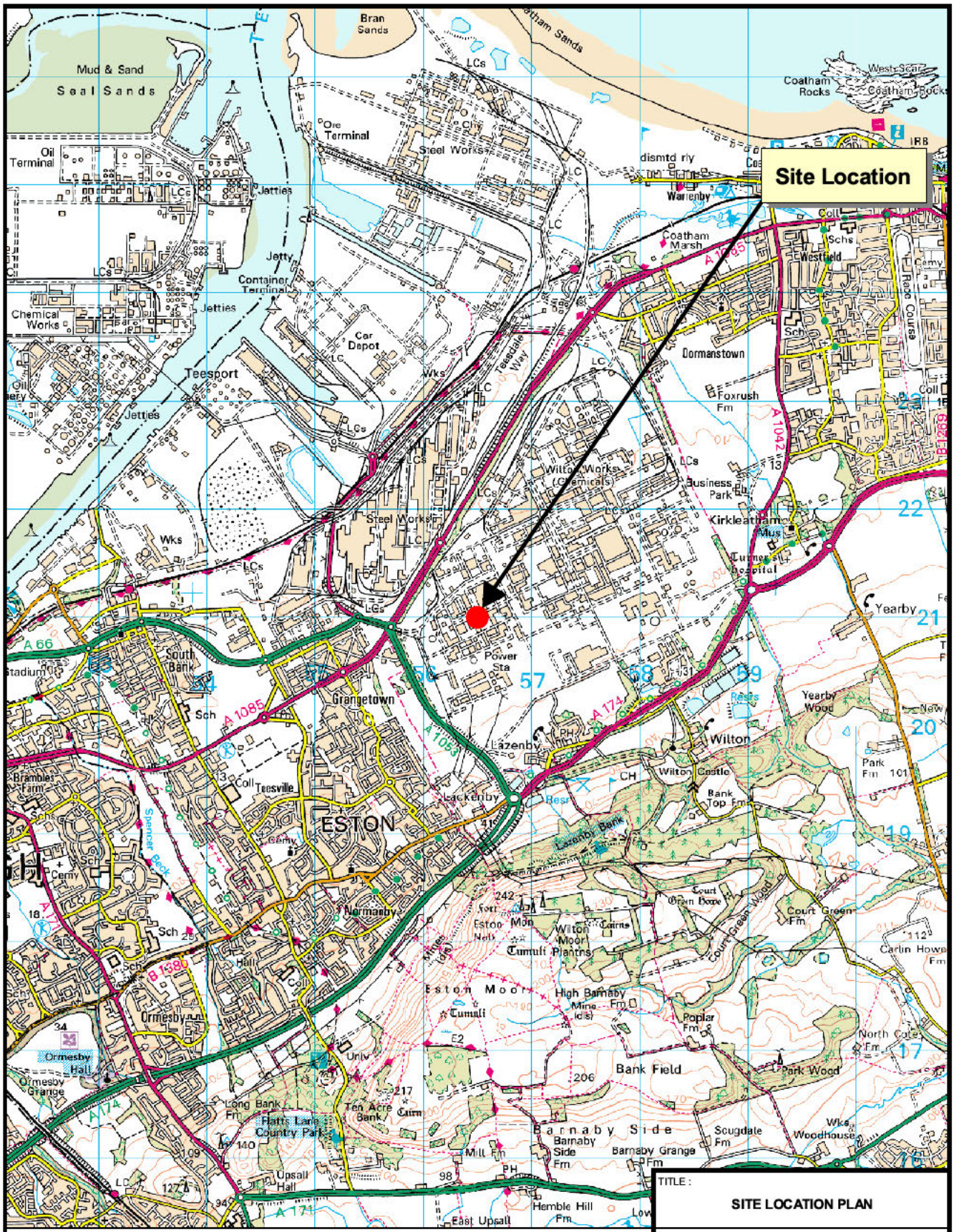
As part of the work undertaken by ARCADIS for the surrender of INVISTA's Environmental Permit the area around borehole BH304 was identified as an area of concern with elevated concentrations of ammonium. Based on the findings of ARCADIS' previous investigations at the site, the impact in BH304 was identified to be an isolated hotspot. Given the ground conditions and isolated nature ARCADIS considered limited soil remediation the most appropriate course of action.

The aim of the remedial works was to improve the ground conditions so that the land immediately around BH304 was in a suitable condition for the surrender of the Environmental Permit. This was achieved through the excavation of material around BH304 and decommissioning of monitoring well BH304. The excavation was backfilled with clean imported material. None of the samples taken from the sides and base of the excavation recorded ammonium levels higher than the laboratory method detection levels.

Following the removal of the target material around borehole BH304 and the decommissioning of the well it is the opinion of ARCADIS that the area has been successfully remediated and requires no further action to allow the surrender of the Environmental Permit.

FIGURES

ARCADIS



REPRODUCED FROM OS 1:50,000 SCALE BY PERMISSION OF ORDNANCE SURVEY® ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 100020449. CONTACT ARCADIS UK IN CASE ANY QUERY

LEGEND

- SITE LOCATION

NOTES

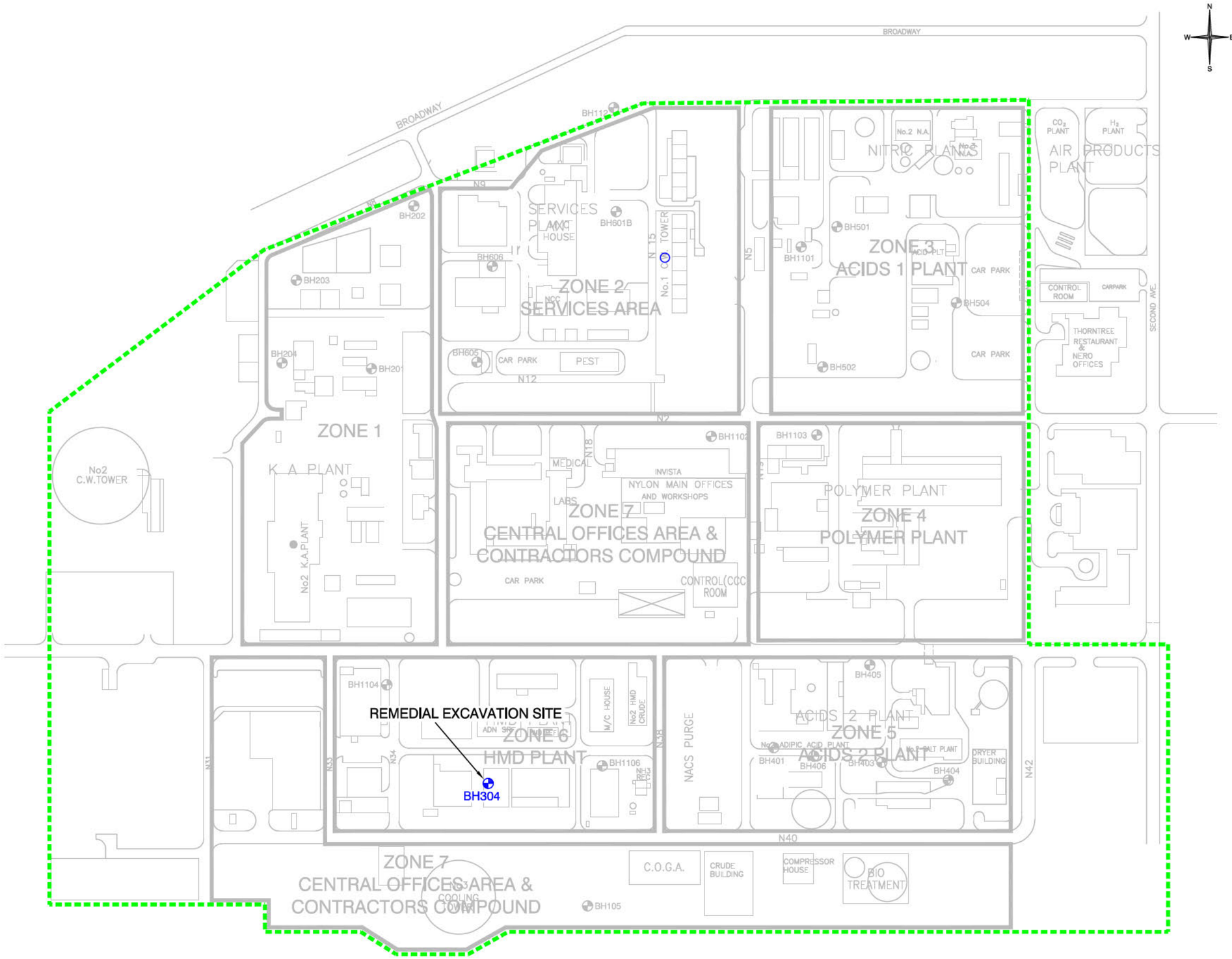
TITLE : **SITE LOCATION PLAN**

SITE : **INVISTA WILTON**

CLIENT : **INVISTA**

PROJECT :	9601004	FIGURE	1
DATE :	03/09/10	DRAWN BY :	ASZ
DRG No :	960100405.apr / SLP		
SCALE :	1 : 50,000	PRINT :	A4

ARCADIS
infrastructure, environment, buildings
2 Craven Court,
Newmarket, CB8 7FA
www.arcadis-uk.com



KEY

- APPROXIMATE BOREHOLE LOCATION
- PROPERTY BOUNDARY

NOTES

BASED ON DRAWING BY INVISTA UK LTD.
DRAWING No: E5004526 Rev.P3
DATE: 02/09/04

REV	DATE	COMMENT	CAD

TITLE: BH304 REMEDIAL EXCAVATION LOCATION

SITE: INVISTA WILTON

CLIENT: INVISTA TEXTILES (UK) LTD

PROJECT: 96010.04 | FIGURE 2

DATE: 03/09/10 | DRAWN: BNB | REV: -

DRG.No.: 960100404-CAD | PRINT: A3

NOTE: THE LOCATIONS OF ANY UNDERGROUND SERVICES SHOWN ON THIS DRAWING HAVE BEEN DETERMINED USING ELECTRO-MAGNETIC TECHNIQUES AND VISUAL OBSERVATIONS. THE LIMITATIONS OF THIS DRAWING SHOULD BE REALISED AND NO GUARANTEE CAN BE GIVEN THAT ALL SERVICES HAVE BEEN IDENTIFIED. ANY AMENDMENTS TO THE SITE LAYOUT AFTER THE ISSUE OF THIS DRAWING WILL MAKE THIS DRAWING INVALID. NO MEASUREMENTS TAKEN FROM THIS DRAWING SHOULD BE USED FOR THE LOCATION OF INTRUSIVE INVESTIGATION WORKS ON SITE. SYMBOLS FOR BOREHOLES, TRIAL PITS AND OTHER SPECIFIC FEATURES ARE REPRESENTATIONS OF LOCATION ONLY AND UNLESS OTHERWISE SPECIFIED, DO NOT REPRESENT THE TRUE SIZE OF THE FEATURE. - CONTACT ARCADIS IN CASE OF ANY QUERY

ARCADIS
Infrastructure, environment, buildings
2 Craven Court,
Newmarket, CB8 7FA
www.arcadis-uk.com

APPENDICES

ARCADIS

Appendix A
Photographs

CLIENT: Invista **PHOTOGRAPH #:** 1 **COMMENT:** Mesh panel HERAS fencing was used to define the excavation area.	

CLIENT: Invista **PHOTOGRAPH #:** 2 **COMMENT:** Breaking the concrete using a hydraulic hammer. BH304 was at the centre of the excavation area.	

CLIENT: Invista **PHOTOGRAPH #:** 3 **COMMENT:** Extent of remedial excavation area.	

CLIENT: Invista **PHOTOGRAPH #:** 4 **COMMENT:** Completed remedial excavation.	

CLIENT: Invista **PHOTOGRAPH #:** 5 **COMMENT:** Loading materials from excavation.	

CLIENT: Invista **PHOTOGRAPH #:** 6 **COMMENT:** Completed remedial works.	

Appendix B
Excavation Log

Excavation log
~~BH Log~~

Project No.: 96016.04 Client: Invista Site: Wilton Recorded By: [redacted] Date Drilled: 17/8/10

Location by EDM: Base station ID: _____ Distance: _____ Angle: _____

~~Drilling~~ Method: JCB digger Hole Diam (mm): _____ Final depth (m): _____

Well Diam (mm): _____ Well Type: _____

ARCADIS GERAGHTY & MILLER INTERNATIONAL, LTD.

Borehole ID: _____

Top (m)	Base (m)	Strata Description/Recovery	Top (m)	Base (m)	Type	PID (ppm)	Well Installation
0.0	0.2	Concrete with rebar.					
0.2	0.5	MADE GROUND, soft, dark brown, slightly sandy, gravelly clay. Gravel is subangular, medium to very coarse. Some cobbles (mudstone). Brick fragments, very coarse, subangular.					
0.5	2.0	Soft to firm, red-brown, with some grey mottling, ~~CLAY~~ ~~Some~~ occasionally gravelly CLAY. Gravel is subangular, fine to ~~medium~~ coarse.	0.6m	"	tub, 2 jar, 2 vial		ES1
			1.35m	"	"		ES2
			2.0m	"	"		ES3
			2.0m	"	"		ES4

Remarks:

Groundwater Details:

Strike (m)	Rest (m)	Remarks

Clay/Silts - Consistency/ Discontinuities/ Bedding/ Colour/ Subordinate/ NAME/ other, incl roots etc/ Stratum name.
Rocks - Strength/ Structure/ Colour/ Texture/ Grain Size/ NAME/ Subordinate/ Weathering/ Discontinuities/ Fracture State/ Other.

Sands - Density/ Discontinuity/ Bedding/ Colour/ Subordinate/ Angularity/ Grain Size/ NAME/ other/ Stratum name.
Cross - s x 20, m x 10, l x 5 **Disc** - s x 25, m x 10, l x 2 **Pen** - x 50

* = Sample submitted for analysis

Appendix C
Laboratory Certificate

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Attention: [redacted]

CERTIFICATE OF ANALYSIS

Date:	09 September 2010		
Customer:	H_ARCADIS_LEE-24		
Sample Delivery Group (SDG):	100819-53	**Report No.:**	96243
Your Reference:	96010.03		
Location:			

We received 4 samples on Thursday August 19, 2010 and 4 of these samples were scheduled for analysis which was completed on Friday August 27, 2010. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Asbestos testing - we are not accredited for screening soil samples for asbestos fibres. We are only accredited to identify asbestos fibres in bulk material (ACM).

Approved By:

[redacted]

[redacted]

Operations Director - Land UK & Ireland

1291
GROUP

Alcontrol Laboratories is a trading division of ALcontrol UK Limited
Registered Office: Units 7 & 8 Hawarden Business Park, Manor Road, Hawarden, Deeside, CH5 3US. Registered in England and Wales No. 4057291.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
1974691	ES1		0.60	17/08/2010
1974723	ES2		1.35	17/08/2010
1974756	ES3		2.00	17/08/2010
1974799	ES4		2.00	17/08/2010

Only received samples which have had analysis scheduled will be shown on the following pages.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

SOLID

Results Legend

X Test

N No Determination Possible

			Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Container
			197491	ES1		0.60	250g Amber Jar
							400g Tub
							60g VOC
			197492	ES2		1.35	250g Amber Jar
							400g Tub
							60g VOC
			197493	ES3		2.00	250g Amber Jar
							400g Tub
							60g VOC
			197494	ES4		2.00	250g Amber Jar
							400g Tub
							60g VOC
Ammonium Soil by Titration	All	NDPs: 0 Tests: 4					X
							X
							X
Sample description	All	NDPs: 0 Tests: 4	X	X	X	X	

Validated

ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
1974691	ES1	0.60	Dark Brown	Silty Clay	0.063 - 0.1 mm	Stones	N/A
1974723	ES2	1.35	Dark Brown	Silty Clay	0.063 - 0.1 mm	Stones	N/A
1974756	ES3	2.00	Dark Brown	Clay	<0.063 mm	Stones	N/A
1974799	ES4	2.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	N/A

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Validated

ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

Test Completion Dates

Lab Sample No(s)	1974691	1974723	1974756	1974799
Customer Sample Ref.	ES1	ES2	ES3	ES4
AGS Ref.				
Depth	0.60	1.35	2.00	2.00
Type	SOLID	SOLID	SOLID	SOLID
Ammonium Soil by Titration	24/08/2010	24/08/2010	24/08/2010	24/08/2010
Asbestos Containing Material Screen	19/08/2010	19/08/2010	19/08/2010	19/08/2010
Boron Water Soluble	23/08/2010	23/08/2010	23/08/2010	23/08/2010
EPH CWG (Aliphatic) GC (S)	24/08/2010	21/08/2010	21/08/2010	21/08/2010
EPH CWG (Aromatic) GC (S)	24/08/2010	21/08/2010	21/08/2010	21/08/2010
GRO by GC-FID (S)	26/08/2010	26/08/2010	26/08/2010	26/08/2010
Metals by iCap-OES (Soil)	23/08/2010	23/08/2010	23/08/2010	23/08/2010
PAH by GCMS	24/08/2010	24/08/2010	24/08/2010	27/08/2010
pH	20/08/2010	23/08/2010	23/08/2010	23/08/2010
Sample description	19/08/2010	19/08/2010	19/08/2010	19/08/2010
TPH CWG GC (S)	26/08/2010	26/08/2010	26/08/2010	26/08/2010

Validated

ALcontrol Laboratories Analytical Services

SDG	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

Results Legend	
#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of the individual compounds within the samples are not corrected for this recovery.

Component	LOD/Units	Method	Customer Sample Ref.	ES1	ES2	ES3	ES4
			Depth (m)	0.60	1.35	2.00	2.00
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	17/08/2010	17/08/2010	17/08/2010	17/08/2010
			Date Received	19/08/2010	19/08/2010	19/08/2010	19/08/2010
			SDG Ref	100819-53	100819-53	100819-53	100819-53
			Lab Sample No.(s)	1974691	1974723	1974756	1974799
			AGS Reference				
Exchangeable Ammonium as NH4	<15 mg/kg	TM024		<15 M	<15 M	<15 M	<15 M

SDG	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

ASSOCIATED AQC DATA

Ammonium Soil by Titration

Component	Method Code	QC 14
Exchangeable Ammonium as NH4	TM024	**95.60** 80.84 : 103.27

Boron Water Soluble

Component	Method Code	QC 19
Water Soluble Boron	TM222	**102.95** 86.36 : 114.95

EPH CWG (Aliphatic) GC (S)

Component	Method Code	QC 12	QC 18
Total Aliphatics >C12-C35	TM173	**82.58** 66.13 : 101.56	**90.79** 58.96 : 117.71

EPH CWG (Aromatic) GC (S)

Component	Method Code	QC 12	QC 18
Total Aromatics >EC12-EC35	TM173	**88.59** 64.00 : 112.00	**90.76** 58.79 : 118.66

Metals by iCap-OES (Soil)

Component	Method Code	QC 12	QC 12
Aluminium	TM181	**104.41** 95.21 : 133.11	**103.92** 95.21 : 133.11
Antimony	TM181	**101.58** 63.92 : 138.56	**119.10** 63.92 : 138.56
Arsenic	TM181	**101.21** 77.96 : 122.04	**109.39** 77.96 : 122.04
Barium	TM181	**105.82** 90.49 : 117.24	**102.50** 90.49 : 117.24
Beryllium	TM181	**100.37** 77.50 : 122.50	**114.78** 77.50 : 122.50
Boron	TM181	**95.61** 82.46 : 141.11	**91.76** 82.46 : 141.11
Cadmium	TM181	**95.04** 77.50 : 122.50	**108.78** 77.50 : 122.50
Chromium	TM181	**101.48** 82.90 : 117.10	**92.89** 82.90 : 117.10
Cobalt	TM181	**95.83** 78.26 : 121.74	**104.44** 78.26 : 121.74
Copper	TM181	**98.87** 86.52 : 113.48	**101.41** 86.52 : 113.48

SDG	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

		QC 12	QC 12
Iron	TM181	**100.78** 93.59 : 123.28	**103.23** 93.59 : 123.28
Lead	TM181	**99.72** 81.22 : 118.78	**100.39** 81.22 : 118.78
Manganese	TM181	**98.55** 87.42 : 112.58	**97.25** 87.42 : 112.58
Mercury	TM181	**106.50** 72.27 : 127.73	**107.91** 72.27 : 127.73
Molybdenum	TM181	**99.26** 71.12 : 128.88	**112.71** 71.12 : 128.88
Nickel	TM181	**97.25** 81.27 : 118.73	**99.39** 81.27 : 118.73
Phosphorus	TM181	**106.40** 84.04 : 115.96	**102.71** 84.04 : 115.96
Selenium	TM181	**102.02** 72.61 : 127.39	**106.45** 72.61 : 127.39
Strontium	TM181	**101.50** 80.21 : 119.79	**98.79** 80.21 : 119.79
Thallium	TM181	**84.92** 73.04 : 126.96	**97.28** 73.04 : 126.96
Tin	TM181	**95.28** 71.55 : 128.45	**107.58** 71.55 : 128.45
Titanium	TM181	**92.63** 78.26 : 121.74	**91.37** 78.26 : 121.74
Vanadium	TM181	**99.69** 82.03 : 117.97	**95.79** 82.03 : 117.97
Zinc	TM181	**93.53** 83.18 : 100.43	**91.67** 83.18 : 100.43

PAH by GCMS

Component	Method Code	QC 12	QC 29
Acenaphthene	TM218	**90.43** 68.10 : 128.67	**97.30** 68.10 : 128.67
Acenaphthylene	TM218	**81.41** 68.11 : 109.28	**87.03** 68.11 : 109.28
Anthracene	TM218	**83.18** 61.75 : 122.01	**90.99** 61.75 : 122.01
Benz(a)anthracene	TM218	**87.61** 79.35 : 115.30	**93.56** 79.35 : 115.30
Benzo(a)pyrene	TM218	**97.18** 79.80 : 116.48	**93.54** 79.80 : 116.48
Benzo(b)fluoranthene	TM218	**93.41** 79.51 : 116.19	**95.22** 79.51 : 116.19
Benzo(ghi)perylene	TM218	**101.62** 80.08 : 114.22	**96.87** 80.08 : 114.22
Benzo(k)fluoranthene	TM218	**97.18** 65.05 : 129.07	**96.12** 65.05 : 129.07
Chrysene	TM218	**92.51** 80.14 : 113.92	**97.02** 80.14 : 113.92
Dibenzo(ah)anthracene	TM218	**101.70** 59.79 : 136.56	**94.58** 59.79 : 136.56
Fluoranthene	TM218	**83.73** 74.35 : 115.70	**94.49** 74.35 : 115.70
Fluorene	TM218	**87.79** 75.68 : 111.55	**95.97** 75.68 : 111.55

Validated

ALcontrol Laboratories Analytical Services

SDG	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Reference:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

		QC 12	QC 29
Indeno(123cd)pyrene	TM218	**102.18** 74.42 : 114.62	**95.43** 74.42 : 114.62
Naphthalene	TM218	**89.84** 73.21 : 108.15	**91.15** 73.21 : 108.15
Phenanthrene	TM218	**85.70** 66.61 : 129.12	**95.85** 66.61 : 129.12
Pyrene	TM218	**83.65** 74.35 : 111.75	**93.87** 74.35 : 111.75

pH

Component	Method Code	QC 10	QC 15
pH	TM133	**99.00** 97.90 : 102.35	**99.37** 97.42 : 102.50

The above information details the reference name of the analytical quality control sample (AQC) that has been run with the samples contained in this report for the different methods of analysis.
The figure detailed is the percentage recovery result for the AQC.
The subscript numbers below are the percentage recovery lower control limit (LCL) and the upper control limit (UCL). The percentage recovery result for the AQC should be between these limits to be statistically in control.

Table of Results - Appendix

SDG Number : 100819-53 **Client :** ARCADIS Geraghty & Miller **Client Ref :** 96010.03

REPORT KEY

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03x10-7

NDP	No Determination Possible	#	ISO 17025 Accredited	*	Subcontracted Test	M	MCERTS Accredited
NFD	No Fibres Detected	PFD	Possible Fibres Detected	»	Result previously reported (Incremental reports only)	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control

Method No	Reference	Description	Wet/Dry Sample [1]
PM001		Preparation of Samples for Metals Analysis	Dry
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material	Wet
TM001	In - house Method	Determination of asbestos containing material by screening on solids	
TM024	Method 4500A & B, AWWA/APHA, 20th Ed., 1999	Determination of Exchangeable Ammonium and Ammoniacal Nitrogen as N by titration on solids	Wet
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter	Wet
TM173	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID	Dry
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES	Dry
TM218	Microwave extraction – EPA method 3546	Microwave extraction - EPA method 3546	Wet
TM222	In-House Method	Determination of Hot Water Soluble Boron in Soils (10:1 Water:soil) by IRIS Emission Spectrometer	Dry

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Validated

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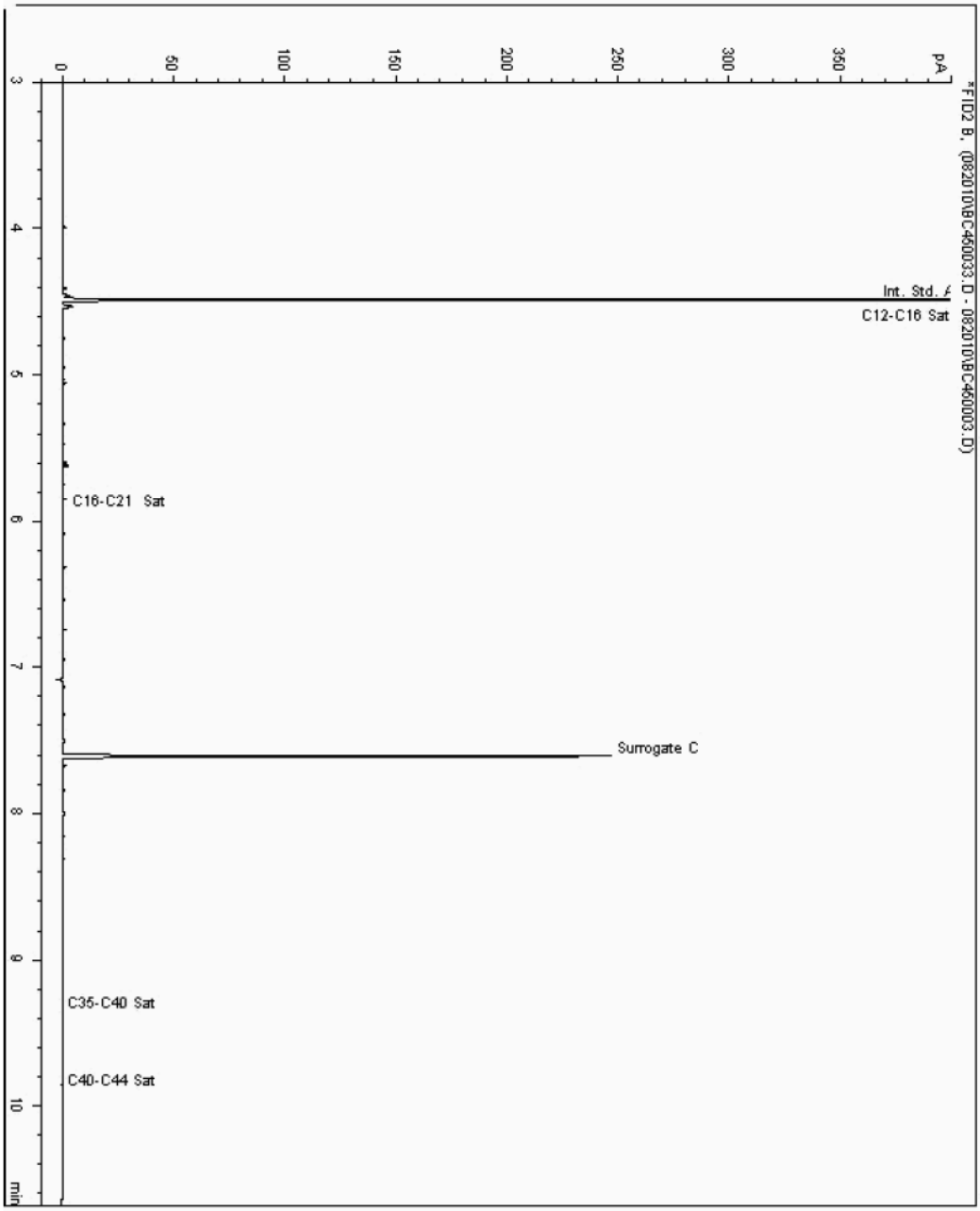
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Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

Chromatogram

Analysis:	EPH CWG (Aliphatic) GC (S)	**Sample No**	1982391
		Sample ID	ES2
		Depth	1.35

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2080866-1982391
Date Acquired : 21/08/10 06:24:59 PM
Units : ppb
Dilution:



Validated

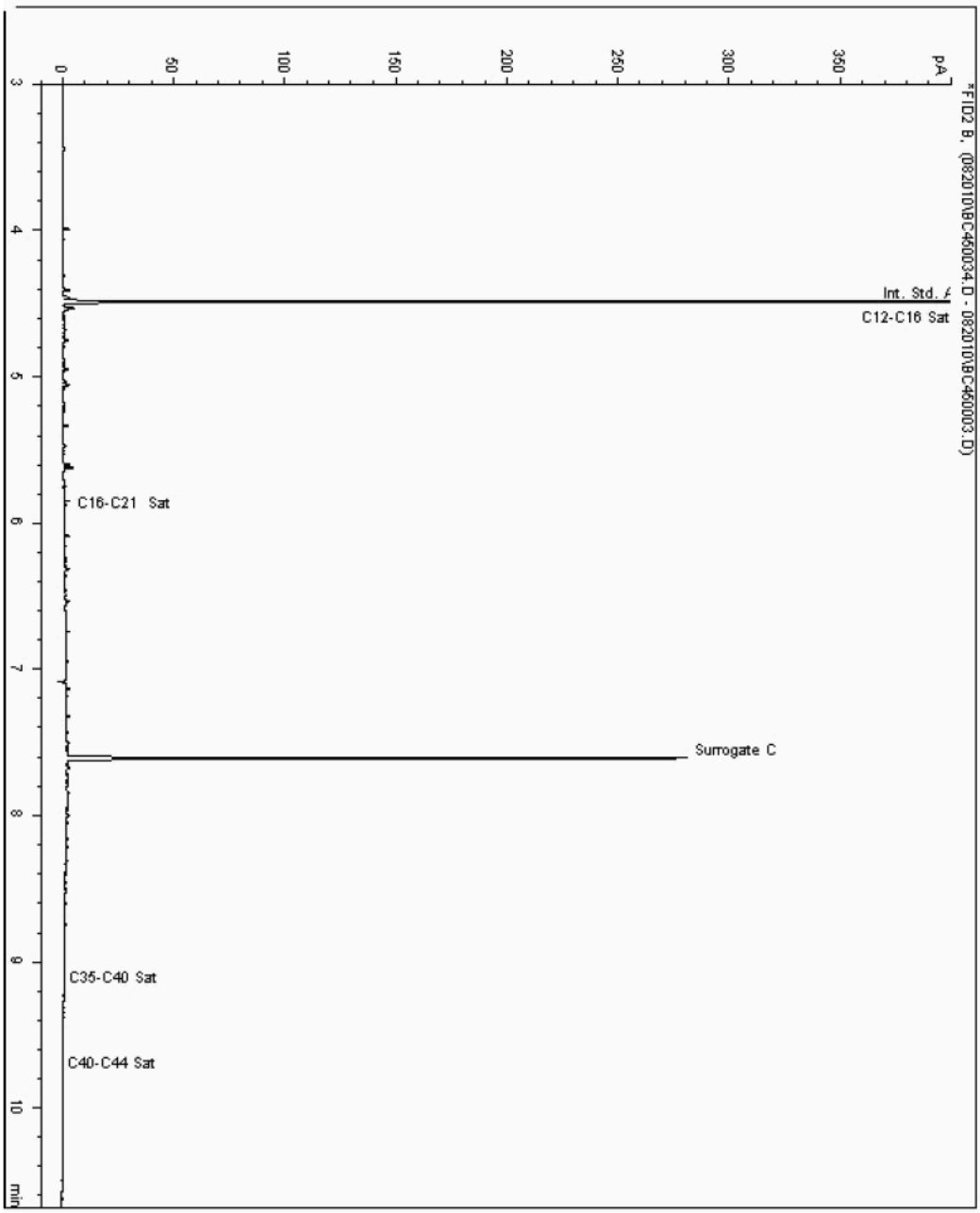
ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243

Analysis:	EPH CWG (Aliphatic) GC (S)	**Sample No**	1982417
		Sample ID	ES3
		Depth	2.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2080880-1982417
Date Acquired : 21/08/10 06:44:42 PM
Units : ppb
Dilution:



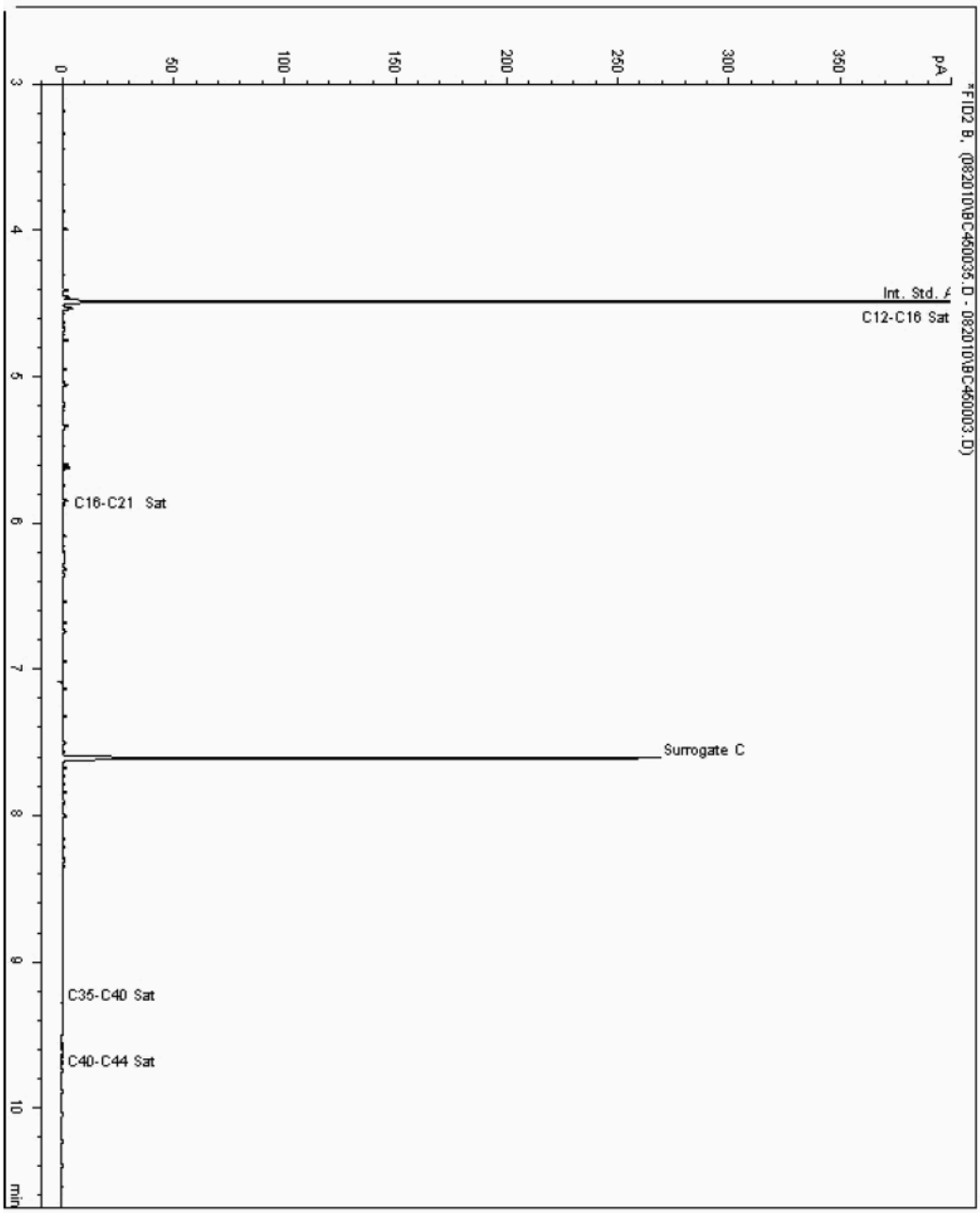
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ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]t
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	EPH CWG (Aliphatic) GC (S)	**Sample No**	1982511
		Sample ID	ES4
		Depth	2.00

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2080894-1982511
Date Acquired : 21/08/10 07:04:04 PM
Units : ppb
Dilution:



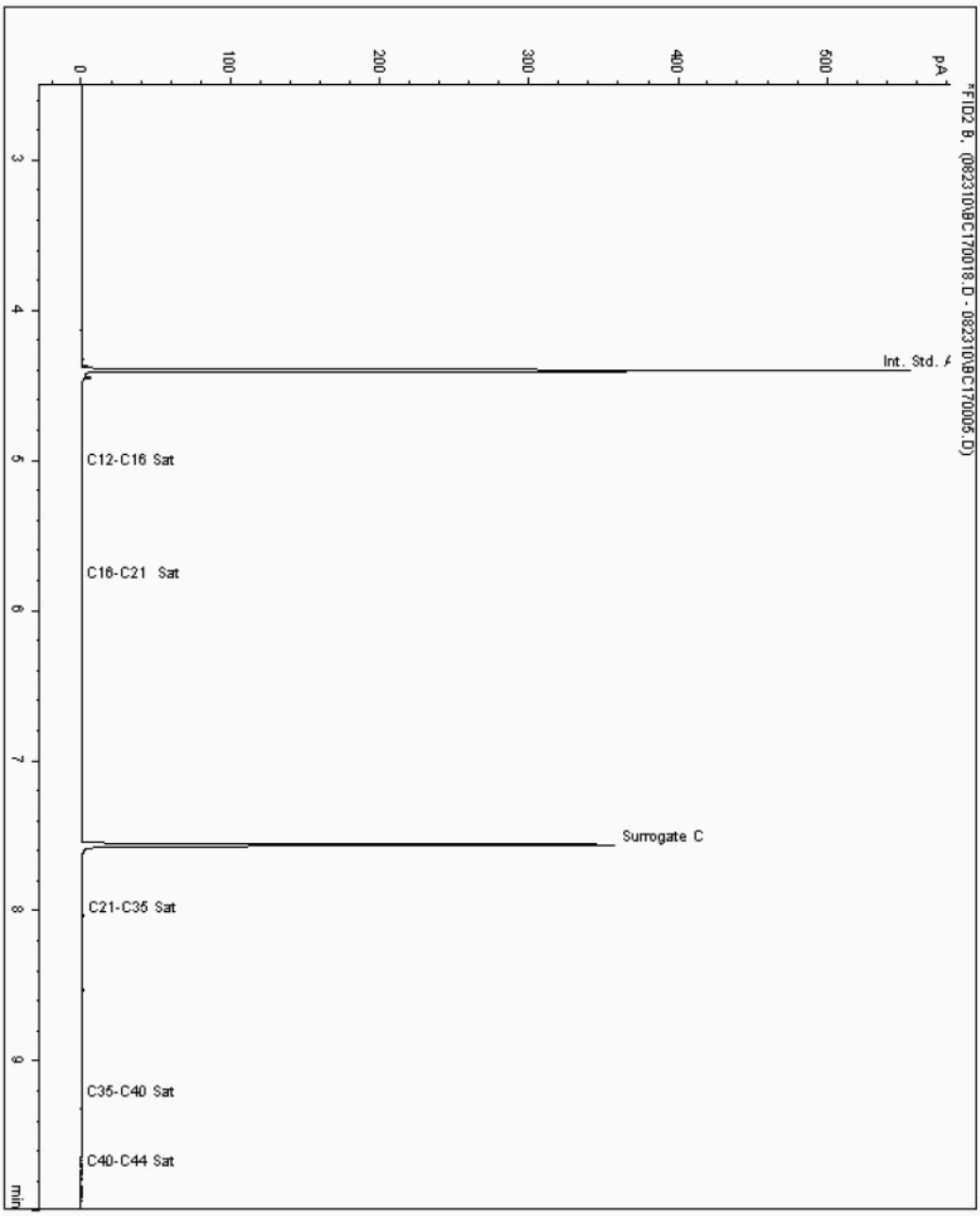
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ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	EPH CWG (Aliphatic) GC (S)	**Sample No**	1984100
		Sample ID	ES1
		Depth	0.60

Alcontrol/Geochem Analytical Services
Speciated TPH - SATS (C12 - C40)

Sample Identity: 2080852-1984100
Date Acquired : 23/08/10 16:58:22 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.993



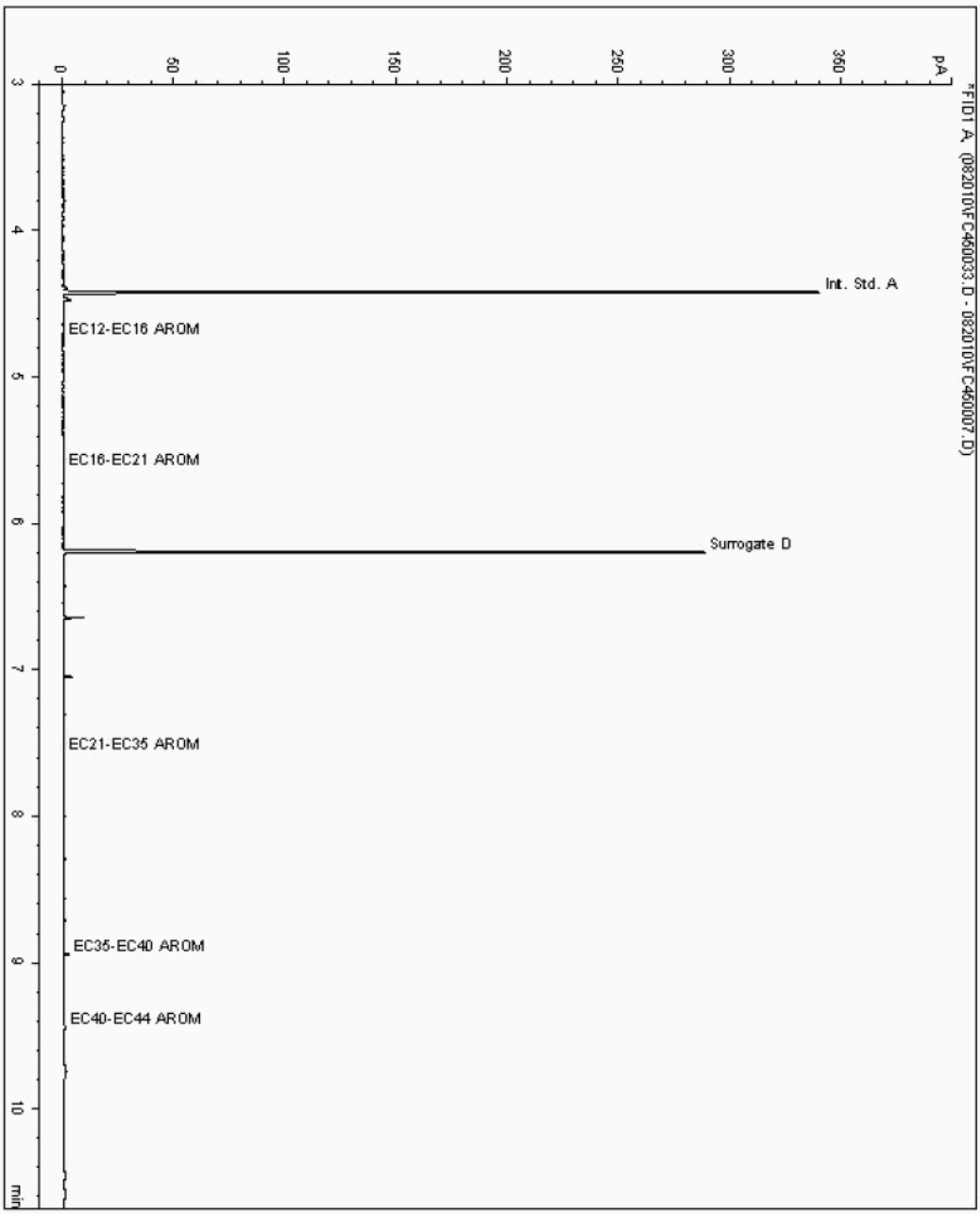
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ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	EPH CWG (Aromatic) GC (S)	**Sample No**	1982391
		Sample ID	ES2
		Depth	1.35

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2080867-1982391
Date Acquired : 21/08/10 06:25:00 PM
Units : ppb
Dilution:



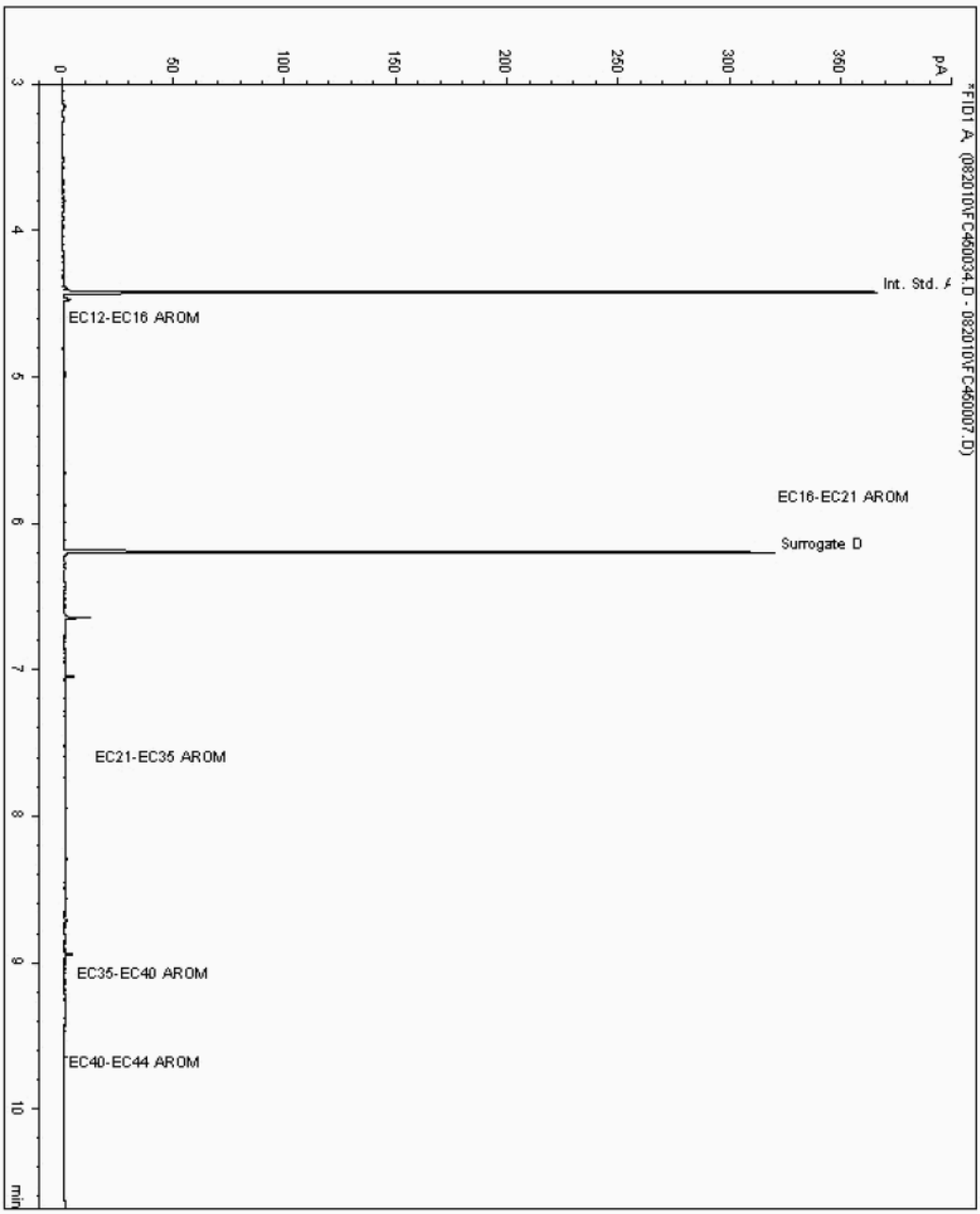
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ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	EPH CWG (Aromatic) GC (S)	**Sample No**	1982417
		Sample ID	ES3
		Depth	2.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2080881-1982417
Date Acquired : 21/08/10 06:44:43 PM
Units : ppb
Dilution:



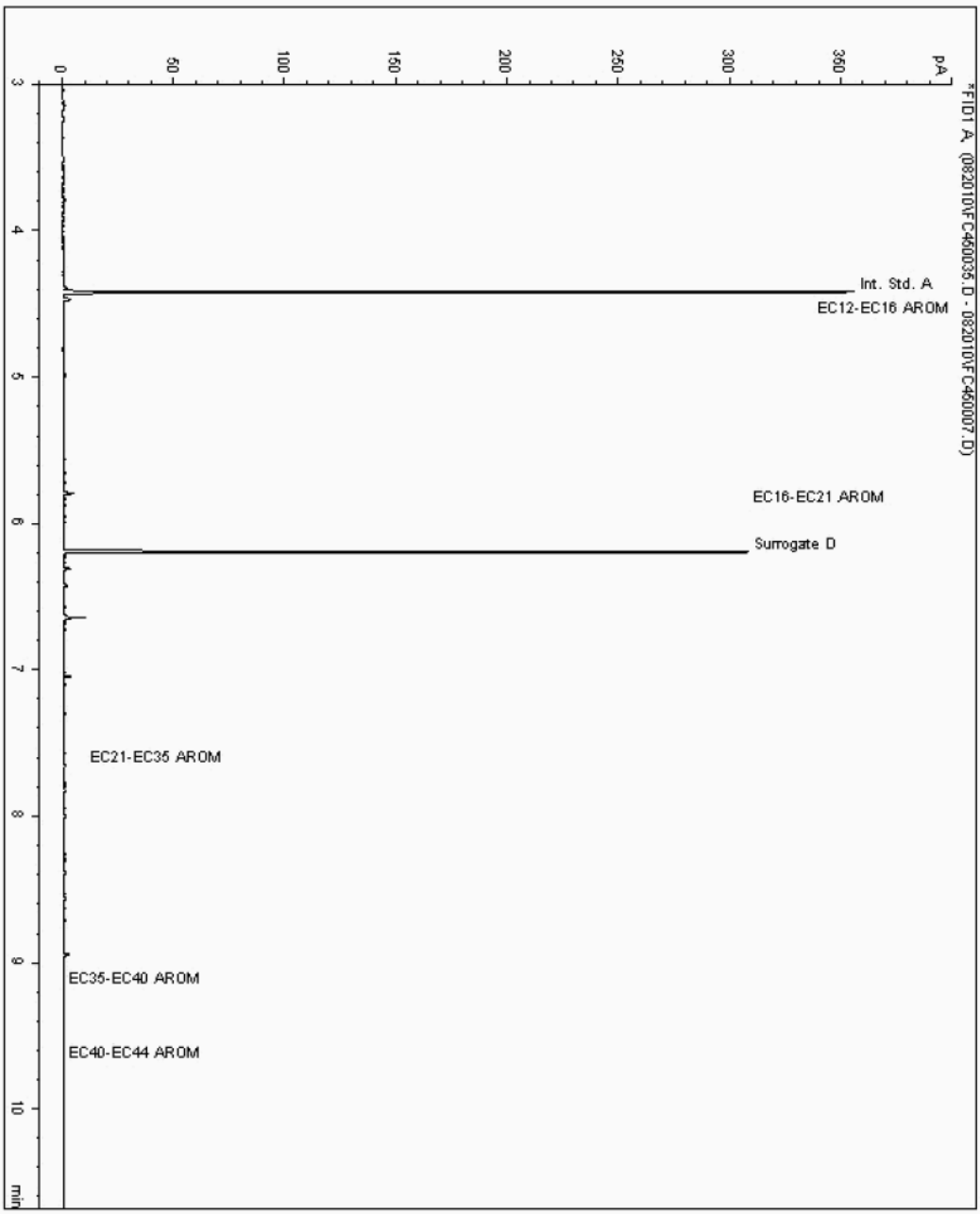
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ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	EPH CWG (Aromatic) GC (S)	**Sample No**	1982511
		Sample ID	ES4
		Depth	2.00

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2080895-1982511
Date Acquired : 21/08/10 07:04:03 PM
Units : ppb
Dilution:



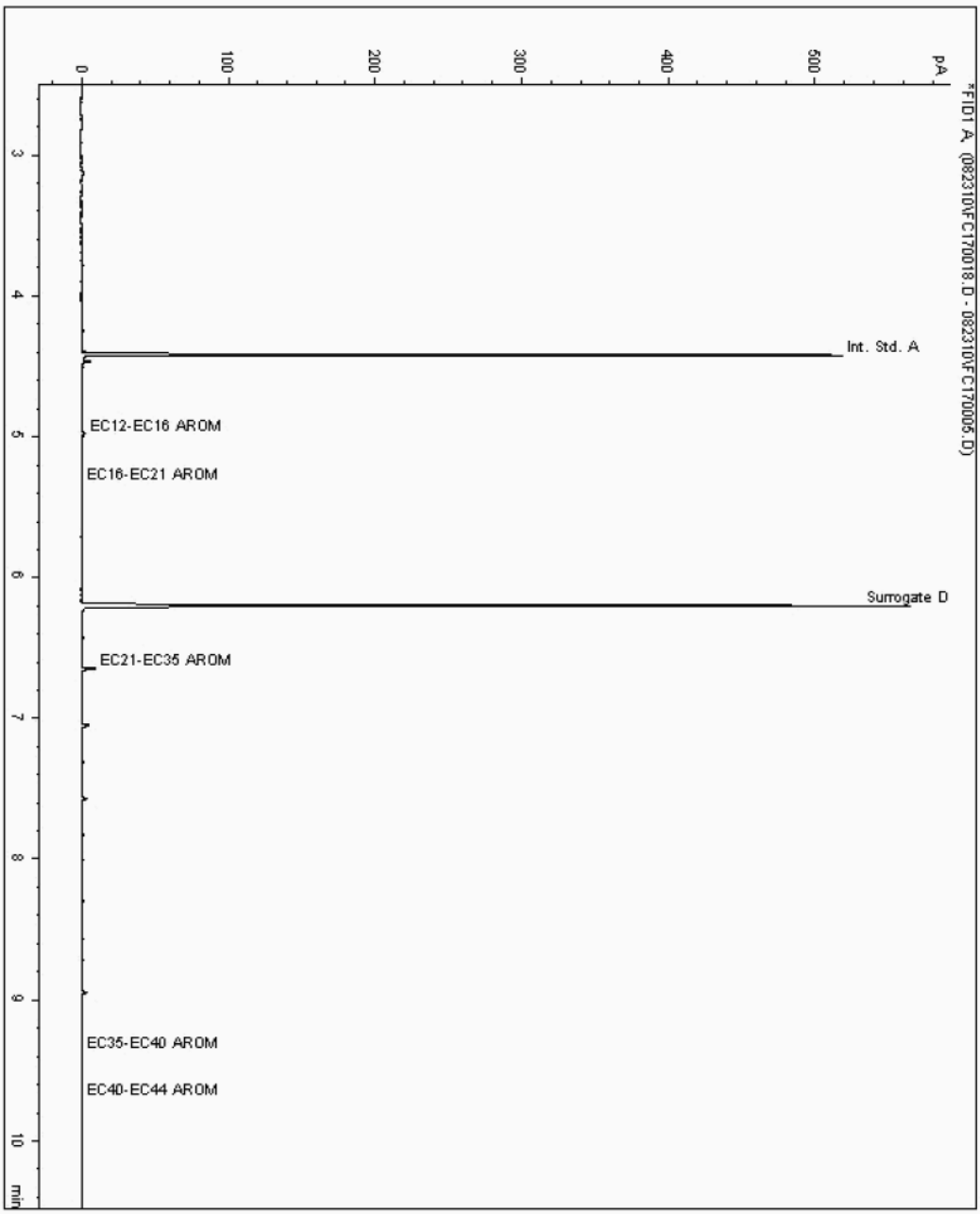
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ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	EPH CWG (Aromatic) GC (S)	**Sample No**	1984100
		Sample ID	ES1
		Depth	0.60

Alcontrol/Geochem Analytical Services
Speciated TPH - AROM (C12 - C40)

Sample Identity: 2080853-1984100
Date Acquired : 23/08/10 16:58:22 PM
Units : ppb
Dilution :
CF : 1
Multiplier : 0.993



Validated

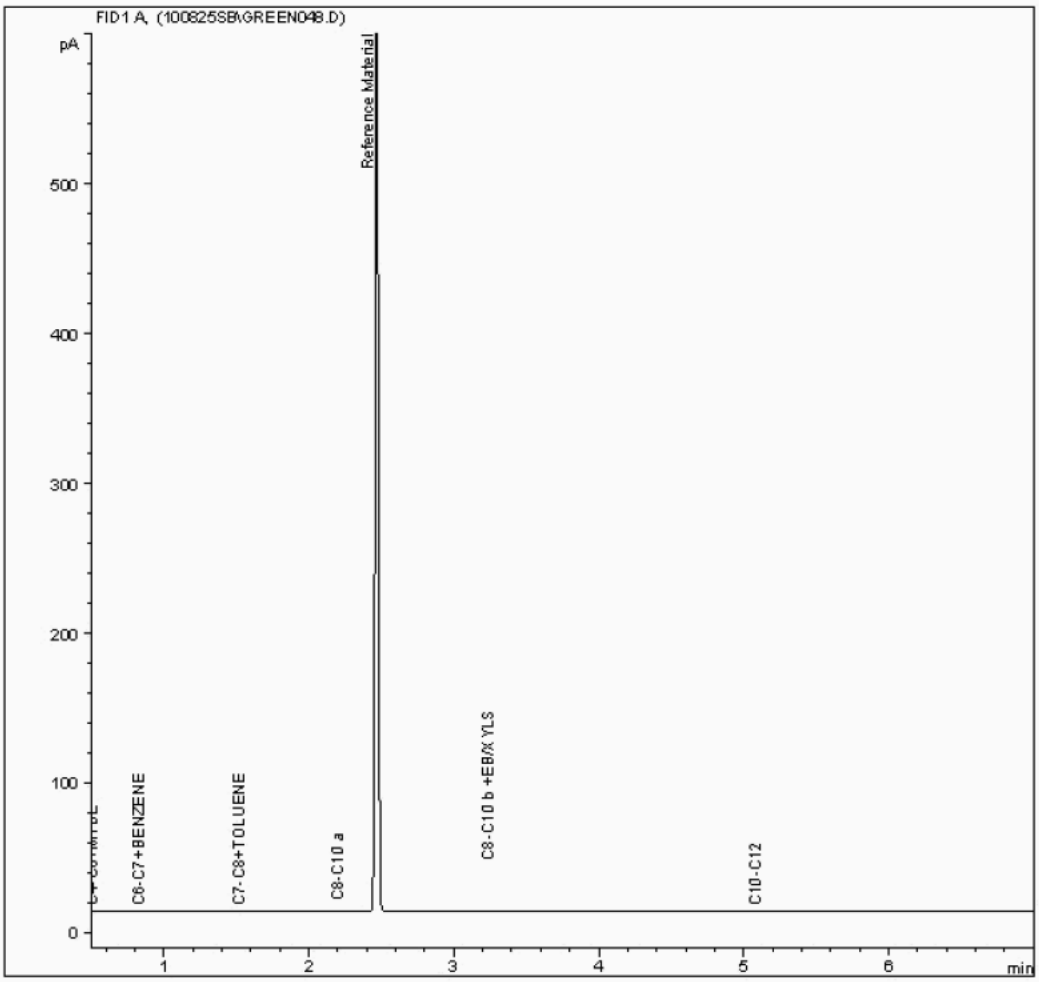
ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	GRO by GC-FID (S)	**Sample No**	1974708
		Sample ID	ES1
		Depth	0.60

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 2090138-1984543
Date Acquired : 26/08/10 05:29:03
Units : ppb
Dilution : 1

#	Compound Name	Amount
1	C4-C6+MTBE	29
2	C6-C7+BENZENE	11
3	C7-C8+TOLUENE	48
4	C8-C10 a	22
5	Reference Material	8949
6	C8-C10 b +EB/XYLS	301
7	C10-C12	147



Validated

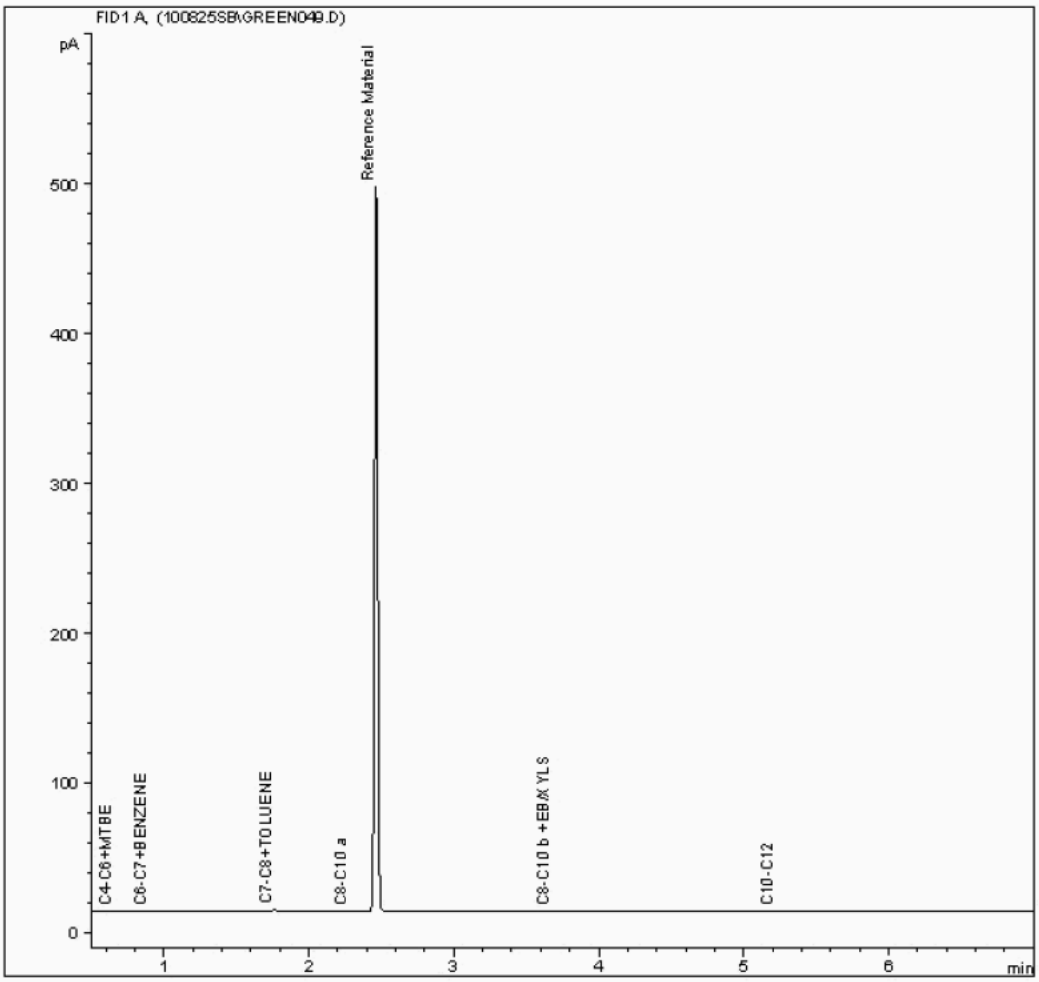
ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	GRO by GC-FID (S)	**Sample No**	1974742
		Sample ID	ES2
		Depth	1.35

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 2090148-1984551
Date Acquired : 26/08/10 05:43:04
Units : ppb
Dilution : 1

#	Compound Name	Amount
1	C4-C6+MTBE	0
2	C6-C7+BENZENE	0
3	C7-C8+TOLUENE	34
4	C8-C10 a	0
5	Reference Material	6927
6	C8-C10 b +EB/XYLS	0
7	C10-C12	0



Validated

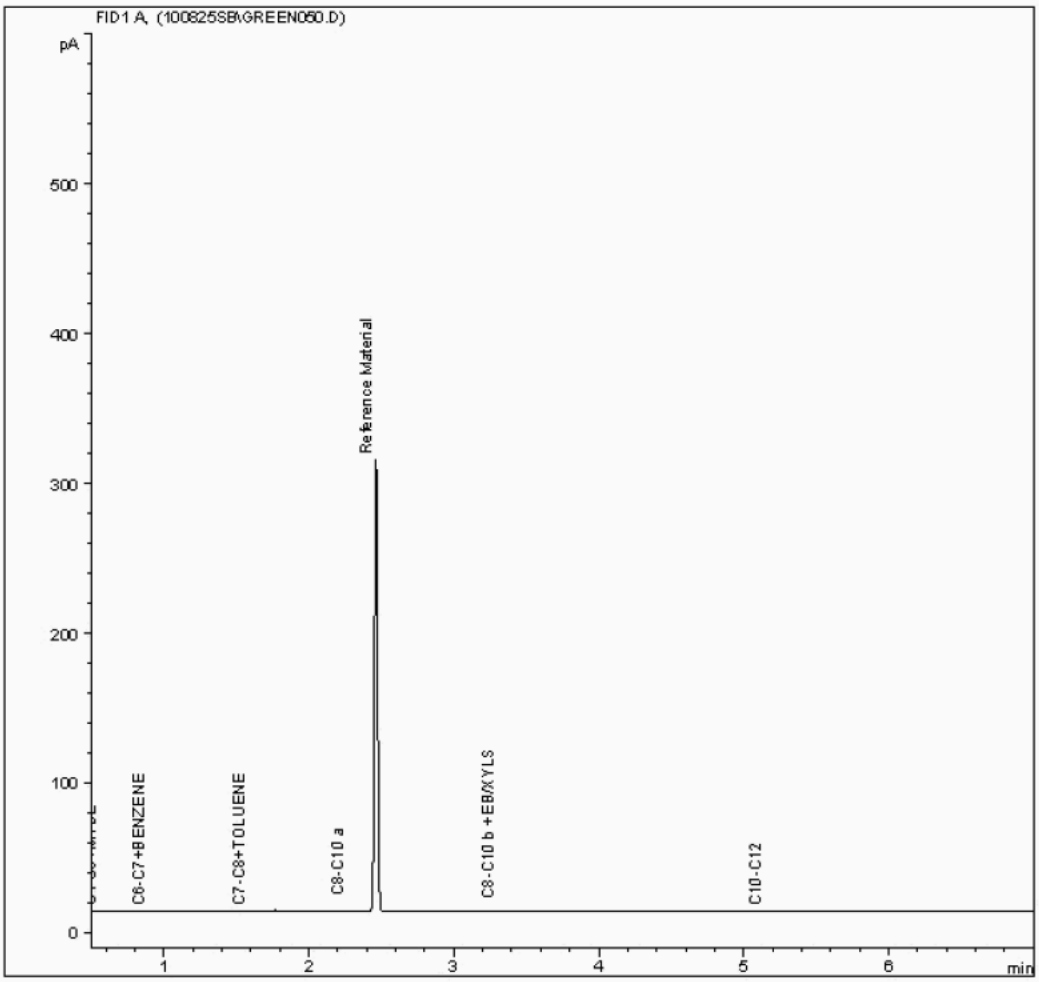
ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	GRO by GC-FID (S)	**Sample No**	1974778
		Sample ID	ES3
		Depth	2.00

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 2090167-1984565
Date Acquired : 26/08/10 05:57:09
Units : ppb
Dilution : 1

#	Compound Name	Amount
1	C4-C6+MTBE	27
2	C6-C7+BENZENE	17
3	C7-C8+TOLUENE	51
4	C8-C10 a	37
5	Reference Material	4369
6	C8-C10 b +EB/XYLS	113
7	C10-C12	76



Validated

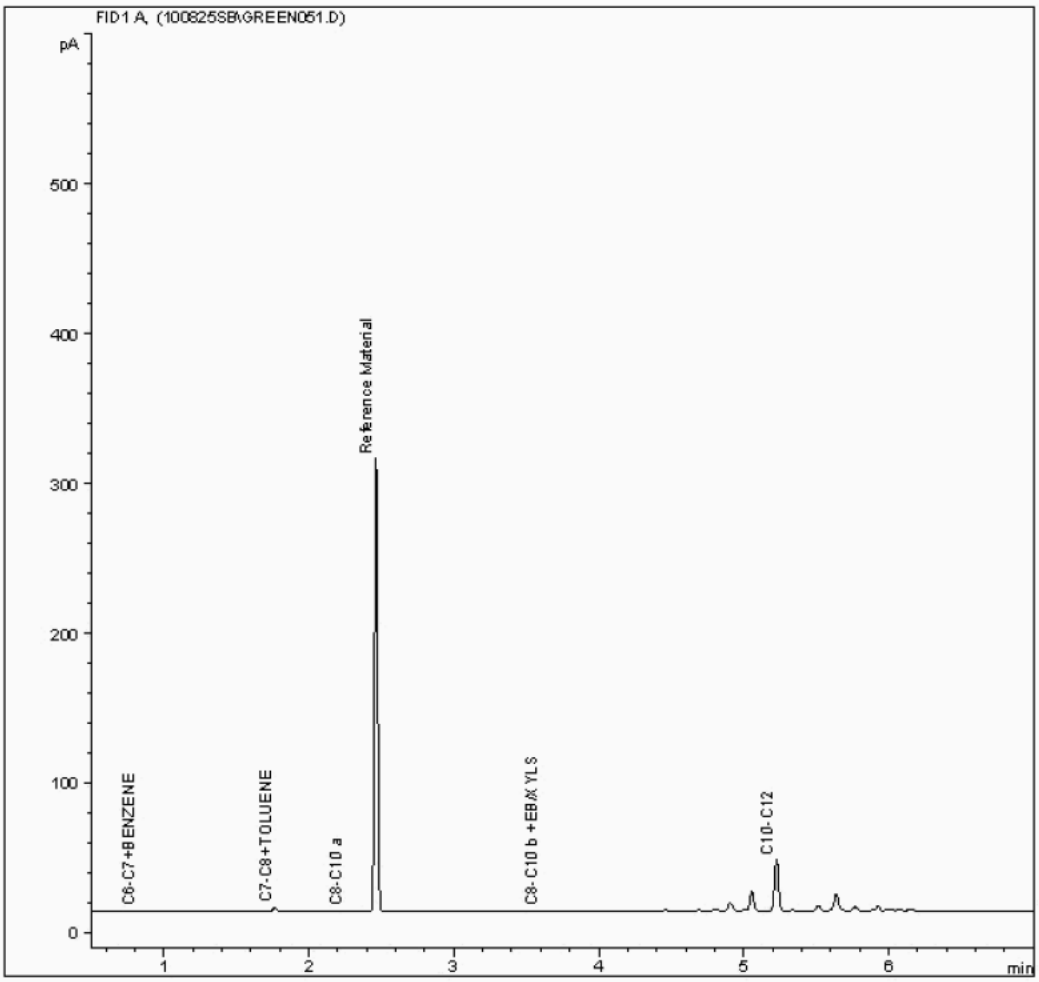
ALcontrol Laboratories Analytical Services

SDG:	100819-53	**Customer:**	ARCADIS Geraghty & Miller
Job:	H_ARCADIS_LEE-24	**Attention:**	[redacted]
Client Ref.:	96010.03	**Order No.:**	
Location:		**Report No:**	96243
Analysis:	GRO by GC-FID (S)	**Sample No**	1974817
		Sample ID	ES4
		Depth	2.00

ALcontrol Geochem Analytical Services
Gasoline Range Organics

Sample Identity : 2090179-1984588
Date Acquired : 26/08/10 06:11:16
Units : ppb
Dilution : 1

#	Compound Name	Amount
1	C4-C6+MTBE	0
2	C6-C7+BENZENE	0
3	C7-C8+TOLUENE	99
4	C8-C10 a	0
5	Reference Material	4393
6	C8-C10 b +EB/XYLS	0
7	C10-C12	4059



APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All material removed during an asbestos containing material screen and analysed for the presence of asbestos will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, the individual sub sample scheduled will be screened in house for the presence of large asbestos containing material fragments/pieces. If no asbestos containing material is found this will be reported as 'no asbestos containing material detected'. If asbestos containing material is detected it will be removed and analysed by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If asbestos containing material is present no further analysis will be undertaken. At no point is the fibre content of the soil sample determined.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. Results relate only to the items tested
13. **Surrogate recoveries** – Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 – 130 %.
14. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
18. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
19. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C4 – C10 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKE	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM	LIQUID/LIQUID SHAKE	GC MS
TRIAZINE HERBS	DCM	LIQUID/LIQUID SHAKE	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	NONE	DIRECT INJECTION	GC FID

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexane Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	WET	HEXANE:ACETONE	Microwave TM218.	GC-MS
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic Compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Identification of Asbestos in Bulk Materials

The results for asbestos identification for soil samples are obtained from possible Asbestos Containing Material, removed during the 'Screening of soils for Asbestos Containing Materials', which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Visual Estimation Of Fibre Content.

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: -

Trace – Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in MDHS 100.

The identification of asbestos containing materials falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-