

PREMIER FOODS

**IPPC Application
Long Sutton**

**Section 1.3
Site Condition Report**

March 2005

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1.3 Site Condition Report

1.3.1 Introduction

The scope of works for this report was to review published data and to conduct a site reconnaissance visit in order to complete a Site Condition Report to be submitted to the Environment Agency (EA) in support of an IPPC Permit Application.

Site Location

The installation is located off Bridge Road, c.1.5km ESE of Long Sutton town centre.

The centre of the site is at National Grid Reference 54500 32200 and the location of the site is shown on Drawing No NL07182/LS/13. The site covers an area of very approximately 4.2 Ha and the extent of the Permit Application area is shown on Drawing No. NL07182/LS/17. at an elevation of c.4m above Ordnance Datum and is effectively flat, with no discernible gradients.

The site is bounded by Bridge Road to the north, Hundred Lane road to the west, a fence line with agricultural land beyond to the east and a further fence line by a dismantled railway track to the south. In general the site is surrounded by open agricultural (arable) land.

Details of Installation

The installation comprises a factory for the receipt and preparation of canned foods for human consumption. Raw materials mainly vegetables and some meats are received and prepared, filled into cans and sterilised, packaged and palletised and despatched by road to the clients. A comprehensive description of the processes employed on site is given elsewhere in this Permit Application. Briefly, the factory comprises food receipt and preparation areas, sauce and brine rooms, canning plant (with associated warehousing of empty cans and sterilisation cookers) and a packing department for the finished food product. The installation also has ancillary operations, facilities etc to enable the food production business to operate and includes, inter alia, boiler plant, an effluent treatment plant (ETP), electricity substations, forced draught evaporative coolers etc.

The installation includes associated maintenance, administration, canteen and welfare facilities to support the staff and manufacturing processes.

No major changes to the processes or operational layout are proposed at this stage.

The company has a published Environmental Management System (EMS) and is in the process of implementing the system with accreditation to the BS/EN/ISO1400 standard to be gained for June 2005.

1.3.2 Objectives

The objectives of this report are:

To satisfy the requirements of the Pollution Prevention and Control Regulations (PPC) at the time of permitting by:

- identifying the environmental setting and land pollution history of the site;
- identifying activities that will be conducted at the installation that may lead to land pollution;
- identifying and assessing the preventative measures that are in place to protect the land; and
- assessing whether there is:
 1. little likelihood that land pollution or leaks to land will occur during the future life of the installation;

or there is:

2. a reasonable possibility that there is potential for current or future land pollution of the land from the installation.

1.3.3 Site Setting and Sources of Desk Study Information

Introduction

The following sections details the sources of desk study information searched in order to describe the condition of the installation and, in particular, to determine the potential for substances to be present in, on or under the land associated with present and past uses of the site and its surrounding areas.

Environmental Consents, Licences, Authorisations, Permits and Designations for the Site and Surrounding Area

Information from various statutory sources has been summarised in Table I.3.1 following information received in the form of an Envirocheck report dated 16th November 2004 from the Landmark Information Group Ltd. This information includes, *inter alia*, records of any Discharge Consents, Waste Management Licences, Abstraction Licences, IPC Authorisations, PPC Permits and Land Drainage Consents for the site and within 1000m metres of the site boundary.

Table 1.3.1 Summary Of Statutory Information							
Data Type		Distance from Site Centre (m)				Detail of the Closest Relevant Entry	Nominal NGR of feature
		On Site	0-250	251-500	501-1000		
Agency & Hydrological	Air Pollution Controls				2	Transco, Sutton Bridge. PG1/15, odourising natural gas and LPG.	545550 322180
	Discharge Consents				2	Mr Collins, 42 Woad Lane, Long Sutton. Sewage Works – not water company. Final treated effluent to trib of South Holland Main Drain. Issued 2003.	544540 323090
	Integrated Pollution Control					None within 1km.	
	Pollution Incidents to Controlled Waters	1		5	2	1995 Category 3 pollution of drain/stream with vegetable washings from “Food industry” most likely to be attributable to site.	544700 322400
	Registered Radioactive Substances	5				All on site, Four registered to Premier Foods and one to HI Food Limited. All closed sources. Three extant, two superseded by variations. All less than 4 terabequarrels.	
	Water Abstractions			1	1*	Hillsdown limited. Borehole at Bridge Road, water for use in industrial processing. 1200000 m ³ pa. Reference to “fluvial sands and gravels, status shown as revoked.	
Waste	Licensed/Registered Waste Management Facilities					There are no waste management facilities within a 1km radius of the site.	

* water abstraction greater than 1000m but less than 2000m from site centre
The site centre is assumed as NGR 545000 322210 and distances are estimated from this point

The site has a National Rivers Authority (NRA) issued Consent to discharge treated trade effluent to the River Nene. The Consent (variation) was issued in 1995. There have not been any breaches of the Consent or any enforcement actions by either the NRA, or their successor the EA.

The government funded Multi-Agency Geographical Information for the Countryside (MAGIC) website was interrogated to determine the presence/absence of environmentally sensitive areas/sites within a 5km radius of the site. The search identified that there were none of the following recorded: National Nature Reserves, Ramsar sites, Special Protection Areas, Special Area of Conservation, RSPB Reserves or Sites of Special Scientific Interest within a 5km radius of the site.

Geological, Hydrogeological and Hydrological Data

Geological and hydrogeological information for the site was obtained from the following sources:

- Environment Agency Groundwater Vulnerability Map Sheet 25 (West Norfolk), 1:100000;
- Borehole Record for on site soil borehole (Ref:145/93);
- Environment Agency Source Protection Zone Mapping (online).

Hydrological data was provided as part of the Envirocheck report.

Historical Data

Table 1.3.2 summarises the history of the site and its immediate vicinity over the period from about 1887 to the present day (2000).

Date (approx)*	Site Land Use	Adjacent Land Use of Significance
1877	The site is enclosed agricultural fields.	A railway line (Bourn and Lynn Joint Railway) is situated immediately to the south of the site and Bridge Road to the north.
1888	As above. A small possible pond is shown on the site's northern boundary.	As above.
1889	As above.	As above. A water well is shown c.20m west of the site along Bridge Road.
1904	As above, the pond is still shown.	As above.
1906	As above.	As above.
1931	The site is largely occupied by what appears to be orchards. A glasshouse is located in the centre of the orchard.	As above; some fields to the north have been given over to orchards.
1938	Six buildings (use not given) are present within the orchards on site. One is quite large and may be industrial	
1959	There has been a further expansion in both the number and size of the buildings on site (primarily located in the eastern part of the site). The trees are no longer marked. The use of the buildings is not given but they are likely to be industrial.	Largely as above. The water well is still marked.
1972	A single very large, and several smaller buildings occupy over 75% of the site and are recorded as a "canning Factory". Several tanks are shown (contents unknown). The water well is no longer shown.	The site immediately to the east has been developed considerably and extensive glasshouses? are shown. The railway is shown as being dismantled. A drain is marked immediately to the west of the site. Although features similar to drains/ditches have been marked on previous editions.
1975	As above.	As above.
1991	As above. The factory layout has changed.	The glasshouses are no longer shown. Further glasshouses are shown to the NW and NE. A pumping station is shown c.100m to the NE.
2000	As above, except the layout of the activated sludge sewage treatment is marked in the SE part of the site.	As above.
*The dates and periods in this column relate to major revisions or new editions of published topographical maps.		

Records of any Land Pollution Incidents in the Vicinity of the Site

In the recent past there has been no recorded pollution incidents. There have however been recorded incidences of pollution of local Dykes by vegetable washings in the past the last one being 2004 due to mechanical failure or blockage of the drains. The causes for the spills were immediately rectified to an extent that the same could not happen again. No other records of any spills or discrepancies in stock control of potentially polluting substances have been identified from the operational records of the site.

The Environment Agency has provided, via Landmark Information Group Ltd, records of any land pollution incidents associated with the site and within 1000 metres of the site boundary. Detailed information is available on request.

Site operational layout plans are shown on Drawing No NL07182/LS/17. Additionally Drawing No NL07182/LS/21 details the site zones, for the purposes of both historical and current day site activities that may impact upon ground(water) quality. These are summarised below in Table 1.3.3 below.

Zone number	Activities/Substances of Concern	Potential contaminants
Zone 1	General site, including food preparation and canning areas, cooling towers, warehousing, sub-stations, yard areas, ETP, workshop etc.	Various chemicals: including PCBs, lube oils, NaOCl, CaCl, cleaning chemicals etc.
Zone 2	Former bulk oil storage tank on unsealed ground.	Hydrocarbons (general).
Zone 3	Five former bulk oil storage tanks in present day ETP.	Hydrocarbons (general).
Zone 4	Gas oil/heavy oil above ground storage tanks, external in central yard area.	Heavy/gas oils

A schematic plan showing the arrangement of the site's foul and surface water drainage is shown on Drawing No NL07182/LS/23.

Existing Site Investigation and Assessment Reports

There have been no previous site investigations undertaken on the installation. However, there is an on site borehole record, provided by the British Geological Survey (BGS) and which is commented later in this report.

Other Information

No other information has been investigated at his stage.

1.3.4 **Site Reconnaissance**

Introduction

The site reconnaissance was undertaken on the 29th January 2005 by Senior Environmental Scientist (Mark Edwards) of the independent consultancy contracted by Premier Foods to prepare this report.

The purpose of the reconnaissance was to inspect the site and surrounding area for indicators of potential land pollution. Site infrastructure was visually inspected to assess its competence and potential to cause or have caused releases to land.

Storage Tanks, Bunds and Associated Pipe Work

The site contains a large number of tanks, industrial bulk containers, drums, carboys etc containing a wide variety of substances that have the potential to cause pollution of soil, groundwater or surface water. It is beyond the scope of this report to undertake a detailed inventory of substances and tanks/vessels which has been done elsewhere in the application. However, the locations of the primary bulk tanks are shown on Drawing No NL07182/LS/19 as are the locations of the site's substations. Bulk tanks are defined as tanks that contain potentially hazardous materials at volumes in excess 2000 litres. Professional judgement was exercised in determining which bulk ASTs are listed below and discussed further below.

In general terms if the tank has a maximum capacity of 2000 litres or more and contains substances, that if released to the environment, may pose a significant risk to human health **and** the environment then this screening process has included them in Table 1.3.4 below. For example gas oil, if it escapes containment, may present a significant risk to both human health and the environment. However, if a food sweetener (*glucosweet*) or apple juice is released then these substances' primary environmental effects would be, if they escaped into surface drains and thence to watercourses, to deplete the dissolved oxygen in the watercourse possibly with a consequent fish kill. Table 1.3.4 gives a list of the tanks. In accordance with site records and anecdotal information there are/were no underground storage tanks or underground pipework (transporting chemicals) present on the site.

Table 1.3.4 Bulk Storage Tanks			
Tank Name/Descriptor	Tank Contents	Capacity	Location, Building, Comments (with nominal risk category).
Heating oil	Heating Oil	3000 litres	Outdoors, concrete base, no drains, integral bund with plastic construction (low risk)
Soda (NaOH)	32% Soda	>5000 litres	Outdoors, concrete base, no drains nearby, integral bund with plastic construction (low risk)
Calcium chloride	CaCl (R36-irritating to eyes, liberates Cl gas in water)	>5000 litres	Outdoors, bunded, no spills/stains, no drains nearby (low risk).
Gas oil and heavy oil	Mineral oils	Three tanks each of 50000 litres	All bunded on concrete base, fill and draw points outwith bund, some staining visible, very close (2m) to possible surface drain (moderate risk).
Workshop/oil store	Mineral oils	Aggregated volume possibly more than 4000 litres	Indoors on concrete floor, some drums located on drip tray (>25% aggregated volume/ 110% largest drum) also room bunded at entrance/exit by 2 coarse brick wall, no drains close by (low risk).
Seven substations	Mineral oils and PCBs	NA	Several locations. Majority indoors, all secured. No evidence of spills, no reports of fires/explosions, some too recent to contain. Informed by Premier Food of fact that all PCB's removed from site PCBs (low risk).
<p>Notes: PCBs polychlorinated biphenyls, NA not available, Risk rating also attempts to assess future risk potential.</p>			

The actual secondary treatment phase of the ETP is based on the upflow anaerobic sludge blanket (USAB) digester type of biological waster treatment, where the waste water passes through a blanket of naturally formed bacterial granules. The bacteria carry out the reactions the end products of treatment are biogas, treated effluent and sludge. Associated primary settlement and secondary aeration and settling also takes place. The ETP is relatively modern and recent in construction and transfers between vessels takes place by pipework. Should any part of the effluent treatment system become non operational then sufficient holding capacity for 24 hours is maintained on site. The ETP discharges treated trade effluent under EA consent to the River Nene. There are no known reported pollution incidents relating to this discharge.

Made Ground

Made ground is not anticipated to be present in extensive deposits on the site; the site was essentially developed from *greenfields* in the 1950/1960s. Chemically inert sub base is likely to be present across virtually the entire site, below the concrete slabs.

Superficials

The BGS borehole log referred to above records top/sub soils to 0.5m and 11.5m of fine brown sand (believed to be blowing sands) beneath. Four metres of brown sands shells and gravels were intersected next.

Solid Strata

The Amphill Clay, described as green clay and gravel, was noted from 16m to the base of the borehole at 22m below ground level.

Vegetation

Formal, and informal, landscaped areas were noted in several parts of the site. No assessment of the vegetation types was undertaken. However, none of the plant growth appeared to be stressed or diseased.

Surface Water Features

There are no surface water features on site. Drainage dykes abut the site to the west and east; neither are classified according to their chemical water quality. Aesthetically, the water quality in the dykes appeared to be good. The dykes are considered to be a sensitive receptor to any mobile contamination. The site discharges, under appropriate consent, treated trade effluent to the River Nene, which also must be considered to be a sensitive receptor to pollution, especially so if there are excursions in excess of the conditions attaching to the Consent.

Nature of the Storage and Handling of Materials

All tanks are loaded from road tankers/vehicles in a responsible manner, no spills have been noted or recorded. Fork lift trucks are powered by LPG. There are no liquid refuelling facilities on site. All heavy goods vehicle maintenance is undertaken off site. Waste is generated on site but is essentially non polluting in nature, e.g. waste food, cans, packaging and metal.

Surface Water and Foul Drainage

The schematic arrangement of the site's storm, effluent and foul drainage is shown on Drawing No. NL07182/LS/23.

No oil/water interceptors, for the removal of oils, have been identified within the surface water drainage system during the course of the site reconnaissance and after examination of drainage plans provided by Premier Foods.

The site has a comprehensive waste water treatment works (based upon the USAB treatment method) where trade effluent is collected, treated and discharged to the River Nene under an appropriate discharge consent.

Foul drainage from the office accommodation/toilet blocks/canteen etc is directed to the public foul sewer located in Bridge Road.

The trade effluent collection system is of a modern and comprehensive design. For essential food production hygiene purposes it is also well maintained. The organisation of the system is precised below:

The trade effluent (wash down water, vegetable wash water etc) from the food preparation and canning halls and eastern yard areas is directed, under gravity, from these areas to the rear (south) of the site (main collection pit) and thence to the site's ETP. The treated effluent is then pumped to a nearby tributary of the River Nene. There is a pen stock on the discharge point which if closed prevents any unauthorised discharge to the River Nene. There is also adequate emergency storage capacity on site.

There are former, and current day, underground effluent pipes from the ETP to the discharge point. It is understood that these are well maintained and regularly surveyed. No leaks have been reported. Any leakage would release impersistent biodegradable contaminants to the ground(water) system, rather in the form of leaking sewer pipes. There are no aquifers, and more importantly on-site drinking water abstractions, that require protection and this low risk is therefore not considered further in this report.

Given the largely external storage of polluting substances it is considered unlikely that any releases of these substances would find their way into the effluent drainage system and so this low risk is not considered further here.

With respect to the site's surface drainage system there is a north-south "watershed " across the site. The surface water drainage form the western part of the site (roof and yard drainage) discharges by gravity drains to dykes at either discharge points W3 or W4, both equipped with pen stocks that enable discharges to be temporarily stopped. The roof drainage from the eastern part of the site discharges to a dyke at W2, again equipped with a pen stock.

External yard spills of polluting substances, e.g. tank failure, HGV fuel tank failure, drum leakage, are unlikely to discharge via the surface water drainage system since all the bulk storage of materials is in the eastern part of the site. The downpipes are all are sealed off from the yard surface water drainage system especially in the eastern part of the yard. Spillages in the eastern yard areas would drain to the ETP. There are however no devices/procedures (oil interceptors/drain blocks etc) to prevent escape of any pollutants/ minor spillages

in the northern car parking areas to the dykes. No such incidents have been reported to date.

There are two small office units located on the periphery of the site remote from the factory and its drainage system. The surface water from these units, essentially roof drainage, is directed to soakaways. There would appear to be no viable way for this drainage to become polluted. The foul, essentially toilet, drainage, is directed to a septic tank in each case and thence to land drains. This is the normal procedure and if the tank is emptied regularly and not overloaded this arrangement represents a negligible risk to soil and groundwater quality.

1.3.5 Assessment of Land Pollution Potential

Polluting Substances and Relevant Activities

A list of all the major substances used, stored, manufactured (or waste by-products from the manufacturing process), with the potential to cause pollution, has not been provided with this report due to the extensive nature of such a list. The main groups of substances are, however, precised below. Any substances stored at volumes of less than 1000 litres have not been so summarised. An initial assessment of their pollution potential to land, groundwater and surface water has been made based upon a professional judgement as to the combination of their chemical properties, toxicity and volume stored/used and has already been summarised in Table 1.3.4.

As mentioned above a screening process has already eliminated some of the following substances - Oils, food additives (fruit acids and juices, vinegars, sweeteners etc), liquefied petroleum gases (which will vapourise to atmosphere if any loss of pressurised containment), potential PCBs, calcium chloride, bleaches (sodium hypochlorite), caustic soda (sodium hydroxide), reducing agents (sodium metabisulphite) and oxygen scavenger (Amersite).

Preventative Measures

The pollution preventative measures (physical infrastructure and those relating to testing, inspection, maintenance and training) for each relevant activity associated with the potentially polluting substances have been identified and their extent and condition assessed and are discussed here.

The site is currently seeking accreditation to the environmental quality standard ISO14001 and has published a draft Environmental Management System as part of the accreditation process.

All bunds are periodically checked to ensure their continued integrity and any accumulated oils/rainwater pumped out as necessary to ensure an adequate free board.

Spillage and emergency procedures are in existence on the site as part of the emerging EMS. Spill prevention/response kits are available on site and relevant members of staff are trained in their deployment.

Assessment of the Likelihood of Land Pollution

The assessment has identified relevant activities and three site zones where there is a possibility that there is or may be current or future pollution of the land from the installation. It is proposed that supplementary reference data from these zones be collected within fourteen months from the date of issue of the site Permit. The scope of these works will be broadly as follows:

- One day's window sampling, with standpipe installation around Zone 4;
- One day's window sampling between Zones 2 and 3.

Testing of soil samples and (if obtainable) groundwater samples will be undertaken on a representative frequency and for an appropriate suite of determinands – expected at this stage to be speciated extractable/total petroleum hydrocarbons and polyaromatic hydrocarbons. A limited gas spike survey may also be undertaken if ground contamination is determined in order to assess the lateral extent of any contaminant migration.

1.3.6 Conceptual Site Model

Geology and Hydrogeology

From the desk study information, the geological sequence beneath and in the vicinity of the site is as follows:

- Made ground, probably laterally discontinuous and restricted to inert sub base;
- In the region of 16m of superficial deposits, sands, gravels and shells;
- Ampthill Clays of the Jurassic era.

Structure

The site's geological structure from geological mapping in the general region to be quite simple, horizontally arranged unfaulted structure with a very gentle dip to the east.

Made Ground

Made ground is likely to be restricted to laterally discontinuous areas of inert granular sub base. It is possible, though considered unlikely, that there are isolated areas of demolition rubble on site from previous phases of development. However, the topographical mapping does not show any low lying areas/depressions etc that may require with the exception of a postulated pond on the site's northern boundary.

Superficial Deposits

A nearby borehole log records 16m of sands, gravels and shells.

Ampthill (Jurassic) Clay

The superficial deposits are underlain by the solid strata of the Ampthill clays. These are variously described as green clay and gravel and green clay.

The Groundwater Vulnerability map for the area (Sheet 25, West Norfolk) shows the site to be located on a non aquifer. These are defined as negligibly permeable formations that contain insignificant quantities of groundwater.

Surface Water Features

There are various small surface water features bot abutting the site and in close proximity to the site. These take the forms of drainage dykes that drain the surrounding low lying flat arable lands. In particular there are dykes to the east and west of the site. The route of surface water drainage for the site is shown on Drawing No. NL07182/LS/23.

The Envirocheck report obtained for the site does not record any water courses with a notified water quality classification within 1km of the site.

Groundwater within the superficial deposits beneath the site is considered to be in hydraulic continuity with the Ampthill Clay. The groundwater within the superficial deposits is anticipated to be in hydraulic continuity with the adjacent canal.

Results of Previous Investigations/Assessments

There have been no known previous site investigations on the Permit area.

Other Receptors

No sites of Special Scientific Interest (SSSI) have been identified within 5km of the site.

No National Nature Reserves or European Sites have been identified within 10km of the site.

Land Pollution History

Site personnel are not aware of any spills associated with the site's bulk above ground storage tanks (ASTs), other incidental storage facilities or sub stations.

The Environment Agency data, via the Landmark Envirocheck report, records seven pollution incidents relating to controlled waters at or in the near vicinity of the site. None of the recorded pollution incidents are specifically attributed to Premier Foods, although some of the incidents (referred to above as vegetable washings from the food industry) are likely to be attributable to Premier Foods given the existing site knowledge of past pollution of the dykes and the lack of other food industry in the immediate vicinity of the site. However, from the summary descriptions offered within the Envirocheck report the incident is considered unlikely to have led to long term pollution of the installation.

Site Zoning

The site has been divided into four zones based upon the site setting and the possible/actual location of potentially polluting substances and former and current site storage/use areas. These zones are shown on Drawing No NL07182/LS/21. Table 1.3.5 below has been divided on the basis of these Zones.

Table 1.3.5 Site Zones		
Zone	Description	Reason for Delineation
1	General site area, includes some chemicals and oil storage, sub stations, workshops etc.	Any release within the zone could enter the ground and/or site surface drainage and may ultimately enter surface water courses. Integrity of surface drains unknown. Possible contaminants: hydrocarbons, degreasers, PCBs, etc.
2	Former bulk oil storage tank on unsealed ground.	Any releases from this former tank will have infiltrated directly into the local ground(water) and possibly into the nearby drainage dyke. Possible contaminant: Hydrocarbon.
3	Five former bulk oil storage tanks in current day ETP.	Any releases from these tanks may have penetrated the concrete flooring, where present, into the ground(water) system and also into the surface water drainage system and thence into the dykes – no spills/stains evident. Possible contaminants: Various grades of refined hydrocarbons.
4	Gas oil/heavy oil above ground storage tanks, external in central yard area.	Releases are likely to have been contained within bund. Some external spills/stains from draw and fill points on concrete flooring. Possible escape down adjacent (suspected) surface water drain to nearby drainage dykes – no reported incidents. Possible contaminants: Heavy/gas oils

Summary Conceptual Site Model (CSM)

Introduction

The findings of the desk study and site reconnaissance (detailed above) have been used to develop the conceptual site model (CSM) for the site. Uncertainties in the CSM are identified and their significance discussed.

Preliminary Conceptual Site Model

The preliminary site model is described below in 1.3.6.

Table 1.3.6 Preliminary Conceptual Site Model					
Zone	Source	Pathway	Receptor	Risk Factor	Justification for Risk Factor
1	General site.	Former spills filling tanks/IBC, spills of solvents, spills of food additives, eg. Fruit juices, sweeteners, chloride and metabisulphite solutions, leaks of oils/PCBs from substation direct to ground(water) and drainage entering surface water through drains.	Soils, surface water, groundwater, human health.	Low	Little/no evidence of spillage, easy to arrest runoff on hardstanding area.
2	Former oil storage tank on unsealed ground.	Leaks/spills/overtops etc directly to ground(water).	Soils and groundwater. Surface water only considered to be a receptor if gross contamination exists. Human health.	Moderate.	No reported leaks, no staining evident. Reference data to be obtained.
3	Five former oil storage tanks.	Leaks/spills/overtops etc directly to ground(water) through cracks/unsealed ground or to surface drains and thence to surface water courses, indoor vapour inhalation.	Soils and surface/ground water, human health.	Low to moderate.	No reported leaks, no ongoing releases. Reference data to be obtained.
4	Bunded gas and heavy oil.	Via concrete to ground(water), spills from draw/fill lines to surface water drains and water courses, indoor vapour inhalation	Soils, surface/ground water, human health	Low to moderate.	No reported leaks – detailed inspection not possible due to access restrictions. Stains near fill/draw lines outwith bund very close to possible surface water drain.

Site Workers are not considered to be an at risk group from any ground(water) contamination due to the reduced number of pathways for the ground(water) pollution to impact upon site workers. Seven of the ten CLEA pathways considered for the default commercial/industrial land use model are considered realistically viable: ingestion of building dust, dermal contact with building dust, inhalation of fugitive building dust, inhalation of fugitive soil dust, inhalation of fugitive building dust, indoor vapour inhalation and outdoor vapour inhalation. However, because of the nature of the business and the additional hygiene

measures adopted by the staff exposure to any contaminants will be much reduced. Also there is an absence of any recorded pollution incidents.

Uncertainties in the Preliminary CSM

The following uncertainties could affect the distribution of pollutants in the subsurface:

- Geology – thickness and exact nature of remaining superficial materials, fraction of organic carbon in superficial materials, clay mineral content/type of clay (especially important for metallic contaminants) of superficials and solid strata – heterogeneity of geological parameters;
- Nature of fill materials – presence of contaminants (presently only inert granular sub base considered to exist);
- Water table – orientation and gradient, unsaturated zone thickness, seasonal fluctuation of unsaturated zone;
- Recharge – effective recharge to groundwater;
- Hydrogeological parameters of superficial deposits – including porosity, permeability, flow velocity, dispersivity, retardation (foc);
- Unsaturated zone source term – existence of oil contamination; residual oil contamination, concentration and distribution; presence and volume and extent of free-product ponding on the water table and capillary fringe; solubility of different hydrocarbon species; viscosity, vapour pressure, density of hydrocarbons;
- Dissolved phase plume – existence, dimensions, orientation, concentrations, extent of natural attenuation processes, speciation of hydrocarbons;
- Pollution prevention measures – integrity of hardstanding and surface water drainage. Integrity of secondary containment.