

HUNTSMAN
PETROCHEMICALS
OLEFINS
Manufacturing Area
Phase 1b/2 IPPC
Site Report





Huntsman Petrochemicals Olefins Manufacturing Area Phase 1b/2 IPPC Site Report

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1.0 Introduction

ABB Eutech was appointed by Huntsman Petrochemicals Ltd to prepare a Phase 1b/2 Baseline Site Report (BSR) in support of an Integrated Pollution Prevention and Control (IPPC) submission for the Olefins Manufacturing Area, Wilton Site, Redcar. A Phase 1a Site Report (ABB Report No ILM078-01) for the Olefins Manufacturing Area has already been issued and should be referred to in conjunction with this report (ref 1).

The Olefins Manufacturing Area consists of three geographically discrete operating areas:

- Olefins 6, Butadiene 3 Plants and 'off plots' storage;
- Wilton Ethylene Control (WEC);
- Central Control.

Figure 1 illustrates the locations of these facilities while area / plant layouts are presented in Figures 2A-2C. The boundaries shown on these figures for the different parts of the installation have been adopted for the Olefins Manufacturing Area IPPC initial site report.

The Olefins 6 plant converts a range of feedstocks into olefins products, mainly ethylene and propylene. By-products include hydrogen, methane, a mixed C4 stream (consisting of a mixture of butadiene and butenes), raw gasoline and fuel oil. The mixed C4 stream is further processed on the Butadiene 3 plant for the extraction of butadiene with a C4 raffinate (butenes) by-product. The raw gasoline is processed on the Gasoline Treatment Unit to produce a range of gasoline components.

Wilton Ethylene Control (WEC) comprises six underground cavities used for storage of ethylene and mixed C4 hydrocarbons, as well as above ground storage of:

- refrigerated butadiene,
- raffinate (butenes),
- naphtha .

Central Control (CC) comprises above ground storage and distribution facilities for a range of feedstocks and products including raw and hydrotreated C5s, paraxylene, dependanced hydrotreated gasoline (DPHG) and raw gasoline.

In terms of potential soil and groundwater contaminant source areas, key features within the plants are as follows:

- Process areas, including linear potential sources which are difficult to delineate in a specific area such as live product intraplant pipelines and effluent drains;
- 2. Bulk Chemical Storage (all above ground with the exception of the underground cavities, which are situated at depths of over 600m below ground level). In particular, earth (usually clay) lined tank bunds;
- 3. Effluent drains, in particular oil water separators;
- 4. Any of 1-3 above where there is evidence of historical spills or leaks.

During the Phase 1a assessment, a number of potential contaminant source areas were identified, all of which fit into groups 1-4 above (see section 3 for summary of Phase 1a assessment). Given that these potential source areas are evenly distributed through the three Olefins operating areas, the site report presents baseline conditions for each area rather than sub-dividing the operating areas further. In the case of Wilton Ethylene control, only part of the geographic area is used actively for storage, in this case, only the active parts of the plant were investigated.

The Olefins Manufacturing Area also operates a number of pipeline systems. Two long-distance ethylene pipelines (the TPEP- Trans-Pennine Ethylene pipeline to Runcorn and the WGEP – Wilton Grangemouth Ethylene Pipeline) are controlled from WEC, although these are not part of the IPPC installation. Additionally a number of interplant pipelines (within the site and to other sites) are operated by Olefins.

Under the new IPPC regulations there is a requirement for a baseline site report (BSR) prior to the award of an IPPC permit by the Environment Agency (EA) to operate certain installations and processes. IPPC permits also stipulate certain compliance conditions such as emission limit values and discharge consents for wastewaters. This report forms the statement of baseline conditions, the baseline site report or BSR. It is based in intrusive investigations and monitoring carried out in Dec 01 – Feb 02 and follow-up monitoring in Feb 03.

To surrender an IPPC permit, an operator is required to produce a closure site condition report (CSR) to document soil and groundwater conditions prior to permit surrender. It is envisaged within the regulations that if there has been a deterioration of the soil or groundwater quality as a direct result of the licensed operations, then the operator may have to remediate the site to the initial site report baseline conditions before the permit can be surrendered.

2.0 Phase 1b/2 Assessment Objectives

The Phase 1b/2 Assessment objectives were to define the initial baseline site conditions as detailed in EA IPPC guidance (ref 2). In particular, the objectives were to:

- Obtain soil and groundwater samples at locations of potential contaminant source areas, up and down assumed hydraulic gradient boundaries and general plant areas;
- Obtain samples during different sampling events (March 2002 and February 2003) to check for concentration variation;
- Conduct the appropriate laboratory analyses that will identify the potential presence of chemicals relating to current site processes in soil and groundwater beneath the site;
- Make a statement as to the baseline conditions on site prior to issue of the IPPC licence.

3.0 Summary of Phase 1a Assessment

3.1 Site Setting

The Wilton International Site is situated on the south side of the River Tees on the river flood plain 4 - 5 km from Teesmouth. It covers an area of approximately 800 hectares in total, with approximately one quarter used as arable farmland and the rest occupied by chemical plant, chemical storage, warehouses, contractor facilities, office space and roads. It measures approximately 3 km from east to west and 3.5 km from north to south. The infrastructure of the site is managed by Enron Teesside Operations Limited (ETOL) who provide most of the central site services.

Land use surrounding the site is as follows:

- To the south and east there is farmland and woodlands and residential areas including, Kirkleatham, Dormanstown and Wilton village (all within 1 km from the site boundary).
- To the north is the Corus Lackenby Works and other generally open industrial land (including various former and current landfill sites);
- To the west are the residential areas of Grangetown and Lazenby village.

Land use surrounding each of the Olefins Manufacturing area plants is as follows (including approximate distances from plant boundaries):

PLANT	NORTH	EAST	SOUTH	WEST
Olefins 6	Du Pont -SA	Site boundary, 300m	Wilton Centre, 200m	Basell
	Polyester	WEC		polypropylene
	Plants, 200m			plant, 250m
				(permanently shut
				down from May
				2002 in process of
	A A A A A A A A A A A A A A A A A A A			demolition in
				October 2002)
WEC	Open land,	Mains Dyke and site	B7 (Off-plot) Storage	Du Pont -SA
	former	boundary, 100m	tanks, 300m from	Polyester Plant,
Parameter State Company	propathene	ETOL pipeline corridor	active areas of WEC	200m
A CONTRACTOR OF THE CONTRACTOR	plants, 100m,	Particular and a second	excluding wellheads	
	Dow Offices,			
	50m		NAME OF THE PARTY	
СС	Site boundary,	Open land, former	Paraxylene IV Plant,	Central Control and
	50m	Petroleum Resins	50m	Paraxylene area
		plant on land adjacent to	Paraxylene V Plant	flare stacks, 100 -
		east. Buffer Tanks,	(south west)	300m, Site
		100m, Mill Race & site		boundary, 300m,
And a control of the		boundary, 300m	New York Control of the Control of t	Lackenby Steel
			Name of the state	plant, 500m

Inter-plant and inter-site pipelines are operated by Huntsman or other businesses and are located on land owned by ETOL. These pipelines transfer materials between producing and/or consuming plants either on Wilton or to and from plants located at North Tees and Billingham.

3.2 Geology

According to published geological information, the Wilton site is underlain by up to 20m of drift comprising glacial and alluvial deposits. The drift deposits overlay a sequence of Jurassic mudstones & siltstones dipping towards the east. The Jurassic mudstones are underlain by a thick sequence of Permo-Triassic deposits including the Sherwood Sandstone Group, marls and anhydrite/halite deposits.

The geological sequence (based on deep boreholes in the Olefins 5 area and published geological information) is summarised below, with depth ranges from ground level:

DRIFT

Glacial & Alluvial deposits

Up to 20m

JURASSIC

Redcar Mudstone Formation (Lias Group) 17m to 94m

Mudstones & siltstones, calcareous sandstones with subsidiary thin limestone (the Calcareous Shales), sandstones and ironstones.

PERMO-TRIASSIC

Penarth Group & Mercia Mudstone Group 19m to 307m

Mudstones and siltstones, with subsidiary sandstones and thin limestones (in Penarth Group).

Sherwood Sandstone Group

307m to 560m

Three informal units differentiated on lithological grounds. Upper unit of silty sandstones; middle unit of poorly to well sorted fine to coarse grained sandstones; lower unit of silty clayey fine grained sandstones.

Roxby Formation

562m to 636m

Formerly known as the Upper Permian Marls

Sherburn Anhydrite

636m to 640m

Mixed marls with anhydrite and halite

640m to 645m

"Boulby" Halite

645 to at least 680m

This rock unit is the layer used for storage of ethylene and mixed-C4s in cavities.

According to geotechnical borehole records reviewed as part of the Phase 1a assessment, made ground deposits and fill materials (where fill is defined as materials placed for engineering purposes) are present associated with foundations, underground services and below ground structures (e.g. interceptors) beneath most areas of the developed areas of the site, especially in areas previously developed for the earlier Olefins plants (i.e. around Central Control for Olefins 1 to 4, Petroleum Resins and within WEC for Olefins 5).

Made ground and fill materials are generally granular and less than 0.5m thick, but have been proved during the Phase 1b/2 investigation to be over 2m thick in some areas, mainly associated with interceptors and footings of large structures (for full Phase 1b/2 ground condition results – see section 5).

The drift deposits comprise predominately stiff boulder clays and undifferentiated clays. Geotechnical boreholes and the Phase 1b/2 investigation encountered sand lenses within the drift deposits, these were mainly encountered beneath Olefins 6. The drift deposits generally thin northwards to less than 3m close to the northern boundary of Central Control. The drift deposits encountered by the Phase 1b/2 site investigation are further discussed in Section 5.0. The Phase 1b/2 investigation only proved the Lias Group in Central Control.

3.3 Hydrogeology

Perched groundwater is typically present in made ground and fill materials above clay deposits. Groundwater is also present within sand lenses with the boulder clay sequence. Laterally continuous sand lenses were only encountered beneath Olefins 6.

Groundwater flow in the drift deposits and made ground/fill is likely to be northerly, which is consistent with the topographical gradient towards the River Tees. However, these groundwaters are likely to be influenced locally by the presence and distribution of made ground, permeable sand lenses or sandy partings within the clay dominated drift deposits and potential leakage of utilities (e.g. cooling water, potable water, drainage).

The Lias Group is classified by the EA as a non-aquifer, although the Calcareous Shales, sandstones and ironstones are expected to contain groundwater. The Penarth group is also classified as a non-aquifer. The Mercia Mudstone is effectively a non-aquifer, although it can yield limited quantities of groundwater for domestic or small-scale agricultural use in other areas.

The Sherwood Sandstone Group is classified as a major aquifer. The underlying Permian deposits are non-aquifers. The area is classified as a non-aquifer on the EA groundwater vulnerability map based on the presence of drift deposits and the Lias Group at or near-surface.

Environment Agency records indicate that there are no groundwater (source) protection zones on site or in the surrounding area and that there are no licensed groundwater abstractions within a 2 km radius of the site. Given the geological conditions of the Wilton area, impacts to groundwater abstractions at distances greater than 2km from the site due to on-site contaminant source areas are considered unlikely (see conceptual site model, Section 6). The local authority environmental health department report that they are not aware of any unlicensed private abstractions in this area.

3.4 Hydrology

Within the developed areas of the site, surface water run-off is generally collected by site-specific drainage systems (complete with necessary interceptors or other treatment facilities, where appropriate).

Outside of the process areas, surface water runoff collects in various drainage ditches and is either passed to soak-away, intercepted by site drainage systems, or fed into one of the watercourses running through the site. Plant drainage systems include sub-surface land drains (e.g. within earth bunds), which discharge to the plant, and then site drainage systems. Older land drains associated with the previous agricultural land use may also be present with overall flow direction expected to be towards the north.

In addition to the drainage ditches, named watercourses at the site include:

- Kettle Beck. This runs inside the western boundary and leaves the site at the west end of the northern boundary,
- Mains Dike. This enters and runs alongside the eastern boundary of the site to link into the Mill Race that leaves the site at the east end of the northern boundary to run north to northwest to the River Tees.

The surface water drainage ditches and streams are too small to be classified under the EA General Quality Assessment (GQA) scheme. The River Tees is not classified under the GQA scheme, as it is tidal in this area. Although there has been considerable improvement in the water quality of the Tees Estuary in recent years, the EA reported that water quality was poor for the stretch between the Tees Barrage to the Teesport area in 1999 (EA website, Water Quality on Teesside Report; May 2002). However, it is estimated that approximately 26,000 migratory fish (salmon and sea trout) passed through the estuary in 1999.

Environment Agency records indicate that there are no licensed surface water abstractions within a 2 km radius of the site. Abstractions beyond this distance are unlikely to be impacted by contaminant migration in normal operating conditions.

3.5 Site Layout and Description

The layout of Olefins 6, Wilton Ethylene Control and Central Control is shown in Figures 2A to 2C of this report.

A summary of the operations in each area is provided in the introduction to this report (Section 1) and in greater detail in the Phase 1a Assessment Report (ABB Report No ILM078-01, ref 1).

3.6 Source Pathway-Target relationships

3.6.1 Potential Sources

A number of areas have been identified as potential sources of contamination, these are listed below: (from Phase 1a Assessment)

Table 1A. Potential Sources for Olefins 6 Area

POTENTIAL SOURCE AREA REFERENCE FIGURE 2A	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
S1	Day Tanks Area: Caustic, Petrinex, Fuel oil, naphtha
S2	Caustic oil water separator, general oils, caustic soda
S3	Olefins 6 Oil water separator: General hydrocarbons, Red oil, recovered oil, light oil
S4	General hydrocarbons
S5	F1705 catchpot, "flushing oil"
S6	H,J, K, P Furnaces: Liquid hydrocarbons
S7	Storage tanks in west : GTU Petrol Product, Gasoline,
	Benzene, Topanol
S8	J1702 / J1703 Lube oil
S9	F1721, gasoline
S10	Butadiene 3, N-methyl pyrrolidone
S11	Heat exchangers, naphtha
S12	Flare knock out drum, gasoline : potential leakage
S13	Plant link / vein lines, gasoline - reported gasoline leaks south east of control room

POTENTIAL SOURCE AREA REFERENCE FIGURE 2A	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
S14	Flare area, gasoline, potential drainage of drum bottoms to ground
S15	Equipment wash bay / oil water interceptor
S16	B7 / Off-plots area, gasoline, naphtha

Table 1B. Potential Sources for Wilton Ethylene Control Area

POTENTIAL SOURCE AREA REFERENCE FIGURE 2B	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
WEC: S1	BF5 tank, Naphtha
WEC : S2	Visible localised compressor oil & RBS oil water
	separator, general oils
WEC: S3	WEC Oil water separator, general oils

Table 1C. Potential Sources for Centrol Control Area

POTENTIAL SOURCE AREA REFERENCE FIGURE 2C	POTENTIAL SOURCE AREA & POTENTIAL CONTAMINANT
CC : S1	Bf2 bund: DPHG/Paraxylene,
CC : S2	Nf 1 bund, Hydro treated or Raw C5s
CC : S3	Former Leaking Valve, (Discounted)
CC : S4	Southern Oil-Water Separator, general oils, Paraxylene
CC : S5	Northern Oil-Water Separator, general oils
CC : S6	Nf 48 tank, Light Reject Naphtha (C5, C6, olefins, 17% hexane, 2% benzene) & former benzene tank

3.6.2 Potential Pathways and Receptors

Potential receptors of contamination from the three operating areas which make up the Olefins Manufacturing area, and potential contaminant migration pathways which may link the potential contaminant source areas to these receptors are listed below:

- On-site workers involved in excavation works in source areas (e.g. interceptors)
 this scenario could be managed through appropriate site health and safety procedures;
- Off-site workers down gradient of the plants involved in excavation could be exposed to contaminants migrating north in shallow groundwater within the permeable made ground, sand/gravel horizons within the drift deposits and former land drains dating from the period when the land was used for agricultural purposes. However, most of these land drains will no longer be operative due to their age and the subsequent development of the site which will have damaged or removed these features. Given the likely discontinuous nature of the shallow groundwater deposits, this pathway is considered unlikely to be operating to a significant extent;
- Surface watercourses to the east including The Mill Race and Mains Dyke.
 However, drainage from the plants is unlikely to reach these receptors due to the
 discontinuous nature of shallow groundwater flow and the fact that plant drainage
 would intercept surface water flow before contaminants could reach these
 receptors;
- The River Tees estuary. Contaminated water within permeable surrounds of the plant drains and the main site drainage system and former land drains (potential preferential pathways) could migrate into Dabholme Gut (discharges within the drains are regulated through the EA-registered discharge consent). This pathway is also considered unlikely to be operative due to the large distance that contaminants would have to travel within the drainage surrounds to reach Dabholm Gut (1.5km). In addition, the drainage system includes sumps and manholes which are likely to provide barriers to the permeable surrounds of the plant and site drains as this permeable material does not extend to the surrounds of the manholes and sumps which are likely to be installed within natural clay;
- Deeper groundwater deposits are not considered to be at risk of impact from site contaminants due to thick, low-permeability, non-aquifers which are present beneath the site.

4.0 Intrusive Investigation

4.1 Programme of Intrusive works

The investigation work was divided into the following work elements:

- Shallow soil sampling using percussion driven window-sampling techniques at over 32 locations to depths of up 4m below ground level (mbgl).
- Installation of 35mm diameter PVC groundwater monitoring wells into eleven selected window sample bores.
- Near surface soil sampling from hand dug trial pits at two locations within a tankage bund at WEC.
- Installation of 50mm diameter groundwater monitoring wells into 22 bores constructed using a JCB mounted solid/hollow stem rotary auger drilling rig to depths of up to 8 mbgl.
- Borehole logging and on-site PID headspace testing.
- Soil sampling for laboratory analysis.
- Monitoring well gauging.
- Groundwater sampling for laboratory analysis in March 2002 and February 2003.

The site works were performed under the Huntsman work permit system. The intrusive locations were cleared for underground services and structures by Huntsman under the Huntsman excavation certificate system.

The drilling and monitoring well installation works were undertaken by a specialist environmental drilling sub-contractor, Cape Site Services Limited, under the supervision of WD Environmental Limited and ABB Eutech.

Borehole logging, on-site soil testing and soil sampling was undertaken during the period 4th December 2001 to 31st January 2002. Groundwater sampling was undertaken during the period 25th March 2002 to 4th April 2002 and 3rd to 6th February 2003.

4.2 Sampling Strategy

Borehole and well locations are presented on Figures 3A-3C and tabulated below. The locations of each intrusive sampling point were selected to:

- Target potential historical sources
- Target specific and general process areas
- Achieve overall geographic site coverage
- Provide coverage up & down groundwater gradient of main plant areas
- Sample groundwater wells at different times in order to present a baseline from more than a single sampling event

It is noted that no groundwater monitoring wells were installed within earth bunds due to the possibility of providing a vertical migration pathway and compromising the integrity of the bund. No drilling at all took place in certain hazardous process areas and in concrete bunds or within 1m of major underground services.

Sampling locations, reference numbers, drilling techniques and installations are summarised below:

Olefins 6

Table 2A. Sampling locations, techniques and installations for Olefins 6 Area

WINDOW	WELL	ROTARY AUGER	WELL
SAMPLING	INSTALLATION	DRILLING	INSTALLATION
OL101	No	OL201	50mm PVC
OL102	35mm	OL202	50mm PVC
OL103	35mm	OL203	35mm
OL104	35mm	OL204	50mm PVC
OL105	No	OL206	50mm PVC
OL106	No	OL207	50mm PVC
OL107	35mm	OL208	50mm PVC
OL108	No	OL210	50mm PVC
OL109	No	OL211	50mm PVC
OL110	No	OL212	50mm PVC
OL111	No	OL213	50mm PVC
OL114	35mm	OL214	50mm PVC
- OL115	35mm	OL215	50mm PVC
		OL217	50mm PVC

Wilton Ethylene Control

Table 2B. Sampling locations, techniques and installations for Wilton Ethylene Control Area

WINDOW	WELL	ROTARY AUGER	WELL
SAMPLING	INSTALLATION	DRILLING	INSTALLATION
WEC101 (Hand Dug)	No	WEC201	50mm PVC
WEC102 (Hand Dug)	No	WEC203	50mm PVC
WEC103	35mm	WEC204	50mm PVC
WEC105A	No	WEC104	50mm PVC
WEC105B	35mm		
WEC202	No	7.77-03000000000000000000000000000000000	

Central Control

Table 2C. Sampling locations, techniques and installations for Central Control Area

WINDOW	WELL	ROTARY AUGER	WELL
SAMPLING	INSTALLATION	DRILLING	INSTALLATION
CC101	No	CC201	50mm PVC
CC102	No	CC202	50mm PVC
CC103	No	CC203	50mm PVC
CC104	No	CC204	50mm PVC
CC105	35mm		
C106	No		
CC107	No		
CC108	No		
CC109	35mm		
CC110	No	Name (See also and a see also and a	
CC111	No		
CC111A	No		
CC112	No		
CC113	35mm		
CC114	No		

As previously mentioned, the areas that were identified by the Phase 1a assessment as being potential contamination sources are detailed in Tables 1A-1C. In order to establish the rationale between the potential sources in Phase 1a and the sampling strategy of Phase 1b/2, Tables 3A-3C show potential source areas together with their corresponding sampling locations.

Table 3A. Sampling locations and corresponding source area / potential contaminants for Olefins 6 Area

POTENTIAL SOURCE AREA	BH NO (S)	POTENTIAL SOURCE AREA
	511110 (3)	AND POTENTIAL
S1	OL101, OL205, OL206	CONTAMINANTS
\	OL101, OL203, OL208	Day Tanks Area: Caustic,
S2	OL105	Petrinex, Fuel Oil, Naphtha
J	OL 105	Caustic oil water separator:
S3	01107 01100 01010	general oils, caustic soda
	OL107, OL108, OL212	Olefins 6 oil water separator:
		general hydrocarbons, red oil,
S4	01404 01000	recovered oil, light oil.
S5	OL104, OL209	General hydrocarbons
S6	-	F1705 catchpot: 'flushing oil'
56	OL103, OL207, OL208	Furnace area: general
07		hydrocarbons
S 7	OL211	Storage tanks in west: GTU
		Petrol Product, Gasoline,
00		Benzene, Topanol
S8	No access possible for safety	J1702 / J1703: Lube oil
00	reasons	
S9	OL215	F1721: Gasoline
S10	OL109	Butadiene 3, N methyl
	,	pyrrolidone
S11	OL106, OL210	Heat exchangers, naphtha,
		Quench oil, localised oil staining
010		on ground
S12	OL115	knock out drum, gasoline :
040		potential leakage
S13	OL213	Plant link / vein lines, gasoline -
		reported gasoline leaks south
044		east of control room
S14	OL115	Flare area, gasoline, potential
All regions and the second sec		drainage of drum bottoms to
04-		ground
S15	OL201	Equipment wash bay / oil water
		interceptor
S16	OL110, OL111, OL112, OL216,	B7 / Off-plots area, gasoline
	OL217	
	OL214, OL202, OL203, OL204	Up-gradient and down gradient
		coverage

Table 3B. Sampling locations and corresponding source area / potential contaminants for Wilton ethylene Control Area

POTENTIAL SOURCE AREA	BH NO (S)	POTENTIAL SOURCE AREA
		AND POTENTIAL
		CONTAMINANTS
S1	WEC101, WEC102, WEC201,	BF5 tank, Naphtha
	WEC203	
S2	WEC103, WEC105	Visible localised compressor oil
		& RBS oil water separator,
		general oils
S3	WEC104, WEC202	WEC Oil water separator,
		general oils
-	WEC 204	Down gradient coverage

Table 3C. Sampling locations and corresponding source area / potential contaminants for Central Control

POTENTIAL SOURCE AREA		
POTENTIAL SOUNCE AREA	BH NO (S)	POTENTIAL SOURCE AREA
		AND POTENTIAL
		CONTAMINANTS
S1	CC101, CC102, CC106, CC107,	Bf2 bund : gasoline/para Xylene,
	CC108, CC110	C5s
S2	CC103	Nf 1 bund, Hydro treated C5s
S4	CC109	Southern Oil-Water Separator,
		general oils
S 5	CC203	Northern Oil-Water Separator,
		general oils
\$6	CC104	Nf 48 tank, Light Reject Naphtha
		(C5, C6, olefins, 17% hexane,
		2% benzene) & former benzene
		tank
	CC202, CC204	Down gradient coverage

Due to access restrictions, underground obstruction and underground services, it was not possible to complete the boreholes at the following locations (all located in Olefins 6):

- OL105 Concrete encountered at a depth of <1mbgl
- OL112 Underground Services
- OL113 Underground Services
- OL205 Underground Services
- OL209 Concrete encountered at a depth of <1mbgl
- OL216 Concrete encountered at a depth of <1mbgl

4.3 Field Methods Used During Intrusive Site Works

4.3.1 Borehole Drilling

The window-sampling rig comprised a hand-held hydraulic drive hammer unit powered by a remote portable diesel unit (complete with Chelwyn valves & spark arrestors) and operated by a two-man drilling crew. The rig advanced steel window sample tubes of 60mm (reducing to 36mm diameter) and 1m to 1.2m in length to depths of up to 4 mbgl. Removal of the sample tubes was achieved via a hydraulic jacking unit (using the same power unit) to provide undisturbed soil profile cores. Soils were then accessed through open sections along the length of each window sampler tube.

The rotary auger rig comprised a drilling mast mounted on a JCB-type excavator. The drill rig was diesel-hydraulic powered and fitted with a spark arrestor and Chelwyn valve. The drill rig is capable of utilising hollow stem augers and solid continuous augers. All the augers were 1.5m in length. The hollow stem augers had a nominal outside diameter of 400mm and a nominal internal diameter of 200mm. The solid stem augers had a nominal outside diameter of 100mm.

Where the ground surface was concrete, a corer was used to cut an access hole to allow access for the drilling equipment. Power for the coring unit was provided by an 110V direct diesel generator fitted with spark arrestor and Chelwyn valves.

Down-hole drilling tools were cleaned with a water washer between drilling locations. The location of the wash down area was agreed with Huntsman operational staff.

4.3.2 Soil Sampling and Field Testing

The soil profile at each location was logged in accordance with BS 5930:1999.'Code of Practice for Site Investigations'. Soil samples were screened on-site for total ionisable volatile organic compounds (VOCs) using a 10.2 eV photo-ionisation detector (PID). Each location was photographed during the investigation and selected images of the locations are presented in Appendix A.

During borehole construction, disturbed soil samples were selected for possible subsequent laboratory analysis. The samples were placed in laboratory-supplied containers at the sampling location. The types of sample container utilised varied according to the type of analysis required, as shown below:

- 125 ml Glass Vial Petrol Range Organics (PRO) & VOCs
- 500 ml Glass Amber Wide Mouthed Jar Other Organic Analyses
- 250 ml Plastic Tubs Metals

The selection of samples for possible subsequent laboratory analysis was made by the environmental engineer at each location based on the requirements of the sampling strategy, surrounding structures & processes, bore depth, lithological sequence, visual inspection, olfactory evidence, PID readings and the need to provide analytical results from different soil types across the site. Details of the soil sampling schedule are presented in Tables 4A-4C.

The samples were stored in cooler boxes and transported to the laboratory by arranged courier under chain of custody documentation.

To provide flexibility in sample selection for actual analysis, samples were often recovered from a number of depths and lithologies within a specific borehole. Again, sample selection was made on a location specific basis.

Borehole logs, including details of the PID screening, soil sampling for laboratory analysis and water strikes, are presented in Appendix B. The monitoring well completion details are summarised on the borehole logs.

4.3.3 Monitoring Well Installation

On completion of the window sampling, selected window sample locations were completed as 35mm diameter monitoring wells comprising PVC slotted well screen, PVC plain standpipe, 1mm to 2mm filter sand, bentonite seals and steel monitoring well covers.

The window bores to be completed as wells were selected on the basis of the sampling strategy, surrounding structures & processes, location of adjacent wells & boreholes, bore depth, lithological sequence, visual inspection, olfactory evidence, PID readings and the need to provide well coverage across the site. A list of narrow diameter monitoring wells is presented in Tables 2A-2C (section 4.2 above).

Window sample bores not completed as monitoring wells were backfilled and sealed with bentonite and concrete as required.

On competition of rotary auger drilling, the bores were completed as 50mm monitoring wells comprising PVC slotted well screen, PVC plain standpipe, 1mm to 2mm filter sand, bentonite seals and steel monitoring well covers. A list of standard diameter monitoring wells (i.e. 50mm) is presented in Tables 2A-2C (section 4.2 above).

All wells were designed on-site on a borehole specific basis according to sampling strategy, lithologies, groundwater strikes, potential contamination encountered, surrounding structures & processes, location of adjacent wells & boreholes and investigation objectives.

The borehole logs, including details of water strikes and well installations, are presented in Appendix B.

4.4 Groundwater Monitoring and Sampling

All the installed monitoring wells were gauged relative to top of well casing (TOC) and ground level using a water-product interface meter. The wells selected for groundwater sampling are detailed in Tables 5A-5C.

Due to the lack of groundwater recharge into the wells selected for sampling, it was not possible to "purge" the wells completely prior to sampling and only half to one well volume of groundwater was typically removed prior to sampling. Disposable bailers were used for purging and sampling. Prior to purging, the wells were gauged using a product interface meter.

Groundwater samples were placed in laboratory supplied containers and labelled with a unique ID, date & location. The type of sample container utilised varied according to the type of analysis required, as shown below:

- 125 ml Glass Vial Petrol Range Organics (PRO) & VOCs
- 1000 ml Glass Amber Winchester Style Bottles Other Analyses

The samples were stored in cooler boxes and transported to the laboratory by laboratory arranged couriers under chain of custody documentation

4.5 Selection of Analytical Determinants

The selection of analytical determinants for samples from particular boreholes was guided by the findings from intrusive works and the Phase 1a Assessment (ref 1). The soil and water analyses were submitted to Alcontrol of Chester. The rationale for the sampling strategy is described in Section 4.3.2

Selected soil and groundwater samples were scheduled for the following determinants:

- Benzene, toluene, ethyl-benzene and xylenes (BTEX) by GC/FID
- Petroleum Range Organics (PRO) by GC/FID
- Diesel Range Organics (DRO) by GC/FID
- Volatile organic compounds (VOC) by GC/MS
- Semi volatile organic compound (SVOC) by GC/MS
- Heavy metals suite (arsenic, cadmium, total chromium, copper, lead, mercury, nickel, zinc, selenium) by ICP OES
- Water soluble Boron by colorimetry

Details for the schedule of analyses for the soil and groundwater samples are given below in Tables 4A-4C and 5A-5C respectively.

Table 4A - Olefins 6 Soil Analytical Suite

Sample Identity	Depth (m)	DRO by GC/FID	PRO by GC/FID	BTEX by GC/FID	SVOC inc TIC by MS	VOC inc TIC by MS	ICP Heavy Metals	Boron (H2O Sol)
QL101 D1	0.20		X	Х			metars	301)
OL101 D2	0.10-0.20	Х						
OL101 D3	3.25		X	V	***************************************			
OL101 D5	3.20-3.50	X	<u> </u>	X				
OL102 D1	1,20		X	X			X	 X
OL102 D4	1.80-1.90		X					
OL102 D5	1.70-1.90	×		X				
OL103 D1	0.05							
OL103 D3	0.00	X	X	X				
OL103 D6	1,40-1,50							<u> </u>
OL103 D0	3.40-3.50		X	X				
OL104 D3			X	X	·			
OL104 D3 OL105 D1	3.00-3.40 0.40	X						Property of the Control of the Contr
OL105 D1 OL105 D2			X	X				
	0.30-0.40	X			X		X	X
OL106 D1	1.40-1.50	X	Per		X		X	X
OL106 D2	1.60		X	X				
OL107 D1	1.70-1.80		X	X				
OL107 D3	1.60-1.90	X			X		X	X
OL108 D4	2.40		X	X				
OL108 D6	2.30-2.50	X					X	X
OL109 D1	0.20					X		
OL109 D2	0,20-0,30				X			
OL110 D2	0.15		X	X				
OL110 D3	0.10-0.20	-x						
OL111 D1	0.55		X	X				
OL111 D3	0.50-0.60	X			X		X	X
<u> QL114 D1</u>	0.10-0.20	X					X	Х
QL114 D2	2.50		X	X				
OL115 D1	1.60		X	X				Millionide III Sommon consistentime designation
OL115 D3	1.50-1.60	X					x	X
OL115 D4	2.90		Х	X	- Constitution of the Cons			<u> </u>
OL201	4.20-4.50	X	X	Х	1000			i
OL202 D1	1.40-1.50	X		- Landard Control			TOTAL SERVICE	Traction (the International State of the Interna
OL202 D2	1.40		X	x				*** (*) *******************************
OL203 D1	1.50-1.60							
OL203 D2	1.50		X	x				
QL204 D2	5.40-5.70	x	X	X				
OL206	4,40-5,00		X	$\stackrel{\wedge}{x}$				***************************************
OL208	3,00-3.50	X	X	X			_X	X
OL210	0.3 - 0.4	X		\rightarrow				
OL214 D1	2.40-2.50	X						
OL214 D2	2.90							

Table 4B - WEC Soil Analytical Suite

Sample Identity	Depth (m)	DRO by GC/FID	PRO by GC/FID	BTEX by GC/FID	SVOC inc TIC by MS	VOC inc TIC by MS	ICP Heavy Metals	B (H2O Sol)
WEC 103	0.60-	Х				0		
WEC 103	0.60		Х	X				
WEC 104	0.10-	X		Andreas				
WEC 104	0.30		X	Х				
WEC 104	1.70-	Х	OF STATE OF		X		×	X
WEC104	4.50-	Х	Х	Х	The state of the s	X	No.	
WEC 105	2.10		X	Х				
WEC201	5.00-	X	X	X	``		X	\overline{x}
WEC203	4.50-	X	X	X		X		
WEC204	7.50-	X				4	X	X

Table 4C - CC Soil Analytical Suite

Sample Identity	Depth (m)	DRO by GC/FID	PRO by GC/FI	BTEX by GC/FID	SVOC inc TIC by MS	VOC inc TIC by MS	ICP Heavy Metals	B (H2O Sol)
CC101 D1	0.10-	X	D					
CC101 D2	0.40		X		X		X	X
CC101 D4	0.80		^X	X				
CC101 D6	1.70		X	1				
CC101	0.70-	X		X				adiya kirani karaja mine eksinda in Kara kara kara karaji kiraki karaki karaji kara
CC102 D1	0.30		X	X	X		X	<u> </u>
CC103 D1	0.15		X	X X				
CC103 D3	0.10-	X						
CC105D1	2.80		Х	X				
CC105 D2	2.70-	X		\longrightarrow				
CC106 D1	0.45		×	X				
CC106 D2	1.80		X	X				
CC107 D1	0.30		X	$\begin{array}{c c} & & \\ \hline & x & \end{array}$				
CC108 D1	1.40		X	$\frac{\lambda}{x}$				
CC 109 D2	1.60-	X						
CC109 D3	1.90		x	X			X	X
CC109 D4	2.80-	X						
CC110 D1	0.20		X	X			X	X
CC111 D1	0,10		X	X				
CC111 D3	0.05-	X						
CC112	1.10-	X						
CC112	1.10		X	X				
CC113	0.60-	Х		Name of the last o				
CC113	0.70	- Control of the Cont	X	X				
CC201	2.30-	Х	X	X	X	X	×	
CC201	3.50-	X	χ	X				X
CC202	5.50-	X					X	
CC203	0.00-	X	_x	_ x			X	X

Table 5A. Olefins 6 Groundwater Analytical Suite

Sample Identity	1	O by /FID	}	O by :/FID		EX by /FID	SVOC inc	VOC inc TIC	Metals
Date	Mar	Feb	Mar	Feb	Mar	Feb	Mar 02	Mar 02	Mar 02
	02	03	02	03	02	03			14,00, 02
OL102	X	Х	X	Х	Х	Х			X
OL104	X	Х	Х	Х	Х	Х	X	Х	
OL107	Х		Х		Х		X	X	· X
OL114	Х	Х	Х	Х	Х	Х	Х	X	
OL201	Х		Х		Х		X	X	X
OL204	Х	Х	Х	Х	Х	Х			
OL206	Х	Х	Х	Х	Х	Х			
OL207	Х	Х	Х	Х	Х	Х	X	X	X
OL208	Х		Х		х				
OL211	Х	Х	Х	Х	Х	X			
OL213	Х	Х	Х	Х	Х	X			
OL214	Х	Х	Х	Х	X	X			
OL215	Х		Х		X		X	X	V
OL217	Х		Х		Х		X	X	×

Table 5B. Wilton Ethylene Control Groundwater Analytical Suite

00	FID	GC/	D by FID		X by /FID	SVOC inc	VOC inc TIC	Metals
ar	Feb	Mar	Feb	Mar	Feb	Mar 02	Mar 02	Mar 02
2	03	02	03	02	03			
	PR	Χ	PR	X	PR	X	X	
(Х		Χ				×
		Х		Х				
		Х						X
	ar	2 03 PR	2 03 02 C PR X X X	2 03 02 03 C PR X PR C X	2 03 02 03 02 C PR X PR X C X X	2 03 02 03 02 03 02 03 (C PR X PR X PR X X X X X X X X X X X X X	ar Feb Mar Feb Mar Feb Mar 02 2 03 02 03 02 03 4 PR X PR X 4 X X X	ar Feb Mar Feb Mar Feb Mar 02 Mar 02 2 03 02 03 02 03 4 PR X PR X X 4 X X X X

PR = product sample analysed

Table 5C. Central Control Groundwater Analytical Suite

Sample Identity	1	O by /FID	1	O by C/FID		X by /FID	SVOC inc	VOC inc TIC	Metals
DATE	Mar	Feb	Mar	Feb	Mar	Feb	Mar 02	Mar 02	Mar 02
	02	03	02	03	02	03			
CC104	Х		Х		Х				
CC105	Х		Х		Х		· · · · · · · · · · · · · · · · · · ·		
CC109	Х	Х	Х	Х	Х	Х	X	X	X
CC113	Х	Х	Х	Х	Х	Х			
CC201	Х		Х		Х				
CC202	Х		Х		Х		Х	X	X
CC203	Х	Х	Х	Х	Х	X	X	X	X
CC204	Х		Х		Х		X	X	X

4.6 QA/QC procedures

4.6.1 Field

Field methods and procedures used on site were based on accepted industry standards (e.g. BS 5930, 10175, refs 3 and 4) and were detailed in the project method statements (ref 5).

All soil and water samples were given a unique reference that included the site reference, sampling location, date of sampling and name of sampler. Samples were placed in cooler boxes with ice packs. Cooler boxes were transported to the laboratory by couriers under chain of custody documentation. Details of the chain of custody sheets are presented in Appendix C.

4.6.2 Laboratory

The laboratory providing the analytical services was Alcontrol of Chester, who are accredited by UKAS (United Kingdom Accreditation Service) for all methods used in this investigation. UKAS provides a standard for accuracy, precision, reproducibility and general competency based on approved methods and procedures.

As part of their standard QA/QC procedures, every fifth sample is run in duplicate by the laboratory, but not reported to provide a check on the reliability of the analytical results. The use of certified materials under the WRC (Water Research Council) laboratory proficiency programme allows checking for bias within the testing for all methods. The results of the proficiency testing of Alcontrol for the period in which the samples were analysed along with method summaries are detailed in Appendix C.

5.0 Investigation Results

5.1 Intrusive Investigation

5.1.1 Ground Conditions

The lithologies encountered in each of the areas are summarised in Tables 6A to 6C and presented on the borehole logs in Appendix B.

Table 6A - Summary of Lithologies Encountered in Olefins 6

LITHOLOGICAL UNITS	DESCRIPTION	DEPTH TO BASE MBGL	THICKNESS MIN TO MAX
Made Ground	Sometimes absent. When present it is mainly associated with structures. Composition variable from clayey gravel to gravelly clay. Where made ground is thicker, it often contains perched groundwater (e.g. interceptors)	0m to 1.8m	0m to 1.8m
Clay Drift Deposits	Predominately stiff red-brown to brown sandy gravelly clay (Boulder Clay). Sandy clays up to 0.8m thick present in some bores. Rare minor groundwater seepages associated with sandy partings	> 6m	> 5.5m
Sand Drift Deposits	A laterally extensive water bearing strata found in most boreholes across Olefins 6 typically comprising a silty fine to medium sand lens within the boulder clay sequence	2.7m to > 5.7m	0.2m to > 1.8m
Lias Group	Not encountered	Not Proven	Not Proven

Table 6B - Summary of Lithologies Encountered in Wilton Ethylene Control

LITHOLOGICAL	DESCRIPTION	DEPTH TO BASE	THICKNESS
UNITS		MBGL	MIN TO MAX
Made Ground	Often absent. When present it is associated with structures, especially around the interceptors. Composition variable from clayey gravel to gravelly clay. Where made ground is thicker, it often contains perched groundwater	0m to 2.2m	0m to 2.2m
Drift deposits	Predominately stiff red-brown to brown sandy gravelly clay (Boulder Clay). Sandy clay up to 1.3m thick present at depth (c.5m) in WEC-201 & WEC-203 Rare minor groundwater seepages associated with sandy partings	> 7.8m	> 7m
Lias Group	Not encountered	Not Proven	Not Proven

Table 6C - Summary of Lithologies Encountered in Central Control

LITHOLOGICAL UNITS	DESCRIPTION	DEPTH TO BASE MBGL	THICKNESS MIN TO MAX
Made Ground	Often absent. When present it is associated with structures, especially around the interceptors. Composition variable from clayey gravel to gravelly clay. Where made ground is thicker, it often contains perched groundwater (e.g. interceptors)	0m to 2.7m	0m to 2.7m
Drift deposits	Predominately stiff red-brown to brown sandy gravelly clay (Boulder Clay). Sandy clays up to 0.8m thick present in some bores. Rare minor groundwater seepages associated with sandy partings	3.3 to > 5.5m	2.4 to > 5.5m
Lias Group	Possibly strong grey Mudstone	Proved in CC202 & CC204	Not Proved

5.2 Field Evidence of Contamination

Qualitative evidence of hydrocarbon related soil and groundwater contamination (based on headspace screening and soil condition) is summarised in Table 7 below. The results of the headspace tests in ppm by volume (ppm(v)) are presented on the borehole logs in Appendix B.

With the exception of oil product identified in WEC105B in February 2003 and minor contamination in OL103 (oily sheens up to 0.3m), no gross hydrocarbon impact was encountered in the boreholes constructed in Olefins 6 and WEC. Field evidence of contamination was observed in the boreholes constructed in Central Control in made ground and clay deposits in the following areas:

- Main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201)
- Interceptor adjacent to the northern boundary of Central Control (CC203)
- In the parts of the main tankage bund (CC101 and CC 111)

Table 7 – Field Evidence of Contamination in Olefins 6 and Central Control

BOREHOLE	DEPTH (MBGL)	DESCRIPTION	QUALITATIVE ASSESSMENT	NOTES MAX. PID PPM (V)*
OL-103	0.0 - 0.5	Made Ground & Clay	Oily Sheens	46 ppm (v)
CC-101	0.0 - 0.8	Made Ground & Organic Clay	Sheens & strong petrol odours	81 ppm (v)
CC-105	1.5 - 2.5	Made Ground	Sheens & very strong petrol odours	489 ppm (v)
CC-109	0.5 - 2.7	Made Ground	Oily product & strong solvent odours	380 ppm (v)
CC-111	0.025	Made Ground	Petrol odours	66 ppm (v)
CC-113	0.4 - 1.0	Sandy Gravelly Clay	Impacted by hydrocarbons	955 ppm (v)
CC-201	2.0 - 3.5	Sandy Gravelly Clay	Very strong hydrocarbon & solvent odours	2,500 ppm (v)
CC-203	0 – 1.5	Made ground and slightly gravely sandy clay	Shallow groundwater impacted by oily hydrocarbons	Unable to measure due to natural soils being impacted by perched contaminated waters



5.3 Groundwater Monitoring

The results from the groundwater gauging of the monitoring wells are presented in Table 8A - 8B.

Groundwater in Central Control and WEC was mainly related to made ground and sandier horizons within the boulder clay sequence. The groundwater flow direction in these areas is likely to be locally influenced by site drainage systems. The effect of potential leaks (e.g. fire water ring mains and process waters) on groundwater levels and water balance is also likely to be locally significant.

Groundwater at Olefins 6 was present within a laterally persistent sand lens encountered at depths of between 2 mbgl and 6 mbgl. The monitoring data suggest that the groundwater is confined or semi-confined. Perched groundwaters were also encountered within made ground deposits. The groundwater flow direction is likely to be locally influenced by site drainage systems. The effect of leaks on groundwater levels and water balance is also likely to be significant.



Table 8A – Summary of Groundwater Monitoring Field Results (March 2002)

WELL	WELL DIAMETER	WELL DEPTH	DEPTH TO WATER	COMMENTS
			(MBGL)	
CC105	35mm	2.9m	1.390	Oily sheens
CC109	35mm	2.9m	1.070	Slight sheens
CC113	35mm	2m	0.620	Oily sheens
CC201	50mm PVC	3.5m	1.035	Slight solvent odours
CC202	50mm PVC	5.5m	0.520	
CC203	50mm PVC	1.5m	0.420	Oily sheens
CC204	50mm PVC	2.5m	0.830	-
WEC103	35mm	2.3	0.910	-
WEC104	50mm PVC	6	1.275	-
WEC105B	35mm	4	1.430	۵۵
WEC201	50mm PVC	6.2	0.410	-
WEC203	50mm PVC	6	0.820	**
WEC204	50mm PVC	3.5	1.560	-
OL102	35mm	2.8	1.225	-
OL103	35mm	1.2	0.120	-
OL104	35mm	4	1.380	-
OL107	35mm	3	0.970	
OL114	35mm	3.5	1.390	
OL115	35mm	3	0.305	-
OL201	50mm PVC	5	2.376	**
OL202	50mm PVC	4.5	2.520	**
OL203	35mm	2.2	1.728	New 1
OL204	50mm PVC	5.9	2.030	==
OL206	50mm PVC	6	1.255	
OL207	50mm PVC	6	1.815	ana.
OL208	50mm PVC	4.5	1.425	-
OL210	50mm PVC	4.5	1.270	Ma .
OL211	50mm PVC	3.5	1.160	em .
OL212	50mm PVC	4.8	- Charles - Char	No Access
OL213	50mm PVC	5	2.020	und .
OL214	50mm PVC	4.5	0.930	//
OL215	50mm PVC	3.6	1.610	
OL217	50mm PVC	4.5	3.125	-



Table 8B - Summary of Groundwater Monitoring Field Results (February 2003)

WELL	WELL DIAMETER	WELL DEPTH	DEPTH TO WATER	COMMENTS
		(M)	(MBGL)	
CC105	35mm	2.9	1.34	-
CC109	35mm	2.9	1.07	-
CC113	35mm	2	0.33	
CC201	50mm PVC	3.5	0.97	-
CC202	50mm PVC	5.5	0.27	-
CC203	50mm PVC	1.5	0.37	-
CC204	50mm PVC	2.5	0.86	-
WEC103	35mm	2.3	0.90	-
WEC104	50mm PVC	6	1.24	H-0
				0.16m thickness of
WEC105B	35mm	4	(1.48 – 1.64)	product measured
WEC201	50mm PVC	6.2	0.34	-
WEC203	50mm PVC	6	0.69	-
WEC204	50mm PVC	3.5	1.36	-
OL102	35mm	2.8	4	-
OL103	35mm	1.2	0.04	34
OL104	35mm	4	0.96	w.
OL107	35mm	3	1.09	
OL114	35mm	3.5	1.25	
OL115	35mm	3	0.27	ine and the second seco
OL201	50mm PVC	5	2.3	-
OL202	50mm PVC	4.5	2.37	
OL203	35mm	2.2	1.51	ent.
OL204	50mm PVC	5.9	1.84	
OL206	50mm PVC	6	1.24	SA
OL207	50mm PVC	6	1.6	Con.
OL208	50mm PVC	4.5	1.34	_
#Provinced Labasing	uponyanemadala.	OSSISTANTA		Gravel had to be
We distribute and the second	A CONTRACTOR OF THE CONTRACTOR	<i>обис</i> ница, адама	SARATA SA	cleared prior to
OL210	50mm PVC	4.5	1.27	sampling
OL211	50mm PVC	3.5	٥. ١	18
OL212	50mm PVC	4.8	**	No Access
OL213	50mm PVC	5	1.86	as a
OL214	50mm PVC	4.5	0	Flooded
OL215	50mm PVC	3.6	4	140
OL217	50mm PVC	4.5	3.12	-

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5.4 Laboratory Analyses

The results from the soil analyses are summarised below, presented in full in Appendix D (Tables D1-D12) and illustrated in schematic form as Figures 5A to 5C.

Soils Summary

VOC and SVOC

The total VOC and SVOC (Semi-volatile organic compounds) concentrations detected in the samples were generally <1mg/kg.

PRO & DRO

The highest (>100 mg/kg) concentrations of PRO (C_5 - C_{12}) and DRO (> C_8 - C_{35}) were detected in soil samples in the following areas:

Olefins 6

- In made ground at OL103 with a maximum PRO concentration of 101 mg/kg and a maximum DRO concentration of 1,117 mg/kg. Total BTEX (Benzene, toluene, ethyl benzene and xylene) concentration was <1 mg/kg.
- All the remaining samples yielded PRO concentrations of <15 mg/kg
- In made ground at OL101 with a maximum DRO concentration of 926 mg/kg.
- In made ground at OL114 with a maximum DRO concentration of 180 mg/kg.
- The remaining DRO concentrations were between 5 mg/kg and 91 mg/kg.

WEC

- All the samples yielded PRO concentrations <3 mg/kg
- All the samples yielded DRO concentrations <70 mg/kg

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Central Control

- In made ground and clay deposits around the main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201), with concentrations of up to 2,831 mg/kg PRO and up to 2,938 mg/kg DRO. Total BTEX concentration was up to 1,612 mg/kg (98% xylenes).
- In made ground adjacent to the interceptor next to the northern boundary of Central Control (CC203), with concentrations of up to 4,569 mg/kg DRO. Total BTEX concentration was <1 mg/kg.
- In made ground in the eastern part of the main tankage bund (CC101 & CC103) with concentrations of up to 583 mg/kg PRO and up to 180 mg/kg DRO. Total BTEX concentration was up to 32 mg/kg (63% xylenes).

Groundwaters Summary

The majority of the groundwater samples from Central Control and WEC were recovered from perched waters in made ground. The majority of the water samples from Olefins 6 were recovered from the laterally persistent sand lens within the boulder clay sequence.

Of all the laboratory testing, the PRO and DRO analyses are considered to have yielded the most significant results and these are discussed further below.

The total SVOC concentrations detected in the samples were generally <1 mg/l, with the exception of 2 mg/l of fluorene detected in perched groundwater in CC203 located adjacent to the northern interceptor.

PRO & DRO (March 2002)

The highest (>1 mg/l) concentrations of PRO (C_5 - C_{12}) and DRO (> C_8 - C_{35}) were detected in groundwater samples in the following areas:

Olefins 6

- In groundwater in the sand lens at OL104 with a concentration of 0.356 mg/l PRO and 0.016 mg/l DRO (identified as a discrete C_{15} Peak). Total BTEX <0.01 mg/l.
- All the remaining samples yielded PRO concentrations <0.01 mg/l
- All the remaining samples yielded DRO concentrations <0.015 mg/l

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WEC

- In perched groundwater associated with made ground adjacent to an interceptor in the RBS area (WEC105), with concentrations of <0.1 mg/l PRO and 8.5 mg/l DRO (identified as a discrete C₁₅ Peak). Total BTEX <0.01 mg/l.
- All the remaining samples yielded PRO concentrations <0.01 mg/l

Central Control

- In perched groundwater associated with made ground and clay deposits around the main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201), with concentrations of up to 387 mg/l PRO and up to 123 mg/l DRO. Total BTEX up to 42 mg/l.
- In perched groundwater associated with made ground adjacent to the interceptor next to the northern boundary of Central Control (CC203), with concentrations of 17.8 mg/l PRO and 3.6 mg/l DRO. Total BTEX <0.01 mg/l.
- Wells were not installed in made ground in the eastern part of the main tankage bund where DRO/PRO soil impact was identified in CC101 & CC103. Dissolved phase PRO & DRO are expected to be present in this area.
- All the remaining samples yielded DRO concentrations <0.1 mg/l.

PRO & DRO (February 2003)

The highest concentrations of PRO (C_5 - C_{12}) and DRO (> C_8 - C_{35}) were detected in groundwater samples in the following areas:

Olefins 6

- OL114 (hot fractionation) with a concentration of 0.19 mg/l total volatiles (PRO), OL204 (north east of site), 0.11 mg/l, OL213 (east of site) 0.06 mg/l and OL102 (Dilution and VLP steam area), 0.05 mg/l;
- All the remaining samples yielded PRO concentrations <0.01 mg/l;
- OL214 (Gasoline Treatment Unit) with a concentration of 4.3 mg/l DRO;
- All the remaining samples yielded DRO concentrations in the range 0.01 0.06 mg/l.

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WEC

- 0.16m of product was measured in monitoring well WEC105B, located adjacent to the interceptor in the RBS area.
- no other samples were collected in this area during this sampling round.

Central Control

 In perched groundwater associated with made ground and clay deposits around the main interceptor in the southwest corner of Central Control (CC105, CC109, CC113 & CC201), concentrations of up to 25 mg/l PRO and up to 4.6 mg/l DRO. Total BTEX up to 1.7 mg/l.

Comparison of March 2002 and February 2003 Results

It is proposed that both sets of results make up the overall baseline conditions for the site (see section 6). Inspection of the two sets of results allows the following observations to be made:

- In OL6, nearly all water PRO / DRO results were <0.04 in March 2002. The
 results of February 2003 are slightly higher but generally do not exceed a
 concentration of 0.19 mg/l. The exception is OL 214, where the sample
 collected contained a DRO concentration of 4.3 mg/l;
- In WEC in February 2003, only one sample was collected from WEC105B, this was a product sample (rather than a groundwater sample) as 0.16m of product was measured in this monitoring well. No product was detected in this well in March 2002 (see also free product discussion below);
- Concentrations detected in samples collected from monitoring wells within the Central Control area in February 2003 are generally one to two orders of magnitude lower than those detected in March 2002.

Free Phase Product

Free product can occur if a contaminant is present at a fraction (sometimes as low as 1%) of its solubility in water. Depending on the volume of product present and the geological strata, the product can occur as a mobile phase (discrete layers in which the product can overcome capillary forces and potentially move into a monitoring well if the screen is positioned correctly) or as an immobile phase (sorbed to formation material or as isolated lenses of product in either the saturated or unsaturated zone).

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The presence of sheens or even small amounts of free product (i.e. not in a measurable layer) is an indication that a component of the hydrocarbon mixture has a low solubility which has been exceeded. This effect is possible for hydrocarbon mixtures above relatively low concentrations (e.g. <1 mg/l) due to the following:

- Some components of the hydrocarbon mixtures present on-site have very low solubility (e.g. n-decane <0.1mg/l, dodecane, <0.005 mg/l);
- Where a mixture of compounds is present, the solubility of each compound within the mixture reduces in accordance with Raoult's Law.

During the IPPC investigation, where a discrete layer of product was measured in a monitoring well, no water sample was collected, however, in cases were indications of product were observed during well installation, water samples were collected and analysed.

If immobile or residual free product is present in the vicinity of a monitoring well, significant variability may be seen in the analytical results for groundwater samples due to the nature of sampling a shallow groundwater monitoring well which has small, isolated pools of free product present local to the monitoring well. Hence, for a sensible baseline in such instances, it is proposed that analytical results are treated with caution and that a note is made of the small quantities of hydrocarbon product that are present but not to an extent that a discrete layer of product can be measured in monitoring wells. In such cases, the following comment is applied: "hydrocarbon product present, thickness in monitoring well <0.01m" (see also Section 6.2).

During the March 2002 monitoring round and the well installation exercise, no discrete product layers were measured. However, evidence of free product was observed in the form of visible oily product / oily sheens and strong odours within the soil and groundwater samples at well locations listed in Section 5.2 above (Table 7).

Groundwater monitoring wells were also checked for the presence of free phase (hydrocarbon) product during the February 2003 monitoring round. In this case, well WEC105B in the RBS area contained a product thickness of 0.16m. The source of this product is thought to be historical leakage from the adjacent oil-water separator. Migration into the well must have taken place between March 2002 and February 2003 – the mechanism for this is unclear.

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6.0 Conclusions

6.1 Discussion of Findings

The main objective of the report was to determine the current baseline conditions prior to issue of an IPPC permit.

6.1.1 Shallow Geology

Olefins 6

The shallow geology within the Olefins 6 area typically comprises made ground to depths of up to 1.8m with underlying clay drift deposits to depths greater than 6m and of thickness greater than 5.5m. Olefins 6 area also includes a laterally continuous water bearing sand drift deposit at depths from 2.7m to 5.7m and thickness ranging between 0.2m and 1.8m.

Wilton Ethylene Control

This area contains made ground, typically associated with structures (e.g. interceptors), but is also absent in places. The shallow geology predominantly comprises gravelly boulder clay although some sandy clay was found in boreholes WEC-201 and WEC-203 at a depth of approximately 0.5m and up to a thickness of 1.3m.

Central Control

Made ground is often absent. Where present, it is usually associated with the interceptors. Beneath the made ground, the shallow geology is predominantly stiff sandy gravelly boulder clay at depths of between 3.3 and >5.5m and of thickness 2.4 to >5.5m. Sandy clays of up to 0.8m thick were present in some boreholes. At depths of 3-5m, the investigation encountered stiff grey clay which is likely to be the upper layer of mudstone bedrock (Lias age).

6.1.2 Shallow Hydrogeology

In general the groundwater inflow to monitoring wells installed for sampling purposes was limited as indicated by the difficulties in purging the monitoring wells prior to sampling (section 4.4). Groundwater was found in all monitoring wells at depths of between 0.1m and 3m. Contamination of the groundwater with hydrocarbon substances was only evident in the field (PID, visible and odour) in the Central Control area.

Groundwater within the Olefins 6 area was present within a laterally persistent sand lens whilst in Central Control and Wilton Ethylene Control areas it was mainly related to made ground and within sandier laterally discontinuous horizons within the boulder clay sequence.

6.1.3 Extent of Investigation

In total, approximately 60 intrusive sampling locations were investigated across the three areas. Boreholes and monitoring well installations were situated in areas where chemicals are used, for example, process areas, chemical storage compounds, effluent interceptors etc. Selection of these areas was based on an assessment of potential contaminant source areas as defined in the initial Phase 1a Assessment. Selected boreholes were also installed outside of chemical operating/storage areas, but within the plant boundary, in order to provide a background level of soil/groundwater conditions and to provide a comparison of conditions up and down hydraulic gradient of potential contaminant source areas.

6.1.4 Summary of Analytes

Samples obtained from soils and groundwater samples were analysed for a range of potential contaminants based on the chemical substances used and/or stored in the respective plant areas. These included:

- Volatile organic compounds (VOC), including, benzene, toluene, ethyl benzene, xylene isomers, trimethylbenzene isomers, styrene, butyl benzene, naphthalene, C_4-C_5 aliphatic hydrocarbon fractions and C_9-C_{12} aromatic isomers.
- Semi volatile organic compounds (SVOC), including, naphthalene, phenanthrene, flouranthrene, pyrene, 2-methylnaphthalene, Di-n-butylphthalate, Bis(2ethylhexyl)- phthalate
- Diesel and Petrol range hydrocarbons;
- Metals, including, arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium and zinc.

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6.2 Baseline Conditions Statement

Analysis of soil samples for specific substances from the VOC and SVOC target range of compounds generally resulted in highest detected concentrations of 1mg/kg for a single substance. In many cases analysis for single substances was below the level of detection of the analysis methods used.

Similarly, heavy metal concentrations were detected at levels considered consistent with typical made ground and natural drift deposits with the exception of selected chromium and arsenic concentrations in soil samples (the made ground / former foundry slag waste deposits) of Olefins 6 and Central Control. Baseline values for metals are not discussed as heavy metal-containing chemicals are not used for site processes.

The soil baseline condition is therefore proposed on the basis of diesel range organics (DRO), petrol range organics (PRO) and benzene, toluene, ethyl benzene and xylenes range organics (BTEX) as these are the key chemical groups used within past and present manufacturing processes at the site.

Groundwater samples from the Olefins 6 area were typically obtained from the laterally persistent sand lens within the boulder clay sequence. Groundwater samples from Wilton Ethylene Control and Central Control were typically obtained from perched groundwater samples within the made ground. Groundwater and free product monitoring took place in March 2002 and February 2003 thus the groundwater/product baseline is based on two sets of data.

The statement of baseline conditions is expressed in three parts:

- Concentration ranges summarised in the tables below;
- Concentrations detected in samples collected from the locations plotted on plan as Figures 5A-5C;
- Full analytical results, Appendix D, Tables D1 D12.

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Concentration Ranges detected in samples collected from the OL 6 area:

Table No.	Analyte:	Concentration Range (mg/kg or mg/l)	Comments
D1	VOCs, Soils	<0.001	Limited analysis few target
			compounds used on site
D2	VOCs, Groundwater	Target compounds <0.001, Tentatively	
		Identified Compounds (TICs) 0.14 – 0.23	
D3	VOC Target List		
D4	SVOCs, Soils	Target compounds <0.001 – 0.5	
		TICs 2.6 – 142	The distributions and the second seco
D5	SVOCs, Groundwater	<0.001	
D6	SVOC Target List		
D9	DRO, Soils	5 – 1,117	Despite the fact that oily
D10	DRO, Groundwater	<0.01 – 4.3	sheens were noted at very
D11	PRO, Soils	<0.01 101	shallow depths when OL103
D12	PRO, Groundwater	<0.01 – 0.36	was installed, water results
The state of the s	The state of the s		do not indicate the presence
			of free product

Concentration Ranges detected in samples collected from Wilton Ethylene Control:

Table	Analyte:	Concentration Range (mg/kg or mg/l)	Comments
No.			
D1	VOCs, Soils	<0.001 - 0.036	Limited analysis due to lack of target compounds used on site
D2	VOCs, Groundwater	Target compounds <0.001 - 0.006 TICs 0.08 - 2.98	Limited analysis due to lack of target compounds used on site
D3	VOC Target List		actiget compounds used on site
	SVOCs, Soils	Target compounds <0.001 – 0.2 TICs 0.8 – 10.8	Limited analysis due to lack of
⁻ D5	SVOCs, Groundwater	Target compounds <0.001 TICs 0.07 – 1.1	Limited analysis due to lack of
D6	SVOC Target List		target compounds used on site
D9	DRO, Soils	6 – 68	0.16 m of product was
D10	DRO, Groundwater	<0.01 – 8.5	detected in monitoring well
D11	PRO, Soils	<0.01 – 2.8	WEC 105B, this should be
D12	PRO, Groundwater	<0.01	treated as the baseline condition at this location

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Concentration Ranges detected in samples collected from Central Control:

Table	Analyte:	Concentration Range (mg/kg or mg/l)	Comments
No.		(Comments
D1	VOCs, Soils	<0.001 – 52	Limited analysis due to lack of
			target compounds used on site
D2	VOCs, Groundwater	Target compounds <0.001 - 7.1	
		TICs 0.025 - 64.1	
D3	VOC Target List		
D4	SVOCs, Soils	Target compounds <0.001 - 0.47	
		TICs 0.09 - 178	
D5	SVOCs, Groundwater	Target compounds <0.02	
		TICs 0.001 - 5.22	
D6	SVOC Target List		
D9	DRO, Soils	41 – 4,659	* In select locations, the
D10	DRO, Groundwater	<0.01 – 124	maximum concentration
D11	PRO, Soils	<0.01 – 2,832	detected was probably
D12	PRO, Groundwater	<0.01 – 387	influenced by the presence of
			entrained free phase product
	The state of the s		(thickness in monitoring well not
			measurable). Hence,
	The state of the s		monitoring results from these
			locations are likely to be
			variable and a baseline
	1		comment is applied:
menoriilia piana	T. C.		"hydrocarbon product present,
мандараленорий			thickness in monitoring well
			<0.01m"

^{*} In the case of wells CC105, CC109, CC113 and CC201 in the area of the southern oil-water inceptor and possibly 203 in the area of the northern oil-water interceptor, it is proposed that the laboratory analysis be treated with caution and an addition baseline is noted in words as in the table above.

6.3 Limitations of Baseline Conditions Statement

In some of the chemical process and storage areas that could not be sampled during this investigation (e.g. adjacent to hazardous process equipment, where difficulties arose in drilling boreholes due underlying ground conditions or the presence of underground services) chemicals could be present in the ground at concentrations close to the maximum values listed above or possibly higher than these values.

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Similarly, chemicals may be present at concentrations higher than the maximum values listed above in contaminant source areas not identified by the Phase 1a assessment and therefore not sampled by this investigation. However, the IPPC site report assessment process has been designed to identify key potential contaminant source areas as well as giving a representative view of soil and groundwater quality.

6.4 Updated Conceptual Site Model

The number of contaminant source areas identified during this investigation has reduced relative to the corresponding number of such areas identified during the Phase 1a assessment. On the basis of the potential contaminant source areas identified by the Phase 1a assessment and inspection of the results of the Phase 1b/2 investigation, an updated list of contaminant source areas is presented below:

Olefins 6:

No significant contaminant source areas identified on the basis of the Phase 1b/2 investigation. Further potential source areas could be present under hazardous processing areas which are likely to remain inaccessible while the plants are operating.

WEC:

One contaminant source area (S2) from the Phase 1a was identified after a thickness of 0.16m of free product was detected in monitoring well 105B in February 2003.

CC:

On the basis of the results of the Phase 1b/2 investigation, three contaminant source areas were identified, the 'southern' oil water separator (S4), the 'northern' oil water separator (S5) and the Bf2 tank bund (S1).

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Potential Contaminant Migration Pathways and Receptors

Potential contaminant migration pathways and receptors identified as part of Phase 1a have been modified following assessment of the results of Phase 1b/2. Although no source-pathway-receptor relationships are considered likely to result in significant harm to human health or the environment under normal site operating conditions, a number of such relationships are considered to remain plausible in linking potential source areas to receptors as follows:

- On-site workers involved in excavation works in source areas (e.g. interceptors) this scenario should be managed through appropriate site health and safety procedures;
- Off-site workers down gradient of selected Olefins areas involved in excavation could be exposed to contaminants migrating north in shallow groundwater within the permeable made ground, sand/gravel horizons within the drift deposits and former land drains dating from the period when the land was used for agricultural purposes. However, these land drains are unlikely to remain operative as contaminant migration pathways due to their age and the subsequent development of the site which is likely to have damaged or removed these features. Moreover, given the likely discontinuous nature of the shallow groundwater deposits, this pathway is considered unlikely to be operating to a significant extent;
- The River Tees estuary. Contaminated water within permeable surrounds of the plant drains and the main site drainage system and former land drains (potential preferential pathways) could migrate into Dabholme Gut (discharges within the drains are regulated through the EA-registered discharge consent). This pathway is also considered unlikely to be operative due to the large distance that contaminants would have to travel within the drainage surrounds to reach Dabholme Gut (1.5km). In addition, the drainage system includes sumps and manholes which are likely to provide barriers to the permeable surrounds of the plant and site drains. The permeable material in the surrounds of these services is not likely to extend to the surrounds of the manholes and sumps which are likely to be installed within natural clay. One possible way in which contaminants could migrate to the river would be if the drains integrity were breached and contaminants in the surrounds of the drains migrated into the drainage system. It is anticipated that routine drainage monitoring would identify such a scenario and use of the drainage containment procedures (e.g. buffer tanks, diversions) could be implemented to reduce the potential impact of this scenario, should it present an issue in the future.

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7.0 Main Limitations and Constraints

Any intrusive ground investigation is a limited sampling of the site to the locations that have been chosen and it is possible that an area of contamination remains undetected and has not been sampled. However, this investigation has been designed to include potential sources of contamination that were identified during the Phase 1a assessment (ref 1) and other general plant areas in order to give as accurate representation of baseline site conditions as possible.

Analyses have only been carried out for the determinants selected. The design of the schedule of analyses was based on the Phase 1a assessment (ref 1), as well as taking into account field observations made during the intrusive work.

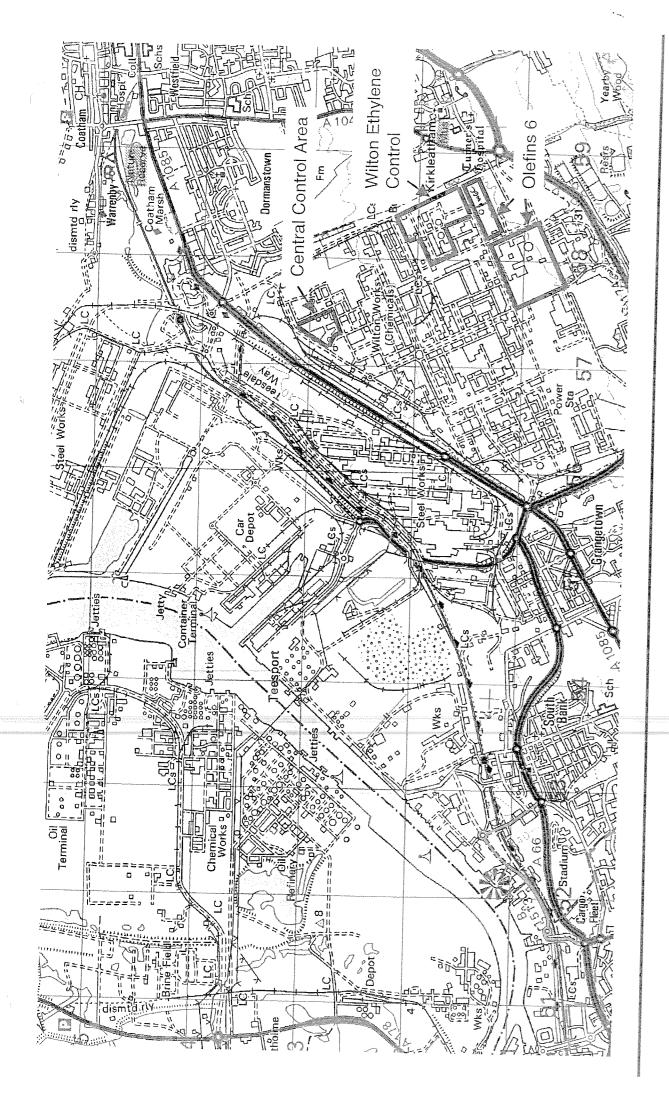
It was not possible to position exploratory holes to target all of the identified potential source areas, mainly due to physical and operational constraints relating to access and underground services. This means that assessment of ground conditions under some of the active plant areas has been restricted due to the unavoidable constraints of investigating an operational site. In these areas it is possible that baseline conditions are higher than those presented in this report.

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References

- ABB Eutech Limited. February 2002. Olefins Manufacturing Area, Phase 1a IPPC Site Report, Huntsman Petrochemicals. ILM089/1a.
- 2. Environment Agency. Dec 2000. IPPC Application Form, Guide for Applicants. Part A(1) Installations. Version 2.
- 3. BS5930:1999 Code of Practice for Site Investigations
- 4. BS10175:2001 Investigation of Potentially Contaminated Sites A Code of Practice
- 5. Project Method statements, see project file, ABB Eutech, ILM089, 2002.

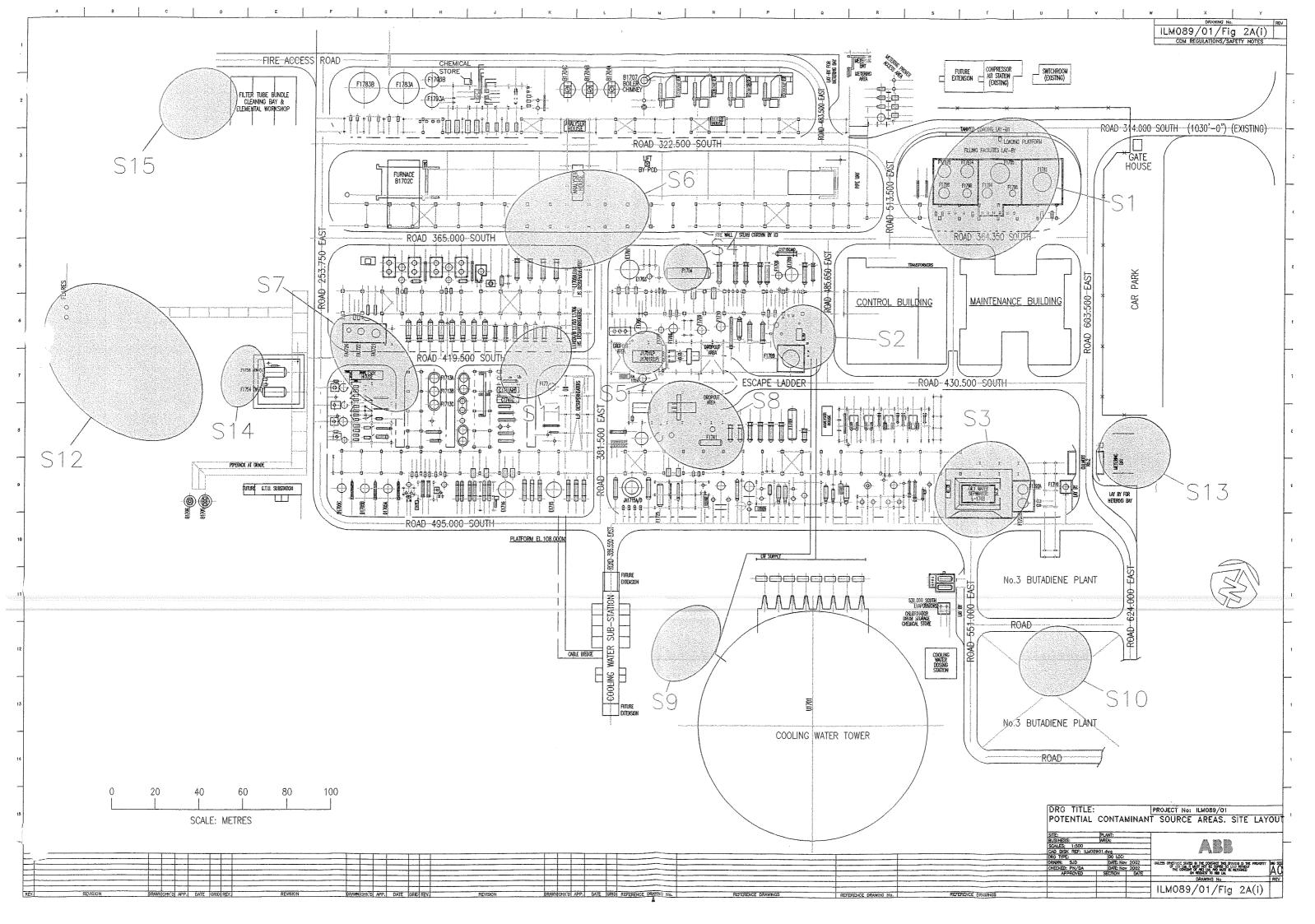
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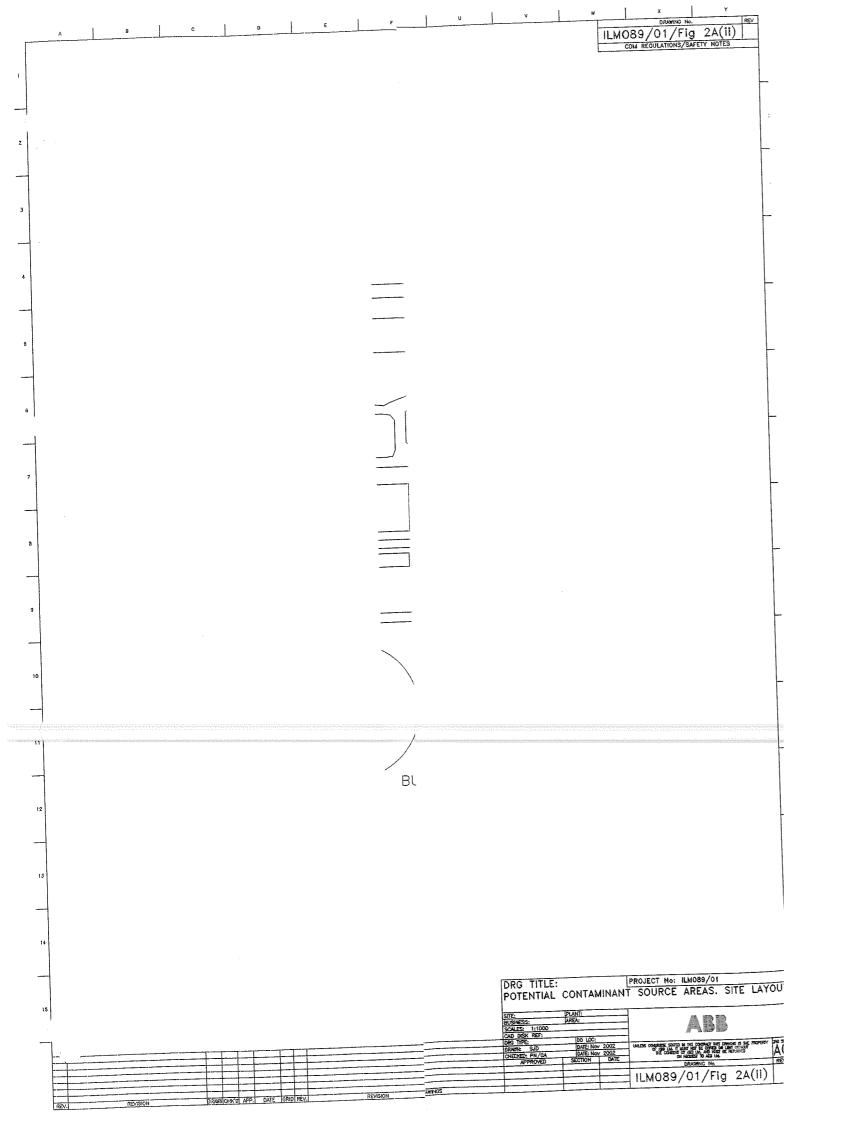


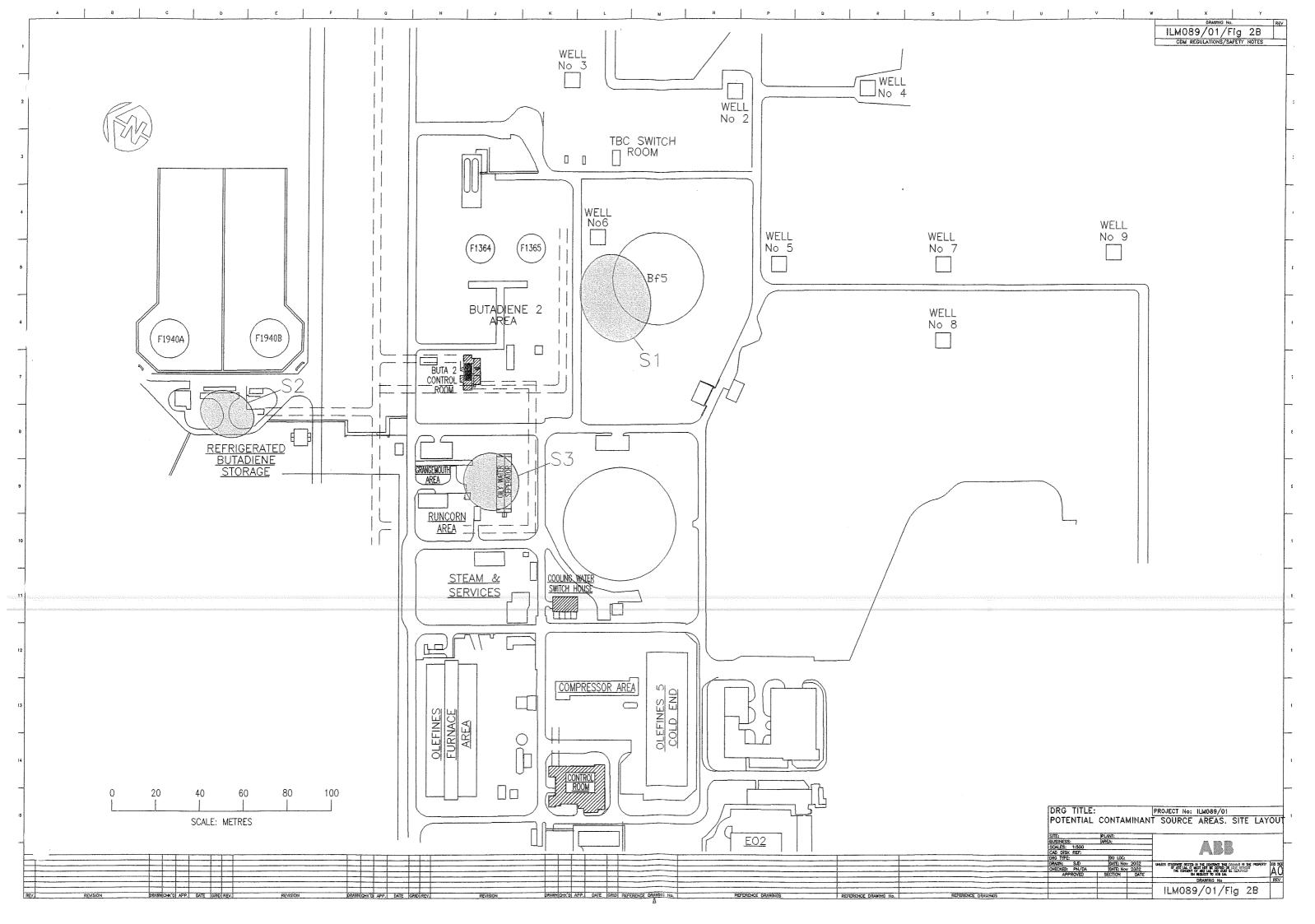


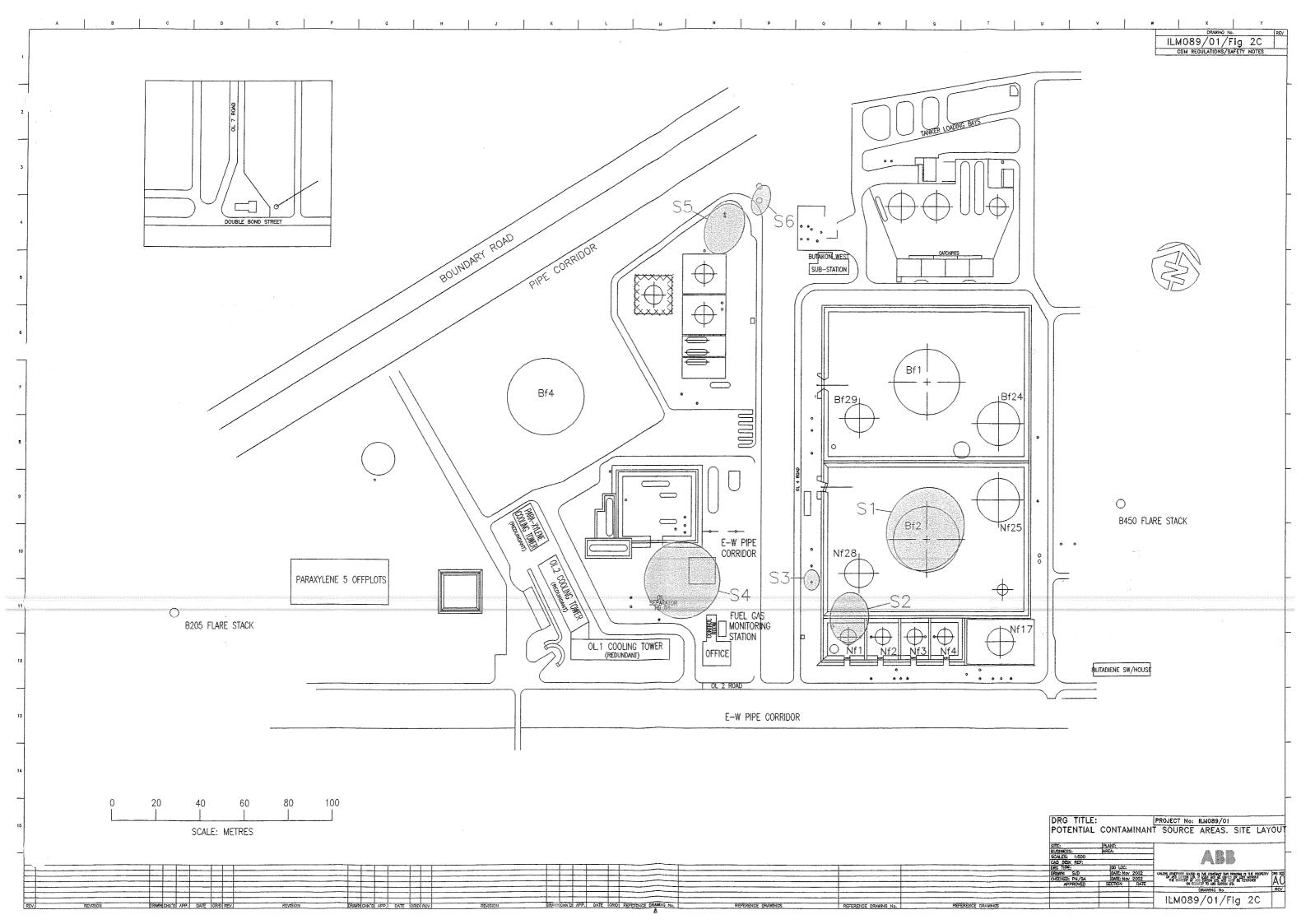
Site Location Olefins Manufacturing Areas

Ligare









W(53 L Tring	ongfield R	ng Limited load HP23 4DF	Site Hunstman Olefins 6	And the second s	Numbe OL1(
cavation I	Method dow Sampler	60r	ons nm to 1.00m nm to 3.00m nm to	Ground	Level (mOD)	Client Huntsman Petrochemicals	- File	Job Numbe ABB
		Locatio		Dates 31	/01/02	Engineer A88 Eutech Limited		Sheet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description Le	gend	Water
					0.05	MADE GROUND. Loose brown sandy angular fine to coarse gravel.	\$\$\$\$\$\$ 	
		Lancata and the same of the sa	1		(0.55)	Soft to firm dark grey mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).		
					0.60	becoming light grey from 0.5m		
		120-120-120-120-120-120-120-120-120-120-		A. DOMANO POPULATION	5.30	Stiff to very stiff brown slightly sandy slightly gravelly CLAY with occassional pocket of firm grey sandy clay. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
	-	Aldereith appropriate in the manner of the state of the s	1	w	(1.00)			
			1					
	A CONTRACTOR OF THE PROPERTY O				1.60	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1	And the second s	2.00	Firm to stiff brown CLAY. (UNDIFFERENTIATED DRIFT).		
					(0.90)			
			,	in				
			Water strike(1) at 2.90m.	100000000000000000000000000000000000000	2.90	Possibly medium dense brown slightly silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).		
-3.50 -3.50)-3.50	D1 D2 D3				(1.10)	silty between 3.4m and 3.5m		
			1	d.	4.00	Complete at 4.00m		
					promotion of the state of the s			Color & Barbaration Color
					ina. Pangha Ann pandan			
lemarks	:	:					Scale	Logg By

Figure No. ABB.OL104

WCL	Ware 53 Lo Tring Hertfo	Consulting Limited Ingfield Road ordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL10	5
	Dimensions 80mm to 0.60m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number AB8	
	Location OL6	Dates 31/01/02	Engineer ABB Eutech Limited	Sheet	
Depth (m) Sample / Tests	Water Depth Field Records	Level Depth (m) (Thickness)	Description	Legend	Water
0.30-0.40 D2 0.40-0.40 D1	Water strike(1) at 0.20m. 6	(0.15) (0.35) (0.35) (0.36)	CONCRETE. MADE GROUND. Loose brown slightly clayey sandy angular fine to coarse gravel CONCRETE. Complete at 0.60m		Nat Nat

Remarks
Field records by 10.2 eV PID in bomiv)
Location cleared for services by Huntsman
Backfilled with concrete.

Scale L (approx) B

Logged By SJD

1:25

Figure No.

48B.OL105

.cavatior		Dimens	sions		, HP23 4DF Level (mOD)	Hunstman Olefins 6 Client	OL.	10
T in Wii	ndow Sampler	80 60	mm to 1.00m mm to 1.50m		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Huntsman Petrochemicals	Job Num AE	
		Locatio		Dates 10	0/12/01	Engineer ABB Eutech Limited	Shee	et
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	. Description		
.40-0.50	D1 D3 D2		Medium from MG(1) at 0.30m. 1	Level (mOD)	(0.90)	MADE GROUND. Loose grey sandy fine to coarse angular subangular gravel. Stiff becoming very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Refusal on clay Complete at 1.50m	Legen	D TO THE TOTAL OF
	:	Annual Company		San	; ; ;		employed and analysis of the second	

1:25 QUE Figure-No. ABB.OL:106

W	CL			Trina	sulting Limited eld Road iire, HP23 4DF	Hunstman Olefine 6		Number OL107
	n Method indow Sampler	Dimens 80r 60r	ions nm to 1.00m nm to 3.00m		und Level (mOD	· · · · · · · · · · · · · · · · · · ·		Job Number ABB
		Location		1 10/12/01 1		Engineer ABB Eutech Limited		Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Lev (mO	(el Depth (m) (Thickness	Description Leg	∍nd	instr
1.60-1.90 1.70-1.80 1.70-1.80	D3 D1 D2	1 No. 3	dedium(1) at 2.40m.		(0.60)	MADE GROUND. Loose to possibly medium dense grey brown slightly clayey sandy fine to medium angular to subrounded gravel. Soft becoming stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Grey Shale cobble at 1.7m becoming very soft from 2.3 Possibly medium dense brown well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).		

Remarks
Field records by 10.2 eV PID in opm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale Logged (approx) By

1:25

CUD

Figure No. ABB:OL107

	CL		<u> </u>	os Longfie Tring	sulting Limited ld Road ire, HP23 4DF	Site Hunstman Olefins 6	Numb OL1	i
	n Method indow Sampler	Dimens 80 60	mm to 1.00m mm to 2.60m	Grou	and Level (mOD)	Client Huntsman Petrochemicals	Job Numb ABE	
		Locatio		Dates 10/12/01		Engineer ABB Eutech Limited	Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Lev (mO	el Depth D) (m) (Thickness)	Description	Legend	Water
1.40 1.40 10-1.50 2.30-2.50 2.40-2.40 2.40-2.40	1		1 1 3 Water strike(1) at 2.25m.		(2.20)	MADE GROUND. Loose dark grey sandy fine gravel. Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). becoming soft from 1.2m becoming very soft from 2.0m Loose to possibly medium dense brown grey well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT). Refusal on sand Complete at 2.60m		<u>w</u>
Ramarke		90001						

Remarks
Field records by 10.2 eV PID in opm(v)
Location cleared for services by Hunisman
Backfilled with centonite

Scale Logged (approx) By

1:25

CJD

W	CL		53 Trir	Longfield (na		Site Hunstman Olefins 6	Numb	
j	n Method ndow Sampler	Dimens 80 60			, HP23 4DF Level (mOD)	Client Huntsman Petrochemicals	Job Numb	per
		Locatio OL		Dates 13/12/01		Engineer ABB Eutech Limited	Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description		Water
0.20-0.20	D1		2 Slight seepage MG(1) at		0.10	MADE GROUND. Loose grey slightly sandy angular fine to medium gravel of limestone.		000
0.20-0.30	D2	1	0.20m. 2		(0.30)	MADE GROUND. Stiff brown sandy gravelly clay.		∇1
		A THE REAL PROPERTY OF THE PERSON OF THE PER	1	000000	(0.20)	Stiff brown slightly sandy slightly gravelly CLAY, Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
						Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
			1		-			
					(1.40)			
			1					
					-			
			ſ		2.00	Refusal on clay Complete at 2.00m		SAMPLE AND A STREET STREET, ST
		PORTOR ALL MARKET P.			-			
mercenna and percentage of the second					Mariana a		444	Withernternentenness
		-						Lichter was a second and a second a second and a second a
		WOOD, Lib.			-		PERMIT	
Þ		Name of the Control o			-			
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		A SASSACIA DE TRANSPORTA DE LA CONTRA DELIGIA DE LA CONTRA DEL CONTRA DE LA CONTRA DEL LA CONTRA DE LA CONTRA DE LA CONTRA DE LA CONTRA DE LA CONTRA DEL CONTRA DE LA CONTRA DE LA CONTRA DE LA CONTRA DE LA CONTRA D		-				de l'arrivant de
	W 0.00						And the second second second	
					And the second s		A. V. American de la constantina della constanti	The state of the s
		and other sections						
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Remarks
Location cleared for services by Huntsman
Sackfilled with centionite
Field records by 10.2 eV PID in opm(v)

Scale Logged (approx) By

CID 1:25

Figure No. ABB.OL109

<u> </u>			53 Tr	are Consult 3 Longfield F ing ertfordshire,	Road	Site Hunstman Olefins 6	Number OL11(
eavation. in Win-	Method dow Sampler	Dimensi 80r	ions nm to 1.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
		Location		Dates 13	3/12/01	Engineer	Sheet
		OL	5			ABB Eutech Limited	1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0.10-0.20	D3			777	(0.35)	Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	
0.15-0.15 0.15-0.15	D1 D2				0.35		
		PPPPPBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB	1		0.40	Loose brown slightly clayey medium SAND. (UNDIFFERENTIATED DRIFT).	
		V. a. iii ay i				Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	
		TO THE REAL PROPERTY OF THE PARTY OF THE PAR				•	
	•			*	1.00	Refusal on clay Complete at 1.00m	
Sylvin Commission of the second of the secon					orana	L. S.	A THE RESIDENCE AND ADDRESS OF THE PERSON OF
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		The second secon		endrandische der der der der der der der der der de	-		
		OOL HARMAN AND AND AND AND AND AND AND AND AND A		and a sub-sub-sub-sub-sub-sub-sub-sub-sub-sub-	-		
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		- A			-		
THE PERSON AS INCIDENCE OF					-		
					- 1		
					. :		

Figure No. ABB.OL:10

CJD

1:25

WCL	1	Nare Consulting Limited 53 Longfield Road Fring Hertfordshire, HP23 4DF	Site Hunstman Olefins 6	Number OL11
xcavation Method	Olmensions 80mm to 1.00m	Ground Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location OL6	Dates 13/12/01	Engineer ABB Eutech Limited	Sheet
Depth (m) Sample / Tests	Water Depth (m) Field Records	Level Depth (m) (Thickness)	Description	Legend
0.50-0.60 D3 0.55-0.55 D1 0.55-0.55 D2	1	(0.50) - 0.50 - 0.60 - (0.40) - 1.00	Stiff brown slightly mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT). Loose brown slightly clayey medium SAND. (UNDIFFERENTIATED DRIFT). Very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Refusal on clay Complete at 1.00m	
Remarks eld records by 10.2 eV PID in opr ackfilled with bentonite ication cleared for services by Hu			Scale (approx)	Logged By

Figure No. ABB.OL111

W(CL		53 Trii He	Longfield F na	ing Limited Road HP23 4DF	Site Hunstman Olefins 6			lumber DL114
cavation, االا ni-ج- شا	Method dow Sampler	1 0011111	ns n to 1.00m n to 3.00m n to 3.50m		Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB	
		Location OL6		Dates 3-	1/01/02	Engineer ABB Eutech Limited		Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10-0.20	D1	2			(0.20) - 0.20	MADE GROUND. Loose brown sandy angular to subrounded fine to medium gravel. Stiff to very stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).			
and the second s		2			(0.70) 	Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		odroodkinnenseed acengery by confere datasesses in the contrast	
		2			(1.10)	sandstone and shale, (BOULDER CLAY).			
		Wa 1	iter strike(1) at 2.00m.		2.00	Possibly medium dense brown slightly silty well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).		∇1	
2.45-2.45	D2	1			(1,40)				
	,	1				Soft red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Complete at 3.50m	×		

Field records by 10.2 eV PID in opm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Weil Cover

Scale Logged By

CLD

Figure No.

1:25

.A**89**.OL114

.cavation ` `-in Wir	n Method ndow Sampler	Dimens 80 60	ilons mm to 1.00m mm to 3.00m		HP23 4DF Level (mOD)	Client Huntsman Petrochemicals		+	OL11: lob lumber ABB
	7	Locatio OL		Dates 31	/01/02	Engineer ABB Eutech Limited		Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legen	Water	Instr
			Water strike(1) at 0.15m. . 1		(0.80)	MADE GROUND. Loose grey brown slightly claye angular fine to coarse gravel with some pockets o stiff sandy clay.	Ý	₩ ₩ ₩	
		STOPLAND TO THE PARTY OF THE PA	1	-	0.80	Soft brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone ar shale. (BOULDER CLAY).	nd	XXXX	
J-1.60 J-1:60 J-1:60	D3 D2 D1		Water strike(2) at 1.25m.		1.25	Possibly medium dense brown stightly silty well sorted medium SAND. (UNDIFFERENTIATED DRIFT).		∇2	
			1		(1.75)	becoming dense from 2.2m			
-2.90	D4	***************************************			3.00	Complete at 3.00m		1	
arks					100 mm m			- Add	The second secon

Field records by 10.2 eV PID in ppm(v)

1:25 CJD

Figure No. 488.OL115

cavation	CL Mothed	Tp:		ring Hertfordshire,		Hunstman Olefins 6		Number OL20
	d Rotary Solid	Dimension 100	ons mm to 6.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals		Job Numbe
		Location OL6		Dates 19)/12/01	Engineer ABB Eutech Limited	***************************************	Sheet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legen	Water Insi
					(0.40)	MADE GROUND. Possibly dense brown grey angular fine to coarse gravel.	sandy	A XXXXXXXXXXX
The second secon						Stiff brown slightly sandy slightly gravelly CLA Gravel is fine to medium angular to subrounde sandstone and shale. (BOULDER CLAY),	ed	
		5			(1.90)			
		5			-			
		5			2.30	Stiff red brown slightly sandy slightly gravelly C Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).	LAY.	
4		5			- (1.50)			
4.50	02	Wa	ster strike(1) at 4.20m.		(0.40)	Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).		
	D1	- Year	34 KG(1) at 4.2011.			Loose to possibly medium dense very silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).	0	
		Man man man and a decision of				Stiff red brown slightly sandy slightly gravelly CL Gravel is fine angular to subrounded sandstone male. (BOULDER CLAY).	AY. and	
iarks				- Ver			2	
ion cleare	Steel Monitoring Wa for services by Hur (10.2 by PID in opm	neman					Scale (approx)	Logged By

Direct D	W(CL		Wa 53 I Trir Her	re Consult Longfield f Ig tfordshire.	ting Limited Road . HP23 4DF	Site Hunstman Olefins 6		Number OL201
Complete	JCT \ founte	ed Rotary Solid	1	ons	Ground	Level (mOD)	1		Job Number
(if) (15-0) (15-					Dates 19	9/12/01			
2 5.00 Complete at 8.00m	Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water Instr
Remarks						6.00	Complete at 6.00m		
	Remarks								

1:25

Figure No. ABB.OL201

CJD

Drive in Window Sampler	Client Huntsman Petrochemicals Engineer ABB Eutech Limited Description Leger MADE GROUND. Loose brown gravelly coarse sand. Gravel is fine to medium angular of shale. Soft brown slightly mottled grey black slightly sandy CLAY. (UNDIFFERENTIATED DRIFT).	OL202 Job Number ABB Sheet 1/1 Ind a land Instr
Stem Auger (200mm/100mm) OL6 13/12/01- 21/01/02 Af 21/1/2002 to 4.5m OL6 13/12/01- 21/01/02 Af 21/101/02 Af 21/101/02	Description Leger MADE GROUND. Loose brown gravelly coarse sand. Gravel is fine to medium angular of shale. Soft brown slightly mottled grey black slightly sandy	Sheet
(m) (Thickness) (Thickness) 4 - 0.10 sa	MADE GROUND. Loose brown gravelly coarse sand. Gravel is fine to medium angular of shale. Soft brown slightly mottled grey black slightly sandy.	nd Mater
- (0.60)	Soft brown slightly mottled grey black slightly sandy	
1.40 D1	Soft brown mottled black slightly sandy CLAY. UNDIFFERENTIATED DRIFT). Soft to firm red brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to nedium angular to subrounded sandstone and shale. (BOULDER CLAY). /ery soft grey green mottled black sandy CLAY. UNDIFFERENTIATED DRIFT). Soft becoming stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	
1 (0.20) (0.80) Suff Grashal (1.00)	Dose brown very silty fine SAND, INDIFFERENTIATED DRIFT). Litif brown slightly sandy slightly gravelly CLAY ravel is fine angular to subrounded sandstone and hale. (BOULDER CLAY).	□ □ □ □ □ □ □ □ □ □
Remarks		

Remarks
Field records by 10.2 eV PID in opmit/)
Location cleared for services by Huntsman
150mm Square Steet Monitoring Well Cover

Scale Logged (approx) By

1:25 000

Figure No.

ABB.OL202

W	CL		5 T	rvare Consult 53 Longfield F Tring	Road	Site Hunstman Olefins 6		Numb	er
}	n Method	Dimensi	ons	Hertfordshire, HP23 4DF Ground Level (mOD)					203
Drive-in Wi	ndow Sampler		nm to 1.00m nm to 2,20m						er B
· ·		Cocation OL6		Dates 10/12/01		Engineer ABB Eutech Limited			:
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description Legs	nd		\dashv
11.50 1.50-1.60	D2 D1	N 7	łedium(1) at 1.50m.		(0.40)	MADE GROUND. Loose grey very sandy subrounded fine to medium gravel of clinker. MADE GROUND. Loose brown clayey sandy angular to subrounded fine to coarse gravel of clinker shale sandstone. Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).	▽		itr Control of the Co
					1				
Remarks					-				~~~

Remarks
Field records by 10.2 eV PID in pomiv)
Location cleared for services by Huntsman
'50mm Square Steel Monitoring Well Cover

Scale Logged (approx) By

1:25 | CJD

Figure No. ABB.OL203

W			5	vare Consult 3 Longfield F	ing Limited Road	Site		Number
4 4 4			F	ring Hertfordshire,	HP23 4DF	Hunstman Olefins 6		OL204
cavation. Mounte ا Auger.	ed Rotary Solid	Dimension 100m	ns nm to 4.50m	Ground	Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB
		Location OL6		Dates 21	/01/02	Engineer ABB Eutech Limited		Sheet 1/2
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Mater Instr
		1 1			(0.50) - (0.50) - (0.50) - 1.00	MADE GROUND. Loose brown sandy fine to medium subrounded gravel. Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Soft to firm dark grey very sandy CLAY. (UNDIFFERENTIATED DRIFT). Soft to firm becoming stiff dark brown slightly sar slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		M STATE OF THE STA
Remarks	!						The second secon	
Location clear	e Steel Monitoring W ed for services by Hu	internan					Scale (approx)	Logged By
reiu records s	y 10.2 eV PID in opr	T(V)					25	210

Figure No. ABB:OL204

.cavation Method Mounted Rotary Solid Auger	1	isions	1 -			- 1	OL204
		Dimensions 100mm to 4.50m		l Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB
	Location OL6		Dates 21/01/02		Engineer ABB Eutech Limited		Sheet 2/2
Depth (m) Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description Leg	end	Nater Instr
5.40-5.70 D2 5.40-5.70 D1		Water strike(1) at 5.40m. 1		5.40 (0.30) - 5.70 - (0.60) - 6.30	Possibly medium dense brown silty fine SAND. (UNDIFFERENTIATED DRIFT). Firm to stiff brown slightly sandy slightly gravelly- CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Complete at 6.30m		Z1 Instr

Figure No. ABB: OL204

W	CL		,	53 Longfi Tring	ield R		Site Hunstman Olefins 6			umber)L206
Javation Journal Journal Jouger	ed Rotary Solid	Dimensions 100mm to 6.00m			Ground Level (mOD)		Client Huntsman Petrochemicals			ob umber ABB
		Locatio		Da	tes 24,	/01/02	Engineer ABB Eutech Limited		SI	heet 1/2
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Le (m	evel 100)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1 1 1 1			(0.20) 0.20 (0.30) - (0.40) - (0.40) - (0.40)	MADE GROUND. Loose grey angular sandy medium to coarse gravel. Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Firm to stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
4.40-5.00 4.40-5.00 4.40-5.00 Remarks 200mm Rour	D2 D1 D3	/ell Cover	1 Water strike(1) at 4.40m. 1				Possibly medium dense brown silty fine to mediu SAND interbeaded with sandy clay and clayey sand. (UNDIFFERENTIATED DRIFT).	·	Z1 → OV	idential (Control (Co
ocation clea	ared for services by Hi s by 10.2 eV PID in op	I I I'' TO TO TOO I'V I'V						(approx)		JD :
								Figure No.		6

WCL	V 5: T H	Vare Consult 3 Longfield F ring lertfordshire,	ing Limited Road HP23 4DF	Site Hunstman Olefins 6		Number OL206
.avation Method CR Mounted Rotary Solid uger	Dimensions 100mm to 6,00m	Ground	Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB
	Location OL6	Dates 24/01/02		Engineer ABB Eutech Limited	Sheet 2/2	
Depth (m) Sample / Tests	Water Depth (m) Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water Instr
				Complete at 6.00m		
пагкѕ					Scale (approx)	Logged By
					1:25	arc
					Figure No.	

cavation (Method	Dimensions			e, HP23 4DF	Hunstman Olefins 6		Numb OL2
	d Rotary Solid		to 6.00m	Groun	d Level (mOD	Client Huntsman Petrochemicals		Job Numb AB
***		Location OL6		Dates	23/01/02	Engineer ABB Eutech Limited		Sheet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD	Depth (m) (Thickness	Description	Legend	Water
TO CASE OF THE PARTY OF THE PAR					- (0.00)	CONCRETE.		
отте валинения (применями).					(0.20) - 0.20 - (0.10) - 0.30	MADE GROUND. Loose grey sandy angular coarse gravel.	fine to	
AMAY ART TOTAL OF THE STATE AND A STATE AN		ż			0.40 (0.10)	Firm dark brown grey slightly sandy slightly graduated CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).		
THE RESERVE THE PROPERTY OF TH		7				Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angu subrounded sandstone and shale. (BOULDER CLAY).	lar to	
					-			
		1			-			
	1			(3.60)				
	1		-					
			MAN - THE RESIDENCE OF THE PARTY OF THE PART					
			OTTOR DATE TO THE REAL PROPERTY AND THE REAL	Participants Pa		2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
				-				
	Water 1	strike(1) at 4.00m.		4.00	Possibly medium dense brown very silty fine to medium SAND with lenses of sandy clay, (UNDIFFERENTIATED DRIFT).		Z1 [
		1	To the second se	(0.70)				
		**************************************				Firm brown slightly sandy slightly gravelly CLAY Gravel is fine to medium angular to subrounded sandstone and shale. :BOULDER CLAY).		
n clearer	/ 10.2 eV PID in opm 1 for services by Hur Steel Monitoring Wei	teman		en e	STORY CONTRACT OF THE		Scale (approx)	Logged By
		will					1:25 Figure No.	CUD

Demonstrate Discontinue Discon	Depart D	W	CL		W 53 Tr ———————————————————————————————————	are Consulti Longfield R ing ertfordshire,	ng Limited load HP23 4DF	Site Hunstman Olefins 6			umber 0L207
Output Sample / Tests Cyclit Pfield Recerds (1995) Death	Depth Sample / Tests Control (1997) Sample / Tests Control (1997) Sample / Tests Control (1997) Field Records (1997) Field Recor	. ^ Mounte	ed Rotary Solid	100п	ns					Jo	ob umber
Interviews Description Legend & Instruction (CAV) CAV Cave and the signature growthy CAV Cave as the common and shale. (In OULDER CLAV) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder Clav) Cave as the common and shale. (In Oulder	TRANS	D 41		OL6		Dates 23.	/01/02	,		SI	
Grave his fine to supplement anguar to institute (BOLLOSE CLAY) (0.30) (0.30) Complete at 6.00m	Stiff red brown sightly carry sightly carry sightly carry sight to a mixture of the sight to a m	(m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legen	Water	Instr
9 1	approx) By	emarks					6.00	Complete at 6.00m			

Figure No. ABB.OL207

	CL		Ť	Vare Consul 3 Longfield I ring lertfordshire,	Road	Hupetman Olefina 6		Numbe
Acavation ICB Mounte The Auger	ed Rotary Solid	Dimensions 100mm		,	Level (mOE			Job Numbe
		Location OL6		Dates 23	3/01/02	Engineer AB8 Eutech Limited		A88 Sheet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness	Description	Leger	l l l
					(0.40) - (0.40)	MADE GROUND. Loose brown very sandy subrounded to rounded fine to coarse grave	el.	A
		2			(0.60)	Firm ofive green slightly sandy slightly grave CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULD CLAY).	elly ER	
	-	2			1.00	Firm to stiff brown to red brown slightly sand slightly gravelly CLAY. Gravel is fine to med angular to subrounded sandstone and shale (BOULDER CLAY).	y um	
		1			(2.00)	becoming dark brown from 1.5m		
3.00-3.50	D1 .	1				becoming soft to firm from 2.5m		
3.00-3.50	D2 .	1	trike(1) at 3,00m.		(0.50)	Possibly medium dense brown very silty fine t medium SAND. (UNDIFFERENTIATED DRIF	o T).	∇ 1
		1				Stiff to very stiff red brown slightly sandy slight gravelly CLAY. Gravel is fine to medium angul subrounded sandstone and shale. (BOULDER CLAY).	ly ar to	
		1			4.50			
				-	Cı	omplete at 4,50m		
icaliun crearen	10.2 aV PID in opmi for services by Hunt Steel Monitoring Well						Scale (approx)	Logged By
							1:25 Figure No.	

WCI		mensions	Tring	ongtield F Ordshire,	HP23 4DF	Site Hunstman Olefins 6	Number OL21
OB Mounted Rotary Auger	Solid	100mm to 4.00m		Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
		cation OL6		Dates 23	/01/02	Engineer ABB Eutech Limited	Sheet
Depth (m) Sampl	e / Tests De (n	ater epth n) Field Records		Level (mOD)	Depth (m) (Thickness)	Description Legend	Water Instr
0.40-0.40 D1		1			(0.80)	MADE GROUND. Loose brown grey very sandy subrounded to rounded fine to coarse gravel.	
		1			0.80	Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).	
		1			2.30	Firm dark grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).	
		Water strike(1) at 3.00m.			(0.50)	Possibly medium dense brown very sitty fine to nedium SAND. (UNDIFFERENTIATED DRIFT).	1
		1			st 9	tiff to very stiff red brown slightly sandy slightly ravelly CLAY. Gravel is fine to medium angular to ubrounded sandstone and shale. (BOULDER LAY).	
					Co	mplete at 4.00m	

Remarks
150mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in opm(v)

Scale (approx)	1	Logged By	
			-
1:25	1	OLD	

avation	Method	Dimens		ertfordshire,					umb L2
Nounte Auger	ed Rotary Solid	1	Omm to 4.50m	Ground	Level (mOE	O) Client Huntsman Petrochemicals			ob umb AB8
		Location		Dates 23	3/01/02	Engineer AB8 Eutech Limited			neet
epth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth			 	1/-
		(m)		(11100)	Depth (m) (Thickness		Legend	Wate	ln:
		10000			(0.19)	CONCRETE.			
					0.19	sandy subrounded fine to coarse gravel,			
			2		(0.41)			1111111	
					0.60	Firm to stiff brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale.			
						(BOULDER CLAY).			
			2	-					
					 - - (1.40)	1			
The state of the s	T T T T T T T T T T T T T T T T T T T	-	1		remonia				
					-				
	11.7						2	Z	
	1	Vater strike(1) at 2.00m.		2.00	Possibly medium dense brown very silty fine to medium SAND. (UNDIFFERENTIATED DRIFT).		▽ 1[5		
					- -				
		1			- (0.80) 				
A CONTRACTOR OF THE CONTRACTOR									
	7 *************************************				2,80	Soft to firm brown to red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
	Table Section 1	1		-	-	(BOULDER CLAY),			
					-				
4		1		E	-				
			·		(1.70)				,
									7 7
		1							1
					The state of the s			K	10 m
		4			4.50				1
1				Jensel Par 1990. Luck	(Complete at 4,50m		and the same of the same of the	
	:				!				
ks Pound	Steel Monitoring We a for services by Hur 10.2 eV PID in bom			· entresses				-	

Figure No. ABB.OL211

avation	Method	Dimensi		Hertfordshire,		_1		OL2
	d Rotary Solid		mm to 4.80m	Ground	Level (mOD	Client Huntsman Petrochemicals		Job Numt A8
		Location		Dates	1/01/02	Engineer		Sheet
		OLE	;	2	1/01/02	ABB Eutech Limited		1/1
epth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth			
		(m)	- Tela Necolas	(MOD)	Depth (m) (Thickness)	Description	Legend	Mate Ins
And the second s					(0.40)	MADE GROUND. Loose brown grey very sandy angular coarse gravel of roadstone type fill.		
		2	•		- 0.40	Stiff brown becoming dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).		
		1		-	(2.10)	t t		
		1			-			
		2			2.50	Soft brown very sandy CLAY. Sand is fine to medium. (UNDIFFERENTIATED DRIFT).		
The state of the s		Wa	ater strike(1) at 3.00m.		3.00	Possibly medium dense brown fire to be a fire	v	1
						Possibly medium dense brown fine to medium SAND. (UNDIFFERENTIATED DRIFT).		
					(1.00)			
		1			4.00	Soft to firm to stiff brown very sandy CLAY. (UNDIFFERENTIATED DRIFT).		
					1.30			

Field records by 10.2 eV PID in comits Field records by 10.2 eV PID in comits Location cleared for services by Huntsman 150mm Square Steel Monitoring Well Cover

Scale (approx) By

Figure No. ABB:OL212

Applin Sample / Tests Very Proid Seconds Description Description Legand International Provided	cavation Method Red Mounted Rotary Solid Auger	Dimensions 100mm to 5.00m	Tring Hertfordshire, HP23 4DF Ground Level (mOD)			Job Numb ABB
MADE GROUND, Possibly dense grey sandy alightly gravely curve and state of the same alightly sandy alightly gravely curve and state of the same alightly sandy alightly gravely curve and state of the same alightly sandy alightly gravely curve and same alightly sandy alightly sandy alightly gravely curve and same alightly sandy alightly gravely alightly gravely curve and same alightly sandy alightly gravely alightly gravely curve and same alightly sandy alightly gravely		OL6				Sheet
MADE CROUND. Possibly densu groy sandy angles of the source groy sandy angles from to care grove. (0.30) Firm to stiff house stightly sandy alignity gravely bury of sands and stroke (1) at 4.00m. (0.40) Water stroke(1) at 4.00m. 1 Lose to possibly medium cores alignity safe (no to medium safe). (0.40) Doze to possibly medium cores alignity safe (no to medium safe). (0.40) Doze to possibly medium cores alignity safe (no to medium safe). (0.40) Doze to possibly medium cores alignity safe (no to medium safe). (0.50) Doze to possibly medium cores alignity safe (no to medium safe). (0.50) Doze to possibly medium cores alignity safe (no to medium safe). (0.50)	Depth (m) Sample / Tests	Water Depth (m) Field Record	ds Level Depth (m) (Thickness)	Description	Legend	Water
Water strike(1) at 4.00m. 1 Loose to possibly medium dense slightly sity fine to medium SAND. (UNDIFFERENTIATED DRIFT). 4.50 Firm to stiff brown slightly sandy slightly gravetly CLAY. Gravet is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		1	0.60	Firm to stiff brown slightly sandy slightly grave: CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOLI OFR		
Scale Logged By 10.2 eV PID in opmity Scale (approx)	arks	Water strike(1) at 4.00	m. 4.00 (0.50)	Loose to possibly medium dense slightly silly fine medium SAND. (UNDIFFERENTIATED DRIFT).		21

A A 4		1	}	53 Longfield F Tring Hertfordshire,		Hunstman Olefins 6	1	Number OL21
Drive in Win 7/2001	n Method ndow Sampler to 2.5m	60r	ions nm to 1,00m nm to 2,50m 0mm to 4,50m		Level (mOl		+	Job Number ABB
	ed Rotary Hollow r (200mm/100mm) o 4.5m	Location OL		Dates 13 20	3/12/01- 1/12/01	Engineer ABB Eutech Limited	9,	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness	Description Legen	Water	Instr
.40-2.40	D1 D2	1	Vater strike(1) at 2 40m		(Thickness 0.05 0.10 0.05 0.10 0.20 0.20 0.10 0.20 0.10 0.20	MADE GROUND. Loose grey angular medium gravel of limestone. CONCRETE. MADE GROUND. Loose light brown sandy fine to medium gravel. Stiff brown to red brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).	A National Control of the Control of	Instr
emarks		1			4.50	Complete at 4.50m		

150mm Square Steel Monitoring Well Cover Location cleared for services by Huntsman Field records by 10.2 eV PID in opmit/i

Scale Logged By

Figure No.

ABB:OL214

W	\mathbf{CL}		•	ware Consul 53 Longfield Tring Hertfordshire	Road	Site Hunstman Olefins 6		Numbe	
1	n Method Ited Rotary Solid er	Dimensi 100	ons Imm to 3.60m		Level (mOD)	Client Huntsman Petrochemicals	145,000	Job Numbe	er
		Location OL6		Dates 19	9/12/01	Engineer 'ABB Eutech Limited		ABB Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water Inst	r
		1			(0.40) - (0.40) - (0.20) - (0.40) - (0.40) - (1.00) - (1.50) - (1.10) - (1.10)	MADE GROUND. Loose grey sandy angular fine to medium gravel. CONCRETE. MADE GROUND. Loose brown slightly gravelly medium sand. Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Possibly medium dense slightly sitty fine to medium SAND. (UNDIFFERENTIATED DRIFT).			r Villa Vill
emarks								100 mm	

Remarks
Field records by 10.2 eV PID in opmivil Location cleared for services by Hunisman 50mm Square Steel Monitoring Weil Cover

Scale Logged (approx) By

1:25 CJD

Figure No.

4**88**.0L215

WCL			Irina		ling Limited Road HP23 4DF	Site Hunstman Olefins 6		Number OL21
.avation Method JCB Mounted Rotary Solid S' Auger	Dimension 100m		-		Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB
	Location OL6 (Off-Plots		Dates 24	4/01/02	Engineer ABB Eutech Limited		Sheet
Depth (m) Sample / Tests	Water Depth (m)	Field Records		Level (mOD)	Depth (m) (Thickness)	Description		Legend
					(0.70) - (0.70) - (0.10) - (0.10) - (0.80)	MADE GROUND. Possibly medium dense very angular to subrounded fine to coarse gravel.	sandy	
			-		- 0.80 -	Complete at 0.80m	•	
				process great			=	As an analysis of the state of
emarks ackfilled with centonite cation cleared for services by Hu	Intsman		TO THE PERSON NAMED OF THE				Scale (approx)	Logged By
						· : :	::25 Figure No	CJD

	Location OL6 Oth Sample / Tests Water Depth (m) 1 1 1 1 1	ns	Ground	Level (mOD)) Client				
B Mounted P Auger	Rotary Solid	100п	nm to 5.00m			Huntsman Petrochemicals			ob umb AB
		Location		Dates	10 - 10 0	Engineer		Si	heet
1				25	5/01/02	ABB Eutech Limited			1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	ln:
		1			(0.90)	MADE GROUND, Possibly dense grey angular to subrounded fine to coarse gravel of clinker with cobble and boulder of clinker up to 300mm.		1 Samment	
	-	1		-	0.90	Possibly medium dense brown very clayey fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
		a management of the state of th	·		1.90	Possibly medium dense brown well sorted fine to medium SAND. (UNDIFFERENTIATED DRIFT).			
		. 1			2.20	Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
	1 Water strike(1) at 3.2	ter strike(1) at 3.20m.		3.20	Possibly medium dense dark grey clayey fine to medium SAND. (UNDIFFERENTIATED DRIFT).	∀	11		
	1			3.70	Possibly dense dark brown clayey fine to medium SAND interpedded with sandy clay.				
				(1.30)	(UNDIFFERENTIATED DRIFT).			This and a recently strained	
					5.00				

WCL			Ware Consulti 53 Longfield F Tring Hertfordshire,		Site Hunstman Olefins 6	Numb WEC	- 1
avation Method Hand dug trial pit	Dimensio			Level (mOD)	Client Huntsman Petrochemicals	Job Numb ABI	
	Location		Dates 17	7/01/02	Engineer ABB Eutech Limited	Sheet	- 1
Depth (m) Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				0.05	MADE GROUND. Possibly very dense black cobble (Flint? Foundry Waste?). Refusal on made ground Complete at 0.30m		EXXXXXI
Remarks Location cleared for services by	Huntsman				Scale (approx)	B y Foga	
					Figure		

WCL	\[ri	na	ing Limited Road HP23 4DF	Site Hunstman Olefins 6	Number WEC10
avation Method: Hand dug trial pit	Dimensions		Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB
	Location WEC	Dates 17	701/02	Engineer AB8 Eutech Limited	Sheet 1/1
Depth (m) Sample / Tests	Water Depth (m) Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
			0.05 (0.25)	MADE GROUND. Possibly very dense black cobble (Flint? Foundry Waste?). Refusal on made ground Complete at 0.30m	
emarks cation cleared for services by Hu	intsman			Scale (approx) 1:25 Figure No.	Logged By

W	CL		5	Ware Consuit 53 Longfield f Tring Hertfordshire,	Road	Site Hunstman Olefins 6		1	mber EC103
	n Method ndow Sampler	Dimension 80mm 60mm			Level (mOD)	Client Huntsman Petrochemicals Engineer		Jo Nu	b mber ABB
		WEC			6/12/01	'ABB Eutech Limited		Sh	1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.60-0.60 0.60-0.80	D2 D1	1			(1.20)	MADE GROUND. Loose to possibly medium dense brown clayey fine to coarse angular to subrounded shale, sandstone, concrete gravel. Stiff brown mottled grey slightly sandy CLAY. (BOULDER CLAY).		N .	
2.10-2.10 2.10-2.10 2.10-2.20	D4 D3 D5	1			(0.35) - 1.55 - (0.35) - 1.90 - (0.50)	Stiff to very stiff red brown slightly mottled grey and black slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Stiff to very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Refusal on very stiff clay. Complete at 2.40m			
	1								

Remarks 150mm Square Steel Monitoring Well Cover Location cleared for services by Hunisman Field records by 10.2 eV PID in ppm(V) No groundwater strikes

Scale (approx)		Logged By
1:25	:	ato

Figure No. ABB:WEC103

W	CL	T	50 Tr	/are Consult 3 Longfield f ring ertfordshire,	Road	Site Hunstman Olefins 6		Num WE	nber C10
Drive in Win 5/12/2001 t		Dimensior 80mm 60mm	n to 1.00m n to 2.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals		i i	nber 88
Mount own Auge 19/12/2001	ed Rotary Solid r (100mm) to 6.0m	Location WEC		Dates 05 19	5/12/01- 0/12/01	Engineer ABB Eutech Limited		She 1	et 1/2
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legeno	Water	nstr
0.10-0.30	D1	4			(0.40)	Stiff dark brown mottled black slightly organic CLAY. (UNDIFFERENTIATED DRIFT).	× \(\delta\lambda\) \(\delta\) \(- Commence of the Commence of
0.30-0.30	D3				0.40	Stiff brown slightly sandy slightly gravelly CLAY Gravel is coarse subrounded gravel of quartzit (BOULDER CLAY).	e		William
		4			(1.00)				
4.70-6.00		4			1.40	Very stiff chocolate brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded of fine grained sandstone. (BOULI CLAY).	/ DER		
1.70=1.90	D4	2							
					(2.80)				
		2			-				
		2							
.50-4.80 .50-4.80 .50-4.80	D7 D6 D5	Mino	or(1) at 4.20m.		4.20	Soft brown very sandy CLAY. Sand is fine to medium. (UNDIFFERENTIATED DRIFT).		Z1	を表現した。 では、これでは、これでは、これでは、これでは、これでは、これでは、これでは、これ
Remarks eavy rain du	iring window sampling) anllina					Scale	Logge	
Juanun Cies	iring window sampling by 10.2 eV PID in ppr red for services by Hu re Steel Monitoring W	nternon					Scale (approx)	Logge By	Q .
							Figure No		

W	CL			Ware Consul 53 Longfield Tring Hertfordshire	Iting Limited Road , HP23 4DF	Site Hunstman Olefins 6		Number WEC104
Drive in Win 5/12/2001 to	Method adow Sampler o 2,0m	Dimensi 80n 60n			d Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB
Nounte Siem Auger 19/12/2001	ed Rotary Solid (100mm) to 6.0m	Location		Dates 0	5/12/01- 9/12/01	Engineer ABB Eutech Limited		Sheet 2/2
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description Le	gend	Nater Instr
Remarks			5		- (1.30) - 5.50 - (0.50) - 6.00	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Complete at 6,00m	e E E	a ogged
						1:25		CJD
						Figur AB	e No. B.WE	C104

W	CL			53 Loi	ngfield F	lng Limited Road HP23 4DF	Site Hunstman Olefins 6		lumber /EC10
į.	n Method ndow Sampler	Dimens 80 60 40	sions imm to 1.00m imm to 3.00m imm to			Level (mOD)	Client Huntsman Petrochemicals	 J	lob lumber ABB
		Locatio			Dates 05	/12/01	Engineer ABB Eutech Limited	S	Sheet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records		Level (mOD)	Depth (m) (Thickness)	Description Legend	Water	Instr
2,10-2,10 2,10-2,10	D1 D2		Fast(1) at 1.50m.			(1.80)	POSSIBLY MADE GROUND. Very soft brown very gravelly clay. Wet black oily impact. Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of fine grained sandstone. (BOULDER CLAY).	✓	

Remarks
150mm Square Steel Monitoring Well Cover
Heavy rain during critling
PID failure in rain
cation cleared for services by Huntsman

Scale Logged By

1:25 : 0JD

Figure-No. ABB.WEC105

W(CL		,	Tring	Consulting Limited ongfield Road ordshire, HP23 4DF	Site Hunstman Olefins 6			umber EC201
JCB Mounte Auger	Method ed Rotary Solid	Dimens	sions Omm to 6.20m		Ground Level (mOD)	Client Huntsman Petrochemicals		JN	ob umber ABB
	1		n entral Control		Dates 18/12/01	Engineer ABB Eutech Limited		S	heet 1/2
Depth (m)	Sample / Tests	Water Depth (m)	Field Records		Level Depth (mOD) (Thickness)	Description	Legeno	Water	Instr
			2		. (0.50)	MADE GROUND. Loose brown sandy gravel. Soft to firm brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).		W Programme and the state of th	
,			Slight seepage 3.0 to 3.5(1) at 3.00m.		- (4.50)			∇1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1	
					5.00				

Remarks
Field records by 10.2 eV PID in ppm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale Logged 1:25 CUD

> Figure No. A**89.**CC201

WCL		53 Tri	Longfield F ina	ting Limited Road . HP23 4DF	Site Hunstman Olefins 6		Number WEC20
avation Method JCB Mounted Rotary Solid Suger	Dimens	sions Omm to 6.20m	Ground	Level (mOD)	Client Huntsman Petrochemicals		Job Number ABB
	Locatio Ce	in entral Control	Dates 18	3/12/01	Engineer ABB Eutech Limited		Sheet 2/2
Depth (m) Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water Instr
5.00-5.50 D3 5.00-5.50 D1 5.00-5.50 D2		Minor(2) at 5.00m.		(0.90) - (0.30) - (0.30) - (0.30)	Stiff red brown slightly sandy slightly gravelly CLAY Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Complete at 6.20m		Re Instr
						,	
Remarks	:		I		; ;	Scale pprox)	Logged By

Figure No. ABB:CC201

1:25 CJD

<u> </u>		,	5. T	lare Consult 3 Longfield f ring ertfordshire;	Road	Site Hunstman Olefins 6	Numi	
avation /e-in Win	Method dow Sampler	Dimens 80 60	ions mm to 1.00m mm to 2.50m	Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Numi	
		Locatio		Dates 05	5/12/01	Engineer	Shee	t
		WE	=U			ÅBB Eutech Limited	1/	1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legen	d Water
			Slight seepage(1) at 0.05m.		0.10	MADE GROUND Soft grey gravelly clay. Gravel is fine to coarse angular clinker.	×	χ Σ Σ
			2 2		(0.10)	Stiff brown mottled black slightly organic CLAY. (UNDIFFERENTIATED DRIFT).		1
			3			Stiff brown mottled grey slightly sandy slightly gravelly CLAY Gravel is fine to medium subangular to subrounded of shale and sandstone. (BOULDER CLAY).		
THE THE PROPERTY OF THE PROPER			3	*	(2.30)			
2			4					
			4					
		- The state of the	4		- 2.50 	Refusal on very stiff clay. Complete at 2.50m		- The second sec
		**************************************			-			
					-			***************************************
					-			
		WARRANCE TAKEN ALL			-			
		-			-	i		
	of the second se				-			
					-			
							and the second	
					-		5	
				-	-			
irks on clear	red for services by Hu by 10.2 eV PID in ppr	ıntsman			: 	Scale (approx)	Logged By	d
acknile	oy 10.2 eV P1D in ppr d with bentonite oelle ler strikes in natural g	15				(approx)	SUD	

Figure No.
ABB:WEC202

ons mm to 6.00m ntral Control Field Records	Dates	Depth (Thickness)	Client Huntsman Petrochemicals Engineer ABB Eutech Limited Description	Legend	Job Number A88 Sheet 1/2
rtral Control Field Records	19	Depth (m) (Thickness)	ABB Eutech Limited	Legend	1/2
Field Records	Level (mOD)	_		Legend	
	(mõb)	_	Description	Legend	<u>a</u>
1		0.10	·		Instr
		(0.60)	Tarmacadam MADE GROUND. Possibly dense grey clayey very sandy fine to coarse gravel. Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).		
inor(1) at 4.50m.		1.50		V.	1
	190 data ang pantang repansa kepansa kujur ana kepansa kepansa ang penjambah penjambah penjambah at ata		or(1) at 4.50m.		or(1) at 4.50m.

Remarks
200mm Round Traffic Rated Monitoring Well Cover
Location cleared for services by Huntsman
Field records by 10.2 eV PID in opmry)

Scale (approx) Logged

UD

Figure No. ABB:CC203

1:25

WCL	D:	[ri He	are Consulting Longfield Ring ertfordshire, I	HP23 4DF	Hunstman Olefins 6		Numbe WEC2	
cavation Method CB Mounted Rotary Solid Auger	Dimensio	nm to 6.00m	Ground Level (mOD)		Client Huntsman Petrochemicals		Job Numbe ABB	
	Location		Dates	12/01	Engineer		Sheet	
	Ceni	tral Control	19/	12/01	ABB Eutech Limited		2/2	
Depth (m) Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water tsul	tr
	1			(1.00)	Stiff red brown slightly sandy slightly gravelly CLAY Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Complete at 6,00m			

1:25 CJD

Figure No. ABB.CC203

W		—	5 T	Ware Consult 53 Longfield F Tring Hertfordshire,	Road	Site Hunstman Olefins 6		1	imber EC20
ccavation JCB Mounte	d Rotary Solid	Dimens	ions Omm to 7.80m	Ground	Level (mOD)	Client Huntsman Petrochemicals		ž.	b Imber ABB
		Location Ce	n ntral Control	Dates 18	/12/01	Engineer ABB Eutech Limited		Sh	eet 1/2
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			2 2 1 1		(0.50) - (0.50) - (0.30) - (0.80) - (1.40) - (2.20) - (2.20) - (2.20) - (2.20) - (2.20) - (2.20) - (2.20) - (2.20) - (2.20)	MADE GROUND. Loose sandy angular to subangular fine to coarse gravel. Soft to stiff dark grey mottled black sandy organic CLAY with rare traces of fibrous plant remains. (UNDIFFERENTIATED DRIFT). Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		M M M M M M M M M M M M M M M M M M M	
Remarks	3		74.b-1		-				
leid records	by 10.2 eV PID in op rea for services by Hi re Steel Monitoning W	m(v) untsman /eil Cover				. (a	Scale pprox)	By By	:
							1:25 Figure: No	DJ.	D

AB**B**:CC204

Cavation Method Dimensions			Longfield ing ertfordshire	Road HP23 4DF	Site Hunstman Olefins 6	Number WEC20		
cavation Method B Mounted Rotary Solid m Auger	Dimensions 100mm to			Level (mOD)	Client Huntsman Petrochemicals		Jo Ni	ob umber
	Location Central C	ontrol	Dates 1	8/12/01	Engineer ABB Eutech Limited			ABB neet 2/2
Depth (m) Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Vater	Instr
				(4.90)	becoming brown from 5.2m			
	1							
D-7.80 D1				7.80	Complete at 7.80m			
				1 00 c c c c c c c c c c c c c c c c c c				

1:25

Figure No. 488.CC204-

CJD

Depth (m) Sam 0-0.40 D1 0-0.40 D2 0-0.40 D3 0-0.80 D4 0-0.80 D5		Locatio	mm to 1.00m mm to 2.00m	Dates	Level (mOD) /12/01	Huntsman Petrochemicals	Job Numbe ABE	
0-0.40 D1 0-0.40 D2 0-0.40 D3 0-0.90 D6 0-0.80 D4 0-0.80 D5	nple / Tests	Ce	entral Control	11	/12/01	F:	1	
0-0.40 D1 0-0.40 D2 0-0.40 D3 0-0.90 D6 0-0.80 D4 0-0.80 D5	nple / Tests				71201	Engineer	Sheet	
0-0.40 D1 0-0.40 D2 0-0.40 D3 0-0.90 D6 0-0.80 D4 0-0.80 D5	nple / Tests	Water Depth (m)	Field Records	Level		ABB Eutech Limited	1/1	
0-0.40 D2 0-0.40 D3 0-0.90 D6 0-0.80 D4 D5				(mOD)	Depth (m) (Thickness)	Description	Legend	
0-0.40 D3 0-0.90 D6 0-0.80 D4 0-0.80 D5			Medium from MG(1) at 0.10m.		- (0.40)	MADE GROUND. Loose slightly clayey sandy angular medium gravel. Sheens and very strong petrol odours.		
0-0.80 D4 D5			81		0.40	Very soft grey slightly sandy organic CLAY with rare plant stems. Sand is fine. (UNDIFFERENTIATED DRIFT).	*****	
0-0.80 D5			45		-	,	× .\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
)-1.70 D7	200000	And a management of the state o	25		(0.80)		×	
D7	T.		15				×	
D-1.70 D7			5	and the second s	1.20	Soft red brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	V/-	
					(0.80)	becoming stiff from 1.6m		
		The second secon	1		2.00	becoming very stiff from 1.8m		
vy v zmanače naky		TOO CALL			-	Refusal on clay Complete at 2.00m	MANAGEMENT AND	
***************************************	THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN THE PERSON NAMED IN T						The second secon	
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		a management magnitude of the					Annual control of the	
rarks					-		Logged By	

V V	Mathad	15	-	ring lertfordshire		Hunstman Olefins 6	Numbe CC1(
cavation ive-in Wir	ndow Sampler	Dimension 80mr 60mr	n to 1.00m n to 1.80m	Ground	l Level (mOD)	Client Huntsman Petrochemicals	Job Numbe ABB
		Location	ral Control	Dates 1	1/12/01	Engineer	Sheet
Depth			ar oomior		1	ABB Eutech Limited	1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend
0-0.30	D1					Very soft brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	
0-0.30	D2	2			(0.90)	becoming soft from 0.4m	
	TO THE PROPERTY OF THE PROPERT			100 Maria	-	becoming stiff from 0.6m	
					0.90	becoming very stiff from 0.8m	
		7		*		Very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	
		1			(1.10)		
					-		
		1					
					2.00	Refusal on clay Complete at 1.80m	
					-		
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	a construction	100 mm			•		
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ecoras llea with	by 10.2 eV PID in opr Dentonite Ted for services by Hu					Scale (approx)	Logged By
		manan				- 1:25 - 1:25	CJD

W	CL		5 T 	Vare Consul 3 Longfield I ring Iertfordshire	Road	Site Hunstman Olefins 6	Numb	
cavation Drive-in Wir	Method ndow Sampler	Dimensions 80mm 60mm	to 1.00m to 2.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Numb AB	per
		Location Centra	l Control	Dates 1	1/12/01	Engineer ABB Eutech Limited	Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.20 0.15-0.15 0.15-0.15	D3 D2 D1				(0.30)	MADE GROUND. Soft brown gravelly clay. Gravel is fine to coarse angular to subrounded of mudstone.		
).35-0,35).35-0.35	D4 D5	1			(0.20) - (0.50)	Soft becoming firm brown mottled black slightly sandy CLAY. (UNDIFFERENTIATED DRIFT). Firm becoming stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).	· "manhan"	The state of the s
	-	1					9 9 9	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		1			-			1
7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1			2.00	becoming very stiff from 1.0m Refusal on clay Complete at 2.00m	3 3	The second secon
					-			MARKATAN MA
							77700000	
					-			
All and the second seco							And the second s	
					-		Advanced specification of the second	
emarks								

Remarks
Field records by 10.2 eV PID in ppm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale Logged By

Figure No.

A88.CC103

W	CL_{-}	•••		Ware Consul 53 Longfield I Tring Hertfordshire	Road	Site Hunstman Olefins 6	Number CC104	
1	n Method ndow Sampler	Dimensi 80n 60n	ons nm to 1,00m nm to 2,50m	Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Number AB8	
		Location		Dates 0	4/12/01	Engineer	Sheet	
		ļ.,	ntral Control			ABB Eutech Limited	1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Vaior
			8.0		(0.20) 0.20	MADE GROUND. Soft to firm dark brown clay.		
0.30-0.50	D1	-	0.8		(0.10) - (0.30 - (0.25)	MADE GROUND. Soft dark brown gravelly clay. Gravel is medium to coarse angular shale.	×	
		1	4	1	0.55	Soft to firm dark grey to black mottled brown slightly organic CLAY. (UNDIFFERENTIATED DRIFT).	×	
					(0.45)	Stiff light brown slightly mottled grey sandy CLAY. Sand is fine. (BOULDER CLAY).		
	-	4	4	77.000	 1.00	Firm becoming very stiff red brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to coarse angular to rounded of sandstone, shale and mudstone. (BOULDER		
1.30-1.50	D2			-		CLAY).		The second secon
<i>a</i> -		4	1		-			***************************************
		ATTRICTORY OF THE PARTY OF THE			(1.50)			***************************************
		4	\$					
2.30-2.50	D3		A					
		4			2.50	Refusal on very stiff clay. Complete at 2.50m		and and a second or second or second or second
					-			-
OCCUPATION AND ADDRESS OF THE PROPERTY OF THE	7	The state of the s		- Total Annual A	-			
Per proposition and a second		T TO THE PROPERTY OF THE PROPE					700000	
		W VARIABLE CO.			-		es e mande, en comprende participa de la caracita d	A Administration or a second or a second
100000000000000000000000000000000000000		PP			-			The Thomas of the Control of the Con
		PETER DE TEMPONOMINA DA						
					reference.			
		1 CONT. 10 C			-		!	

Remarks
No groundwater strikes
Field records by 10.2 eV PID in opm(v)
Location cleared for services by Huntsman
The backfilled with bentonite beilets

Scale Logged By

Figure Ne. ABB.CC104

W	WCL				load load	Site Hunstman Olefins 6		1	ımber
avation	Method ndow Sampler	Dimensi-			HP23 4DF Level (mOD)	Client Huntsman Petrochemicals		Jo	C105
/	Table Callipson	60n	nm to 3.00m			Automan enconemicals		1	AB8
		Location	n ntral Control	Dates 12	/12/01	Engineer ÄBB Eutech Limited		Sh	ieet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
			1		(0.55)	MADE GROUND. Loose grey sandy subangular fine to coarse gravel of clinker. MADE GROUND. Loose to possibly medium dense brown clayey sandy subangular fine to medium gravel.		***************************************	
			1 22 Slow from MG(1) at 1.60m. 290		(0.95) 	POSSIBLE MADE GROUND. Soft brown slightly gravelly sandy CLAY. POSSIBLE MADE GROUND. Very soft dark grey slightly gravelly sandy CLAY. Oily sheens, very strong petrol odours.		∇1	
2.70-2.90 2.80-2.80	D2 D1				2.45	Very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Refusal on clay Complete at 3.00m			

Remarks
Field records by 10.2 eV PID in opmi(v)
50mm Square Steel Monitoring Well Cover
Location cleared for services by Huntsman

Scale Logged By

1:25 CJD

Figure No. ABB:CC105

W	WCL			53 Longfield F Tring Hertfordshire,	Road	Site Hunstman Olefins 6	Numbe CC10	- 1
cavation		Dimens			Level (mOD)	Client	Job	
Drive-in Win	idow Sampler	80 60	mm to 1.00m mm to 1.90m			Huntsman Petrochemicals	Numbe ABB	
		Locatio		Dates	2/12/01	Engineer	Sheet	-
	T		intral Control		a 1201	ABB Eutech Limited	1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description .	Legend	Water
					(0.40)	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
0.45-0.45	D1	THE THE PARTY AND ADDRESS OF THE PARTY AND ADD	1 ·		0.40 (0.20) - 0.60	Soft to firm grey mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).		
			1		-	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
	-		1	-	(1.30)	becoming very stiff from 1.1m		
1.80~1.80	D2		1		- 400			
					1.90	Refusal on clay Complete at 1.90m		MAAAAA AA
								ATTACAMAN PARTY PROPRIESTOR CONTRACTOR CONTR
		200000000000000000000000000000000000000						de la companya de la
							Commission of the Commission o	
ackilled with	red for services by Hi i bentonite by 10.2 by PID in no			1		Scale (approx)	Loggea By	

1:25 CUD

Figure No.

ABB.CC106

W(CL		\ r	ına	ting Limited Road , HP23 4DF	Site Hunstman Olefins 6	Numb CC1	
avation Drive-in Win	Method dow Sampler		ons nm to 1.00m nm to 1.80m		Level (mOD)	Client Huntsman Petrochemicals	Job Numb AB	er
		Location	tral Control	Dates 1	1/12/01	Engineer	Sheet	:
. D H			uai Control			ÀBB Eutech Limited	1/*	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	(mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30-0.30	D1		2		(0.50) - - - - - - - - 0.50	Very soft light brown mottled grey sandy CLAY. (UNDIFFERENTIATED DRIFT). Stiff becoming very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		The state of the s
	-	1		-	- - - - - - - - - - - - - - - - - - -	sandstone and shale. (BOULDER CLAY)		
		1			- - - - - - - - -	Refusal on clay Complete at 1.80m		
								5
Remarks								The second secon

Remarks
Field records by 10.2 eV PID in domityl Backfilled with centonite Location cleared for services by Huntsman

Scale (approx) Logged By

W	CL			Vare Consul 53 Longfield I ring Hertfordshire,		Site Hunstman Olefins 6	Numb CC1	
1	n Method indow Sampler	Dimensio 80mr 60mr	ns n to 1.00m n to 1.60m		Level (mOD)	Client Huntsman Petrochemicals	Job Numb	per
			ral Control	Dates 1	1/12/01	Engineer	Sheet	t
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legeno	Nater
1.30-1.40 1.40 1.40	D3 D1 D2	1				Soft brown mottled grey slightly sandy slightly gravelly CLAY Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). becoming stiff from 0.8m becoming very stiff from 1.0m Refusal on clay Complete at 1.60m		

Field records by 10.2 eV PID in opmit/)
Location cleared for services by Huntsman
Backfilled with pentonite

Scale (approx) By

Figure No: ABB:CC108

	CL			53 Longfie Tring	sulting Limited ld Road ire, HP23 4DF	Site Hunstman Olefins 6	1	umber C109
.cavation Drive-in Win	n Method ndow Sampler	40	ions nm to 1.00m nm to 3.00m nm to		and Level (mOD)		Jo	
		Locatio	ntral Control	Date	s 04/12/01	Engineer ABB Eutech Limited	Sh	neet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Lev (mO	el Depth D) (m) (Thickness)	Description Legend	Water	Instr
0.30-0.40	D1 ,	With the second	38		-	MADE GROUND. Loose grey becoming dark brown clayey angular fine to medium gravel. Gravel of grey shale, brown mudstone and fine grained sandstone.	1	
	-		102 Fast(1) at 1.00m.	-	(1.50) 	-	$ abla_1$	
1.60-1.90 1.90-1.90	D2 D3		350 180		1.50	MADE GROUND. Loose dark grey medium to coarse angular shale and mudstone gravel (roadstone type fill). Very oily product and strong solvent odours.		
		3	2		(1.20)			
2.80-2.90	D4	4			2.70	Soft grey mottled dark brown CLAY. (UNDIFFERENTIATED DRIFT).		
		2			4.00	Possibly medium dense light brown slightly clayey fine SAND (UNDIFFERENTIATED DRIFT). Firm red brown slightly sandy slightly gravelly CLAY. (BOULDER CLAY).		
Remarks					The state of the s			# 1

Remarks
150mm square steet monitoring well cover Location cleared for services by Huntsman Field records by 10.2 eV PID in ppm(V)

Scale Logged (approx) | By

1:25 CLC

Figure No. 488.WEC109

AAA			lun	ıa	ing Limited Road HP23 4DF	Site Hunstman Olefins 6	Numb CC1	
	Method ndow Sampler		nm to 1.00m nm to 2.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Numb ABE	er
		Location	i ntral Control	Dates 11	/12/01	Engineer ABB Eutech Limited	Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	
0.20-0.20	D1				(0.30)	Soft brown mottled black sandy CLAY. (UNDIFFERENTIATED DRIFT).		S
			1		0.30	Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
	-	1			0.90	Stiff to very stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		THE PROPERTY OF THE PROPERTY O
		1			(1.10)			
		1			2.00	Refusal on clay Complete at 2,00m	9	THE RESIDENCE OF THE PARTY OF T
TO TO TO TO THE		an entre con entre						
					-		THE PROPERTY OF THE PROPERTY O	
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Remarks
Fleid records by 10.2 eV PID in opmity)
Backfilled with centonite
Location cleared for services by Huntsman

Scale (approx) Logged By

Figure No. ABB.CC110

WCL			53 Tri	Ware Consulting Limited 53 Longfield Road Tring Hertfordshire, HP23 4DF		Site Hunstman Olefins 6	Number CC111	
avation Method Drive-in Window Sampler		Dimensions 80mm to 1.00m 60mm to 2.00m Location Central Control		Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Number ABB	
				Dates 17/01/02		Engineer ABB Eutech Limited	Sheet	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend A	
0.05-0.15 0.10-0.10 0.10-0.10	D3 D2 D1		66 Damp MG(1) at 0.20m. 23		(0.25) - (0.25) - (0.35)	MADE GROUND. Loose grey slightly clayey sandy rounded fine to medium gravel. Petrol odours. Soft dark grey brown sandy CLAY. (UNDIFFERENTIATED DRIFT).	Σ-	
			1		- (0.40)	Soft to firm brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Stiff red brown slightly sandy slightly gravelly CLAY. Gravel		
		1			- (1.00)	is fine angular to subrounded sandstone and shale. (BOULDER CLAY). becoming very stiff from 1.5m		
***					- 2.00	Descrining very sun nom 1.5m		
					-	Refusal on clay Complete at 2.00m		
					-			
		distance with a second						
Remarks				Indiana in the second in the s				

Remarks
Location cleared for services by Huntsman
Backfilled with centonite
Field records by 10.2 eV PID in opmit/l

Scale (approx) Logged By

W	CL		W: 53 Tri He	Site Hunstman Olefins 6	Number CC111A			
avation Method Drive-in Window Sampler		Dimensions 80mm to 1.00m 60mm to 2.00m Location Central Control		Ground	l Level (mOD)	Client Huntsman Petrochemicals		per B
				Dates 1	7/01/02	Engineer ÁBB Eutech Limited	Sheet 1/1	
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					2.00	TOPSOIL Stiff to very stiff brown to dark brown slightly mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular subrounded sandstone and shale. (BOULDER CLAY). Refusal on clay Complete at 2.00m		
Remarks			and the second s			D		

Remarks Location cleared for services by Huntsman Backfilled with centonite Field records by 10.2 eV PID in opmi(v)

Scale Logged By

Sevalue Netrod Direce in Windows Sander Direction Control Councy Date	W	CL			53 Longfield F Tring	Road	Site Hunstman Olefins 6	Number	
Driven Minute Sample Find Sample Dates Find Records Dates Find	cavation	Method	Dimonei					CC112	
Sheet ABB Extent Limited Depth (In) Sample / Tests Simple / Tests	l		80m	nm to 1.00m	Ground	Level (mOD)		Number	
Depth (iii) Sample / Tests West (leght (limited)) Sample / Tests (limited) Field Records (Levy (mob)) The first (limited) (lim			Location		Dates	104 100	Engineer	Sheet	
(m) (Thickness) (Thickness) (Pays aff throw to red brown slightly sandy slightly gravely CLAY, Gravel is fine angular to subrounded andstane and shale. (BOULDER CLAY). 1 (0.90) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). Soft brown very sanety CLAY, (UNDIFFERENTIATED DRIFT). (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). Soft brown very sanety CLAY, (UNDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). Soft brown very sanety CLAY, (UNDIFFERENTIATED CRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT). - (0.75) (Possibly dense groy green sandy angular gravel. (INDIFFERENTIATED DRIFT).			Cen	tral Control	17	101/02	ABB Eutech Limited		
Very stiff brown to red brown slightly sandy slightly gravelly OLAY, Gravel is fine angular to subrounced sandstone and shale. (800LDER CLAY). 10-1.10 D1 D2 Possibly dense grey green sandy angular gravel. (INNDIFFERENTIATED DRIFT). (0.75) Control throw very sandy CLAY, (UNDIFFERENTIATED DRIFT). 1.70 Firm to stiff red brown slightly sandy slightly gravelly CLAY, Gravel is fine angular to subrounded sandstone and shale. (800LDER CLAY). 1 Control throw the sandy slightly sandy slightly gravelly CLAY, Gravel is fine angular to subrounded sandstone and shale. (800LDER CLAY).	Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Fedeuq Water	
	1 10-1.10 0-1.20		1			0.90 0.95 - - - - - - - - - - - - - - - - - - -	Possibly dense grey green sandy angular gravel. (UNDIFFERENTIATED DRIFT). Soft brown very sandy CLAY. (UNDIFFERENTIATED DRIFT). becoming firm from 1.5m Firm to stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Refusal on clay Complete at 2.80m		
	Remarks							A Commence of the Commence of	

Remarks
Field records by 10.2 eV PID in opm(v)
Backfilled with bentonite
Location cleared for services by Huntsman

Scale Logged ay

Figure-No.

ABB.CC112

		T	Tring Hert	ongfield f fordshire	. HP23 4DF	Hunstman Olefins 6		1	_{imber} C113
	n Method ndow Sampler	Dimensi 80r 60r	nm to 1.00m nm to 2.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals		1	b imber A88
		Location Cer	n ntral Control	Dates 12	2/12/01	Engineer 'ABB Eutech Limited			ieet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.60-0.70 0.70-0.70	D2 D1		3 45 Water strike(1) at 0.60m. 800 955 600 42		0.05 0.15 0.20 (0.05) (0.40) - 0.60 - (0.30) - 0.90	MADE GROUND. Loose brown rounded cobbles. CONCRETE. MADE GROUND. Loose brown sandy angular fine to medium gravel. Loose brown slightly gravelly sandy CLAY. Gravel is fine angular. (UNDIFFERENTIATED DRIFT). Soft grey green stained black sandy gravelly CLAY. Highly impacted by hydrocarbons with strong hydrocarbon odours. (UNDIFFERENTIATED DRIFT). Firm red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). becoming stiff from 1.2m becoming very stiff from 1.5m Refusal on clay Complete at 2.00m		∇1	

Remarks Field records by 10.2 eV PID in opmivi 150mm Square Steel Monitoring Well Cover Location cleared for services ov Huntsman

Scale Logged By

WCL		53 l Trir	re Consulti Longfield R ng tfordshire,	ng Limited Road HP23 4DF	Site Hunstman Olefins 6	Numb	1
avation Method Drive-in Window Sampler	Dimensio 80m 60m	ons m to 1.00m m to 3.00m	Ground	Level (mOD)	Client Huntsman Petrochemicals	Job Numb AB	
	Location Cent	tral Control	Dates 17	/01/02	Engineer ABB Eutech Limited	Sheet	
Depth (m) Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	1			(0.15) 0.15 (1.05) - (1.05) - (1.30) - (1.30)	MADE GROUND. Loose light orange angular cobbles of fire brock. MADE GROUND. Loose light orange angular cobbles of fire brock. Stiff to very stiff brown becoming red brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY). Stiff dark brown mottled black sandy CLAY. (BOULDER CLAY). Stiff to very stiff red brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).		
Remarks Location cleared for services by Hackfilled with bentonite Field records by 10.2 eV PID in or					Scale (approx)	Logge By)d

Figure No. 488:CC114

	n Method ed Rotary Solid r	Dimensi			HP23 4DF Level (mOD)	Client Huntsman Petrochemicals		Jo Nu	ımber
		Location	ntral Control	Dates 18	1/12/01	Engineer ABB Eutech Limited		Sh	ABB leet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Le C	Instr
			2		(0.40)	Soft light brown sandy CLAY. (UNDIFFERENTIATED DRIFT). Soft brown sandy CLAY. (UNDIFFERENTIATED		WITH Comment	
	~		3		- (1.30)	DRIFT).			
		u)	600		1.70	Soft brown grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY). Very strong hydrocarbons and solvent odours from 2.m			
2.30-2.70 2.30-2.70 2.30-2.70	D1 D2 D3	2	500		- (1.80)				
-4.00	D4		50		-	becoming stiff from 3.2m			
,-4.00 3.50-4.00	D5 D6	60			(0.50)	Stiff red brown slightly sandy slightly gravelly CLAY Gravel is fine to medium angular to subrounded sandstione and shale. (BOULDER CLAY). Appears unimpacted by hydrocarbons and solvents.			
					4.00 C	Complete at 4.00m			

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Figure-No. A**8B**.CC201

Districtions Solid Control Carrier Solid Control Contr	W	CL	,	11	/are Consull 3 Longfield f ring ertfordshire,		Site Hunstman Olefins 6			umber	
Control Control Control Control Control Control Control Control Control Control Cont	JCB Mounte	ed Rotary Solid		15			l .		Jo	ob umber	
Stiff red brown signify carely clarky (CLAY) (1.50) Stiff red brown signify samely signify growthy CLAY Share in the signify samely signify growthy CLAY Share in the significant statement of the significant statement stat				al Control	Dates	7/12/01			Si	neet	
GERT brown signify samely county of samely county county of samely county	Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	instr	
the state of the s			1 1 1			2.00	Stiff red brown slightly sandy slightly gravelly CLAY. Gravel is fine angular to subrounded sandstone and shale. (BOULDER CLAY).				

Remarks
Field records by 10.2 eV PID in opm(v)
Location cleared for services by Huntsman
150mm Square Steel Monitoring Well Cover

Scale (approx) Logged By

Figure No. ABB:CC202

cavation	Method	Dimensio	Не		HP23 4DF	Hunstman Olefins 6		Numbe CC20
CB Mounte 'am Auger	d Rotary Solid	1	nm to 5.60m	Grouna	Level (mOD)	Client Huntsman Petrochemicals	WYTHAN IN A STREET OF THE STREET	Job Numbe ABB
		Location Centr	al Control	Dates 17	7/12/01	Engineer ABB Eutech Limited	-	Sheet
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description Leg	end 3	
					(0.50)	Stiff grey slightly sandy CLAY. (BOULDER CLAY).		
50-5.60	D1	1			5.50 5.60 - 5.60	Possibly moderately strong grey MUDSTONE. [JURASSIC REDCAR MUDSTONE FORMATION] Complete at 5.60m		
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Figure No. ABB.CC202

: CJD

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W(·	53 L Trinç Hert	ongfield F a	ing Limited Road HP23 4DF	Site Hunstman Olefins 6			umber C203
cavation JCB Mounte Stern Auger	ed Rotary Solid	Dimens 10	oions Omm to 1.50m	Ground	Level (mOD)	Client Huntsman Petrochemicals		J.C	ob umber ABB
		Locatio Ce	n entral Control	Dates 17	7/12/01	Engineer 'ABB Eutech Limited		Si	heet 1/1
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.15 0.00-0.15 0.00-0.15	D1 D2 D3		Fast from MG(1) at 0.05m.	de delan terrandramental terrandrament	(0.15) 0.15	MADE GROUND. Loose black grey sandy angular fine to coarse. Heavily impacted by oily hydrocarbons.		∑1	
				e de la composito de la compos		Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded sandstone and shale. (BOULDER CLAY).			
		TO THE PROPERTY OF THE PROPERT			(1.35)	•			
	-						9		
					1.50	Drilling stopped due to impacted perched waters Complete at 1.50m			
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Remarks Inable to do	headspace PID testi	חם מח חפת	Hiral Soils due to perched ware	as rece of	ntamination	roll ceturne	Scale	ا ا	gged
	by 10.2 eV PID in or ired for services by H ire Steet Monitoring v		ural soils due to perched wate	is cross cc	manmaung d	an leturis	(approx)		CJD
	2						Figure N		

ABB.CC203

JCB Mounted Rotary Solid 100mm to 3.55m 20mm to 3.55m	cavation	Method	Dimensions	53 Longfield F Tring Hertfordshire,	HP23 4DF	Hunstman Olefins 6			lumber CC204
Central Control Central Control ABB Eutech Limit ABB Eutech Li	8 Mounted	d Rotary Solid		Ground	Level (mOD)	Client Huntsman Petrochemicals			ob lumber ABB
Company Comp				Dates 17	7/12/01	Engineer 1 ABB Eutech Limited		S	heet
2 (0.90) 2 (0.90) Soft to firm brown CLAY, Gravel is 1 subrounded sand CLAY). 2 (1.30) Slight minor seepage(1) at 2.00m. 2 (1.10) 2 (1.10) 2 (1.10) 2 (1.10) 2 (1.10) Possibly strong graphs also (BOULDER) 2 (1.10) Possibly strong graphs (Boulder) Possibly strong graphs (Boulder) Refusal on muds Refusal on muds	Depth (m)	Sample / Tests	Water Depth (m) Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
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Remarks Field records by 10.2 eV PID in opm(v) Location cleared for services by Hunisman	records by	y 10.2 eV PID in opr	n(v)		C	Refusal on mudstone complete at 3.55m	Scale (approx)	Log	ged

Figure No: 4BB.CC204

APPENDIX C

QA/QC FORMS

CHAIN OF CUSTODY AND SELECTED LAB QA/QC CHECKS

Samplers Signature tel: (01244) 671121 fax: (01244) 683306 website: www.geochem.com email: mkt@geochem.com (1), ALcontrol Geochem Chester Street, Chester CH4 8RD, England ALCONTROL GEOCHEM USE ONLY PAPARACATA RECEIVED AT LAB (sign) SAMPLE CONDITION: DATE AND TIME: inda Sand Comments The sold Spring in TO CLONG SMOCE M No REPORT FORMAT YES 040 OTHER FORMAT (specify): RESULTS BY e-mail: (yrioeqs) noizevaesang eldme2 Sample Concentration Low Medium or High (L,M,H) e-mail address: م. ميلمد. - Sec. 붉 Type of Analysis *SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED SAIMPLING AND CHAIN OF CUSTODY RECORD 5 MJ PH 7012 75 TURNAROUND 50 OA * 6-10 DAYS (specify) 4310 * < 5 DAY (specify) 000 N. X 10-12 days * med × * S DAY Other (Specify in Comments Column) Matrix Type tnamiba2\lio2 1916VV DEPTH سه ات سیار افک 54 22 SAMPLE REF. 1D 3 76 277 7007 34 37 7 5000 (J. 45.) . Janes . Tanan 11. (11) 1 inc. 1,117 Cleme 1928 504 50.13 GEOTRACE Site/Project Ret: J. Lagellin. GEOCHEM GEOCHEM SC OF JOB No.: (it known) RELINQUISHED (sign) DAIL AND HME COURIER -4 1 34

tel: (01244) 671121 fax: (01244) 683306 website: www.geochem.com email: mkt@geochem.com (1), ALcontrol Geochem Chester Street, Chester CH4 8RD, England ALCONTROL GEOCHEM USE ONLY RECEIVED AT LAB (sign) SAMPLE CONDITION: DATE AND TIME: Comments いにつって びきなっと TETTON M ත් g -1) -1) 11-1 為四百 REPORT FORMAT YES 📋 OTHER FORMAT (specify): RESULTS BY e-mail: Sample Preservation (specify) Sample Concentration Low Medium or High (LM,H) e-mail address; TICK Type of Analysis SAMPLING AND CHAIN OF CUSTODY RECORD SURCHANGE WILL APPLY UNLESS OTHERWISE AGREED TURNAROUND * 6-10 DAYS (specify) *< \$ DAY (specify) 1 10-12 days 1 Other (Specify in Comments Column) * 5 DAY Matrix Type soil/Sediment 1916W DEPTH Ż. SAMPLE REF. ID Man 2002 5 i Zi ا میسد مدر ا سيد آنيد آسيد 1,11,11 GEOTRACE GEOCHEM ULUCHEM SC OF JOB NO.; (if known) KELINQUISHED (sign) Site/Project Ref. 🗟 DATE AND TIME DATE day/month/year Combact. Address: COURILER

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Chester Street, Chester CH4 8RD, England tel: (01244) 671121 fax: (01244) 683306 website: www.geochem.com email: mkt@geochem.com Alcontrol Geochem ALCONTROL GEOCHEM USE ONLY DATE AND TIME: RECEIVED AT LAB (sign) SAMPLE CONDITION: Comments SET SUN NO No REPORT FORMAT YES OTHER FORMAT (specify): Sample Preservation (specify) RESULTS BY e-mail: Sample Concentration Low Medium or High (L.M.H) e-mail address: Type of Analysis ΙĆΚ SAMPLING AND CHAIN OF CUSTODY RECORD SURCHARGE WILL APPLY UNLESS OTHERWISE AGREED TURNAROUND * 6-10 DAYS (specify) * < 5 DAY (specify) 10-12 days * 5 DAY Matrix Type tnemibe2\lio2 TO COLON AND NATION DEPTH 상미도관 SAMPLE REF. ID を表され 18 2023 G 7977 88 777 2 But 14 **5**1 (개) 삼: 1 3. TO C. S. K. Z. M. S. S. 2.504.5 42 F. C. C. GEOCHEM REF. CEOCHEM SC or JOB NO.: KELINQUISHED (sign). DATE AND HIME Sitte/Project Ref. let. CORRECT Address. CHURCH

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SAMPLING AND CHAIN OF CUSTODY RECORD

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With Addition to the Control of the			

LABORATORY PERFORMANCE DATA

The following section presents precision and bias data for the test methods used in the investigation. Precision and Bias parameters are within accepted UKAS and MCerts (where proposed) limits.

BIAS — is the difference between the analytical result and the actual concentration expressed as a percentage (the actual concentration is assessed using a standard of known concentration). The bias is usually less than 10% depending on the method — see following data.

PRECISION – the reproducibility of an analytical result by a method, the standard deviation expressed as a percentage of the known concentration, usually less than 15% depending on the method – see following data.

UKAS accredited politant in taketels. Pajameter

TPRIBY GC-FID (DRO)

Prior to this method, appropriate sample solvent extraction techniques must be used, eg microwave extraction, accelerated solvent extraction (ASE) or soxhiet Extraction for soil/oil based cutting samples . A known volume of the sample extract Heptrantellydnonane at a known concentration. 1-Chlorooctadecane and Squalane are incorporated as surrogate standards. Final Petroleum Hydrocarbons (TPH) is the sum of all components detected within the carbon number range C10 – C40. is injected into a Gas. Chromatograph (GC) and is analysed by temperature programmed capillary, chromatography and thance tonisation detection (PID). Quantification is carried out by means of the Internal Standard technique using

> Extraction Time & Temp Suil : Extractant ratio

Dried & crushed 5-10g: 30mt-40mHEXANE

Accelerated solvent extraction (ASE) for soxblet extraction ASE 15mins @ 200psi ,120"C Sognific 6 hours

Certiffed Jacksteiner Material Sutable CRM mayallable at present Majain

Performance

See Performance data

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Reporting detection limits are stated below (Invethod detection levels are all lower than reporting detection limit)

Standard deviation

See Performance data

Degrees of Treedom

See Performance data

Petails of validation procedure Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed See Performance data

Details of rontine AQU

AQC unalysed every 10 samples

References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soits (draft) 1998

PH by GC-FID (DRO) UKAS accredited Abstract of method Larmicler

Prior to this method, appropriate sample solvent extraction techniques must be used, eg. solid phase extraction (SPE) or detection (1910). Quantification is carried out by means of the Internal Standard technique using Heptamethylnonane at a known concentration. I-Chlorooctadecane and Squalane are incorporated as surrogate standards. Total Petroleum Hydrocarbons (TPH) is the sum of all components detected within the carbon number range C10 – C40.
300 500mls extracted through a solid phase extraction cartrige followed by elution with DCM or liquid/figuid extraction using DCM. Unronnitograph (GC) and is analysed by temperature programmed capillary chromatography and flame ionisation Institut/liquid extraction for water/leaching samples. A known volume of the sample extract is injected into a Gas

Editartion Time & Temp

Soil: Extractant ratio

Suriable CRM univailable at present Water Certified Reference Material

Performance

I imit of detection

See Performance data

Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit)

Standard deviation

See Performance data

See Performance data

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See Performance data

Degrees of freedom

Details of validation procedure Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed

References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998

Defails of routine AQC

AQC analysed every 10 samples

DRO by GC-FID in Soil Summary

		MCERTS Recommended % 15 30
DRO mg/l 758 706 600 494	603 631 636 636 590 618 521 523 523 523 572 672 670 670 670 505	55.0 9.3 30.6 20 20 5.1
UCL (MEAN + 3 X SD) UWL (MEAN +2 X SD) AQC ACTUAL CONC. LWL (MEAN -2 X SD) LCL (MEAN - 3 X SD)	DAY 1 2 3 3 4 4 4 10 10 11 11 11 11 11 11 11 11 11 11 11	MEAN mg/l STANDARD DEVIATION mg/l RSD % BIAS mg/l n Precision % Bias %

Abstract of method Parameter

GRO (PRO) including BTEX by IS GC-FID

UKAS accredited

(CRC), in the carbon number range 臺土區 C12, including BTEX components namely Benzene, Toluene, Ethyl Benzene and Xylene isonners (o., m- and p- isonn∰s)∥and MTBE (t-Bulyl methyl ether) in samples of water, soil and other materials. This method describes a procedure for the determination of the conentration of GasolineRange Organic Hydrocarbons

injected into a tias Chromatograph (@O) and analysed by temperature and pressure programmed capillary chromatography and thune ionisation detection (FiD). Quantification of the components is carried out by means of the internal standard technique. The relative response of the detector to the various components is taken into consideration in the calculations, A portion of sample and a known volunted of internal standard are sealed in a septum sealed glass vial. The glass vial is headspace. After this time, a known volume of headspace is sampled , by the autosampler using a gas-tight syringe and subjected to agitation and heat for 10 minutes, in order to release the volatile components from the sample into the towether with any dilution factor which may be required. Wet as received soil preferably sent in a voluite yial

> Extraction Time & Temp Soil : Extractant ratio

Mania

Suitable CRM unavailable at present Certified Reference Material

See Performance data

Performance

I init of detection

Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 10 mg/kg

See Performance data

Standard deciation

See Pertormance data

Degrees of freedom

See Performance data

References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998 Details of validation procedure Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed

Details of routine AQC

AQC analysed every 10 samples

PRO INCLUDING BTEX BY GC-FID

O XVI ENE	mg/l 10.2 9.5 8.0 6.5 5.8		O A TERINE	7.1 7.2	~ · · · · · · · · · · · · · · · · · · ·	ο α	n c	ο α σ	ο α ο Δ	t. 0.	D: 7	o c	8.2		8.2	0.73	8.9	-0.2	A	9.1	-2.4
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ETHYL BENZENE M/P XYLENE	mg/l 10.6 9.7 8.0 6.3 5.4	ETHYL BENZENE	7.0	0.6	8.9	9.2	9.1	8.8	8.7	7.6	6.7	8) 4.	80 80	o C	; ;	0.0	†. e	, ÷		р. О	5.4-
TOLUENE	mg/l 10.2 9.5 8.0 6.5 5.8	TOLUENE	7.3	8.9	g. 8	8,9	8.8	9.0 9.0	8.5	7.6	6.8	8 2.	හ ඩ	or.	0.73	α	o e) 4	- r		-3.2
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SOILS	UCL (MEAN + 3 X SD) UWL (MEAN +2 X SD) AQC ACTUAL CONC. LWL (MEAN -2 X SD) LCL (MEAN - 3 X SD)		-	O	୯୨	4	ည	co.	_	00	on .	2	American Ame	MEAN mg/l	STANDARD DEVIATION mg/l	% USB	BIAS mg/l	c	Precision %	Bise o/	2

PRO INCLUDING BTEX BY GC-FID

F O XVI ENE	mg/l 10.1 9.4 8.0 6.6	OXYLENE	7.6	5. 8	; m	7.4	6.5	80	7.3	7.9	ğ.' Γ	ρ ς	. 80 60	`	6.7	0.69	8.7	60.0	-	8.6	1
M/P XYLFN	mg/l 21.4 19.6 16.0 12.4	M/P XYLENE	15.3	18.2	19.3	14.8	12.6	16.4	14.4	15.7	16.1	16.6	16.5	C T	0.0	00.1	E .	0.02		11.3	0.1
ETHYL BENZENE M/P XYI FNF O XVI ENE	mg/l 10.8 9.9 8.0 6.1 5.2	ETHYL BENZENE	7.7	9.2	9.8	7.4	6.3	8.3	7.2	7.9	8.1	8.4	ю ю.	c	850) 4	- c	°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°°		11.7	9.0-
TOLUENE	mg/l 10.2 9.5 8.0 6.5 5.8	TOLUENE	7.5	8.8	9.0	7.4	6.3	7.9	7.2	7.8	6.7	6.7	8.2	7.8	0.73	on On	0.17		- 7	- -	2.1
BENZENE	mg/l 10.0 9.4 8.0 6.6	BENZENE	7.5	8.7	8.7	7.5	හ. ම	7.8	4.7	a:0	8.0	. i	60, 44.	7.8	0.68	8.6	0.15	\$1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	- ur) ·	D)
WATERS	UCL (MEAN + 3 X SD) UWL (MEAN +2 X SD) AQC ACTUAL CONC. LWL (MEAN -2 X SD) LCL (MEAN - 3 X SD)	,	-	01 11	י מי	र ।	an c	0 !	,	oco d	ກ	9	year.	MEAN mg/l	STANDARD DEVIATION mg/I	RSD %	BIAS mg/l		Precision %	0	% Spica

reclamique, using o demerand functional Standards, Biphenyl-d10 is, also, available as a surrogute standard when required (see Table 1 for details). The relative response of the details consideration in the calculations together with Prior to application of this method, appropriate sample solvent extraction techniques must be used. A known volume of the sample extract is injected into a Cus. Chromatograph (GC) and is analysed by temperature programmed capillary any allution factors required. In the case of uncalibrated compounds being identified within the sample, a response factor of I will be Identification is performed using Scan Mode and quantification of the components is carried out by means of the Internal Standard Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) chromatography, using a suitable capillary column, and Mass Selective Detection (MSD). Wel as recieved 5-10g: 40ml-100ml DCM Semi Volatile Organic Compounds Suitable ('RM mayailable at present See Performance data UKAS accredited Suxhilet 3-6 hours Ceriffied Reference Material Estraction Time & Temp Soil: Extractant ratio Abstract of method imit of detection Parameter Performance Mattrix

See Performance data

Degrees of freedom

See Performance data See Performance data

Standard deviation

Bins

References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (druft) 1998 Details of validation procedure laternal Method Validation Procedure CLS 036 Version 3.0 - Uncontrolled document enclosed

Details of routine AQC:

AQC analysed every 10 samples

porpore of marging

Semi Volutile Organic Compounds UKAS accredited

Prior to application of this method, appropriate sample solvent extraction techniques must be used . A known volume of the sample extract is injected into a Gas Chromatograph (GC) and is analysed by temperature programmed capillary chromatography, u

Identification is performed using Scan Mode and quantification of the components is carried out by means of the Internal Standard technique, using 6 deuterated Internal Standards, Biphenyl-d10 is, also, available as a surrogate standard when required

300-1000m/s extracted through a solid phase extraction cartrige followed by elution with DCM: Ethyl acetate (1:1) or liquid/liquid extraction using DCM

Extraction time & Temp Volume extracted

Certified Reference Material Apatrix

Performance

Suitable CRM unavailable at present

Water

See Performance data

timit of detection

Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 0.01 ug/l

Standard deviation

See Performance data

See Performance data

See Performance data

Sing

Degrees of freedom

Details of validation procedure

Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed

References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998

Details of rontine AQC

AQC analysed every 10 samples

SVOC BY GCMS in Soil & Water Summary

Bis(2-chloroethoxy)methane ug/l 6786 6786 6191 5000 3809 3214 4869 6350 5216 5122 5385 6127 5627 5658 5658 5658 5658 5658 5658 5658 74234
Bis(2-ethylhexyl)phthalate ug/l 6832 6222 5000 3778 3168 3168 4401 4179 4688 4185 4874 6270 4559 5327 4965 4309 4792 611 12.7 -207.64 10 12.2
Dimethyl phthalate ug/l 6872 6248 5000 3752 3752 3728 4525 6528 5121 4965 5230 5309 5207 5473 5007 5473 5162 624 12.1 161.82 10
Benzo(a)anthracene ug/I 6147 5765 5000 4235 3853 4065 4605 4706 5169 4832 4927 4970 4945 5004 5026 4752 382 8.0 -248.09 10 7.6
Naphthalene ug/l 6008 5672 5000 4328 3992 4755 5082 5082 5134 5077 5089 5237 5205 5239 4067 4984 336 6.7 -15.91 10 6.7
Nitrobenzene ug/l 7501 6667 5000 3333 2499 5463 5463 3373 6435 5463 4758 4900 5438 6435 5403 4758 4900 5438 6435 16.4 88.91 10 16.7
Phenol ug/l 6819 6213 5000 3787 3181 5195 4968 4432 4966 5133 5612 4900 5193 5612 4900 5193 5612 4900 5193 606 12.2 31.00 10
UCL (MEAN + 3 X SD) UWL (MEAN + 2 X SD) AQC ACTUAL CONC. LWL (MEAN - 2 X SD) LCL (MEAN - 3 X SD) LCL (MEAN - 3 X SD) DAY 1 2 3 4 4 5 6 6 7 7 7 8 8 8 9 110 111 MEAN mg/l STANDARD DEVIATION mg/l RSD % BlAS mg/l BlAS mg/l Brecision % Bias %

The vials, containing the samples, are first heated to 80°C and shaken for 15 minutes using a Hewlett Packard HP7694 Headspace Sampler, during this time any volatile organic compounds present are partitioned into the headspace in the vial. After this t Samples received wet in a volatile vial Headspace Volatiles by &CNFS UKAS accredited Abstract of method injattatit.

Extraction Time & Temp Soil: Extractant ratio

Complet Reference Material Matrix

Performance

Limit of detection

Suitable CRM unavailable at present

Heated at 80°C and shaken for 15 minutes on GC autosampler

See Performance data

Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit)

Simplar d deviation

Degrees of freedom

Hins

Details of validation procedure

See Performance data

See Performance data

See Performance data

References include: AWW. 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998 Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed

AQC analysed every 10 samples

Defails of routine AQC

The vials, containing the samples, are first heated to 80°C and shaken for 15 minutes using a Hewlett Packard HP7694 Headspace Sampler, during this time any volatile organic compounds present are partitioned into the headspace in the vial. After this t Heated at 80°C and shaken for \$5 minutes on GC autosampler Headspace Volatiles by GCMS Suitable CRM unavailable at present UKAS accredited Ceriffed Reference Material Saturation Time & Temp Abstract of method in this property Aluttia

Reporting detection limits are signed below (method detection levels are all lower than reporting detection limit)

See Performance data

ring of celebrating

Performance

Standard deviation See Performance data

References include: AWWA 1916 Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998 Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed See Performance data See Performance data betails of validation procedure Degrees of freedom

Defails of routine AQC: AQC analysed every 10 samples

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1.2-Dichlorobenzene	1/011	625	500	375			492	506	549	492	545	488	494	467	461	524	466	491	547	499	513	505	467	577	494	475	488	494	535	526	557	488	503	494		505	30	9.3	4 0:	2 88	· · · · · ·	0. 0.
Isopropylbenzene	na/l	625	500	375			560	492	572	526	540	485	498	494	519	524	499	528	542	498	532	531	534	556	521	485	523	524	496	541	531	495	492	502		519	24	4.6	19,3	28	4.8	3.9
Tetrachloroethene	l/Bn	625	500	375		;	609	475	594	555	485	487	518	462	498	483	475	522	591	443	506	504	523	568	541	485	484	505	458	485	493	511	488	503		509	42	8.2	8.9	28	8.3	6
Toluene	l/Bn	625	900	375		į. C	000	4/8	617	518	516	487	535	514	5 18	524	497	5/5	584	512	450	524	575	594	515	481	207	534	5/3	485	41.	497	در ت	517		526	35	7.4	25.7	28	7.8	D.
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handelet

NIETALS by ICP-OES UKAS accredited method

Abstract of method

A known aliquot of dried soil is digested in aqua regia to produce an aqueous solution for the analysis of trace metals. After filtering and diluting the acid

*Screening analysis only

Dried & Crushed soil 5g:30m Hydrochloric acid & 10ml Nitric acid

solution to a known volume it is submitted for ICP-OES analysis.

As, Cd, Cr, Cu, Hg*, Ni, Pb, Ser, V, Zn

Soil: Extractant ratio

Extraction Time & Temp

Reflux 2 hours

Mainta

Certified Reference Material

Performance

Reporting detection limits are stated below (method detection levels are all lower than reporting detection limit) 1 mg/kg IN SOIL FOR ALL METALS EXCEPT As, Se & Cd = 0.5 mg/kg, Hg = 0.3 mg/kg

Standard deviation

See Performance data

See Performance data

Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998

Details of routine AQC

AQC analysed every 10 samples Soil QC extracted & analysed daily

1.00:6138

Soil

See Performance data

Limit of detection

See Performance data

Degrees of freedom

Details of validation procedure

AQC Data from Standard Solutions for Metals by ICP-OES

	ARSENIC	CADMIUM	CHROMIUM	COPPER	NICKEL	MERCURY	LEAD	SELENIUM	VANADIUM	ZINC
	ma/l	ma/I	mg/l	mg/l	mg/l	l/bm	mg/l	mg/l	mg/l	l/gm
(CS X E + NA HM) (CE	8 95	6.69	10.8	39.8	32.7	2.11	53.3	42.4	8.0	26.6
UWI (MEAN +2 X SD)	58.2	68.2	10.6	38.2	31.8	2.07	52.2	41.6	7.8	26.0
AGC ACTUAL CONC.	55	65	10	35	30	2.00	50	40	7.5	25
WI (MEAN -2 X SD)	51.8	61.8	9.4	31.8	28.2	1.93	47.8	38.4	7.2	24.0
LCL (MEAN - 3 X SD)	50.2	60.1	9.2	30.2	27.3	1.89	46.7	37.6	7.0	23.4
DAY										
hone	57.9	63.6	83 67	31.5	28.7	1.91	51.6	40.6	7.7	24.3
· 0/	58.9	65.4	9.4	35.3	30.3	1,79	47.7	37.9	7.3	24.6
. ന	58.7	65.4	9.6	34.1	30.2	1.89	. 51.1	40.2	7.7	24.6
ব	57.1	64.2	9.2	33.6	29.7	1.90	50.7	40.4	7.6	24.2
ស	56.9	64.7	9.5	33.6	29.7	1.88	50.7	39.9	7.8	24.4
· · · · · · · · · · · · · · · · · · ·	67.9	64.0	69	33.7	29.6	1.83	49.2	38.8	7.6	24.0
2	57.4	62.2	8.7	30.3	28.0	1.87	49.B	39.7	7.7	23.8
යට	67.9	60.3	8.6	30.3	27.6	1.89	50.1	39.9	7,5	23.1
on on	55.5	64.7	6.9	34.0	29.9	1.88	50.1	39.5	7.5	24.4
0	56.1	62.7	0.6	33.0	28.8	1.88	50.8	39.8	7.5	23.5
free free	53.3	61.7	8.9	32.6	28.7	1,85	49.2	38.8	7,3	23.3
MFAN mg/	57.1	63.5	e L	32.9	29.2	1.87	50.1	39.6	7.6	24.0
STANDARD DEVIATION mg/l	1.60	1.62	0.278	1.59	0.887	0.037	1.10	0.808	0.172	0.524
RSD %	2.8	5.5	e,	4.8	3.0	2.0	2.2	2.0	2.3	2.2
BIAS ma/l	2.06	-1.48	-0.92	-2.09	-0.81	-0.13	0.07	-0.41	0.07	96.0-
, =	1 4	F		у		-	1		-	
Precision %	2.9	20	2.8	4.5	3.0	1.8	2.2	2.0	2.3	2.1
Bias %	3.7	2.3	9.2	6.0	2.7	9.9	0.1	1.0	1.0	9.6
		500								

n = Number of measurements

CRM LGC 6138 Data for Metals by ICP-OES

SELENIUM	mg/kg	3.6	2.9	1.5	0.1	9.0-	0.2		6.0	Q. T.	चं, स्ट	1.7	2.9	2.1	2.9	3.0	2.0	1.8	1.4		2.0	0.69	34.3	0.5	1	45.7	33.3
ZINC	mg/kg	593.9	547.9	456	364.1	318.1	25		395	397	393	392	372	407	504	391	379	495	451		416.0	45.97	11.0	-40.0	Y	10.1	8.8
LEAD	mg/kg	562.0	538.0	490	442.0	418.0	20		447	461	468	481	482	446	531	469	450	475	482		472.0	24.00	5.1	-18.0		4.9	3.7
*COPPER	mg/kg	151.9	145.2	132	118.8	112.1	34		88	84	84	78	75	78	79	91	82	73	94		82.4	6,62	8.0	-49.6	11	5.0	37.6
CHROMIUM	mg/kg	125.5	116.8	6.99	81.8	73.1	4		88	26	89	94	78	77	96	83	78	82	88		88.1	8.73	6.6	-11.2	Arms	8.8	6.
ARSENIC	mg/kg	38.6	37.3	34.5	31.7	30.4	2.7		38.9	38.7	36.4	36.3	37.9	36.1	35.6	35.3	36.4	35.4	9.4 9.	lan i i u u	36.5	80 80	83 83	2.0		4.0	rð Q
		UCL (MEAN + 3 X SD)	UWL (MEAN +2 X SD)	CERTIFIED ASSESSED VALUE mg/kg	LWL (MEAN -2 X SD)	LCL (MEAN - 3 X SD)	CRM Uncertainty	DAY	-ş-wi	24	Ø	4	S	9		93	o	10	Acres		MEAN mg/kg	STANDARD DEVIATION mg/kg	RSD %	BIAS mg/kg	a	Precision %	Bias %

*Spent oxides sample , have known negative bias effects.

Parameter Abstract of method

Soil: Extractant ratio

Extraction Time & Temp

Certified Reference Material A suffix

Performmee

j imit of detection

Standard deviation

See Performance data

See Performance data

See Performance data

Internal Method Validation Procedure GLS 036 Version 3.0 - Uncontrolled document enclosed References include: AWWA 19th Edition, EA Validation of methods for the Analysis of contaminated soils (draft) 1998 Details of yalidation procedure

AQC analysed every 10 samples Soil QC extracted & analysed daily

Details of routine AQC

WATER SOLUBLE BORON

UKAS accredited method (method submitted pending accreditation in March 2001) BG Method
A purtion of dried soil sample is mixed with water and heated. Any water soluble boron present in the soil, leaches into the water and is analysed by ICP-OES.

Dried & Crushed soil 10g:100ml Delignised water

Boil - 5mins

Soil

1 GC 6177 Landfill Leachate

See Performance data

Reporting detection limits are started below (method detection levels are all lower than reporting detection limit)

Degrees of freedom

CRM LGC 6177- Landfill Leachate Data for Water Soluble Boron by ICP-OES

WATER SOLUBLE BORON

mg/l

2.16 1.96 1.83 1.76

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AGC Data from Standard Solutions for Water Soluble Boron by ICP-OES
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WATERS	WATER SOLUBLE BORON	SORON	
	mg/l		HCI (MEAN + 3 X SD)
UCL (MEAN + 3 X SD)	22.4		IIMI (MEAN +2 X SD)
UWL (MEAN +2 X SD)	21.6		OME (MERCA)
AGG ACTUAL CONC.	20.0		TOO IN THE VIEW OF STORY
(OS X C- NA HW) IN I	18.4		LWE (MEAN -Z A CD)
			LCL (MEAN - 3 X SD)
LCL (MEAN - 3 X SD)	0.71		CRM Uncertainty
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2	r C		MEAN mg/l
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STANDARD DEVIATION mg/l	0.81		HSD %
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BIAS mg/l	-0.52		, =
C			Precision %
Precision %	4.1		% SEIB
Bias %	2.6		

2.04

1.90 2.02 2.08 2.08 2.08 2.02 0.065 3.2 0.06

1.90

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APPENDIX D

CONCENTRATION OF CONTAMINANTS DETECTED IN SOIL AND GROUNDWATER SAMPLES

TABLE D1: VOLATILE ORGANIC COMPOUNDS - SOIL Units = mg/kg

OLEFINS 6

	DEPTH SOIL TYPE ALL TARGETED COMPOUNDS	0.4m Made Ground
A CONTRACTOR OF THE PROPERTY O	DEPTH	0.4m
SAMPLE	REF	OL109

WILTON ETHYLENE CONTROL

	Silve Ability Street Abbasis and					AND THE RESIDENCE OF THE PROPERTY OF THE PROPE	TENTATIVELY IDENTIFIED	
SAMPLE	ALTONOMICS TO SECURE THE PROPERTY OF THE PERSON.	AND THE RESIDENCE OF THE PARTY	THE COURT OF THE PARTY OF THE P	I AHGETED COMPOUNDS	COMPOUN	IDS	COMPOUNDS	
REF	ОЕРТН	SOIL TYPE Ethylbenzene p/m-Xylene 0-Xylene	Ethylbenzene	p/m-Xylene	o-Xvlene	1,3,5-	Carbon	
WECTOA	1 E 1 0m	WEC101 15 1000 Sould	Contraction and the second sec	The state of the s		Trimethylbenzene	Disulphide	
+01011	10.4	Salluy Clay	0.003	0.036	0.012	0.003	0000	
VV EU ZU3	4.5 - 5.0m	WECZU3 4.5 - 5.0m Sandy Clay	<0.001	900.0	<0.001	<0.001	100:0	
			New Control of the Co	Contract of the Contract of th	Commence of the Commence of th	AND CONTRACTOR OF THE PARTY OF		

<0.001 Below Limit of Detection
Not detected by TIC Screen
For VOCs target compound is only listed if detected in one or more sample (for full list see table E3)

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L C L C L C L C L C L C L C L C L C L C	-	THE COURT OF THE C		AHGE	I ED COMPOUNDS	SGNOO			TENTATIVELY IDENT	TENTATIVELY IDENTIFIED COMPOSINDS
SAIMPLE HEF		Toluene	Ethylbenzene p	/m Xylene	o Xylene	1,2,4 Trimethylbenzene	o Xylene 1,2,4 Trimethylbenzene 1,3,5 Trimethylbenzene	Naphthalene	C9-C12 Aromatic	C4-C7Hydrocarbon
OL104	<0.001	<0.001	- CO CV	3	100				Isomers	Fraction
OI 107	10000		0.00	<0.001	0.025	<0.001	<0.001	<0.001	0.930	1000
7++	100.00	<0.001	<0.001	<0.00	<0.001	<0.001	-00.007	10000	003:0	0.133
4 2 2	<0.001	√0.001 1	1000	1000	*00		-00:00	50.001	•	,
01201	- VO 0V	F Q Q Q	00.0	100.00	<0.00	L00.0>	<0.001	<0.001		
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01207	<0.001	<0.001	<0.001	- VO 0/	+00.07	4000	00.00	<0.001	1	•
01215	<0.001	70.07	7000	000	100.00	<0.001	<0.001	<0.001	1	_
01217	-00 00-1	100.00	20.00	<0.00	<0.001	<0.001	<0.001	<0.001		
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WILTON ETHYLENE CONTROL

TENTATIVE! VIDENTIFIED COMPANDE	C19-C19 Everyone to a series COMPOUNDS	Chlorodifluromethane	רומנוטו	2.98 0.080
		Naphthalene		<0.001
	1	1,3,5 I rimethylbenzene	+ 00 C	
COMPOUNDS	1 2 4 Trimosh discount	7. yierie 1,2,4 minetriyibenzene 1,3,5 methylbenzene	/0.001	TO CO
TARGETED COMPOUNDS	analy X o lanaly X m/n	principle o Aylene	<0.001 0.006	THE PROPERTY OF THE PROPERTY O
	Ethylbenzene		<0.001	
	Toluene	THE REPORT OF THE PROPERTY OF	<0.001	The state of the s
A NOT AND THE REAL PROPERTY OF A STATE OF THE STATE OF TH	Benzene		-0.00	
TO THE CHARLES OF THE PARTY OF	SAMPLE REF	WECIOSE	CO C C C C C C C C C C C C C C C C C C	

CENTRAL CONTROL

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			200			THE RESIDENCE OF THE PROPERTY		A STATE OF THE PERSON NAMED IN COLUMN NAMED IN	I EIN I A I IVELY IDEN	I EN LA LIVELY IDENTIFIED COMPOUNDS
SAMPLE REF	Benzene	Toluene	Ethylbenzene	p/m Xylene	o Xylene	1,2,4 Trimethylbenzene	o Xylene 1,2,4 Trimethylbenzene 1,3,5 Trimethylbenzene	Nanhthalene	C9-C13 Hydrocarbon	
CC109	0000	CAMPINE THE RESIDENCE OF A SECRETARY		1					Fraction	Endo-bicycloperitagiene
	0.032	0.031		20.02	0.450	7.4.0	AND DESCRIPTION OF THE PROPERTY OF THE PROPERT			
00000	10000	TO CO		6.00	0.732	0.448	7.10	0 229	+ 73	
10100	20.00	<0.001	-000	10001	4000	7000		0.22.0	04.	
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	100.00		- VO 004	70.001	1000	*000		- 00:07	ı	
CC204	-00 0V	TO CO		0.00	20.00	<0.001	<0.001	<0.001	177	
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		CONTRACTOR DESCRIPTION OF THE PROPERTY OF THE	Section of the sectio	PACKAGE AND PACKAG	-00.00	<0.00 l	<0.001	<0.001	1	1000
			2000				THE CHARLEST THE CONTRACT OF T	THE RESIDENCE AND PARTY OF THE PERSON NAMED IN COLUMN 2 IS NOT THE		0.000

<0.001 Below Limit of Detection
- Not detected by TIC Screen
For VOCs target compound is only listed if detected in one or more sample (for full list see table E3)

TABLE D3: VOLATILE ORGANIC COMPOUNDS - TARGET COMPOUNDS

CAS NUMBER	COMPOLIND
75-71-8	
7 0 - 0	
0-/0-4/	Chloromethane
75-01-4	Vinyl Chloride
74-83-9	Bromomethane
75-00-3	Chloroethane
75-69-4	Trichlorofluoromethane
156-60-5	trans-1,2-Dichloroethene
75-09-2	Dichloromethane
75-15-0	Carbon disulphide
75-35-4	1,1-Dichloroethene
75-34-3	1,1-Dichloroethane
1634-04-4	tert-butyl methyl ether
156-59-2	cis-1,2-Dichloroethene
74-97-5	Bromochloromethane
67-66-3	Chloroform
594-20-7	2,2-Dichloropropane
107-06-2	1,2-Dichloroethane
71-55-6	1,1,1-Trichloroethane
563-58-6	1,1 - Dichloropropene
71-43-2	Benzene
56-23-5	Carbontetrachloride
74-95-3	Dibromomethane
78-87-5	1,2-Dichloropropane
75-27-4	Bromodichloromethane
79-01-6	Trichloroethene
10061-01-5	cis-1,3-Dichloropropene
10061-02-6	trans-1,3-Dichloropropene
79-00-5	1,1,2-Trichloroethane
108-88-3	Toluene
142-28-9	1,3-Dichloropropane
124-48-1	Dibromochloromethane

CAS NUMBER	COMPOUND
106-93-4	1,2-Dibromoethane
127-18-4	Tetrachloroethene
630-20-6	1,1,1,2-Tetrachloroethane
108-90-7	Chlorobenzene
100-41-4	Ethylbenzene
108-38-3*	p/m-Xylene
75-25-2	Bromoform
100-42-5	Styrene
79-34-5	1,1,2,2-Tetrachloroethane
95-47-6	o-Xylene
96-18-4	1,2,3-Trichloropropane
98-82-8	Isopropylbenzene
108-86-1	Bromobenzene
95-49-8	2-Chlorotoluene
103-65-1	Propylbenzene
106-42-4	4-Chlorotoluene
92-63-6	1,2,4-Trimetylbenzene
984-66	4-IsopropyItoluene
108-67-8	1,3,5-Trimetylbenzene
541-73-1	1,3-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
135-98-8	sec-Butylbenzene
9-90-86	tert-Butylbenzene
95-50-1	1,2-Dichlorobenzene
104-51-8	n-Butylbenzene
96-12-8	1,2-Dibromo-3-chloropropane
120-82-1	1,2,4-Trichlorobenzene
91-20-3	Naphthalene
87-61-6	1,2,3-Trichlorobenzene
87-68-3	Hexachlorobutadiene

TABLE D4: SEMIVOLATILE ORGANIC COMPOUNDS - SOILS

Units = mg/kg

	AND THE PROPERTY OF THE PROPER	A CONTRACTOR OF THE PROPERTY O	About the second	PANCESTER (MATERIAL CONTRACTOR CO	A THE RESIDENCE OF THE PARTY OF	Commence to the Commence of th	THE PROPERTY OF THE PROPERTY O	PER STORY OF THE PER ST						
	Additional and Additional Section (1997)	THE CHARLES WHEN THE PLANT OF THE PROPERTY OF	H-94-CALCONOMINATION OF THE PARTY OF THE PAR	ACCUSATION OF THE ACCUSATION OF THE PROPERTY O	I AHGE I ED COMPOUNDS	OMPOUNE	St			TEN	TENTATIVE Y IDENTIFIED COMPOUNDS (TICE)	OIT) SCINITODINO	(0)	The state of the s
			No.	*****					The state of the s			CONTROL INC.	5)	
SAMPLE	ОЕРТН	SOIL TYPE	Naphthalene	Phenanthrene	Fluoranthene	Pyrene	Di-n-butyiphthalate	Bis(2ethylhexyl)-		C11-C28 Hydrocarbons 10%	C11-C28 Hydrocarbons 10% C14-C28 Hydrocarbons 10%	C14-C28	C13-C27 Hydrocarbons 10%	C16,094
			. Websiene			-		printalate	C9-C12 Aromatic	Aromatic 90%	Aromatic 90% Aliphatic	nydiocarbons 100%	Aromatic 90%	Hydrocarbons
OL105	0.3 - 0.4m	Made Ground	PROMOCULE AND A STATE OF THE PARTY OF T	ALCOHOMORPHICATION AND AND AND AND AND AND AND AND AND AN	CONTRACTOR OF THE PROPERTY OF	March Land Control of the Control of	The state of the s		Hydrocarbons	Olipitalic Carolinalic			Aliphatic	
ļ		000000000000000000000000000000000000000						0000	000	TO STATE OF THE PARTY OF THE PA	The second leaves and	The second secon		
	1.4 - 1.5m	Boulder Clay	107	0 404			70.1	0.122	7.62		1	,		7
-	0 7			0.121	4.0	0.118	-0×	0.975		0,1,1				7.0
OL 30	E. D D.	Soulder Clay	<0.1	0.185	2010	7 + 0	0070	0.77.0	1	7.41	,	,	,	
00100	02-03m	Mode Grand	* (20.00	0.100	0.10	0.129	0.242	,		170			
		ייומתם מוסחות	×0.1	×0.1	- - -	- CV	107	*****	-		0.71		,	,
	0.5 - 0.6m	Sand	0.108	+ 0,			0.	410.0	1	,	,	140		
Action of the food of the control of	 УКИ ВЕОКОРНИКА В ВЕОКО ПОВЕКТА В ВЕОКО В В ВОКО В В ВОКО В В ВОКО В В ВОКО В В В В	APPROXIMATION CONTRACTOR AND CONTRACTOR CONT	0.10		- C-C-J	07	- CV	000				7.	,	,
			Winness	The second of the second	COOK ATTWOCHERS OF THE CONTRACTOR	PROGRAMMON PROPERTY OF THE PARTY OF T	· · · · · · · · · · · · · · · · · · ·	0.24		,		3	* 0 *	

WILTON ETHYLENE CENTRAL

	CHOLENNY PROPERTY AND THE CONTRACTOR OF THE CONT	The second control of	TARGETE	TARGETED COMPOUNDS	TICS	
SAMPLE REF	DEPTH	SOIL TYPE	Di-n- butylphthalate	Bis/2ethylhexyl)- phthafate	C14-C30 Hydrocarbons 20% Aromatic 80%	Molecular Sulphur
WEC104	1.7 - 1.9m	Boulder Clay	0.112	0.203	Aliphatic 10 8	0.87
		TOTAL PROPERTY OF THE PROPERTY	Constitution of the Consti	CONCORDANTAMENT	2	20.00

TOTAL CONTRACTOR OF THE PROPERTY OF THE PROPER	WHITE STATE OF THE	A CHARLES AND COLORS A		CLI (AT OLD THE CASE OF THE CA	TAI	TARGETED COMPOUND	OMPOUNDS	A CONTRACTOR OF THE PROPERTY O	A STATE OF THE OWNER OWN					
-		-		Provide	#S00		A THE RESIDENCE OF THE PARTY OF	The state of the s	A CONTRACTOR OF THE PARTY OF TH	adhannes and the second second second	IENIAIIVELY	IENIAIIVELY IDENTIFIED COMPOUNDS	POUNDS	
SAMPLE	DEPTH	SOIL TYPE	Nachthalana	9	É					C10-C28				
ב				- Hendininene	riuoranthene	Pyrene	2-Methylnaphthalene	Di-n-butylphthalate	exyl)-	Hydrocarbons 10%		C14-C28		
****					2000				primarate	Aromatic 90%		Hydrocarbons	Molecular Sulphur	Tri-isopropylbenzene
COTO 101	The state of the s	The state of the s	TO SECURE AND ADDRESS OF THE PROPERTY OF THE P		2000			******		Aliphatic	C8-C30 Hydrocarbons 30%			
	0.1 - 0.4m	Surface Sample	0.47	0.00	CCC C	A C C C		THE COLUMN TWO PROPERTY OF THE			Aromatic 70% Aliphatic			
00101	07-09m	Surface Sample			0.507	0.421	0.131		0 244	178		The state of the s		
10000		outlace callible	- O.	0.126	Ç	0.1.0	+ 0/	0000		2	,	r	•	,
00203	2.3 - 2.7m	Boulder Clay	0.164	0.17	• 0,		70.1	0.206	0.248	,	•	19.6	-	0000
	A CONTRACTOR OF THE PROPERTY O	AND AND ASSESSMENT OF THE PROPERTY OF THE PARTY OF THE PA	Parace Separation of property of the parace	0, 1	5		0		7 (The second secon	0.0		0.000
				STATE OF THE PROPERTY OF THE P	CONTROL CONTRACTOR SERVICE CONTROL CON	Section of the second			-0>		7 07		1	

<0.1 Below Limit of Detection
- Not detected by TIC Screen
- For SVOCs target compound is only listed if detected in one or more sample (for full list see table E6)

TENTATIVELY IDENTIFIED COMPOUNDS	* Петерителення положений положений положений положений положений и положений и положений и положений полож		Samples Octob, and Octob show spikes at	lemention times relating to unknown	compounds, all at a concentration lower than	Course and shows unresolved complex	inaliei wili a concentration of 0.009
ALL TARGETED COMPOUNDS					CO 001		
SAMPLE REF	OL104	OL107	OL114	OL201	OL207	01215	OL217

WILTON ETHYLENE CONTROL

rbons Molecular Sulphur isomers of	0.004
Hydroca	101
C9-C10 Aromatic Hydrocarbons	0.067
WEC 105B	ALTONIO DE LA CONTRACTOR DE LA CONTRACTO
	105B Hydrocarbons

			phthalene		CC	-	,		1000		-	
- CONTRACTOR OF THE PERSON NAMED AND ADDRESS OF THE PERSON NAM			2-Methylnaphthalene	,		0.020	7	10.0	0		5	
AND THE PROPERTY OF THE PROPER			Pyrene		0.001	0.00	<0.001		×0.001		×0.001	
CONTROL BOOK TO BE SENTED TO SELECT THE SERVICE OF	The state of the s	1	rienaliillene		0,005		<0.001		<0.001		<0.001	CANADA CONTRACTOR MAN CONTRACTOR
TARGETED COMPOUNDS		Fiorizana		Melicin professional superproperties of the contract of the co	0.009	+0000	50.00 I	0000	6.000	7		The state of the s
The state of the s		Acenapthene		2000	200.0	×0.001		V0.007	7000	20.00	Promision of the second designation of the s	
THE RESIDENCE OF THE PERSON OF	A	Acenaphthalene	TO CONTRACT THE PROPERTY OF TH	0.003	10000	50.00	-00 00	100.00	10007	00.07	Proposition of the Control of the Co	
POSTET E ANALONO PROCESSANSANS ANAMASTERS (1900) ON SCHOOL PROCESSANS	Nanhtholono	ज्यातावावावा	COLUMN CONTRACTOR CONT	0.00	-U 001	00:00	×0.001	The state of the s	<0.001	STREET, STREET		
The state of the s	SAMPLEREF		00400	0000	CC202		CC203	,0000	50204	MAN PERSONAL PROPERTY AND PROPERTY OF THE PROP		

	isomer isomer dimethyl Indanones isomer dimethyl Indanones isomer G9-G30 Molecular Sulphirr G10	Hydrocarbons	(10)		3.580 0.032
SAMPLE REF C9-C12 Aromatic mathy	Hydrocarbons		- CCUZ	COCO	

<0.001 Below Limit of Detection
- Not detected by TIC Screen
For SVOCs target compound is only listed if detected in one or more sample (for full list see table E6)

TABLE D6: SEMI VOLATILE ORGANIC COMPOUNDS - TARGET COMPOUNDS

CAS NOMBER	COMPOLIND
10000	
7-08-001	Lyenol
85-57-8	2-Chlorophenol
95-48-7	2-Methylphenol
106-44-5	4-Methylphenol
88-75-5	2-Nitrophenol
100-02-7	4-Nitrophenol
120-83-2	2,4-Dichlorophenol
105-67-9	2,4-Dimethylphenol
59-50.7	4-Chloro-3-methylphenol
88-06-2	2,4,6-Trichlorophenol
95-95-4	2,4,5-Trichlorophenol
87-86-5	Pentachlorophenol
541-73-1	1,3-Dichlorobenzene
106-46-7	1,4-Dichlorobenzene
95-50-1	1,2-Dichlorobenzene
120-82-1	1,2,4-Trichlorobenzene
98-95-3	Nitrobenzene
103-33-3	Azobenzene
118-74-1	Hexachlorobenzene
91-20-3	Naphthalene
208-96-8	Acenaphthylene
83-32-9	Acenapthene
86-73-7	Fluorene
85-01-8	Phenanthrene
120-12-7	Anthracene
206-44-0	Fluoranthene
129-00-0	Pyrene
56-55-3	Benzo(a)anthracene
218-01-9	Chrysene
205-99-2	Benzo(b)fluoranthene

CAS NUMBER	COMPOUND
207-08-9	Benzo(k)fluoranthene
50-32-8	Benzo(a)pyrene
193-39-5	Indeno(1,2,3-cd)pyrene
53-70-3	Dibenzo(a,h)anthracene
191-24-2	Benzo(ghi)perylene
 91-58-7	2-Chloronaphthalene
 91-57-6	2-Methylnaphthalene
 86-74-8	Carbazole
 78-59-1	Isophorone
 132-64-9	Dibenzofuran
 131-11-3	Dimethyl phthalate
 84-66-2	Diethyl phthalate
 84-74-2	Di-n-butylphthalate
 117-84-0	Di-n-octylphthalate
117-81-7	Bis(2-ethylhexyl)phthalate
 85-68-7	Butylbenzylphthalate
 106-47-8	4-Chloroaniline
 88-74-4	2-Nitroaniline
 89-09-2	3-Nitroaniline
 100-01-6	4-Nitroaniline
 121-14-2	2,4-Dinitrotoluene
 606-20-2	2,6-Dinitrotoluene
 111-44-4	Bis(2-chloroethyl)ether
 101-55-3	4-Bromophenylphenylether
 7005-72-3	4-Chlorophenylphenylether
 67-72-1	Hexachloroethane
 87-68-3	Hexachlorobutadiene
 77-47-4	Hexachlorocyclopentadiene
 111-91-1	Bis(2-chloroethoxy)methane
 621-64-7	N-nitrosodi-n-propylamine

TABLE D7: METALS - SOILS

OLEFINS 6

	SOIL TYPE Arsenic Soluble) Cadmium Chromium Copper Mercury Nickel Lead Selenium Zinc		2 30 18	00	-			Sand 1 16 8 <1 35			18 12 <1 25 13 9		Sand 9 - 1 5 38 <1 36		Sand 11 13 6 <1 26
	Arsenic			Made Ground 63	-			S 2 7 7 8	V 230	Sala	Carl Contract of the Contract	-		V	
CALL THE CONTRACT OF THE CALL	SAMPLE REF DEPTH	OL101 3.2-3.5m		01.30-0.40m	OI 106 1 4.1 5m		***************************************	OL108 2.3-2.5m	and the same of the same	OL111 0.5-0.6m		- COLUMNIA OF THE PERSON	OL115 1,50-1,60m	To Change Comme	OL206 4,40-5,00m

WILTON ETHYLENE CONTROL

		THE PERSON OF TH									
SAMPLE REF	DEPTH	SOII TVDE	Boron (Water								
			Alseine Colubia	Cadminm	Chromium	Copper	Mercury	Nickel	700	Colonina	ï
WEC104	4 1 4 C	The second section of the second seco	(DICTION CONTRACTOR CO				,	- CAC	בממ	generical	ZINC
VV TO 104	ED: 1-/:	Boulder Clay	1,	T		TO SHARE THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COL	THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.		The state of the s		
WECSO		The second secon		v	92	50	~	000	24	1	L L
10401	0.0-0.0	Sandy Clay	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	+,				3	17	7	င္ပ
WEC204	75-78m	Donald of Charles	AMPERICAL PROPERTY OF THE PROP	-	30	7.7	<u></u>	35	23	~	67
The second secon	Charles Company of the Company of th	Doulder Clay	2	~	27	17	+,	1.0			5

SAMOIRDEE		(DOYOU (A/O+>*	THE RESERVE OF THE PROPERTY OF	And the second s	ENTER SECURITION OF THE PROPERTY OF THE PERSON OF THE PERS	THE RESERVE THE PARTY OF THE PA				
כאווון בב חבר		SOIL TYPE	Arsenic	Solvible)	Cadmium	Chromium	Conner	Merciny	Mickel	7000	10100	i
CC101	O 1 O 1 DO	A fine and a second sec	BOTH HOUSE CONTRACT PROTECTION SHAPE CONTRACT OF THE PERSON OF THE PERSO				2	, D	ביינו	רבשת	Dallellac	7IUC
	1.0-1.0	Made Ground	o	7	+-		THE REPORT OF THE PERSON.	Company on the Company of the Compan		Commence of the Control of the Contr		
00101	0.7-0 9m	Organio Cia	- T		>	9	10	V	50	14	7	70
POLICIA PROPERTY DE LA CONTRACTOR DE LA	0:0	Cura Ciav		`	,	(1	-		-		,	2
00100	16-19m		A see a	Manual Commission of the Commi	>	9	တ	v	22	000	0	30
The state of the s	0.0	ואומכום פואומ	7/	7		CLT					1	25
00100	28-2 gm		0 7	N-4400000000000000000000000000000000000		501	20	V	154	33	~	150
PROPERTY OF THE PROPERTY OF TH	110	למיט לטיב	מכ	7		**	-	The state of the s	-		,	
00201	23-27m	Bouldor Clar.		And the second s		77	3	v	44	2,5		7.0
WHAT COURSE AND ADDRESS OF THE PARTY OF THE	111111111111111111111111111111111111111	טטמוט ואטואסט	200	V	7	00	-	-	-		,	7 /
CC202	5.5-5.6m	Possible Mindatone	C +	Account to the second of the s		30	Ω	V	32	34	V	72
The second secon		חוממסואי טומיססי	0	~	7	C T		The state of the s				7,7
00203	0-0.15m	Tailor Opall	Grow and	Christian Marian Education and Christian Chris		<u>ي</u>	7.7	V	_ 000	<u></u>	~	22
THE RESERVE OF THE PROPERTY OF	Water Street Control of Control	ואימת פוסודים	ွဲဂ	V	7	17	0					77
			AND DESCRIPTION OF THE PROPERTY OF THE PROPERT	WHEN THE PROPERTY OF THE PROPE		/	N	v	16	35	~	22
						Total Control of the	AND CONTROL OF THE PROPERTY OF THE PARTY OF	CONTRACTOR CONTRACTOR CONTRACTOR	THE PROPERTY OF THE PERSON NAMED IN COLUMN TWO	A STATE OF THE PERSON OF THE P		2

Sample Ref	Boron	Selenium	Zinc	Mercury Low Dutch Target AA*	Arsenic Low Level by AA	Cadmium by ICP- USN*	Chromium by ICP- USN*	Copper by ICP- USN*	Nickel by Lead by ICP-USN*	Lead by ICP-USN*
OL102	0.07	<0.05	<0.05	<0.05	0000	70000	1000	0000		
OI 107	200	30.0	100	20.00	20,005	10.00.0	<0.00 ×	0.00	<0.01	<0.005
100		00.07	CU.U>	cn.u>	<0.002	<0.0004	<0.001	<0.005	<0.01	<0.005
0.201	1		1	<0.05	1	1	,			200:00
OL201	90.0	<0.05	<0.05		2000	70000	10000	L		
OI 207	The state of the s	The second secon	The state of the s		700.0	10.0004	<0.001	<0.00>	<0.01	<0.005
10410	NO THE RESERVE OF THE PARTY OF	*	,	<0.05		ı	,	,	,	
01.207	0.19	<0.05	<0.05	and the state of t	0.004	70000	+00.00	1000	100	1 0
01215	ı	The state of the s	The state of the s	10.05		1000	100.00	con.o	<0.0>	0.005
01215	0.15	200	20.00	000			-	-	ſ	
0.010	0	00.00	c0.05	_	<0.002	<0.0004	<0.001	900.0	<0.01	0.010
7170	The second secon	ı	1	<0.05	1	1		-		
OL217	0.63	<0.05	<0.05	*	<0.00>	>0.004	70.001	3000		. 0
		With the second	Biologica and Adams of the Control o	GORGO CONTRACTOR CONTRACTOR DESCRIPTION OF	VALUE ACCOUNTS AND ADDRESS OF THE PARTY OF T	Management of the Control of the Con	100.07	50,000	<0.0	<0.00

WILTON ETHYLENE CONTROL

H					CONTRACTOR OF THE PERSON OF TH	THE RESERVE THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUMN			
m,	Selenium	Zinc	Mercury Low Dutch Target	Arsenic Low Level by AA	Cadmium by ICP- USN*	Chromium by ICP- USN*	Copper by ICP- USN*	Nickel by ICP-USN*	Lead by ICP-USN*
1		The state of the s	WHO WELL THE PERSON NAMED IN COLUMN TWO	CASCALLA CANADA VIOLENCIA DE LA COMPANSION DE LA COMPANSI	Control of the Contro				
	5.5	<0.0>	<0.05	<0.00>	40 00 0×	1000	2000	, ,	100
-	2000	100				-0.00	20.00	<0.0	0.005
	20.00	<0.0>	O. 12	<0.005	<0.0004	0.00	70 OS	5	70.00
WEC203 0.24	2002	70.05	20.0	0000				2.57	×0.000
-		20.0/	50.05	<0.002	<0.0004 -	<0.001	<0.005	~0 O	20 O5
WEC204 0.12	<0.05	<0.05	<0.05	<0.002	<0.0004	<0.001	0.006	5007	2000
	500		The second of th	TATALIST CONTRACTOR CONTRACTOR IN THE CONTRACTOR CONTRA	The state of the s			10.0	20.00

CENTRAL CONTROL

,	٠.			Mercury						STREET,
Sample Ref	Boron	Selenium	Zinc	Low	Arsenic Low	Cadmium by ICP-	Chromium by ICP-	Copper hy ICB.	Nickel by	Lead by
				Target	Level by AA	, NSN	NSN*	-	ICP-USN*	ICP-USN
001	WOOD CONTRACTOR OF THE PARTY OF	STATE OF THE PARTY	CONTROL OF THE PARTY AND ADDRESS OF THE PARTY	HH						
ر د ا رو	0.12	<0.05	<0.05	<0.05	0 005	70007		1000	, 0	
00000	C V C	1.00	THE RESIDENCE AND ADDRESS OF THE PERSONS ASSESSED.		0.00	<0.0004	<0.00	VC.002	~0.0 -	0.006
OEUE	0.47	0.05	<0.05	<0.05	<0.002	<0.000	-0 001	70.00	5	,000
2000	000	200	100		The state of the s		00:00	20.00	\O,0,0	0.004
	0.50	\$0.03	- S-S- S-S-	_ ქე:02 _	<0.002	<0.0004	<0.00	70.00	10.01	000
C204	0.53	0.07	LOO		-			200.07	10.07	0.000
NAMES OF TAXABLE STREET, SALES OF TAXABLE STRE	CONTRACTOR	50.0	CO.U2	CO:02	<0.00Z	<0.0004	<0.001	900	5	2000

Units = mg/l

/bn/ = *

Sample Identity	Depth	Soil Type	Diesel Range Hydrocarbons	Interpretation
OL101	0.1-0.2m	Made Ground	926	Lube oil
OL101	3.2-3.5m	Sandy Clay	91	unknown pattern detected
OL102	1.7-1.9m	Sand	68	unknown pattern detected
OL103	0.0-0.1m	Made Ground	1117	diesel/lube oil
OL104	3.0-3.4m	Sand	45	1 discrete Peak at approx C25
OL105	0.3-0.4m	Made Ground	7	No identification possible
OL106	1.4-1.5m	Boulder Clay	10	unknown pattern detected
OL107	1.6-1.9m	Boulder Clay	47	unknown pattern detected
OL108	2.3-2.5m	Sand	61	unknown pattern detected
OL110	0.1-0.2m	Boulder Clay	26	unknown pattern detected
OL111	0.5-0.6m	Sand	65	unknown pattern detected
OL114	0.1-0.2m	Made Ground	180	Biodegraded Diesel
OL115	1.5-1.6m	Sand	5	No identfication possible
OL201	4.2-4.5m	Silty Sand	122	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel/ Poss Lube Oil
OL202	1.4-1.5m	Sandy Clay	32	unknown pattern detected
OL203	1.5-1.6m	Made Ground	96	unknown pattern detected
OL204	5.4 - 5.7m	Silty Sand	17	unknown pattern detected
OL208	3.0 - 3.5m	Silty Sand		unknown pattern detected
OL210	0.3-0.4m	Made Ground		Biodegraded Diesel
OL214	2.4-2.5m	Sand		unknown pattern detected

WILTON ETHYLENE CONTROL

Sample Identity	Depth	Soil Type	Diesel Range Hydrocarbons	Interpretation
WEC103	0.6-0.8m	Made Ground	6	Possible Lube oil
WE 104	0.1-0.3m	Organic Clay	57	possible humic acids
WEC104	1.7-1.9m	Boulder Clay	54	possible Biodegraded Diesel
WEC104	4.5-4.8m	Sandy Clay		
WEC201	5.0-5.5m	Sandy Clay	68	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel/ Poss Lube Oil
WEC203	4.5-5.0m	Sandy Clay	47	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel/ Poss Lube Oil
-WEC204	7.5-7.8m	Boulder Clay	57	Possible Gasolene Residue / Possible Kerosene Type Residue/ Biodegraded Diesel Possible Gasolene Residue / Possible Kerosene Type Residue/ Possible Biodegraded Diesel

Sample Identity	Depth	Soil Type	Diesel Range Hydrocarbons	Interpretation
CC101	0.1-0.4m	Made Ground	1,039	Biodegraded-Diesel/Lube oil
CC101	0.7-0.9m	Sandy Organic Clay		unknown pattern detected
CC103	0.1-0.2m	Made Ground	180	unknown pattern detected
CC105	2.7-2.9m	Boulder Clay	1,670	PAH'S/Lube oil
CC 109	1.6-1.9m	Made Ground	2,307	unknown pattern detected/lube oil
CC109	2.8-2.9m	Grey Clay	207	Possible kerosene type residue/possible lube oil
CC111	0.05-0.15m	Made Ground	41	unknown pattern detected
CC112	1.1-1.2m	Sandy Clay	53	Possible PAH's
CC113	0.6-0.7m	Sandy Clay	2,938	Lube oil/Possible Biodegraded Diesel
CC201	2.3-2.7m	Boulder Clay	157	possible gasoline residues/ diesel/ possible Lube Oil /Possible Humic acids
CC201	3.5-4.0m	Boulder Clay	73	Possible Gasolene Residue/Possible kerosene type Residue / Possible Biodegraded Diese
CC202	5.5-5.6m	Possible Mudstone	71	possible gasolene Residue/possible kerosene residue
CC203	0-0.15m	Made Ground	4,659	Biodegraded Diesel/ lube oil

Sample Identity	Diesel Range Hydrocarbons	Interpretation
OL102	< 0.010	No Identification Possible
OL104	0.016	unknown pattern detected
OL107	< 0.010	No Identification Possible
OL114	0.012	unknown pattern detected
OL201	0.012	unknown pattern detected
OL204	< 0.010	No Identification Possible
OL206	< 0.010	No Identification Possible
OL207	< 0.010	No Identification Possible
OL208	< 0.010	No Identification Possible
OL211	< 0.010	No Identification Possible
OL213	< 0.010	No Identification Possible
OL214	< 0.010	No Identification Possible
OL215	< 0.010	No Identification Possible
OL217	< 0.010	No Identification Possible

WILTON ETHYLENE CONTROL

Sample Identity	Diesel Range Hydrocarbons	Interpretation
WEC105B	8.53	1 Discrete Peak at C15/ Lube Oil
WEC201	0.084	Possible Lube oil
WEC203	0.050	unknown pattern detected/ Possible Lube Oil
WEC204		No Identification Possible

CENTRAL CONTROL

Sample Identity	Diesel Range Hydrocarbons	Interpretation
CC104	< 0.010	No Identification Possible
CC105	5.35	Gasoline Residues/Naphthalene/Methyl Naphthalene/Possible Lube Oil
CC109	8.65	Gasoline Residues
CC113	124	Gasoline Residues/ Lube Oil
CC201	2.99	Gasoline Residues/ Lube Oil
CC202	0.212	Lube oil
CC203	3.65	Biodegraded Diesel/ lube oil
CC204	0.143	unknown pattern detected

OLEFINS 6 (Feb 03)

Sample Identity	Diesel Range Hydrocarbons	Interpretation
OL102	0.013	unknown pattern detected
OL104	0.038	unknown pattern detected
OL114	0.014	unknown pattern detected
OL204	0.015	unknown pattern detected
OL206	0.013	unknown pattern detected
OL207	0.012	unknown pattern detected
OL211	0.064	unknown pattern detected
OL213	0.011	unknown pattern detected
OL214	4.306	unknown pattern detected

CENTRAL CONTROL (Feb 03)

Sample Identity	Diesel Range Hydrocarbons	Interpretation
CC109	0.618	possible gasoline residue/possible lube oil
CC113	4.615	biodegraded diesel/possible lube oil
CC203	0.023	unknown pattern detected

TABLE D11: PETROL RANGE ORGANICS - SOILS

Units = mg/kg

OLEFINS 6

Sample Identity	Depth	Soil Type	Total Volatiles C ₄ to C ₁₃	Benzene	Toluene	Ethyl Benzene	Total Xylene
OL101	0.2m	Made Ground	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL101	3.25m	Sand	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL102	1.2m	Sand	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL102	1.8-1.9m	Boulder Clay	<0.010	< 0.010	< 0.010	< 0.010	<0.010
OL103	0.05m	Made Ground	101	< 0.010	0.033	0.100	0.549
OL103	1.4-1.5m	Sand	< 0.010	< 0.010	< 0.010	<0.010	<0.010
OL104	3.4-3.5m	Sand	0.598	0.088	0.036	0.058	0.189
OL105	0.4m	Made Ground	14.4	0.051	0.098	<0.010	0.047
OL106	0.6m	Boulder Clay	0.300	< 0.010	< 0.010	<0.010	<0.010
OL107	1.7-1.8m	Boulder Clay	0.680	0.489	0.022	<0.010	0.029
OL108	2.4m	Sand	2.98	1.35	0.052	<0.010	0.032
OL110	0.15m	Boulder Clay	<0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL111	0.55m	Sand	<0.010	<0.010	< 0.010	< 0.010	< 0.010
OL114	2.5m	Sand	3.10	2.92	<0.010	< 0.010	0.033
OL115	1.6m	Sand	0.410	0.019	< 0.010	< 0.010	0.089
OL115	2.9m	Sand	0.516	0.035	0.025	<0.010	0.182
OL201	4.2-4.5m	Silty Sand	0.313	<0.010	< 0.010	<0.010	0.130
OL202	1.4m	Sandy clay	<0.010	< 0.010	<0.010	< 0.010	< 0.010
OL203	1.5m	Made Ground	6.37	<0.010	<0.010	0.011	0.378
OL204	5.4 - 5.7m	Silty Sand	<0.010	<0.010	<0.010	<0.010	<0.010
OL206	4.4 - 5.0m	Silty Sand	0.033	<0.010	< 0.010	< 0.010	0.033
OL208	3.0 - 3.5m	Silty Sand	0.453	0.250	< 0.010	< 0.010	0.059
OL214	2.9m	Boulder Clay	0.045	<0.010	0.014	<0.010	0.021

WILTON ETHYLENE CONTROL

Sample Identity	Depth	Soil Type	Total Volatiles C ₄ to C ₁₃	Benzene	Toluene	Ethyl Benzene	Total Xylene
WEC103	0.6m	Made Ground	0.128	< 0.010	< 0.010	0.042	< 0.010
WEC104	0.3m	Organic Clay	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
WEC104	4.5-4.8m	Sandy Clay	< 0.010	<0.010	< 0.010	< 0.010	< 0.010
WEC105	2.1m	Made Ground	2.825	< 0.010	<0.010	< 0.010	0.072
WEC 201	5.0-5.5m	Sandy Clay	< 0.010	<0.010	< 0.010	< 0.010	< 0.010
WEC203	4.5-5.0m	Sandy Clay	<0.010	< 0.010	< 0.010	< 0.010	< 0.010

Camala			Total		P		
Sample Identity	Depth	Soil Type	Volatiles C ₄ to C ₁₃	Benzene	Toluene	Ethyl Benzene	Total Xylene
CC101	0.4m	Made Ground		0.477	1.061	11.439	19.089
CC101	0.8m	Organic Clay	26.434	0.030	<0.010	0.161	0.285
CC101	1.7m	Boulder Clay	0.137	< 0.010	<0.010	0.053	0.075
CC102	0.3m	Boulder Clay	<0.010	< 0.010	< 0.010	< 0.010	<0.070
CC103	0.15m	Made Ground	8.155	< 0.010	< 0.010	< 0.010	<0.010
CC105	2.8m	Boulder Clay	552.590	0.113	0.414	17.137	154,709
CC106	0.45m	Sandy Clay	1.379	< 0.010	< 0.010	0.016	0.137
CC106	1.8m	Boulder Clay	< 0.010	<0.010	< 0.010	<0.010	<0.010
CC107	0.3m	Sandy Clay	< 0.010	<0.010	<0.010	< 0.010	<0.010
CC108	1.4m	Boulder Clay	0.547	<0.010	<0.010	< 0.010	0.484
CC109	1.9m	Made Ground	1,157	0.109	0.104	3.092	23.078
CC110	0.2m	Sandy Clay	< 0.010	<0.010	<0.010	< 0.010	< 0.010
CC111	0.1m	Made Ground	2.906	0.016	<0.010	< 0.010	0.116
CC112	1.1m	Sandy Clay	0.178	< 0.010	<0.010	<0.010	0.044
CC113	0.7m	Sandy Clay	177.388	0.888	<0.010	3.380	3.941
CC201	2.3-2.7m	Boulder Clay	2,831.740	0.380	13.020	12.590	1,586.625
CC201	3.5-4.0m	Boulder Clay	5.757	0.014	0.112	0.626	4.937
CC203	0.15m	Made Ground	25.118	<0.010	< 0.010	< 0.010	0.130

Sample Identity	Total Volatiles C ₄ to C ₁₃	Benzene	Toluene	Ethyl Benzene	Total Xylene
OL102	<0.010	< 0.010	< 0.010	< 0.010	<0.010
OL104	0.356	0.036	< 0.010	< 0.010	0.089
OL107	< 0.010	< 0.010	<0.010	< 0.010	< 0.010
OL114	< 0.010	< 0.010	< 0.010	< 0.010	<0.010
OL201	<0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL204	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL206	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL207	<0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL208	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL211	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL213	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL214	<0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL215	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
OL217	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

WILTON ETHYLENE CONTROL

Sample Identity	Total Volatiles	Benzene	Toluene	Ethyl Benzene	Total Xylene
WEC105B	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
WEC201	< 0.010	< 0.010	<0.010	< 0.010	< 0.010
WEC203	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
WEC204	< 0.010	< 0.010	< 0.010	<0.010	<0.010

CENTRAL CONTROL

Sample Identity	Total Volatiles C ₄ to C ₁₃	Benzene	Toluene	Ethyl Benzene	Total Xylene
CC104	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
CC105	28.8	0.224	0.071	0.205	7.77
CC109	88.1	0.101	0.035	0.085	5.19
CC113	387	1.69	23.4	7.18	10.48
CC201	6.85	0.080	0.036	< 0.010	4.90
CC202	<0.010	< 0.010	< 0.010	< 0.010	< 0.010
CC203	17.8	< 0.010	< 0.010	< 0.010	< 0.010
CC204	<0.010	<0.010	<0.010	<0.010	<0.010

OLEFINS 6 (Feb 03)

Sample Identity	Total Volatiles C ₄ to C ₁₃	Benzene	Toluene	Ethyl Benzene	Total Xylene
OL102	0.046	< 0.01	< 0.01	< 0.01	< 0.01
OL104	<0.01	< 0.01	< 0.01	<0.01	< 0.01
OL114	0.194	<0.01	< 0.01	< 0.01	< 0.01
OL204	0.112	<0.01	< 0.01	< 0.01	< 0.01
OL206	< 0.01	<0.01	< 0.01	< 0.01	< 0.01
OL207	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
OL211	<0.01	<0.01	< 0.01	< 0.01	< 0.01
OL213	0.064	<0.01	< 0.01	< 0.01	< 0.01
OL214	<0.01	< 0.01	< 0.01	< 0.01	< 0.01

CENTRAL CONTROL (Feb 03)

Sample Identity		Benzene	Toluene	Ethyl Benzene	Total Xylene
CC109	11.7	0.048	< 0.01	0.070	0.486
CC113	25.9	0.074	0.111	0.601	0.884
CC203	1.917	< 0.01	< 0.01	< 0.01	< 0.01