



Tidal Lagoon Swansea Bay

REMEDIATION SCHEME

DCO REQUIREMENT 12

WORKS 7A

May 2020

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1 Introduction

1.1 The Swansea Bay Tidal Lagoon

- 1.1.1 Atkins Limited, part of the SNC-Lavalin Group, (Atkins) was commissioned by Swansea Bay Tidal Lagoon Plc (SBTL) to provide consultancy advice with regard to the Tidal Lagoon Swansea Bay (TLSB) project. The purpose of this report is to provide an outline remediation scheme for Works 7a in accordance with the Development Control Order (DCO) Requirement 12 – Contamination and Remediation for the proposed TLSB project. This report addresses DCO requirement 12(1)(d), 12(1)(e), and 12(2).
- 1.1.2 The Works 7a area includes the Associated British Ports (ABP) entrance near Fabian Way and extends along the sea wall (the 'Western Access Road') to the Western Landfall Area in the south-west of the site. TLSB are currently proposing three areas of construction referred to as Insets A, B and C, as illustrated on drawing TLSB-ATK-03-XX-SK-D-00006_P01 included as Appendix A. This will comprise:
- Inset A: The construction of a new access road and junction, a proposed security cabin, gate and associated storm-water drainage
 - Inset B: The construction of an access road junction from the existing road along the seawall; and
 - Inset C: Preparation of a Laydown Area including the demolition of existing buildings, construction of road junctions and removal/relocation of an existing soil stockpile.
- 1.1.3 The approach of this outline remediation scheme is to establish the most sustainable and cost-effective method for achieving the remediation objectives, focused on the three construction areas, and in with the wider Works 7a area for the DCO Requirement 12. This has been undertaken in the context of the current site use (vacant open space and commercial properties as part of the western dockland), and the proposed commercial land use and the possibility for future public open space.

1.2 Objectives

- 1.2.1 The site remediation objectives are to:
- Mitigate unacceptable risks to human health associated with direct exposure of site employees and visitors to soils containing asbestos;
 - Mitigate unacceptable risks to controlled waters associated with the presence of free phase hydrocarbons; and
 - Implement a sustainable remediation scheme, which balances the aspiration to reduce waste and maximise materials re-use against the need to minimise impact on the local community in terms of nuisance, health and safety as far as reasonably practicable.

1.3 Scope of Report

- 1.3.1 This report presents the following:
- Review of site historical background information;

- A summary of historical ground investigation data and the ground conditions encountered;
- Development of a conceptual model (CM) and identification of plausible contaminant linkages requiring mitigation;
- Development of a detailed Remediation Options Appraisal (ROA, included as Appendix B); and
- Production of an outline remediation scheme and proposed remedial works.

1.4 Previous Reports

1.4.1 This remediation scheme has been produced with reference to the information included in the following listed reports:

- Atkins 2015, Swansea Bay Tidal Lagoon Access Road Ground Investigation Report [1];
- WYG 2016, Tidal Lagoon Swansea Bay Onshore Works – Ground Conditions Desk Study Report [2];
- WYG 2017, Tidal Lagoon Swansea Bay Onshore GI – Ground Investigation Interpretive Report (Phase 1) [3]; and
- Atkins 2020, Tidal Lagoon Swansea Bay Data Review for Phase 7A Works [4].

2 Review of Available Information

2.1 General

- 2.1.1 A detailed review of the available historical information and investigations was undertaken by Atkins to evaluate potential land contamination risks to human health and the environment for Works 7a [4]. Pertinent information from the detailed TLSB data review is included below.

2.2 Site Location

- 2.2.1 Works 7a is located in Swansea Bay within the Western Docklands area and south of Queen's Dock. The site is approximately 2.5 km south-east of Swansea city centre. The wider project area extends east towards Baglan. The site is relatively flat at approximately 2 to 3 m above Ordnance Datum (m AOD).
- 2.2.2 The national grid reference for the centre of the site is approximately 268953 E, 192788 N.
- 2.2.3 The work areas are shown on drawing TLSB-ATK-03-XX-SK-D-00006_P01 included as Appendix A.

2.3 Site Description and Setting

- 2.3.1 A site walkover was undertaken by an Atkins engineer on 27th April 2020 to assess the current site conditions and to identify possible sources of contamination.
- 2.3.2 Works7a is part of the Western Docklands which includes the approximately 2m high and 2.5m wide sea wall and adjoining landform, herein referred to as 'Western Landfall' which forms part of Queen's Dock and extends on a south-west to north-east orientation into Swansea Bay.
- 2.3.3 The sea wall extends approximately 2.5km from the Associated British Ports (ABP) gatehouse off Fabian Way in a south-westerly direction.
- 2.3.4 The north-eastern area of the site is vacant scrubland located near to the ABP entrance off Baldwin Crescent. A site road is located along the length of the sea wall from the ABP site entrance.
- 2.3.5 Towards the western end of the sea wall and near to the proposed Inset C construction area, there are: two operational wind turbines; a soil stockpile, an operational dockland building; and a derelict building at the most westerly point. To the south of the derelict building there is a material stockpile comprising wood, tyres, metal and other demolition material.

2.4 Surrounding Land Uses

- 2.4.1 Along the sea wall and immediately north of Works 7a land are five jetties located on the interior of Queen's Dock. Some broken out concrete and rubble surround the offsite jetties where the majority of the oil pipeline infrastructure has now been removed. The central terminus of Queen's Dock is located approximately 50m to the north from the central portion of the site. Stockpiles of material occupy the majority of the central terminus; however, a closer inspection of this area was not possible during the most recent site walkover. Adjacent to the most westerly portion of the site at Inset C is the Phoenix Wharf, Swansea Dry Docks and the Fertiliser Terminal which represent the remainder of the central terminal.

- 2.4.2 The Central Dockland area is located adjacent to the north of the site and is under the ownership of ABP. Access to the area is also from Baldwins Crescent off the A483 – Fabian Way which connects with the King and Queen's Dock. The area is occupied by commercial and industrial properties including a cement plant and car dealerships.
- 2.4.3 The area east of the docklands towards Baglan is the proposed route for the cable installation to Baglan Power Station. This area was formerly occupied by a series of oil storage tanks operated by BP. Further to the east the cable route is alongside Crymlyn Burrows (a series of sand dunes with SSSI status). Part of the Swansea University Bay Campus has also been constructed 400m east of site. This area was reported to have previously included oil storage tanks operated by BP. Pipeline networks were historically present from the on-site jetties to the oil storage tanks.

2.5 Site Development History

- 2.5.1 A summary of the historical development of the site and its surroundings, together with other relevant information is presented in **Error! Reference source not found..**

Date and scale of map	Onsite	Off-site (within 1 km)
1879 (1:2,500) 1884 (1:10,560)	There is no development. The site is formed of tidal flats.	Arsenic works, Crown Works (spelter) and Port Tennant Cooper Works are approximately 600m north of the site along the coastline prior to the construction of Docklands.
1889 (1:2,500) 1900 (1:10,560)	No significant change.	Prince of Wales Dock has been constructed approximately 1km north-west of the site.
1919 (1:2500) 1921 (1:10,560)	Queen's Dock has been built and the southern sea wall which links the mainland to Western Landfall has been constructed. A Timber Yard and Fish Meal Factory are labelled along the sea wall in Western Landfall.	Kings Dock has been constructed approximately 200m north of the site. Port Tennant Copper works are no longer present. The Phoenix Patent Fuel Works and Graigola Merthyr Patent Fuel Works are located 200m north of the site.
1938 (1:10,560)	No significant change.	Swansea Dry Docks are labelled adjacent to the western edge of the site
1948-1949 (1:1,250) 1951 – 1956 (1:2,500)	Timber Yard is no longer labelled.	The Phoenix Patent Fuel Works is no longer present. To the north east of the Jetties, adjacent to the west of the site are fuel storage tanks as part of a depot. Four oil storage tanks with pumping stations are present along the sea wall. Five jetties have been constructed on the interior of the sea wall of Queen's Dock.

Date and scale of map	Onsite	Off-site (within 1 km)
1960-1966 (1:1,250)	Depot has been constructed in the north-eastern extent of the site. Fish Meal Factory is now labelled as Works.	Graigola Merthyr Patent Fuel Works are labelled as disused works.
1964 (1:10,560) 1968-1971 (1:2,500) 1979 (1:10,000) 1989 (1:10,000)	No significant change.	No significant change.
2010 Google Earth images	No significant change.	No significant change.
2016 Google Earth images	Wind turbine has been constructed adjacent to the most easterly jetty.	No significant change.
2019 Google Earth images	No significant change.	No significant change.

Table 2-1 – Site Development History

2.6 Geology

- 2.6.1 The Envirocheck report [5], as well as observations from exploratory holes in the Atkins 2015 Ground Investigation [1] and WYG 2017 Ground Investigation [3] identified Made Ground across the site typically to depths of 3-5m below ground level (bgl), with a maximum depth of 11m bgl reported in BH2, near to Inset C.
- 2.6.2 Made Ground is described as comprising black becoming brown sand with gravel containing inclusions of ash, clinker, iron slag, concrete, metal and brick. It is described as predominantly granular in nature with evidence of potential dredged material used in the construction of the outer sea wall and for the land reclamation in the wider docks area in the early 1900s.
- 2.6.3 The Envirocheck report [5] and BGS records [6] indicates the site is underlain by Marine Beach Deposits comprising mainly sands with shingle, silt and clay. Observations from the WYG 2017 Ground Investigation [3] identified the Made Ground to be typically underlain by Glacial Till (clay, sand and gravel) in the central and eastern areas, encountered between depths of 11.0 and 12.4 m bgl, near Inset C, 8.8 and 15.45 m bgl near Inset B and between 7.0 and 9.0 m bgl near to Inset A. In the west of the Works 7a, coarse sands of the Marine Beach Deposits were encountered underlying the Made Ground between 7.5 and 9.0 m bgl.
- 2.6.4 The Envirocheck report [5] and BGS records [6] indicates the majority of the site, including the central and western areas along the seawall, are underlain by the South Wales Lower Coal Measures Formation which is described as containing mudstone, siltstone and sandstone. The north-eastern extent of the site is underlain by the South Wales Middle Coal Measures Formation, formed of mudstone, siltstone and sandstone. Bedrock of the Coal Measures was not encountered in the previous investigations [1] [3].

2.7 Hydrogeology and Hydrology

- 2.7.1 The DEFRA Magic online resource [7] indicates that bedrock of the South Wales Lower and Middle Coal Measures Formations are designated as a Secondary A Aquifers and the Marine Beach Deposits are a Secondary Undifferentiated Aquifer.
- 2.7.2 The Envirocheck report [5] for groundwater vulnerability indicates that the site has a high leaching potential and the site is not within a groundwater source protection zone.
- 2.7.3 The site is adjacent to Queens Dock (north) and Swansea Bay of the Bristol Channel (south) located less than 800m from the mouth of the River Tawe. The Envirocheck Report indicates a water abstraction associated with aquaculture located within 250m of the site in the north-west corner of Queen's Dock.
- 2.7.4 An Envirocheck report [5] identifies 13 active discharge consents within 500m of the site. Five related to public sewage, two with sewage works discharging effluent, three for unspecified use by ABP, one for a non-water private sewage company and one consent for trade effluent from BP Chemicals Ltd. There is reported that one active integrated pollution control centre is within 250m of the site relating to coating processes and printing within miscellaneous industries.

2.8 Sensitive Land Uses

- 2.8.1 The Envirocheck report [5] and the DEFRA Magic interactive map [7] states there are no sensitive land uses within 500m of the site. The Crymlyn Bog and Crymlyn Burrows Sites of Special Scientific Interest (SSSI) are located 1 km north-east and 1.2 km east of the site respectively. There are no recorded historic monuments within the vicinity of the site.

2.9 Previous Site Investigations

- 2.9.1 Two previous phases of ground investigation were undertaken by Atkins in 2015 [1] and WYG in 2017 [3], and the pertinent information from these reports has been assessed in the Atkins 2020 Land Contamination Data Review [4]. The interpretation, risk assessments and conclusions from this report are recognised and brought forward into this remediation scheme. The Data Review compared available laboratory chemical soil analysis results with a commercial generic assessment criteria (GAC) and groundwater results with Environmental Quality Standards (EQS)/ Drinking Water Standards (DWS) which were deemed appropriate for the protection of human health and the controlled waters, respectively.

3 Updated Conceptual Site Model

3.1 Introduction

- 3.1.1 Land contamination is assessed through the identification and assessment of Potential Contaminant Linkages (PCLs). The approach in the following section is in accordance with the Contaminated Land Exposure Assessment (CLEA) model produced by DEFRA and the Environment Agency and as outlined in the DEFRA/Environment Agency Land Contamination Risk Management Guidance (LCRM) [8].
- 3.1.2 The LCRM provides a technical framework for identifying and remediating contamination through the application of a risk management process. The assessment involves the development of a conceptual model (CM) which describes the source-pathway-receptor relationship between potential sources of contamination and associated contaminants from both on-site and off-site sources, receptors to such contamination and potential pathways between the two. If all three are present or considered likely to be present, they are described as PCLs, which can be subject to the risk assessment process.
- 3.1.3 The question of whether risk is unacceptable in any particular case involves scientific and technical assessments, together with appropriate criteria and professional judgement.
- 3.1.4 The assessment framework and guidance given within the LCRM has been applied to this Risk Assessment (RA). The CM describes the relationship between contaminants which may be present from past and current activities (including off-site activities from which contaminants may migrate on-site), receptors to those contaminants, and potential connecting pathways.
- 3.1.5 The site wide CM for Works 7a, developed in the Atkins 2020 Data Review [4], will be refined to determine the PCLs for the four specific work areas shown on TLSB-ATK-03-XX-SK-D-00006_P01, which include: Insets A to C and the wider Works 7a area.
- 3.1.6 The Atkins 2020 Data Review identified the following sensitive receptors, and these will be considered across the four work areas (Insets A-C and the wider Works 7a area):
- Construction maintenance workers (working in trenches, open soils, long working hours);
 - Current and future site users (working outside of habitable buildings on roads and lagoon infrastructure, general public using designated walking/driving routes on hardstanding/gravel cover);
 - Groundwater: superficial Marine Beach Deposits (Secondary Undifferentiated); bedrock of the middle/lower Coal Measures Formation (Secondary A);
 - Swansea Bay, located adjacent to the south of the site; and
 - Current and proposed structures and services.

3.2 Sources of Contamination

3.2.1 The following sources of contamination have been identified within or near to Inset A:

- Made Ground associated with on-site land reclamation including TPH concentrations in the soil (circa 2,500 to 6,700mg/kg) proximal to the dock gate entrance with associated concentrations in nearby groundwater and surface water samples (up to 330ug/l for TPH >C12-16); and
- Potential contamination in soils and groundwater associated with off-site historical and current site uses including copper works, paint works, railway land and fuel storage which may contain a range of contaminants including metals, TPH, PAHs and BTEX compounds.

3.2.2 The following sources of contamination have been identified within or near to Inset B:

- Made Ground associated with on-site land reclamation for the construction and operation of the docklands including concentrations of metals (specifically lead, ~17,700 mg/kg) and volatile organic compound (VOC) exceedances including carbazole (0.449 mg/kg); and
- Potential contamination in soils and groundwater associated with off-site historical and current site uses including fuel storage which may contain a range of contaminants including metals, TPH, PAHs and BTEX compounds.

3.2.3 The following sources of contamination have been identified within Inset C:

- Made Ground associated with on-site land reclamation for the construction and operation of the Western Landfall. Sporadically elevated heavy metals (specifically lead circa 22,500 mg/kg and arsenic circa 1,400 mg/kg), dichloromethane ((DCM) circa 0.12 mg/kg), PAHs and TPH in portions of the Western Landfall area;
- Stockpiled soil in the Western Landfall Area containing elevated metals including nickel (1860 mg/kg), TPH (up to 6253 mg/kg), carbazole (1.294 mg/kg), asbestos (below limit of detection) and some minor exceedances of PAHs; and
- Potential contamination in soils and groundwater associated with off-site historical and current site uses including fuel storage which may contain a range of contaminants including metals, TPH, PAHs and BTEX compounds.

3.2.4 The following sources of contamination have been identified across the remainder of Works 7a:

- Made Ground associated with on-site land reclamation for the construction and operation of the sea wall which includes TPHs in saturated soils (11,000 to 36,700mg/kg) and groundwater (up to 790ug/l for specific TPH fractions and a presence of up to 0.22 m thickness of free-phase hydrocarbons) heavy metals (specifically lead ~11,000 to 42,000mg/kg) adjacent to the oil jetties along the sea wall; and
- Potential contamination in soils and groundwater associated with off-site historical and current site uses including fuel storage which may contain a range of contaminants including metals, TPH, PAHs and BTEX compounds.

3.3 PCLs and Remediation Options Appraisal

- 3.3.1 Following the identification of the area specific contamination sources, the following PCLs have been identified when considering the site wide receptors and the available pathways (discussed in the Atkins Data Review [4]).
- 3.3.2 The PCLs will require mitigation and/or remedial measures, with these options assessed in the Remediation Options Appraisal presented in Appendix B.

3.4 PCLs Inset A

- 3.4.1 The entrance to the site at Inset A will generally be covered in hand standing and or gravel, and therefore despite elevated TPH in soils within the vicinity of Inset A, the likelihood of exposure to future site users from vapour inhalation and direct contact is unlikely and therefore the hydrocarbon concentrations are not considered to represent an unacceptable risk requiring further mitigation.
- 3.4.2 Groundwater and surface water samples collected near to Inset A reported concentrations of TPHs exceeding the controlled water assessment criteria (WQS).
- 3.4.3 With the future use comprising hardstanding across Inset A the probability of contaminants leaching from on-soils is reduced and therefore the concentrations of TPHs detected in the previous studies are not considered to be pose an unacceptable risk requiring mitigation. Furthermore, the quality of the regional groundwater conditions is commensurate with that in an urbanised and industrial area and where land reclamation has occurred. It is therefore considered that significant improvement of the overall regional groundwater quality would be difficult and unrealistic to achieve as part of this scheme. Previous studies have also advocated that natural attenuation processes are occurring and would be effective in the lifetime of the TLSB scheme.
- 3.4.4 However, in order to reduce the timescales of natural attenuation, it is proposed that localised areas of gross hydrocarbon contamination in soils, if uncovered during the earthworks programme, should be removed. Additionally, hydrocarbon product found on groundwater should also be removed where reasonably practicable.

3.5 PCLs Inset B

- 3.5.1 Inset B includes the construction of a small road junction, branching off the main access road along the sea wall with the majority of the area covered in hardstanding. The likelihood of direct contact to elevated metals in shallow soils and soil derived dust is unlikely to future site users.
- 3.5.2 The elevated concentrations of contaminants associated with historical fuel storage in the area may have the potential to generate vapours, however the ongoing use of the area as a roadway limits the potential for habitable structures therefore TPHs are not considered to be pose an unacceptable risk requiring mitigation.
- 3.5.3 Elevated concentrations of metals and some PAHs in groundwater above the WQSS near to Inset B are considered consistent with those reported across the site and therefore representative of the poor regional groundwater quality from widespread historical industrial operations and it is not realistic to improve overall regional groundwater quality as part of the scheme. With the future use comprising hardstanding across Inset B the probability of contaminants leaching from on-soils is unlikely and therefore the identified contaminants are not considered to be pose an unacceptable risk requiring mitigation.

- 3.5.4 However, in order to reduce the timescales of natural attenuation, it is proposed that localised areas of gross hydrocarbon contamination in soils, if uncovered during the earthworks programme, should be removed. Additionally, hydrocarbon product found on groundwater should also be removed where reasonably practicable.

3.6 PCLs Inset C

- 3.6.1 The laydown area and Western Landfall Area located within Inset C reported elevated concentrations of asbestos, heavy metals, VOCs, PAHs and TPHs above the commercial land use GAC in Made Ground. It is noted that only a small number of the GAC exceedances were from the upper 0.5m of soil, which is where human exposure through direct contact is most likely. The future works will likely comprise the creation of a laydown platform constructed of granular fill, this would determine that the probability for contaminants to be release from soils and/or soil derived dust is unlikely. No habitable structures are planned and the current structures will be demolished, therefore the probability of vapour inhalation as a pathway is considered to be unlikely.
- 3.6.2 Soil chemical concentrations which have a medium consequence therefore do not represent an unacceptable risk to the health for future users, however the presence of asbestos in near surface soils poses a severe consequence and therefore an unacceptable acute risk to the future users that requires mitigation.
- 3.6.3 The laydown area and Western Landfall Area located within Inset C reported elevated concentrations of metals within groundwater. It is assumed that metals concentrations, which are present in groundwater across the wider site are likely representative of the regional groundwater quality associated with widespread regional historical industrial operations and it is not realistic to improve overall regional groundwater quality as part of the scheme. With the future use comprising hardstanding across Inset C the probability of contaminants leaching from onsite soils is reduced and therefore the identified concentrations are not considered to be pose an unacceptable risk requiring mitigation.
- 3.6.4 However, in order to reduce the timescales of natural attenuation, it is proposed that localised areas of gross hydrocarbon contamination in soils, if uncovered during the earthworks programme, should be removed. Additionally, hydrocarbon product found on groundwater should also be removed where reasonably practicable.

3.7 PCLs Wider Works 7a

- 3.7.1 Predominately in the areas between the ABP entrance near Fabian Way and the Western Access Road, there are elevated concentrations of TPHs and free-phase hydrocarbons were encountered, primarily in deeper soils within the saturated zone. The probability of exposure to future site users through vapour inhalation is considered unlikely, as the proposed scheme involves the construction of a roadway, a high voltage cable and no habitable structures. It is considered that the identified contamination will not pose an unacceptable risk to human health requiring mitigation.
- 3.7.2 The previous site investigation identified thickness of free-phase hydrocarbons in one borehole along the Western Access Road, adjacent to the oil jetties. This contamination is likely associated with the historical fuel storage and transfer infrastructure associated with the past usage of Queens Dock adjacent to the north. The presence of free-phase hydrocarbons is considered to pose an unacceptable risk to controlled waters receptors and will require mitigation.
- 3.7.3 Commensurate with the other areas of the site, in order to reduce the timescales of natural attenuation, it is proposed that localised areas of gross hydrocarbon contamination in soils, if uncovered during the earthworks programme, should be

removed. Additionally, hydrocarbon product found on groundwater will also be removed where reasonably practicable.

4 Remediation Scheme

4.1 Introduction

- 4.1.1 The previous sections have indented the PCLs which require further assessment as part for the site redevelopment. The outline remediation scheme for Works 7a proposes a scope of work, assessment criteria and a monitoring regime to ensure the identified risks are safely mitigated for the future use as a commercial / public open space land use

4.2 Generic Remediation Requirements

- 4.2.1 The following remedial requirements are anticipated as part of the scheme to be undertaken during redevelopment of Works7a:
- Monitoring of groundwater in the existing sampling points to determine the absence or presence of free-phase hydrocarbon contamination as the construction programme proceeds;
 - Removal of easily recoverable free-phase hydrocarbons detected on groundwater in the sampling points; and
 - Visual verification and laboratory validation for potential asbestos fibres and/or asbestos containing materials (ACMs) within the shallow soils in the proposed laydown areas in Inset C.

4.3 Proposed Scope of Works

- 4.3.1 In order to meet the remediation requirements, a remediations options appraisal (ROA) has been undertaken to establish the most sustainable and cost-effective method for achieving the remediation objectives. The ROA is attached as Appendix B and evaluates the available techniques and determines the proposed final remediation option or combination of options while considering the environmental setting and proposed access / road infrastructure and laydown area development.
- 4.3.2 Based on the assessment, the following potential works could be undertaken;
- Oversight of the remedial works by a suitability trained environmental specialist;
 - Removal of visually verified grossly impacted hydrocarbon contaminated soils uncovered during earthworks (i.e. when excavating service trenches or reducing ground levels for road pavement construction) as confirmed by the environmental specialist;
 - Possible onsite ex-situ treatment of soils, by windrows or bio-treatments, if onsite space permits. If not, then offsite ex-situ treatment and disposal;
 - Multiple visits to remove of free-phase hydrocarbons and significant dissolved phase groundwater contamination from existing sampling wells to reduce hydrocarbon mass on a monthly basis. The requirement for longer term monitoring and product removal will be reviewed annually based on the results of the monitoring;
 - Possible delineation and installation of additional groundwater extraction points if significant free-phase volumes persist in site sampling wells; and

- Following removal of stockpile in Inset C and additional excavations to reduce levels, a visual assessment for the presence of asbestos fragments will be undertaken and identified fragments hand-picked followed by asbestos validation sampling on a 10x10 m grid.

5 Proposed Remedial Works and Monitoring

5.1 Watching Brief

- 5.1.1 A suitably qualified environmental specialist must provide supervision during significant ground works to oversee the excavation of material and undertake visual and instrument-based verification, as hydrocarbon contamination and asbestos is known within the vicinity of the work areas. The specialist will be responsible for collection of the asbestos validation sampling grid. The specialist will also ensure the contractor adheres to the requirements of the site-specific Materials Management Plan (MMP) and Construction Environmental Management Plan (CEMP). The environmental specialist must also be contacted by the contractor should small scale works uncover hydrocarbon stained soils or evidence of visual asbestos fragments.

5.2 Monitoring of Free Product

- 5.2.1 Free product was encountered along the seawall in WS25 at a maximum thickness of 0.22 m. In order to meet the generic remediation requirements, easily recoverable free hydrocarbons on the groundwater shall be recovered and removed on a monthly basis from the site for recycling and/or disposal with an annual review of the ongoing monitoring requirements.
- 5.2.2 During the product removal, existing groundwater wells will also be dipped to determine the presence or absence of free product across the site, which will also be removed by bailing or pumping if encountered. The requirement for longer term monitoring and product removal will be reviewed annually based on the results of the monitoring.
- 5.2.3 Hydrocarbon saturated soils encountered during excavations shall also be removed and managed in accordance with applicable waste management procedures and/or environmental permits/exemptions.

5.3 Asbestos

- 5.3.1 It is Atkins' understanding that in the preparation of the laydown area in Inset C, the demolition of existing buildings and structures, as well as the removal of the waste stockpile, which may potentially contain asbestos containing materials will be managed by a specialist contractor prior to commencement of the groundworks. Upon the removal of the stockpile and during excavation works within Inset C there will be visual validation and laboratory sampling at the base of excavations.
- 5.3.2 If asbestos is still present either additional material will be excavated and removed, or if present at sufficient depth then the area may be covered by either permanent hardstanding or by a cover layer comprising suitably validated fill material with a thickness of at least 0.5m. The presence of asbestos at depth will be recorded for future reference in a site verification report.

5.4 Contingency for Unidentified Constraints

- 5.4.1 The potential to uncover previously unidentified hydrocarbon or asbestos materials exists within isolated areas of the proposed works between the positions of previous exploratory holes. Where hydrocarbon stained soils or material resembling asbestos are encountered during the proposed works, works should be temporarily ceased to enable inspection (and testing if necessary) by a suitably qualified engineer. Details of the location, type and final destination of all previously unidentified materials encountered during the works should be recorded.

- 5.4.2 Any required revision to the remediation scheme shall be discussed and subject to the approval of the Local Planning Authority prior to commencement of revised working arrangements.

5.5 Materials Management

- 5.5.1 The management of excavated materials at TLSB is to be undertaken in accordance with CL:AIRE Code of Practice (CoP) 'The Definition of Waste: Development Industry Code of Practice' and in accordance with a site Materials Management Plan (MMP), environmental permit or environmental exemption.

5.6 Environmental Management

- 5.6.1 The contractor should undertake the works in accordance with a phase-specific Adaptive Environmental Management Plan (AEMP).

6 Remediation Verification

6.1 Validation Report

6.1.1 Prior to operation of the Works 7a a remediation verification report will be submitted to the Local Planning Authority (LPA) for their review and approval. This report shall provide sufficient evidence to demonstrate the successful implementation of the Remediation Scheme and any agreed variations thereof. As a minimum it is envisaged that this report will contain the following information:

- Description, dates and detailed location details of all remediation and waste management works undertaken;
- Details of any site clearance or enabling works undertaken including any additional delineation investigations and testing;
- Variations to the Remediation Scheme;
- Applicable correspondence with the LPA, NRW and other key consultees;
- Details of any environmental spillages, incidents or complaints relating to the remedial works;
- Full details, including volumes, description of materials, source location, of all materials (soil, water, free-phase oil, demolition materials etc) removed from site as waste, copies of waste transfer notes and details of the receiving waste management facility;
- Laboratory analysis results and location details for all samples tested from the site;
- Copies of all applicable permits or licences (including waste carriers licence) for the works;
- Details of any unforeseen ground conditions encountered, including any buried utility services (redundant or live);
- Detailed as-built drawings for the final Works 7a area condition;
- A plan clearly illustrating the location of any contaminated materials, in-ground obstructions or utility services remaining on site at depth; and
- A risk assessment for the residual risks considered to be present on the Works 7a.

Appendix A: Figures and Drawings

Drawing List:

TLSB-ATK-03-XX-SK-D-00006-P01.1 – Extent of Works 7a

Appendix B: Remediation Options Appraisal
