

Former Gasworks, Dock Road, Limerick

Human Environment Assessment

November 2012

For Bord Gais

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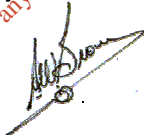
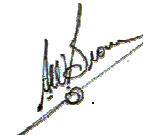
Station House
Mercury Court
Tithebarn Street
Liverpool
L2 2QP

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April 2012

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April 2012

1 Introduction

Human beings comprise one of the most important elements of the “environment”. Any potential impact on human beings that may arise from the proposed remediation of the former Gasworks site on Dock Road, Limerick must therefore be appropriately assessed. The principal concern is to ensure that human beings experience no significant unacceptable diminution in aspects of “quality of life” as a consequence of the remediation/construction processes associated with this development or of the operational phase, which in this case might be more appropriately termed the ‘aftercare’ period of the proposed development (remediation works). Relevant components of “Human Beings” considered in this assessment include: population, employment, and community aspects. Other considerations relevant to human beings include land use and health and safety aspects.

This report considers in detail the existing socio-economic context of the site, identifies the various sensitive ‘communities’ within the vicinity of the site, and assesses the potential for impact on them. Relevant sections of the Environmental Impact Statement submitted as part of the planning and waste licence applications, which are relevant for the purposes of assessing impact on the socio-economic characteristics of the area, are referenced as necessary.

Baseline information for this assessment has been collated by RPS; the impact assessment has been carried out by Mouchel, the authors of the Environmental Impact Statement.

Mitigation measures to address potential impacts are defined.

The design of control measures proposed are based on experience gained during remediation projects of former gasworks specifically in Cork, Dublin and Waterford.

2 Methodology

2.1 Project Evaluation and Impact Assessment

The proposed development is a remediation project on a contaminated former gasworks site. The site is currently disused. The project is largely limited to works to address ground conditions on the site, however, some ancillary demolition of internal structures is proposed as is the relocation of an ESB substation and DRI unit from within the site to the O'Curry Street boundary. Following a further information request from Limerick City Council in response to planning application ref. No. 12/87, the project will also include demolition and construction works along the site boundaries for reasons of traffic safety and to improve the appearance of the area. It is proposed to demolish most of the existing walls and remove the existing hoarding along the O'Curry Street boundary; further demolition is proposed along that section of the Dock Road boundary between the junction with O'Curry Street and the section of wall that is a Protected Structure (refer to Architectural Heritage Impact Assessment prepared by Conor Hourigan submitted with the application). A former vehicular access is also to be closed off in the latter section and a setback is to be provided at the junction just northwest of same. A new pedestrian gate is to be provided within the setback at the Dock Road/O'Curry St. boundary. An existing pedestrian gate is to be replaced along the O'Curry St. boundary and the existing vehicular gate along that street is to be replaced with a steel gate currently located within the site. Some existing internal and external walls, which are afforded protection under the Limerick City Development Plan, will be retained, as will a two-story office block within the site.

The ground remediation works, which comprise the main element of the development proposal, will be carried out in two phases, with some pre-remediation works also being undertaken (see below). It is also noted that the proposed remediation works were derived further to a detailed remedial options appraisal (see References section 7):

Phase 1 will remove free phase liquids (generally coal tars as DNAPL or dense non-aqueous phase liquids), which is likely to be carried out via a pump and treat process which will remove the DNAPL from the site. This phase is to be carried out within 6-12 months. This whole process is undertaken in a 'closed' system to minimise the release of any odours/vapours.

Phase 2 will involve ex-situ (on site) stabilisation of the uppermost 3m of made ground across the site where this is present. The majority of underground structures which are existing on the site since its use as a gas works will be removed during this process, including tanks for example. Structures removed will be crushed and reused as clean capping where possible. Free product not removed as part of the Phase 1 works will be treated or removed as appropriate. Any groundwater encountered will be treated prior to discharge in accordance with an appropriate discharge licence. This phase is expected to continue for c.6 months.

A detailed design specification has been prepared for each phase of remediation, which will inform the precise methodology to be employed by specialist contractors (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012 and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) . Further details are also provided in Chapter 2 Project Description of the EIS (ref Mouchel-1021927/R/07- March 2012).

The proposed development seeks to remove existing potential environmental liabilities and any physical or chemical constraints to future redevelopment of the site. No end use is proposed as part of this development and any future redevelopment will be addressed via separate planning application.

The fundamental goal of the works is to protect human beings and their activities through the remediation of contaminated land, particularly in terms of any future site redevelopment. However, the impacts associated with the remediation/construction process and the aftercare of the scheme must be considered, particularly in light of the location of the works within an urban area which is home to a significant resident population. Limerick City serves as an important employment and service centre for its hinterland, the Dock Road is a particularly busy urban approach road and there is a significant volume of commercial activity within the area surrounding the site, and furthermore the site is located close to visitor facilities including the Clarion Hotel; impacts on the working and visiting communities must therefore also be taken into account.

This socio-economic impact assessment is carried out by way of a combination of desk-based studies and site visits and investigations. The methodology adopted is based on the guidelines and recommendations contained in the EPA advice documents as follows:-

- Guidelines on the information to be contained in Environmental Impact Statements (2002)
- Advice notes on Current Practice in the preparation of EIS (2003)

Having regard to these documents, the issues examined include economic activity, social considerations, land use, and health and safety matters. Where appropriate we have examined impacts on human beings as impacts on different groupings of people in general, rather than specific individuals.

Information on the demographic and employment characteristics of the resident population within the catchment area that are considered of relevance is provided. Population information is sourced mainly from the Census of Population 2011 and 2006. Consideration of current unemployment patterns is based on up-to-date information available from the Live Register (Limerick Area).

Information on tourists visiting the area and visitor facilities was obtained from Failte Ireland Annual Tourism Fact Sheets accessed via their website and via site visit.

Identification of sensitive communities and land uses was undertaken by a mix of site visits, review of Development Plan mapping, internet search and review of local stakeholder information provided by the applicant. Any particularly sensitive land uses are identified and considered in this assessment. The assessment will set out the detail of the existing environment, the characteristics of the development that could have socio-economic impacts; the consequences of such impacts; and mitigation measures where considered necessary.

2.2 Consultation

Extensive consultation has been carried out in relation to the proposed project. Bord Gáis has prepared a comprehensive Stakeholder Management Plan, included as Appendix B of the EIS. Consultees include local residents and businesses, operators of visitor facilities such as the Clarion Hotel, and statutory and public agencies such as the Health and Safety Authority and the Health Service Executive. Issues raised were limited to the HSE's request that human health matters be given more detailed consideration and the concern that a loading bay be reinstated outside a property on St Alphonse Street. These issues are discussed where relevant below.

2.3 Site Visit

Site visits to inform this report were carried out on September 25th and November 5th 2012. The site visits comprised of a walkover of the subject site and of the area surrounding the subject site. The site visits confirmed the nature and content of the existing site and of the land uses surrounding the site. It also provided an overview of this area of Limerick City and its occupants.

3 Description of Existing Environment

3.1 Demography and Employment - Statistical Context

The most recent Census of Population for which population statistics are currently available is the Census of Population 2011. Local information on socio-economic groups and employment in this area can be provided on an Electoral Division (ED) basis. For the purposes of this study it is considered that an appropriate extent of information can be provided by assessing statistics for the following electoral areas: Dock A, Dock B, Dock C and Dock D. While these EDs extend beyond the immediate vicinity of the site in places they are considered the best fit for the purposes of providing meaningful statistics. For the purposes of comparison, information on population levels and change within the State and Limerick City is provided.

Live Register information presents the most up to date situation as regards unemployment levels.

3.1.1 Population Levels

Table 1 below presents population figures for the years between 2006 and 2011. It incorporates a comparison between rates of growth / decline across the Electoral Divisions of the immediate catchment area, as well as comparisons with the County and State averages.

Area	Pop 2006	Pop 2011	Pop Change %
State	4,239,848	4,588,252	8.2
Limerick City	52,539	57,106	0.1
Study Area Total	4,966	4,779	-3.7
Dock A ED	2,138	1,799	-15.8
Dock B ED	845	1,080	27.8
Dock C ED	1,046	1,028	-1.7
Dock D ED	937	872	-6.9

Source: CSO 2006 & 2011

The population of the State increased at a rate of 8.2% in the inter-censal period 2006 to 2011. Growth within Limerick City has been significantly lower; at 0.1%. Population has declined within the overall study area.

It is likely that the population decline in the study area occurred primarily because of out-migration, largely due to the current economic recession. Analysis of age cohorts discussed below reinforces this consideration, as the proportion of population in the independent age groups has declined in the intercensal period.

3.1.2 Age Profile

The age profile of the catchment population of the State, Limerick City and the relevant Electoral Divisions for 2006 and 2011 are highlighted in Tables 2 and 3 below. For ease of analysis of the structure of the population residing within each catchment area, three categories are examined:-

- the dependant population (i.e. those persons within the 0-14 and the 65+ age cohorts);
- the working/independent population (i.e. those persons residing within the 15-64 year age cohorts); and
- the childbearing population (aged 15-44).

Table 2: Population of each area categorised into independent, dependent and childbearing cohorts 2006 (to nearest %)

Area	15-64 Years Independent	0-14 Years Dependent	65+ Years Dependent	Child-Bearing 15 - 44 Years
State	69	20	11	47
Limerick City	70	18	12	55
Study Area Total	81	10	9	67
Dock A ED	88	9	3	79
Dock B ED	81	8	11	65
Dock C ED	70	13	17	45
Dock D ED	78	9	13	67

Source: CSO 2006

Table 3: Population of each area categorised into independent, dependent and childbearing cohorts 2011 (to nearest %)				
Area	15-64 Years Independent	0-14 Years Dependent	65+ Years Dependent	Child-Bearing 15 - 44 Years
State	67	21	12	44
Limerick City	69	18	13	46
Study Area Total	76	14	9	59
Dock A ED	83	13	4	72
Dock B ED	79	12	9	59
Dock C ED	68	13	19	43
Dock D ED	76	17	7	57

Source: CSO 2011

From an analysis of the above, it is concluded that the proportion of the population in the independent age cohort for the study area was above the city and state figures in 2006 and 2011. This is likely to be influenced by the urban nature of the area and the number of apartment units in the area, which tend to accommodate individuals, couples and groups of people in this cohort more frequently than families for example. While levels in this cohort are higher than state or city averages, the proportion in this age cohort fell between 2006 and 2011, and the rate of this decline was greater than that of the state or city. This is likely to be caused by out-migration from the area among this age group in recent years. Factors such as the current economic recession and particularly its impact on Limerick City are of relevance.

There is a lower proportion of population in the dependant age group within the study area for both 2006 and 2011 than in the city or state areas. This has relevance in that these population subsets are generally considered more vulnerable in terms of health impacts than those in the independent age cohort. The Dock C ED contained a higher proportion of population in the 65+ cohort in both 2006 and 2011 than state or city levels, while the Dock D ED showed a significant increase in the 0-14 cohort between 2006 and 2011.

The child-bearing cohort, or the younger sub-groups of the independent cohort, is significantly higher than the state and city average in both 2006 and 2011, although the proportion in this cohort has declined from 67% in 2006 to 59% in 2011. National and city levels in this cohort have also declined, particularly the proportion of the child-bearing cohort in Limerick City.

Numbers in this cohort have implications for the population profile and population trends in the area in future. A high number in this cohort is likely to result in population increase or a slower rate of decrease in forthcoming intercensal periods excluding other factors such as in and out migration. It is also likely to lead to higher numbers in the 0-14 age cohort in future years unless significant out-migration of this group continues.

3.1.3 Employment Status

The most recent information available from the Census of Population in respect of the principle economic status of the local population of the relevant Electoral Divisions, is from the 2011 Census of Population. This information is shown in Table 4 below. These unemployment levels are generated purely from the principle economic status of persons over 15 years recorded in the Census of Population and are useful for comparing the relative performance of an area compared with State or county averages.

High levels of unemployment are noted across all areas, which is representative of the current recession. However, the unemployment level of the local area is significantly higher than the state average and is also above the city average. A particularly high level of unemployment (30%) was recorded in the Dock A ED in 2011. This is likely to be due to the presence of the Limerick Homeless Persons Centre at McGarry House within this area, where occupants would be unlikely to have paid employment at the time of residence.

Table 4: Labour Force and Unemployment Level, 2011					
Area	At Work	1st time Jobseeker	Unemployed	Work Force	Unemployment Level
State	1,807,360	34,166	390,677	2,572,121	15.10%
Limerick City	18,419	606	6,788	29,956	22.60%
Study Area Total	1,673	76	666	2,643	25%
Dock A ED	662	51	341	1,136	30%
Dock B ED	408	14	161	631	25.5%
Dock C ED	349	10	99	515	19%
Dock D ED	254	1	65	361	18%

Source: CSO 2011

A record of numbers receiving unemployment benefits is obtained from live register figures recorded by the Central Statistics Office, (shown in Table 5 below). Live register¹ figures are updated on a monthly basis. In this regard, it should be noted that the standardised unemployment rate recorded for the State as a whole in September 2012 was 14.4%². This includes casual and part-time workers entitled to payments. Numbers unemployed in Limerick City have increased by over 70% since 2008 and by over 160% since 2006.

Table 5: Live Register - State, Limerick City and County, September 2006, 2008 and 2012			
Area	Sept 2006	Sept 2008	Sept 2012
State	152,307	240,217	429,335
Limerick City	5,530	8,431	14,460

The Census information also provides information on the type of industry in which local people are employed in (shown in table 6 below). This information is also provided for the state and city for comparative purposes. The key employment sectors in the study area in 2011 were manufacturing, commerce and trade and 'other' sectors. This is typical of such a study area which predominantly comprises an urban area within and close to the city docks and buildings with extensive office space, analysis of a rural study area would demonstrate a higher number engaged in agriculture, fishing and forestry.

Table 6: Persons at Work by Industry 2011									
Area	Agri. For. and Fish.	Building and Constr'n	Manuf'g Industry	Commerce and Trade	Transp. and Comms	Public Admin	Prof.	Other	Total
State	91,526	87,371	209,803	456,289	146,530	113,860	425,349	276,632	1,807,360
Lk City	30	1208	4197	5434	1217	766	3063	3072	18987
S. A.	6	130	612	616	95	71	268	523	2321
Dock A ED	2	78	408	338	43	16	67	292	1244

¹The Live Register does not record 'unemployment' as it also captures employed people such as those in casual or part-time employment that are in receipt of payments from the state such as Jobseeker's Benefit.
²CSO Live Register Details September 2012, published 3rd October 2012.

Area	Agri. For. and Fish.	Building and Constr'n	Manuf'g Industry	Commerce and Trade	Transp. and Comms	Public Admin	Prof.	Other	Total
Dock B ED	3	26	97	113	15	6	50	110	420
Dock C ED	0	13	45	98	18	34	85	60	353
Dock D ED	1	13	62	67	19	15	66	61	304

Source: CSO 2011 (SA=Study Area)

3.2 Community and Population Groupings

3.2.1 Resident Community

The area surrounding the site is characterised by significant tracts of existing residential land. Indeed the current Limerick City Development Plan indicates that the area is an Inner City Residential Neighbourhood. The residential developments within the area include a range of dwelling types, for example terraced and semi-detached two-storey housing (e.g. Clyde Hill and Henry St. Mews), large apartment developments (e.g. Riverdock House and Valentine Place) and apartments located in subdivided two and three-storey former dwelling houses (e.g. O'Curry Street).

The most proximate residential communities to the subject site are located on O'Curry St., Little O'Curry St., Cogan St., O'Curry Place, St. Alphonsus St., St. James Mews, Claremount Court, Clydehill Mews, Dock Road, Steamboat Quay, Crosley Row and Henry Street Mews. These include a small number of residential premises which bound the subject site at Dock Road, St. Alphonsus St. and St. James Mews.

While the resident population in the streets immediately surrounding the site generally comprises two- and three-storey housing units and a significant number of apartments, it must also be noted that McGarry House, which includes Limerick Homeless Persons Centre and associated facilities (dorms, bedsits and supported long-term accommodation) is located on Alphonsus Street. There is also likely to be a significant student population in the area given the proximity of the site to Mary Immaculate College, a large teacher training facility at South Circular Road. There are student apartments at Courtbrack Avenue for example.

Large-scale services for residents, including retail and business services are concentrated within the city centre. However a number of local services are located adjoining and within close proximity to the site, for example public houses on the Dock Road, a Spar

convenience outlet, take-away, video rental outlet and internet cafe on Henry Street, and a fish shop on St. Alphonsus Street.

3.2.2 Working Community

The subject site is currently vacant and accordingly there are no employees on site. Some negligible employment is generated through the requirement for site security.

The area immediately surrounding the site has a significant working community given the urban nature of the area.

The City Docks, operated by the Shannon-Foynes Port Company, are located just across the Dock Road from the subject site and occupying a significant tract of riverside land. Other commercial entities in the vicinity of the subject site on Dock Road include a number of public houses adjacent the main Dock Road entrance to the site, offices and general commercial enterprises. Further south, there is an industrial facility at National Food Ingredients Ltd., a service station and Docklands Business Park, which contains mixed commercial enterprises.

There are a number of smaller scale enterprises on O'Curry Street, which are dominated by professional services offices (e.g. accountants, solicitors). Diageo's Limerick base is located here as is a car wash and valeting centre. Alphonsus St. contains some commercial occupants such as a fish shop and a garage. McGarry House, along with its residential function, also includes other services operated by NOVAS Initiatives and incorporates some office use for that entity.

Retail activity in the area is mixed; there are some small-scale convenience stores (Spar on Henry Street., Gala Express on Quinlan Street, XL on O'Connell Avenue and a greengrocers on St. Gerard Street) and some speciality retail stores distributed broadly through the area.

The area just north and northwest of the subject site represents the start of the City Centre commercial core per se and accordingly this area is characterised by a more dense and mixed form of commercial development, including substantial office development, occupational health clinics, hotels, restaurants, hair salons, specialist retail outlets, hair salons, recruitment agencies, printers and a radio centre (e.g. Steamboat Quay, Dock Road north of the site, Mount Kennett Place, Henry Street).

A significant working community would be employed in the community and social institutions in the area south and east of the site, particularly due to the large number of educational establishments located here (see land use below).

A large volume of workers would use the road network adjacent the site (particularly Dock Road) to access workplaces in this area of the city centre and throughout the centre generally. There are a number of large multi-storey car parks just north of the site, which are used by the city's working community, among others.

3.2.3 Visiting Population

Fáilte Ireland's 'Overseas Visitors to Counties in 2011 – Preliminary Estimates, July 2012' advises that 380,000 people visited County Limerick in 2011, generating estimated revenue of €151 million. Limerick was the sixth most visited county after Dublin, Cork, Kerry, Galway and Clare. Visitor numbers to Limerick were highest from Britain (146,000), followed by Mainland Europe (127,000) and North America (92,000). The preliminary figures from 2011, if confirmed will represent an increase in overseas visitors from 2009 and 2010, when visitor numbers were 353,000 and 333,000 respectively. Estimated revenue would also have increased but on a more conservative level, based on a likely reduced spend per visitor.

Of the top ten visitor attractions for the Shannon Region, only one is located within Limerick City – St. John's Castle. This building is not located in close proximity to the subject site. Limerick City does attract visitors to other facilities such as Thomond Park Rugby Stadium for matches and tours, the Hunt Museum, its weekly food markets and its hotels, bars and restaurants.

There is no major visitor attraction (non-accommodation) located close to the site, however the site is within a short distance of the Georgian area of the city, including The Crescent, which is an attraction in itself for some visitors. In terms of streetscape, it should be noted that the site is also located adjacent an Architectural Conservation Area.

In the vicinity of the subject site, the nearest visitor accommodation is the Clarion Hotel on Steamboat Quay. There are also hotels at Lower Mallow Street (Jury's Inn) and at 1 Pery Square. There are very few other visitor accommodation facilities in the area of the site, a bed and breakfast, Abbeyville House is located on O'Connell Avenue and there are a number of hotels and other accommodation facilities within the city centre. There are a small number of dining facilities in the area, including a French restaurant and restaurants associated with the Clarion Hotel on Steamboat Quay.

Given the proximity of the subject site to the River Shannon, water-based leisure activities must be considered. Within Limerick City, the River Shannon is used for kayaking/canoeing; trails publicised by Shannon Trails however, finish at Custom House Quay within the city centre. There are two rowing clubs in the area, Shannon Rowing Club which is based at Wellesley Pier (adjacent Sarsfield Bridge) and St. Michael's Rowing Club based at O'Callaghan Strand. The River Shannon in the vicinity of Limerick City offers angling at Plassey, Annacotty and Casteconnell for salmon, pike and coarse fishing.

3.3 Land Use

The subject site is a disused former Gasworks site. Its most recent use was as a depot and office location for Bord Gáis.

The most sensitive land uses to construction/remediation projects of this nature are considered to be residential areas, schools, hospitals/health facilities, other community

facilities, visitor accommodation or other facilities and amenity areas. These uses are among those most sensitive to noise, odour and vibration.

There is also potential for construction projects to result in temporary or permanent landtake, or temporary or permanent obstruction to access to surrounding land uses.

Surrounding lands uses include residential and commercial development as detailed above in section 3.2. As discussed, there is a significant level of residential development immediately adjacent and within the general area of the site.

There are no schools adjacent the site however there are a number in the nearby streets, and the area of the city south and east of the site contains a significant number of educational facilities on the whole. These include primary schools at St. Philomena's Montessori and Primary School (South Circular Road), Catherine McCauley Special School, which has over 120 primary pupils on Ashbourne Avenue, Scoil Mhathair De, which has over 250 primary pupils (South Circular Road), An Mhodh Scoil, which teaches over 500 primary pupils at O'Connell Avenue, the Limerick School Project (over 200 primary pupils at O'Connell Avenue and the nearest school to the subject site, approximately 275-300m south east) and St Michael's National School (over 110 pupils at Barrington St.).

There are secondary schools at St. Clement's Redemptorist College (the nearest secondary school to the subject site at South Circular Road, approximately 300m to the south west, enrolling c470 pupils), Laurel Hill Secondary School and Laurel Hill Coláiste (enrolling over 1000 pupils also at South Circular Road) and Scoil Carmel at O'Connell Avenue (over 290 pupils).

Other educational facilities include the Limerick City Adult Education Service (O'Connell Avenue), and Mary Immaculate College (South Circular Road) and Limerick Tutorial College (the Crescent).

There are a number of community facilities in the area including a Social Services Centre on the grounds of the Redemptorist community site on the South Circular Road and St. Joseph's Parish Centre on O'Connell Avenue. There are a number of churches nearby.

There is a Centre of Music at the Redemptorist site on South Circular Road, which is likely to be sensitive to noise and vibration.

There are a very limited number of medical facilities in the area, these include an eye clinic and occupational health clinic on Steamboat Quay, a GP clinic on Barrington Street and a dental clinic, podiatrist and ophthalmic surgeon on O'Connell Avenue. There are no hospitals in close proximity to the site.

Visitor facilities are outlined above in section 3.2 and generally include hotels and restaurants in this area of Limerick.

The nearest amenity areas to the site are the Boardwalk along the River Shannon adjacent the Clarion Hotel on Steamboat Quay, Mount Kennett Skatepark and the playing pitches

associated with educational premises to the south of the site (St. Clements, Laurel Hill etc.).

The site is bounded on two sides by public roads. Public parking is available along O'Curry Street and on the Dock Road along the majority of the site's street frontage.

3.4 Health and Safety Aspects

The site currently comprises contaminated land. Its contaminated state renders this relatively large block of urban land unsuitable for redevelopment due to the associated risk to any future workers or occupants of the site.

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4 Potential Impacts

4.1 Population

This section details the potential impacts on population, employment and community aspects, for the pre-remediation works and the Phase 1 and Phase 2 remedial works.

Potential impacts are described using the terminology within the 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA March 2002).

It is anticipated that the following time periods would relate to the three work stages;

- Pre-remediation works 2-3 months
- Phase 1 Remediation 6-12 months
- Phase 2 Remediation 6 months

4.1.1 DRI/Sub-station, Demolition and Boundary Wall Improvements

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Temporary increase in population of area based on influx of workers.	It is anticipated that a minimal number of workers (10-15) will be required to undertake these works (2-3 months). There is adequate local accommodation for workers.	Positive, imperceptible, temporary
Any displacement and resultant reduction of population on temporary basis due to nature of works proposed.	Adjoining residents will not need to be moved from their premises while the works are being carried out.	No impact

4.1.2 Remediation Phase 1

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Temporary increase in population of area based on influx of workers.	It is anticipated that a minimal number of workers (A maximum number of 10) will be required to undertake these works (6-12 months). These are likely to be specialists who will come in from outside the City and stay in Limerick for a period of 3-4 weeks to set up equipment. There is adequate local accommodation for workers.	Positive, imperceptible, temporary
Any displacement and resultant reduction of population on temporary basis due to nature of works proposed.	Adjoining residents will not need to be moved from their premises while the works are being carried out.	No impact

4.1.3 Remediation Phase 2

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Temporary increase in population of area based on influx of workers.	It is anticipated that a minimal number of workers (up to 12 estimated) will be required to undertake these works (6 months). Although on a short term basis specialist contractors may come in from outside of the City for periods of 3-4 weeks during the 6 months. There is adequate local accommodation for workers.	Positive, imperceptible, temporary
Any displacement and resultant reduction of population on temporary basis due to nature of works proposed.	Adjoining residents will not need to be moved from their premises while the works are being carried out.	No impact

4.1.4 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Any increase or decrease in population levels	No future use is currently identified for the site at this time. The site will remain vacant until redevelopment plans are in place.	Neutral, imperceptible, short term impact on population levels and profile for as long as the site remains undeveloped.

4.2 Employment

4.2.1 DRI/Sub-station, Demolition and Boundary Wall Improvements

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Employment benefits (directly in relation to the construction works or indirectly on local suppliers / services e.g. fuel/food.	It is anticipated that a minimal number of workers (10-15) will be required to undertake these works (2-3 months), which will use local suppliers and services.	Positive, imperceptible, temporary

4.2.2 Remediation Phase 1

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Employment benefits (directly in relation to the construction works or indirectly on local suppliers / services e.g. fuel/food.	It is anticipated that a minimal number of workers (up to 12 estimated) will be required to undertake these works (6-12 months). These are likely to be specialists who will come in from outside the City and stay in Limerick for a period of 3-4 weeks to set up equipment, which will use local suppliers and services.	Positive, imperceptible, temporary

4.2.3 Remediation Phase 2

Considerations	Comment	Potential Impact: Quality, Significance, Duration
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Employment benefits (directly in relation to the construction works or indirectly on local suppliers / services e.g. fuel/food.	It is anticipated that a minimal number of workers (A maximum number of 10) will be required to undertake these works (6 months). These are likely to be specialists who will come in from outside the City and stay in Limerick for a period of 3-4 weeks to set up equipment, which will use local suppliers and services.	Positive, imperceptible, temporary
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4.2.4 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Employment benefits (directly in relation to the construction works or indirectly on local suppliers / services e.g. fuel/food.	No future use is currently identified for the site at this time. The site will remain vacant until redevelopment plans are in place.	Neutral, imperceptible, short term on employment for as long as the site remains undeveloped.

4.3 Resident Population

4.3.1 DRI/Sub-station, Demolition and Boundary Wall Improvements, Remediation Phase 1, Remediation Phase 2

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Potential impacts from these works on the resident population include; noise, dust, vibration, odour and emissions from demolition, construction traffic and remediation works.	The most sensitive receptors potentially impacted by these works are the residents of the adjoining and near-by properties. There are no healthcare facilities within the immediate vicinity of the site and the nearest schools are in the order of 300m from the site boundaries. The typical emissions from such works are well understood from previous similar works. The mitigation control measures outlined in chapter 9 of the EIS report	Negative, slight, temporary

	and section 5 below describe how potential impacts on the resident population would be minimised.	
--	---	--

4.3.2 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Removal of contaminants from site	This will increase the likelihood of the site being redeveloped and improving the area.	Positive, imperceptible, long-term
Boundary wall improvements	Proposed improvements to boundary walls will improve the appearance of the area and will increase the likelihood of the site being redeveloped.	Positive, moderate, long-term

4.4 Working Population

4.4.1 DRI/Sub-station, Demolition and Boundary Wall Improvements, Remediation Phase 1, Remediation Phase 2.

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Potential impacts from these works on the working population include; noise, dust, vibration, odour and emissions from demolition, construction traffic and remediation works.	It is considered that the most sensitive working population receptors potentially impacted by these works are the workers of the adjoining and near-by commercial properties. The typical emissions from such works are well understood from previous similar works. The mitigation control measures outlined in chapter 9 of the EIS report and section 5 below describe how potential impacts on the working population would be	Negative, slight, temporary

	minimised. Significant traffic disruption is not expected as a result of the works.	
--	---	--

4.4.2 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Removal of contaminants from site	This will increase the likelihood of the site being redeveloped, and potentially providing further employment opportunities for local residents.	Positive, imperceptible, long-term
Boundary wall improvements	Proposed improvements to boundary walls will improve the appearance of the area and will increase the likelihood of the site being redeveloped.	Positive, moderate, long-term

4.5 Visiting Population

4.5.1 DRI/Sub-station, Demolition and Boundary Wall Improvements, Remediation Phase 1, Remediation Phase 2

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Potential impacts from these works on the visiting population include; noise, dust, vibration, odour and emissions from demolition, construction traffic and remediation works.	It is considered that the most sensitive visiting population receptors potentially impacted by these works are the visitors to Limerick City, specifically those staying in nearby hotels (such as the Clarion Hotel on Steamboat Quay) and guesthouses. The typical emissions from such works are well understood from previous similar works. The mitigation control measures outlined in chapter 9 of the EIS report and section 5 below describe how potential impacts on the visiting population would be	Negative, slight, temporary

	minimised. Significant traffic disruption is not expected as a result of the works.	
--	---	--

4.5.2 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Removal of contaminants from site	Potentially improve the area and make it more attractive to visitors	Positive, imperceptible, long-term
Boundary wall improvements	Proposed improvements to boundary walls will improve the appearance of the area. Dock Road is an approach road to the City Centre, guests in nearby hotels could benefit from improved visual amenities of area, particularly the Clarion Hotel on Steamboat Quay which overlooks the site.	Positive, moderate, long-term

4.6 Land Use

4.6.1 DRI/Sub-station, Demolition and Boundary Wall Improvements

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Any proposed temporary land take or severance or disruption to access;	Any proposed land take for these works is likely to be limited to temporary movement of construction hoarding further out on the footpath along O'Curry St (for Health and Safety purposes) to facilitate relocation of DRI, ESB substation and to undertake boundary wall improvements. The duration is expected to be in the order of 2-3 months. The works will not impact on loading bays or public parking areas on surrounding streets	Neutral, slight, temporary

4.6.2 Remediation Phase 1, Remediation Phase 2

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Any proposed temporary land take or severance or disruption to access;	No temporary land take or disruption to access is proposed.	No impact

4.6.3 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Any proposed temporary land take or severance or disruption to access;	No temporary land take or disruption to access is proposed, although a pedestrian set back in proposed on the corner of O'Curry Street and Dock Road to improve visibility, particularly for traffic. A new pedestrian access to the site will be provided within the set back, and on O'Curry Street. The existing vehicle access on Dock Rd (near to the junction with O'Curry Street) will be closed off as it is in an unsafe position.	Positive, moderate, long-term

4.7 Health and Safety

4.7.1 DRI/Sub-station, Demolition and Boundary Wall Improvements, Remediation Phase 1, Remediation Phase 2

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Any impacts associated with direct contact with contaminants, or contact through	During these initial works, limited contamination is expected to be encountered. Should any material suspected to be contaminated be encountered the appropriate measures	Negative, slight, temporary

<p>odours/vapours/other emissions, water etc.</p> <p>Any risk associated with physical works proposed, noise, general dust, etc.</p>	<p>as outlined in the section 5 below would be undertaken. A Detailed Quantitative Human Health Risk Assessment (DQRA) has been undertaken following extensive investigation of the site (ref Quantitative risk assessment, options appraisal and remedial strategy report: Mouchel-1021927/R/05- March 2010) which has informed the remediation design. It is noted that the DQRA has been undertaken to the protective of the most sensitive population receptor i.e. female less than 5 years old. As indicated in table 3 the percentage of the most sensitive receptors is small within the study area. A full set of baseline line data and risk assessment documents will be provided to the Contractor to allow the works method statements to be appropriately designed to mitigate potential impacts due to the contaminants potentially present.</p> <p>All works would be undertaken to comply with relevant Health and Safety Regulations during remediation, construction and demolition processes to minimise potential impacts. Safety Hoarding will be constructed at the site boundary to isolate works to the site.</p>	<p>Negative, slight, temporary</p>
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4.7.2 Operational/Aftercare

Considerations	Comment	Potential Impact: Quality, Significance, Duration
Removal of contaminants from site	Reduction of potential health risks.	Positive, imperceptible, long-term
Boundary improvement works	Potential improvement in pedestrian and driver safety in the area, due to the set back proposed at the O'Curry St, Dock Rd junction.	Positive, moderate, long-term

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5 Control Measures

5.1 Previous Experience

The proposed mitigating control measures for the potential impacts identified are based on demonstrable experience of similar projects.

The designs of control measures proposed are based on previous successful remediation projects of former gasworks specifically in Cork, Dublin and Waterford. In particular, odour was identified as the most significant potential nuisance and this has resulted in the design of a two phase approach for the remediation at Limerick. The first phase comprising a 'closed' pump and treat process (ref Section 2.1), is designed to significantly reduce potential odour impacts by removal of the most volatile hydrocarbons from the ground, resulting in a reduction of odours during Phase 2 works.

The previous remediation schemes were subject to strict conditions under a waste licence regime, and it is anticipated that similar conditions will be implemented at Limerick. A Waste Licence application was submitted to the EPA in May 2012. although a licence is yet to be granted. The design specifications for the works include the anticipated waste licence conditions and stringent monitoring and control measures. Confirmation from the remediation contractor will be sought that compliance will be made with the actual licence conditions, once received.

5.2 Dust

The creation of dust through site activities will be minimised wherever possible. Nevertheless, carrying out excavation, loading, processing and hauling works has the potential to create dust. The excavation activities will be undertaken in a systematic, phased manner so as to minimise the potential for the creation of dust. A controlled working face will be operated on a day-by-day basis, with the working face being trimmed and sealed at the end of the working day. Dust suppression equipment will be fitted to any processing plant as standard. This will ensure that any airborne particulates are controlled during the processing of the material. In addition, the 'drop' of the processed material will be minimised to reduce the potential of dust generation. Haul routes will be surfaced wherever possible with hard materials that will assist the passage of vehicles without creating excess dust. Stockpiling of materials will be minimised wherever possible so as to reduce the likelihood of particulates being blown from them as dust. Controlled damping may be carried out as required. Dust suppression across the site will be provided using a tractor and bowser on a proactive basis, as

requested. Haul routes will be damped down sufficiently well to control dust but not over damped such that excess, potentially contaminated water is generated. The tractor/bowser will also be fitted with cannon type equipment to damp stockpiles/excavation faces as necessary. Any lorries entering or leaving the site will be required to sheet up, in line with good practice and current guidance and pass through the wheelwash facility a required. The Resident Engineer will monitor the site on a full time basis during construction periods and will have the authority to dictate dust suppression measures as necessary. A record of all activities will be held, which will be made available to Stakeholders as required. A record of weather conditions will also be made. The Resident Engineer will liaise with the Client on feedback from local residents and the Regulators and modify working methods where possible. Dust monitoring will be carried out to monitor the effectiveness of our control methods.

The following series sections within the remediation design specifications (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012 and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) cover the control and monitoring of dust;

840 Control of Dust
850 Monitoring of Dust

5.3 Odour

Due to the nature of the material being excavated, the operations on site may lead to some malodour being experienced during the works. The expected phasing of the works will result in only a small strip section of potentially odorous waste being exposed at any one time. A quantity of the inert material will be used to clad the exposed face at the end of the working day. This daily cover will minimise any odour emissions. When works are undertaken with the potential to cause odours the Resident Engineer will ensure the following, odour nuisance mitigation measures are in place:

- Stockpiles are not allowed to become over large;
- Stockpiles of potentially malodorous waste are well managed and treated/ disposed of promptly so as to minimise the potential for malodours;
- Stockpiles are covered as appropriate;
- Effluent/ liquid collected is collected, handled and disposed of promptly so as to minimise the potential for malodours;

- Odour neutralisers/suppressants or deodorisers are fully functional and operational as required;
- Plant and equipment is washed down and cleaned regularly so as to minimise the potential for build up of waste materials within guards, tyres etc.

If odours are noted during routine monitoring, then the use of alternative odour masking agents/suppressants will be investigated.

Significant monitoring of air quality during the remediation at Waterford gasworks demonstrated that there was no significant risk to human health. The Environmental Protection Agency undertook independent ambient air monitoring in an adjacent car park over a four month period during major excavation works. This monitored the volatile organic compounds benzene, toluene, ethylbenzene, o-, m- and p- xylene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene and isoprene plus nitrogen dioxide, sulphur dioxide and particulate matter (PM10). The method used involved gas chromatography with a photoionisation detector (PID) by means of a BTX Analyser gC855 supplied by Syntech Spectras, Netherlands. The gas chromatograph sampled automatically over thirty minute cycles with analysis then carried out over the following 30 minute period. The EPA results were found to be below the Occupational Exposure Levels (OEL) and Environmental Assessment Levels (EAL) identified for nitrogen, sulphur dioxide and all VOCs with the exception of benzene and isoprene and PM10. Benzene, isoprene and PM10 slightly exceeded their annual EAL means (by <8%) but both benzene and isoprene were well below the 15 minute & 1 hour OELs, whilst there is no corresponding OEL value for PM10. A review of the EPA's results, by the Health Service Executive, concluded that the peak levels measured did not give rise to concern on public health grounds providing that the duration of exposure would have been as indicated in the monitoring data reviewed

An independent assessment of the air quality data at Waterford and Dublin gasworks was undertaken by Professor James Heffron at UCC, who is a leading authority on odour control. Professor Heffron confirmed that there was no impact on human health, albeit that people perceive odour in different ways. The issue of potential odour impact has led to the two phase approach proposed, which should reduce any impact compared with the previous gasworks remediation works where excavations were undertaken without a prior pump and treat phase.

The following series sections within the remediation design specifications (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012 and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) cover the control and monitoring of odour;

- 860 Control of Odours
- 870 Monitoring of Odours

5.4 Noise and Vibration

The plant and equipment that are expected to be used on this project produce noise. All plant will be fitted with approved silencing equipment and will be operated within the manufacturers guidelines. Machinery will not be left on when not in use and on site planning will ensure use of noisy equipment is minimised wherever possible. All operations on site will be carried out during the agreed hours only and operations will occur as far away from potential receptors as practical. All site operations will be undertaken in compliance within approved maximum noise levels. Hand held noise monitoring equipment will be available at the site. Noise monitoring will be carried out around the boundary of the operation. Crushing/ screening operations close to properties may give rise to noise and this operation will be given particular attention in our noise monitoring schedule. The results of noise monitoring will be recorded. The expected remediation methodologies and haulage operations will give rise to some vibration although we believe that vibration will not be a significant impact. However, vibration monitoring will be undertaken for any works carried out in the vicinity of potentially sensitive structures.

The following series sections within the remediation design specifications (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012 and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) cover the control and monitoring of noise and vibration;

- 810 Control of Noise and Vibration
- 820 Monitoring Noise
- 830 Monitoring Vibration

5.5 Prevention of Mud and Debris on the Road

The operation of the site does not involve significant road haulage though the Contractor will still have a duty of care to ensure that any vehicles accessing/ egressing the site comply with all relevant road traffic legislation. Mud generation on site will be controlled by grading and maintaining site haul roads. An on site wheelwash facility will be provided and used when conditions dictate. All lorries will be required to sheet up before leaving the site to prevent spillages of mud and debris and a roadsweeper will be available to clean the access road and haul routes should it be required. The Resident Engineer will monitor the site on full time basis and will have the authority to dictate road cleaning measures as necessary. A record of all activities will be held on site.

The following series section within the remediation design specifications (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012

and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) covering the prevention of mud and debris on the road;

772 Traffic Safety and Management, item a).

5.6 Traffic

The remediation/earthworks proposed on the site do not involve significant road haulage of materials into or out of the site. However, the Contractor will be encouraged to minimise the number of vehicles required for the works together with reducing wherever possible the impact that the vehicles make. The likely procedures to implement this policy could include:

Minimising number of vehicles required

- A remediation strategy of recycling and reuse;
- Bulk Artics for haulage of materials to maximise the load on each vehicle;
- The use of local disposal points or waste material to minimise the number of vehicles in use.

Mitigating Measures

- Provision of a wheelwash facility to ensure vehicles leaving the site do not carry mud onto the highway;
- Availability of a roadsweeper to clean up any spillages;
- Security to control movements and ensure that vehicles accessing/egressing the site are controlled and recorded;
- Operations controlled to avoid vehicles accessing/egressing the site at peak times;

An effective and controlled Traffic Management Plan is to be put in place to ensure vehicles obey rules and regulations

The following series section within the remediation design specifications (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012 and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) covers traffic issues;

772 Traffic Safety and Management

5.7 Litter, pests and scavengers

Due to the nature of the material, the excavation, treatment and infilling works are not expected to lead to problems with litter, pest or scavengers. Though measures will be put in place should problems be observed during the works.

The following series section within the remediation design specifications (refs- Phase 1: Specification and Drawings- Part 3 Mouchel- 1021927/R/22- April 2012 and Phase 2: Specification and Drawings- Part 3 Mouchel- 1021927/R/26- April 2012) covers site tidiness including pests and scavengers;

773 Tidiness of the Site

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6 Conclusions

It is concluded that there will be a positive, imperceptible, temporary impact on population and employment in the vicinity of the subject site.

In respect to community aspects, it is acknowledged that this project has the potential to give rise to temporary, negative environmental impacts. However, should the proposed mitigation control measures be planned, carried out and managed in a responsible and diligent way, such impacts would be reduced to slight significance.

It should be emphasised that experience from previous similar works has demonstrated through extensive monitoring and assessment, that there is no significant impact on human health. Air quality monitoring and assessment was independently undertaken by the EPA at the Waterford site remediation. The data was also independently reviewed by a leading authority at UCC, Professor James Heffron. Both drew the same conclusion that there was no significant impact on human health from the remediation works.

Notwithstanding the assumption that works at Limerick gasworks would create no greater risks to human health than at previous sites, a phased approach has been adopted, to further minimise any impacts on the human environment.

7 References

Environmental Impact Statement: Mouchel-1021927/R/07- March 2012

Natura Impact Statement: Mouchel- 1021927/R/16- February 2012

Phase 1: Specification and Drawings- Part 3: Mouchel- 1021927/R/22- April 2012

Phase 2: Specification and Drawings- Part 3: Mouchel- 1021927/R/26- April 2012

Quantitative risk assessment, options appraisal and remedial strategy report: Mouchel-1021927/R/05- March 2010

Quantitative risk assessment, options appraisal and remedial strategy, Addendum Report: Mouchel- 1021927/R/18- January 2012

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Appendix A- Site Photographs





**LIMERICK GASWORKS
PUMP AND TREAT (PHASE 1) REMEDIATION**

Part 3

SPECIFICATION AND DRAWINGS

Tender Reference no.: 10/054

Report Number: 1021927/R/22A

Rev. No.	Purpose	Originated	Checked	Approved	Date
1.0	Tender	NB	DW	TB	April 2012

Invitation to Tender		Limerick Gasworks Pump and Treat (Phase 1) Remediation
10/054	SPECIFICATION AND DRAWINGS	

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PART 2 CONDITIONS OF CONTRACT

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1021927/PHASE 1 TENDER/OD/001	Site Location
1021927/PHASE 1 TENDER/OD/002	Site Layout (indicating historic structures and existing above ground structures).
1021927/PHASE 1 TENDER/OD/003	Characterisation Exploratory Hole Location Plan
1021927/PHASE 1 TENDER/OD/004	Previous Investigation Exploratory Hole Location Plan
1021927/PHASE 1 TENDER/OD/005A-005H	Cross Sections
1021927/PHASE 1 TENDER/OD/006	Encountered NAPL (Characterisation)
1021927/PHASE 1 TENDER/OD/007	Encountered NAPL (Historic)
1021927/PHASE 1 TENDER/OD/008	Constraints Plan
1021927/PHASE 1 TENDER/OD/009	Existing Offices Floor Layouts
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Appendices

- Appendix A Previous Reports**
- Appendix B Preliminary Safety and Health Plan**
- Appendix C Chemical Testing Suites and Reporting Order**
- Appendix D Service Drawings**
- Appendix E Criteria for Discharge Consent to Foul Sewer / Re-injection into the Ground**

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1 Introduction

1.1 Documentation Description

This specification details the pump and treat remediation works (Phase 1) to be undertaken at Limerick Gasworks. It is arranged using series letters and clause numbers generally in accordance with the divisions in Civil Engineering Standard Method of Measurement (3rd Edition) published by Thomas Telford, 1991 (CESMM3).

This introduction, (together with the Remediation Strategy detailed in Section 2) provides a general description of the site in order to assist the Contractor in his overall appreciation of the data and requirements. However, because of the generalisation it is not definitive and the requirements of the Specification (Section 5) shall take precedence if there is any ambiguity.

The specification is one of the documents which will comprise the Tender documents. The list of Tender documents for the project are detailed in Table 1.

Table 1. Tender Documents for the Project

Document Title	Reference	Prepared by
Instructions to Tenderers, Form of Tender and Appendix to the Form of Tender – Part 1	1021927/R/20	McCann FitzGerald
Conditions of Contract – Part 2	1021927/R/21	McCann FitzGerald
Specification and Drawings (this document) – Part 3	1021927/R/22	Mouchel
Bill of Quantities – Part 4	1021927/R/23	Mouchel

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1.1.1 Project Directory

Table 2 below identifies the project directory including emergency contact numbers.

Table 2 Project Directory

Role	Organisation	Contact Name(s)	Title	Address
Employer	Bord Gais Eireann	Declan Burke	Project Manager	(T) +353 (0) 21 453 4420 Email dburke@bge.ie
Engineer	Mouchel Ltd	Tony Brown	Technical Director	(T) +44 (0) 151 348 8112 (M) +44 (0) 7740 763238 Email tony.brown@mouchel.com
Project Supervisor (Design Phase)	Mouchel Ltd	Charlie Parkinson	Project Supervisor (Design Phase)	(T) +44 (0) 113 203 5632 (M) +44 (0) 7976 343938 Email charlie.parkinson@mouchel.com
Project Supervisor (Construction Phase)	Remediation Contractor – when appointed	TBC	TBC	TBC
Public Liaison	Bord Gais Eireann	Linda O'Brien	Liaison Officer	(T) +353 (0) 21 453 4183 Email liobrien@bge.ie
Main Contractor	Remediation Contractor – when appointed	TBC	TBC	TBC
Land Surveyors (original survey)	Murphy Global Consulting Surveyors	-	-	(T) +353 (0) 21 489 5704 Email cork@murphysurveys.ie
Regulators	Environmental Protection Agency	Brian Meaney	Senior Scientific Officer	(T) +353 (0) 53-9160600 Email B.Meaney@epa.ie
Local Authority	Limerick City Council	Kieran Reeves	Senior Executive Planner	(T) +353 (0) 61 407210 Email kreeves@limerickcity.ie www.limerickcorp.ie
Sanitation Authority	Limerick City Council	Ursula Ahern	Assistant Scientist	(T) +353 (0) 61 407190 Email uahern@limerickcity.ie

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Table 3 below identifies the utilities directory.

Table 3 Project Directory - Utilities

Utility	Organisation	Address
Public Sewers	Limerick City Council Water Services Department	Water Services Department (Water Supply, Sewerage), 2nd Floor, City Hall, Merchants Quay, Limerick, IRELAND (T) +353 (0) 61 407 229 www.limerickcorp.ie/Water/
Water	Limerick City Council Water Services Department	Water Services Department (Water Supply, Sewerage), 2nd Floor, City Hall, Merchants Quay, Limerick, IRELAND (T) +353 (0) 61 407 229 www.limerickcorp.ie/Water/
Electricity	ESB Network	www.esb.ie/esbnetworks/en/home/index.jsp (T) 1850 372 757 Email: esbnetworks@esb.ie
Gas	Bord Gais Networks	www.bordgais.ie/networks/
Telecoms	Eircom	www.eircom.ie

1.2 Site Location and Description

The 1.4 ha site is located in the City of Limerick approximately 100 m south east of the River Shannon and immediately south east of the Dock Road. The national grid co-ordinates for the site are E156950 N156650. A location plan is included as Drawing 1021927/PHASE 1 - TENDER/OD/001.

The site, roughly rectangular in shape, is generally level at approximately 5 m MHD (Malin Head Datum) but rises to approximately 8 m MHD towards the south and east boundaries.

The site is surrounded by housing and light industry to the northeast and housing to the southeast and southwest. To the northwest are Limerick docks comprising industrial properties, a graving dock, wet dock and the River Shannon.

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The site is currently not in use and access is managed by Bord Gais. The site includes a two-storey office block and other ancillary buildings (including No 5. store), none of which are used on a permanent basis. The No. 5 store (also known as the Generator Building), the walls around the AGI site and the masonry wall at the Dock Road boundary have Protected Status.

The remediation works are to be split into two phases. Phase 1 Pump and Treat remediation (this Phase) and Phase 2 Stabilisation / Solidification.

Drawing 1021927/PHASE 1 - TENDER/OD/002 presents the site layout (indicating historic structures and existing above ground structures).

Where grid cells are referenced in this report, the grid labels are indicated on Drawings 1021927/PHASE 1 - TENDER/OD/003 and 1021927/PHASE 1 - TENDER/OD/008.

1.3 Site History

The site history is summarised below:

- in the 1830's a limestone quarry was situated in the eastern part of the site, with a small gas works located on-site immediately to the north west of the quarry;
- by 1872 the gas works occupied the majority of the site, with a water feature located within the remaining quarry;
- the quarry had been backfilled by 1938, and an electricity substation was located on-site along the north east boundary;
- coal gas manufacture ceased in 1974 and the works became an oil gas plant until 1986 when natural gas was introduced;
- demolition and site clearance took place between 1988 and 1995.

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Site clearance (2009) was undertaken to facilitate access for the characterisation works undertaken in November 2009. Works also included the placement of gabion baskets along a short length of the south boundary wall (grid cells G12, H12, and I12 and grid cells L10, L11 and L12) as it was considered to be unstable. Shoring was also provided to the Dock Road wall.

The former Quarry and gasholder wells/ tar tanks etc are identified and numbered (T1, T2, T3 etc) on Drawing 1021927/PHASE 1 - TENDER/OD/008.

1.4 Definitions

For the purposes of these tender documents (Table 1), the following technical definitions apply:-

'NAPL' – Non Aqueous Phase Liquid – A liquid that is present in concentrations in excess of the saturation limit, is immiscible in water and is present as a discrete product.

'DNAPL' – Dense Non Aqueous Phase Liquid – A non aqueous phase liquid that is denser than water. It refers to liquid that is present either as free product or in pore space or adsorbed onto the surface of soil or other particles. It is not necessarily easily liberated or pumpable without thermal or chemical assistance.

'Free Product' – This refers to NAPL that is not locked into pore space or adsorbed onto the surface of soil or other particles.

'The Agency' – This refers to the Environmental Protection Agency.

1.5 Previous Assessments

The site has been subject to a number of previous assessments. These comprise:-

- five ground investigations - O'Connor, Sutton, Cronin (1995); Arup (1996); Parkman (2001 and 2003), Mouchel (2009 site characterisation, reported 2010)
- one desk study – Parkman (2001). But some desk based assessment undertaken by O'Connor, Sutton, Cronin (1995) and Arup (1996)

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- one quantitative risk assessment – Mouchel (2010 – based on the 2009 site characterisation).

These assessments are reported in the following documents which are provided for information on CD in Appendix A.

- i. Summary Report on Limerick Site – O’ Conner, Sutton, Cronin, August 1995,
- ii. Site Investigation Report: Volume 1 Report - Ove Arup, April 1996,
- iii. Site Investigation Report: Volume 2 Factual Site Investigation Data - Ove Arup, April 1996,
- iv. Desk Study Phase 1 Report – Parkman, April 2001 (report reference 25837/OR/01B),
- v. Site Investigation Factual Report Volumes 1A and B – Parkman, October 2001 (report reference 25827/OR/03B),
- vi. Site Investigation General Report Volume 2 – Parkman, October 2001 (report reference 25837/OR/04B),
- vii. Ground Investigation into Boundary Conditions and Quarry Backfill – Parkman, 2003 (report reference 25837/R/11A),
- viii. Preliminary Vibration Monitoring 18th May to 24th June 2009 – Reference NV/09/3857NL01. Dated 13th August 2009 – AWN Consulting,
- ix. Site Characterisation Factual Report 1021927/R/02 November 2011- Mouchel,
- x. Site Vibration Monitoring 4th to 27th November 2009 – Reference NV/09/3857NL03. Dated 4th December 2009 – AWN Consulting,
- xi. Former Gasworks, Dock Road, Limerick: Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 March 2010 – Mouchel, and Addendum Report 1021927/R/18 January 2012- Mouchel,
- xii. Environmental Impact Statement 1021927/R/07 – Mouchel,
- xiii. Natura Impact Statement 1021927/R/16- Mouchel,

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- xiv. Quarterly Groundwater Monitoring Report – Annual Summary 2009/10, 1021927/R/14, November 2010 – Mouchel,
- xv. Quarterly Groundwater Monitoring Report – Annual Summary 2011, 1034973/R/04, November 2011 – Mouchel,

1.6 Geology, Hydrology and Hydrogeology

This Section summarises the Mouchel 2009 Site Characterisation Factual Report 1021927/R/02 February 2010 and the Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 February 2010. More detailed information can be obtained from these reports, presented on CD in Appendix A.

1.6.1 Published Geology

The Geological Survey of Ireland, Sheet 17, Limerick, 1:100,000 Scale; the Geological Survey of Ireland publication “Geology of the Shannon Estuary” and the local geological memoir were consulted and indicated that the bedrock beneath the site comprises the Visean Limestones of the Lower Carboniferous Period.

1.6.2 Site Specific Geology

From the five previous site investigations (including the 2009 characterisation), the general sequence of ground conditions comprised; Made ground underlain by limestone, with localised alluvium around the site boundary extending from the north west to the south west of the site.

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The sequence encountered is summarised in Table 2.

Table 4: Summary of encountered ground conditions during the 2009 Site Characterisation.

Stratum	Range of depth strata encountered (m bgl)	Average thickness (m)
Made Ground	0 – 10	4.3
Alluvium	0 – 5.5	1.8
Limestone bedrock	0 - 10	-
Limestone quarry feature over the eastern half of the site – up to 10m deep.		

Limestone outcrops on the north east and south east boundaries.

1.6.3 Hydrology

The site is situated on the southern side of the River Shannon estuary, which flows westerly into the Atlantic. At the site, the estuary is approximately 200 m in width and subject to tidal influence.

The average rainfall for the area is between 800mm and 1000mm per year (taken from www.met.ie).

The site currently comprises approximately 60 % hard cover and 40 % free draining material (with many underground structures that may impinge on the infiltration and flow of rainwater/perched water through the made ground). There is a fall in the site level from the south east (8 m MHD) to the west and north west (5 m MHD), directing surface run-off in this direction. The River Shannon's water level is typically 0 m MHD near to the site.

1.6.4 Hydrogeology

The Groundwater Protection Maps for County Limerick (Maps 1-6) indicate that the underlying limestone is a 'Locally Important Aquifer' that is generally Moderately Productive (40-100 m³/d).

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The hydraulic properties of the aquifer are dominated by fissure flow and well-developed karst features have been observed in the area.

The nearest abstraction well is 6 km to the south east of the site. The oolitic limestones of the Limerick syncline are known to have relatively high permeabilities. The aquifer is classified as 'Vulnerable' due to the lack of impermeable cover or thick unsaturated zone.

There are no recorded active wells or boreholes in the vicinity of the site; although the historical site plan dated 1977 shows a well 5 m to the north west of Gasholder No.3 (T11). The well was not identified during any of the ground investigation works.

1.6.5 Site Specific Hydrogeology

The Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy report 1021927/R/03 includes a comprehensive section on site specific hydrogeology (Section 3.7.1).

Occasional pockets of perched water were encountered in trial pits in the made ground during the investigations undertaken at the site. However, these were not generally reported in any of the boreholes in any investigation. During the excavation of the trial pits in the 2009 investigation several pockets of perched water were encountered. As the excavations progressed in some instances the water drained away quickly, indicating the presence of impermeable obstructions within the made ground which have created localised areas of perched water.

One soakaway pit was excavated during the characterisation investigation in the made ground which was described as a sandy gravelly clay. A falling head permeability test was undertaken in the pit. The water dissipated very slowly over a period of several hours during the test.

Localised pockets of 'tarry liquid' were identified by Arups (1996). During the 2009 investigation a 'tarry / hydrocarbon' dense non aqueous phase liquid (DNAPL) was recorded in several locations and within some monitoring wells. Drawings 1021927/PHASE 1 - TENDER/OD/006 and 1021927/PHASE 1 - TENDER/OD/007 show areas of NAPL contamination in the made ground and within the fractured limestone bedrock during the recent (2009) and previous investigations respectively.

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Generally hydraulic continuity exists between the Made Ground and the bedrock due to the granular nature of the made ground, and therefore the groundwater potentially acts as one body.

The water table falls from approximately 7.8m MHD in the south eastern section of the site, to approximately 2.7m MHD on the boundary with Dock Road.

The groundwater data implies that there may be two sources of groundwater entering the site; Source 1 – Originating from the southern corner of the site from within the rock outcrop and Source 2 – Originating from the south east section where water is draining into the site.

The water appears to accumulate in the quarry area and flow in an approximately westerly direction as would be expected close to the river.

Mouchel have been undertaking groundwater monitoring at quarterly intervals since the first two visits in December 2009 and January 2010. The results are presented in Appendix A.

1.7 Identified Contamination Sources

This Section summarises information provided in the Mouchel Quantitative Risk Assessment, Options Appraisal and Remedial Strategy ref 1021927/R/03. This report should be referred to for further assessment.

1.7.1 Site Characterisation Identified Sources

The Mouchel 2009 site characterisation investigation identified several areas of extensive NAPL and ash material and one localised deposit of spent oxide ('Blue Billy').

Based upon visual and olfactory evidence gained during the investigation works, the primary areas of NAPL encountered during the characterisation investigation have been outlined in Table 5.

Post characterisation monitoring results including NAPL thickness are presented in the groundwater monitoring report(s) in Appendix A.

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Table 5. Primary areas of NAPL contamination

General area of site	Cell location	Visually Contaminated horizon from borehole logs (m MHD)	Thickness of heavily contaminated soil (m)	Predominant horizon type	Max Measured thickness of NAPL in BH installation (m)	Approx depth of groundwater (m MHD)
Deep Limestone feature (under Gasholder 2 (T12) and surrounds)	B05	1.48 to 0.98*	0.50	MG: Gravelly clay	-	3.7
	B06	2.65 to 1.45	1.20	MG: Gravelly clay	-	3.7
	B07	2.49 to 1.99	0.50	MG: Gravelly clay	-	3.6
	B08	3.69 to 0.99	2.70	MG: Gravelly clay	-	3.7
	C05	6.37 to 5.87	0.50	MG: Gravelly clay	-	4.5
	C06	4.35 to -0.65*	5.00	MG: Gravelly clay	-	4.1
	C07	4.45 to -0.45*	4.90	MG: Gravelly clay	1.78	4.0
	C08	4.68 to 2.38*	2.30	MG: Clayey gravel	-	3.9
	D05	-	0	-	-	5.2
	D06	-	0	-	-	4.7
	D07	4.60 to 2.30*	<u>2.30</u> Ave = 1.81	MG: Gravelly clay	-	4.3
Pre 1872 tank (T23)	D08	6.22 to 4.22	2.00	MG: Gravelly clay/ gravel	-	4.3
	D09	-	0	-	-	4.1
	E08	-0.16 to -1.16	1.00	Limestone Bedrock	-	4.8
	E09	3.92 to -0.08*	<u>4.00</u> Ave = 1.75	MG: sandy gravel	-	4.7
Former quarry area	E03	3.12 to 1.07	2.05	MG: clayey gravel	-	4.9
	E04	6.10 to 4.68	1.42	MG: gravel with NAPL	-	5.0
	F03	1.35 to 0.35	1.00	MG: gravelly clay	-	5.0
	F06	5.76 to 5.06	0.70	MG: sandy gravel	-	5.5
	F07	6.82 to 6.22	0.60	MG: gravelly clay	-	5.5
	G04	-1.55 to -4.55	3.00	Limestone Bedrock	1.24	5.2
	G05	-0.26 to -3.76*	3.50	Limestone Bedrock	-	5.3
	G06	5.20 to 3.70*	1.50	MG: gravelly sand	-	5.9
	G07	4.24 to 1.24*	3.00	MG: clayey sand	-	6.4
	H06	5.45 to 3.95	1.50	MG: clayey gravel	-	6.5
	I06	6.91 to 1.36*	5.55	MG: clays and gravel	-	6.9
I07	5.04 to 2.04	<u>2.00</u> Ave = 2.20	MG: Gravelly clay	-	7.1	
Booster House	F08	6.98 to 6.48	0.50	MG: gravelly silt	-	6.3
	F09	7.17 to 6.67	0.50	MG: gravelly silt	-	6.1
	F10 WS	6.52 to 6.27	<u>0.25</u> Ave = 0.4	MG: cobbles	-	5.3
Tar tank 7 (T28)	H08	4.15 to 2.95	1.20	MG: gravelly sand	-	6.8
	H09	5.65 to 3.65	0	MG: clayey gravel	-	6.8
	I08	4.11 to 2.81	1.30	MG: gravelly clay	-	7.1
	I09	4.15 to 3.45	<u>0.7</u> Ave = 0.80	MG: gravelly clay	-	7.0
Gasholder 3 (T11) and surrounds	J06	3.48 to 1.98	1.50	MG: cobbles	-	7.4
	K04	1.88 to 0.88	1.00	MG: gravelly clay	-	7.0
	K05	7.64 to 2.64	5.00	MG: gravelly clay	-	7.8
	K06	6.82 to 4.62	2.20	MG: gravelly clay	-	7.6
	L03	3.51 to 2.51	1.00	MG: gravelly clay	-	6.1
	L04	5.26 to -0.74	6.00	MG: cobbles-Limestone	-	6.6
	L05	6.91 to 2.41*	4.50	MG: gravelly clay	-	7.2
	L06	6.91 to 1.61*	5.30	MG: gravelly clay	-	7.3
M05	2.35 to 0.35	<u>2.00</u> Ave = 3.2	MG: gravelly clay	-	6.7	
Pre 1840 tank (T13)	D05	-	0	-	-	5.2
	D06	-	0	-	-	4.7
	E05	-	0	-	-	5.2
	E06	4.83 to 2.83*	<u>2.00</u> Ave = 0.5	MG: gravelly clay	-	5.3
Bord Gais office	F12 WS	0.50 to 1.2	0.70	MG: gravelly clay	-	5.2

*Free product intermittent throughout stated horizon MG = made ground

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During the characterisation investigation it was apparent that dissolved phase and free product may have been transported from these primary sources across the site. Hydrocarbon staining and odours were noted in the majority of locations at the site. Both dissolved phase and free product is known to have migrated into the fractured and weathered limestone.

1.7.2 *Historically Identified Sources*

The primary sources of contaminants identified during the assessments undertaken prior to the 2009 site characterisation were the underground tanks and gas holder wells, in addition to the backfill material within the former quarry. Secondary sources are sorbed phase contaminants in soil, free product that has leaked from the primary sources into the soil, or pooled there, dissolved phase contamination in groundwater, and free product contaminants in groundwater. Both dissolved phase and free product is known to have migrated into the fractured and weathered limestone.

Identified contaminants typically correlate with the presence of gasworks-derived tars, liquors, TPH, naphthalene and other waste materials located within underground tanks, structures and made ground, together with material used to backfill the quarry.

1.7.3 *Known Underground Tanks*

Numerous underground tanks are known to be present on site; the significant ones are highlighted on Drawing 1021927/PHASE 1 - TENDER/OD/008. Details of the tanks are presented in Table 6 below. All these tanks with the exception of T34 which straddles the south-western wall of the No.5 Store building (generator building) are known to be backfilled with materials predominantly contaminated with coal tars (sometimes as free product). T34 is known to be partially backfilled with the potential for standing water present.

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Table 6. Details of significant underground tanks

Tank Number & Age	Approximate Diameter	Approximate Depth of tank (source of data)	Approximate Volume of tank	Backfill?
T7 (pre-1919)	6m	1m (Arup 1996 TP14)	30m ³	yes
T11 (Pre-1902)	25m	6.0m (Mouchel 2009 J06, K04, K05, K06, L04, L05, L06, M05, M06)	2,945m ³	yes
T13 (Pre -1840)	10m	3.2m (Mouchel 2009 E06)	250m ³	yes
T14 (Pre-1840)	3m	2m (professional judgment)	14m ³	unknown
T15 (Pre – 1840)	10m	4.8m (Mouchel 2009 E07)	375m ³	yes
T23 (Pre -1872)	19m	5m (Mouchel 2009 E08, E09)	1,420m ³	yes
T28 (Pre-1872)	16m	4m (Mouchel 2009 H09, I08, I09)	800m ³	yes
T34 (Pre-1919)	4m x 13m (rectangular tank)	>2.3m (Connor 1995) 3m (professional judgment)	156m ³	partial
			5,990m³	Total

Based on this conservative assessment (no reduction due to dumpings has been included), it is estimated that the volumes of free product within the buried tanks will be in the order of 200m³, although the Contractor shall make his own assessment of the likely volume of free product present.

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1.7.4 *Former Quarry and Deep Limestone Feature*

An extensive former quarry is known to be present over the eastern half of the site and is up to 10m deep. Free product is present at its base. Drawing 1021927/PHASE 1 TENDER/OD/008 indicates the quarry location.

The quarry is shown as extending outside the boundary of the site in historical maps which appeared to be confirmed during the characterisation investigation as the edge of the quarry could not be located near the O'Curry Street boundary.

A deep area of made ground was identified by the ground investigations under the former large gasholder no. 2 (T12), which was an above ground waterless holder. It appears that a deep limestone feature is present at this location and free product has been identified at the base of the made ground. Anecdotal evidence suggests that a former gasholder well may have existed at this location.

Volumes of heavily contaminated material within the former quarry and deep limestone feature are estimated to be 800m³ and 450m³ respectively. Volumes of free product are estimated to be in the order of 80m³ and 60m³ respectively although the Contractor shall make his own assessment of the likely volume of free product.

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2 Remediation Strategy

2.1 Overview

The comprehensive characterisation site investigation and quantitative risk assessment (QRA) has identified the presence of:-

- total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene and xylenes (BTEX), polyaromatic hydrocarbons (PAH's), cyanide and heavy metals that pose a risk to human health.

Remediation Target Values (RTV's) have been derived for soils. Whilst a theoretical risk to the River Shannon has been identified, it is unlikely that an actual risk exists due to contaminant degradation and increased travel times. However, it should be noted that free phase hydrocarbons were not tested within the water samples. Therefore the models utilised assume no free product is present and the calculations are based on dissolved phase only. Therefore free product will require removal in order to allow justification of the risk assessments.

Further to a detailed options appraisal, the preferred remediation solution is to remove free product by pumping and treating with subsequent removal of DNAPL (for recycling/disposal) followed by ex-situ stabilisation / solidification of the uppermost 3m of made ground.

The remediation is to be undertaken over two separately tendered phases:-

- Phase 1 (this phase) comprises pump and treat works (including a 2 month pilot period);
- Phase 2 (subsequent phase to be tendered separately) is likely to involve excavation to 3m depth (or shallower where rock is present) followed by on site treatment, stabilisation and replacement.

This remediation strategy is relevant to the Phase 1 - Pump and Treat remediation.

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Free product is generally present as coal tars (DNAPL) at the base of several underground tanks, within the quarry area and within a deep limestone feature. At a number of locations, generally within tanks, DNAPL is also present within pore space and adsorbed onto soils and may require thermal or chemical assistance to liberate it. A secondary aim of the pump and treat remediation is to minimise the likelihood of problematic odours during the Phase 2 excavation works.

It is envisaged that the pump and treat works shall comprise a closed system to minimise odour emissions. Groundwater monitoring wells shall be installed with water being pumped into 'injection' wells and a DNAPL/ water mixture pumped from other 'extraction' wells. The DNAPL is then separated from the mixture using gravity settlement tanks and temporarily stored in Intermediate Bulk Containers (IBC's) or similar vessels prior to removal from site for recycling or disposal. As indicated in Sections 1.7.3 and 1.7.4, it is roughly estimated that a volume in the order of 340m³ of free product will require removal from site, although the Contractor shall make his own assessment of the likely volume of free product to present.

Water samples shall be taken as directed by the Engineer from a point immediately before the water treatment plant and tested for the suites as indicated in Appendix C.

Water removed as part of the process shall be passed through a suitable water treatment plant prior to re-injection to the ground or disposal to foul sewer under an appropriate licence in accordance with the criteria identified in Appendix E.

The preferred Contractor who is deemed to provide the most economically advantageous tender shall have a pilot period of no more than 2 months to prove that the chosen pump and treat methodology can successfully remove the free product and to demonstrate that appropriate disposal / recycling facilities are available.

The whole project is expected to last between 8 and 12 months (depending on extraction rates and the proposed methodology) including the 2 month pilot period.

The Contractor shall be required to provide detailed method statements for their proposed methodology including details of the works to be undertaken during the pilot period. Details are provided in Part 1 of the tender documents (Instructions to Tenderers).

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2.1.1 Pilot Study

A pilot study period is available and shall be utilised by the Contractors to prove that their chosen methodology will successfully remove the free product and to demonstrate that appropriate disposal / recycling facilities are available.

The preferred Contractor shall undertake pilot works over a maximum period of 2 months (including reporting) from award of 'Preferred Contractor' status. It is at the Contractor's discretion to shorten the period if he can demonstrate that time and cost savings can be made by doing so without comprising the outcome. The Contractor shall prepare a report on the progress and suitability of his chosen method and submit his findings to the Engineer within the pilot period.

The Contract for the full pump and treat works shall be awarded within 2 weeks of the successful completion of the pilot period.

A maximum allowance of €30,000 has been allocated by Bord Gais for the pilot period and shall include all the Contractor's requirements including welfare, temporary accommodation and health and safety provisions. All works within this period shall be undertaken in accordance with the Contract Documents (including the Specification), except in the case of welfare facilities, accommodation, health and safety and reporting which shall be appropriate for the works undertaken and shall comply with all relevant legislation.

Any additional costs incurred above the €30,000 allowance shall be borne by the Contractor.

2.2 Site Constraints

The following site constraints have been identified as requiring due allowance in the design of the remediation works. Other constraints may exist that have not been identified. Reference should be made to Drawing 1021927/PHASE 1 - TENDER/OD/008 (which indicates the locations of all identified site constraints) and to the Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy report 1021927/R/03 February 2010 for further details of site constraints identified.

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2.2.1 *Unstable boundary walls / steep slopes / buildings*

A significant proportion of the boundary walls are considered to be potentially unstable. These include the following:-

- 1) Dock Road wall (north western boundary) and the Above Ground Installation (AGI) boundary wall – these are constructed of masonry limestone blocks and are up to 6m in height. They have Protected Status.
- 2) Brick boundary walls (south western and south-east) – these are currently being stabilised by the use of gabion baskets covered in ‘shotcrete’. The walls vary in height between approximately 2 and 4m.
- 3) O’Curry Street wall (north eastern boundary) – this acts as a retaining wall to the pavements/ services on O’Curry Street and has a steep slope in front of it on the site side of the wall.
- 4) In addition to the above, the No 5 Store and buildings adjacent to the south western boundary could be affected by vibration during the works.

Remedial works are to be undertaken under and in the vicinity of the structures in 2) above prior to the pump and treat remediation works commencing. Details will be provided when they are available. It is also likely that a retaining structure will be constructed at the location of the O’Curry Street wall prior to works commencing.

2.2.2 *Restricted Access*

Currently, all vehicle and pedestrian access/egress is from O’Curry Street. However, there are no known restrictions on use of the Dock Road entrance and the Contractor shall make his own assessment of how to make best use of these two entrances/exits.

2.2.3 *Retained and Relocated Structures*

Several structures will need to be retained on site and works will need to be designed to allow any remediation required to be undertaken as close as possible to the structures. It is likely that most existing structures on-site such as the Govenor House, Booster House and some internal walls will be demolished prior to remedial works commencing.

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It is anticipated that the retained structures will comprise:-

- 1) ESB electricity sub-station & DRI – to be located at the boundary with O’Curry Street.
- 2) No. 5 Store (Generator Building) - Protected Status. This is a large masonry building which has a large underground tank associated with it that extends to the south-west of the building.
- 3) AGI site walls – Protected Status. This is a large masonry wall around 2 sides of the AGI site.
- 4) Bord Gais offices - to be retained (available for limited use as site accommodation during the remediation works if the Contractor requires).

In addition, a new DRI (District Regulator Installation) and a new ESB sub-station are to be constructed adjacent to the O’Curry Street entrance, and their proposed locations are presented on Drawing 1021927/PHASE1-TENDER/OD/002. Remedial works will be undertaken beneath these two structures and to a distance of 3m from the structures, prior to works commencing.

2.2.4 *Known Underground Tanks*

Refer to Section 1.7.3 of this document.

2.2.5 *Former Quarry and Deep Limestone Feature*

Refer to Section 1.7.4 of this document.

2.2.6 *Limestone Outcrops*

Limestone outcrops near the south-eastern and north-western boundaries of the site and is identified on Drawing 1021927/PHASE 1 - TENDER/OD/008. In particular, a limestone face, up to 8m in height, is present along parts of the south-eastern and north-eastern boundaries.

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2.3 Other Issues for Consideration

2.3.1 Access and shared facilities for Other Contractors

It is unlikely that there will be any other Contractors working on site during the remedial works. However, it is possible that another Contractor or Contractors could be on site if works in the area of the existing ESB sub station, the gabion baskets and the proposed sub station and DRI adjacent to the O'Curry Street entrance are not completed before Phase 1 commences on site. If this is the case it will be necessary for the Remediation Contractor to make appropriate access onto and across the site as well as around the required site feature (sub station, gabion baskets etc). In addition, access shall be made available to welfare and health and safety facilities and allowance shall be made for providing any necessary inductions.

Drawing 1021927/PHASE 1 – TENDER QD/02 indicates the site layout with the site features relevant to this issue highlighted.

2.3.2 Waste Licence

A Waste Licence application has been made to the Environmental Protection Agency (The Agency) in relation to the remediation works (Phases 1 and 2). However, it is unlikely that the licence will be received before the tender return date. Therefore, any conditions attached to the Waste Licence in relation to Phase 1 will be forwarded to the Preferred Contractor (s) who will be asked to confirm that there will be no changes to their programme, methodology and rates. Should there be any changes, Bord Gais reserves the right to consult with other tenderers.

Series A751 of this document lists the Conditions that are likely to be attached to the Waste Licence, based on previous licence applications and the Contractor shall allow for compliance with these conditions within his programme, methodology and rates.

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2.3.3 *Planning*

A planning application has been submitted to Limerick City Council in relation to the remediation works (Phases 1 and 2). However, it is unlikely that the conditions will be received before the tender return date. Therefore, any planning conditions relating to Phase 1 will be forwarded to the Preferred Contractor(s) who will be asked to confirm that there will be no changes to their programme, methodology or rates. Should there be any changes, Bord Gais reserve the right to consult with other tenderers.

2.3.4 *Buried Services*

Underground services may be present at the site. Electricity, water and sewer pipes service the office building. The AGI has been removed and the electricity substation will most likely have been moved and relocated along with a DRI to the O'Curry Street boundary by the time the remedial works commence. Gas and electricity services may still be present on site. For information, as-built details of their locations are provided in Appendix D.

The Contractor shall satisfy himself as to the location of any underground or overhead services in the vicinity of the Works. He shall be responsible for any repair costs to services or losses consequent to their inadvertent disconnection as a result of his works/actions.

The locations of all 'injection' and 'extraction' wells shall be checked for services by the Contractor prior to drilling. Where drilling is to take place in the vicinity/adjacent to possible live services, a trial pit shall be excavated to expose the service prior to drilling, in consultation with the relevant utility provider.

2.3.5 *Traffic Safety and Management*

The Contractor shall take whatever measures are necessary, at his own cost, to ensure that no mud or other material is deposited on the local road network to the satisfaction of the Engineer and Local Authority. Any costs associated with this work (eg road sweepers etc) shall be deemed included in the rates.

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2.3.6 Licenses

The Contractor shall be responsible for the application and procurement of any licences, and the payment of any taxes, duties etc necessary to accomplish the Works (with the exception of the Waste Licence and Planning Application).

2.3.7 Protection of Structures

The Dock Road boundary wall, Generator Building (No. 5 Store) in the eastern corner and the AGI wall have Protected Status.

The Contractor shall take all necessary steps in his method of working to prevent damage to on-site and adjacent structures due to excavations and vibrations caused by executing the Works, and shall be responsible for rectifying any damage caused. Details of how the Contractor shall monitor and prevent damage shall be provided in his tender.

Vibration monitoring shall be undertaken when drilling 'injection' or 'extraction' wells in the vicinity of unstable structures such as the Dock Road wall, the No 5 store and adjacent residential / commercial properties (to the rear of the existing office buildings).

2.3.8 Japanese Knotweed

As far as is known, Japanese Knotweed is not present at the site. However, should the Contractor identify any stands, the area shall be fenced (initially with hazard tape and fence pins), all on-site staff and visitors informed to prevent access and inadvertent spreading and the Engineer shall be informed immediately.

2.3.9 Security

The Contractor shall provide 24hr security at the site for the duration of the contract.

2.3.10 Asbestos

The ground investigation documents have not identified any areas where asbestos has been found in the ground. However, In the event of material suspected to be asbestos being encountered, the Contractor shall deal with the materials in accordance with relevant legislation.

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2.4 Remediation Completion Criteria

The proposed completion criteria for the Phase 1 recovery of DNAPL is as follows:

- 1) The quarterly groundwater monitoring which has been undertaken at the site will provide a set of baseline data for the thickness of the DNAPL present (significant DNAPL detected has been confined to the quarry base, the limestone feature and within some tanks). The average thickness of DNAPL in appropriate wells will be calculated and provided to the Contractor prior to commencement of the works. Reports detailing the findings of the post characterisation groundwater monitoring are presented in Appendix A. In addition, the groundwater monitoring chemical analysis data set will provide baseline information on the chemical composition of the groundwater at the site.
- 2) Method statements will be required from the successful contractor to provide detailed and accurate data on the volume and rate of DNAPL recovery. Samples of pumped water will be taken prior to entering the water treatment plant on a weekly basis by the contractor, to assess the groundwater chemical composition (the suite of analysis is identified in Appendix C). The contractor will also be required to propose the indicator criteria considered most appropriate to assess the recovery methodology, and determine when the recovery operation should cease.
- 3) The DNAPL recovery will be continued until the contractor is instructed to cease by the Engineer. The decision will be based on the appropriate indicator criteria for the recovery methodology (e.g. volume of DNAPL recovered, DNAPL recovery rates and pumped water chemical composition). At this point the DNAPL recovery will cease and the thickness of DNAPL in appropriate wells will be monitored daily (Monday-Friday). Ten successive monitoring results that show the thickness of DNAPL to be equal to or below ten percent of the original average thickness are required to validate the Phase 1 remediation.

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3 Schedule of Drawings

Drawing Title	Drawing No.	Drawing Detail
Site Location	1021927/PHASE 1 -TENDER/OD/001	Site location
Site Layout (including historic structures and existing above ground structures)	1021927/PHASE 1 - TENDER/OD/002	Layout of the site including the location of historic structures and existing above ground features.
Characterisation Exploratory Hole Location Plan	1021927/PHASE 1 - TENDER/OD/003	Locations of exploratory holes from the 2009 site characterisation investigation.
Previous Investigation Exploratory Hole Location Plan	1021927/PHASE 1 - TENDER/OD/004	Locations of exploratory holes from 1995, 1996, 2001 and 2003.
Cross Sections	1021927/PHASE 1 - TENDER/OD/005A to OD/005H	8 No. cross sections NE-SW and NW-SE across the site indicating ground level, made ground type, underlying geology and groundwater level.
Encountered NAPL (Characterisation)	1021927/PHASE 1 - TENDER/OD/006	Encountered extent of NAPL overlying the site layout, exploratory hole locations and rock head contours.
Encountered NAPL (Historic)	1021927/PHASE 1 - TENDER/OD/007	Locations of encountered NAPL from the 1995, 1996 and 2003 investigations.
Constraints Plan	1021927/PHASE 1 - TENDER/OD/008	Identified constraints including unstable walls, above ground structures to be retained, limestone outcrops, known significant underground tanks and the former quarry/deep limestone feature.
Existing Offices Floor Layouts	1021927/PHASE 1 - TENDER/OD/009	Layout of the ground and first floors of the site offices.
Information Boards	1021927/PHASE 1 - TENDER/OD/010	Layout required for the information boards to be erected at the site entrances.
Dust and Vibration Monitoring Locations	1021927/PHASE 1 - TENDER/OD/011	Locations and grid references for dust and vibration monitoring points.
Topographical Survey	1021927/PHASE 1 - TENDER/OD/012	Topographical survey of the site.

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4 Conditions of the Waste Licence

A Waste Licence application has been submitted to the EPA. The final conditions are unlikely to be known before the tender return date. Anticipated conditions are presented in the Specification Series A751. Please note that this list is not considered exhaustive.

For the purpose of pricing his tender, the Contractor should assume that the anticipated conditions will apply. When final conditions are known, clarification will be sought from the Preferred Contractor(s) as per Section 2.3.2 of this Specification.

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5 Specification Series

5.1 Schedule of Items Required

CLASS A: GENERAL ITEMS (Section 5.2)

Clause	Item
100	Contractual Requirements
110	Performance Bond
120	Insurance of the Works
130	Third Party Insurance
140	Professional Indemnity Insurance
200	Requirements of the Engineer
210	Accommodation for the Engineer's Staff
220	Services for the Engineer's Staff
230	Equipment for the Engineer's Staff
240	Attendance upon the Engineer's Staff
280	Reports required by the Engineer
300	Method Related Items
310	Accommodation & Buildings
320	Services
700	General Requirements
710	Duties and responsibilities of the Engineer and their Staff
720	Information Boards
730	Answerphone
740	Survey Information
750	Licences, Notices & other Documents
751	Waste Licence
752	Planning Consent
753	Site Waste Management Plan
760	Service Location, Diversions and Special Requirements for Statutory Authorities
770	Health and Safety Requirements
771	General Health and Safety and Environmental Management Considerations
772	Traffic Safety & Management
773	Tidiness of the Site
780	Self Audit of Procedure
800	Noise, Vibration, Dust and Odours
810	Control of Noise and Vibration
820	Monitoring Noise
830	Monitoring Vibration

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- 840 Control of Dust
- 850 Monitoring of Dust
- 860 Control of Odours
- 870 Monitoring of Odours

- 900 Condition Survey and Protection of Features**
- 910 Condition Survey
- 920 Protection and Preservation of Features

CLASS C: GEOTECHNICAL AND OTHER SPECIALIST PROCESSES (Section 5.3)

- 900 Remediation**
- 910 Pilot Study
- 920 DNAPL Recovery
- 921 Plant
- 922 Pumping, Injection and Monitoring Wells
- 930 Samples
- 940 Chemical Tests for Soils and Liquids
- 950 Contaminated Materials and Removal from Site
- 960 Discharge Consent

CLASS X: MISCELANEOUS WORK (Section 5.4)

- 100 Fences and Gates**
- 194 2.0m High Temporary Mesh Panel Fencing

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5.2 CLASS A: GENERAL ITEMS

A100 Contractual Requirements

A110 Performance Bond

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A120 Insurance of the Works

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A130 Third Party Insurance

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A140 Professional Indemnity

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A200 Requirements of the Engineer

Temporary accommodation for the Engineer's staff (and Contractor) shall be provided on Site. The existing Bord Gais offices are currently unoccupied but could be utilised by the Contractor as he sees fit. They could be utilised as office space, however, they are not in a particularly good state of repair and any proposed use should take this into account. Bord Gais have advised that the following facilities are available, but no reliance is provided as to the accuracy or condition of the equipment / services; male/female toilets, office space with limited chairs and desks, mini fridge, dimplex heaters cold water supply and 220v electricity.

The layout of the Bord Gais offices is shown on Drawing 1021927/PHASE 1- TENDER/OD/009.

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The accommodation and all furnishings, services and equipment shall be ready for occupation and use by the Engineer from the date of commencement of the Phase 1 pump and treat works.

No item supplied under the requirements of A200 shall bear the name of the Contractor.

A210 Accommodation for the Engineer's Staff

The items below will be provided for the duration of the contract. All durable items shall be returned to the Contractor at the end of the contract.

Accommodation for the Engineer, which shall be in the form of shared office and facilities with the Contractor's supervisory staff (items a) to f)), which shall be designated no smoking areas, kept clean and shall comprise:-

a) Engineers's Representative Office

Separate from the Contractor's own accommodation with a floor area no less than 12 square metres, ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum of 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

- 2 desks approximately 2m x 1.5m with lockable drawers
- 2 chairs to suit with arms
- 1 book case
- 1 waste paper basket

b) Secondary Room

Area not less than 8 square metres, ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

- 1 desk approximately 2m x 1.5m with lockable drawers
- 1 chair to suit with arms

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1 book case

1 waste paper basket

c) Meeting Room

Ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

A large table with sufficient space for 10 persons to sit comfortably.

10 chairs to suit with arms

1 waste paper basket

d) Access and hard standing

A hard standing for three cars, adjacent to the accommodation and maintain a clean access to the accommodation at all times, also access must be afforded between the car park areas and accommodation without recourse or need to wear safety boots. Existing areas of hard standing may be suitable for this purpose. The hard standing can remain at the end of the contract period.

e) Sanitary Facilities

A sanitary convenience containing:-

A wash basin with hot and cold running water and supply of soaps or other cleansers

Flushing water closet

Towel rail with clean towels

Shower unit with hot and cold water

f) A Kitchen/Store

Sink unit with combined lower cupboard

Small electric cooker or microwave, with oven and grill

Small electric fridge

Cooking utensils and crockery/cutlery sufficient for all staff and 3 visitors

Toaster

1 electric kettle

1 teapot and sufficient mugs for all staff and up to 10 visitors to allow for meetings.

Supplies of tea, coffee, sugar, milk, soaps, towels etc as required

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A220 Services for the Engineer’s Staff

The Contractor shall provide, maintain and make all payments for the following services to the accommodation identified in Clause A210 for the duration of the remediation works. Connections are to remain on completion of the contract for subsequent remedial phases:

- telecommunications

A230 Equipment for the Engineers’s Staff (Provided by Contractor)

The items below shall be provided for the contract.

The Contractor is to fully insure for the duration of the contract any valuable items listed below as well as any other valuable equipment brought to Site by the Engineer.

a) Stationery

- 2 clipboards
- 1 pencil sharpener
- 1 paper hole punch and stapler
- 2 multiple letter trays
- 1 pin board 1m x 2m with pins
- 10 No. A4 size lever arch files

b) Technical Equipment

- Broadband access
- 1 telephone with answerphone on separate line
- Access to a printer with copying and scanning facilities and sufficient paper.

c) Personal Protective Equipment

- 4 pairs of safety wellingtons to BS EN1870 ‘Dunlop Safety Plus’ or similar sizes to be confirmed
- 4 No white safety helmet to BS EN397, with reduced peak or similar
- 4 No. high visibility waistcoat, to BS EN471 class 2
- 4 No. high visibility jackets to BS EN471 class 3
- 1 No. high visibility over trousers to BS EN471 class
- Blue disposable overalls, (Tyvek pro-tech™ or equivalent) sufficient in quantity for the Engineers staff and visitors as required.

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All personal protection equipment is to be stored in a locker within the changing room of the decontamination area, provided by the Contractor.

d) Testing Equipment

Use of the Contractor's testing equipment suitably maintained and calibrated, including:-

- 1 no Photo Ionisation Detection meter.
- Portable oil/water interface meter.
- Water sampling equipment including bailers, string and bucket with volume increments.

All testing equipment shall be intrinsically safe.

It is anticipated that the equipment will be required on a periodic basis. A programme of when the equipment will be needed will be provided by the Engineer at the start of the contract.

A240 Attendance upon the Engineer's Staff (Provided by Contractor)

The Contractor shall provide at intervals during the Remediation works, a suitably trained and experienced person (or persons) to assist the Engineers staff with the following typical tasks:

- Survey / measurement work;
- Water/soil sampling
- Other tasks, as requested.

The Contractor shall provide the Engineer with the names of persons to assist the Engineers staff with these tasks.

A280 Reports Required by the Engineer (Provided by Contractor)

a) Prior to the commencement of the project, the Contractor shall provide the schedule of proposed recycling/disposal facilities for this project.

The Contractor shall supply reports and information to the Engineer and other members of the project team, as set-out below.

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A 'weekly progress report' shall be completed by the Contractor each Monday morning and e-mailed to the Engineer. The report shall include critical activities, environmental monitoring, downloaded weather information, as well as analytical results from the remediation process. The pro-forma for this report is to be provided by the Engineer before work starts. Record sheets identifying the details of remediation works undertaken shall be attached to the report.

www.met.ie/climate/daily-data.asp presents daily weather information which shall be collated for the week immediately preceding the issue of the weekly progress report. Using the relevant drop down boxes on the right side of the page, select Shannon Airport and then the relevant date to view the data.

Wind direction shall be measured at 9:00, 12:00 and 15:00 each working day and the daily average recorded in the weekly progress report. Record sheets identifying the details of remediation works undertaken shall be submitted to the Engineer on a weekly basis.

Records of work completed to support each monthly valuation submission, shall be supplied to the Engineer in a format to be agreed with the Engineer.

All information relating to the work undertaken by the Contractor, including the Safety and Health File is to be supplied to the Engineer prior to the issue of the Certificate of Substantial Completion.

Details of all complaints, accidents, incidents and near misses which the Contractor may receive including those against which he is required to indemnify the Employer, shall be notified without delay to the Engineer.

Likewise, the Engineer will pass to the Contractor any such complaints or warnings which may be submitted directly to the Engineer or the Engineer's Representative. The Contractor shall undertake appropriate levels of investigation to identify causes and learn lessons, where appropriate. Serious incidents shall be investigated and reported, as directed by the Engineer. All accidents, incidents, near misses and complaints shall be recorded on a summary sheet which shall be issued at each progress meeting. This shall include a summary of corrective actions taken, including investigations.

Two days prior to each monthly progress meeting the Contractor is to prepare a progress report, to include details of the Remediation works under the following headings, as a minimum:

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- Completed Actions from Previous Meeting;
- Progress and Programme;
- Health, Safety and Environment;
- Subcontractors and Suppliers;
- Engineer's Instructions Received;
- Information for the Safety and Health File/Verification Report.

The following information required for the preparation of the Validation Report shall be provided to the Engineer on a monthly basis:

- Surveys and site investigation records
- Waste management/disposal licences.
- Registered waste carriers certificates.
- Records of any consents, authorisations or licences obtained.
- Analytical results from the DNAPL recovery works.
- Waste recycling / disposal records, including DNAPL recycling/disposal summary and daily off site removal records, waste consignment / waste transfer notes
- A record of any validation samples collected including reference by location and depth.
- Air quality monitoring results for dust and organic vapours, including laboratory test results.
- Noise and vibration monitoring results.
- Laboratory QA/QC data report, including Shewart Charts.
- Record of all samples submitted for laboratory testing.

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- Groundwater monitoring results.
- Other information requested by the Engineer.

b) To supplement the downloaded weather data, a 2ft wind sock with bracket shall be obtained from a supplier such as Metcheck - www.metcheck.co.uk/acatalog/Wind_Socks.html and erected at a location on site as agreed with the Engineer. The wind sock shall remain on site on completion of the works.

A300 Method Related Items

A310 Accommodation and Buildings (Provided by Contractor)

The Contractor shall provide, maintain and keep clean facilities for all persons working on the Site in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010, appropriate to the size and duration of the project, including canteen, mess rooms, sanitary facilities, offices and stores. All infrastructure required by the waste licence shall be established prior to commencement of the licensed activities.

In addition the Contractor shall supply the following:

- a) Hygiene facilities to comply with figure 3 of 'Protection of Workers and the General Public during the development of contaminated land' published by HMSO. Fencing shall be provided in such a way that the only non-vehicular accesses between clean and dirty areas shall be through the hygiene facilities.
- b) Canteen, mess rooms and offices for the use of the Contractor.
- c) Provision of shared welfare, first aid and accident emergency cover in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 including:-
 - Washing facilities
 - First aid boxes
 - Sanitary conveniences

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- Ambulance arrangements
- First aid room
- Accommodation for clothing and taking meals
- Appropriate Personal Protection Equipment (PPE) for Contractor's staff. Where disposable overalls are required, these shall be blue in colour, Tyvek protect™ or equivalent.

A320 Services

a) The Contractor shall provide, maintain and make all payments for services to the accommodation identified in Clauses A210 and A310 for the duration of the contract.

The Contractor shall provide at his own cost a continuous temporary water supply solely for the purpose of the accommodation facilities (Clauses A210 and A310). Only clean fresh water from the mains may be used for domestic purposes. He shall make his own arrangements with the water company for obtaining water from the mains and for the provision of any temporary mains, standpipes, stopcocks, meters and hoses and for removal of same at completion.

The Contractor shall not use plastic pipework within the ground, for any temporary water mains which may allow contaminants from the Site to contaminate the water supply.

Sufficient sanitary conveniences for all operatives and Site staff engaged on the Remediation works shall be provided and maintained by the Contractor in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010.

The Contractor shall ensure that all operatives and Site staff are aware that the sanitary convenience provided must be used by all personnel and the Engineer reserves the right to require the dismissal of any person committing nuisance on or about the Site by failing to use the convenience provided.

The Contractor shall arrange for the disposal of sewage effluent arising from Site toilets, the Contractor's office and Engineer's accommodation.

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The Contractor shall supply at his own cost a continuous temporary supply of electricity for the Remediation works.

The Contractor shall provide all other amenities in accordance with the above mentioned Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 and Working Rule Agreement, including adequate heating, lighting, attendance, cleaning and laundry etc.

b) Security is to be provided by the Contractor who shall:-

- i) Maintain gates, walls and fencing to provide adequate site security to the boundary.
- ii) Provide 24 hour security at the site for the duration of the Contract.
- iii) Monitor and maintain a record of all personnel and vehicles entering and leaving the Site.
- iv) Ensure that the access gates are locked at all times unless required for access or egress.

A700 General Requirements

A710 Duties and Responsibilities of the Engineer and their Staff

a) The Conditions of Contract

The Conditions of Contract shall comprise Part 2 of the Tender Documents (ref 1021927/R/21).

b) Staff Duties and Authorities

The names of the staff who will be involved with the supervision of the site works will be given to the Contractor when the Contract has been awarded.

In accordance with the Conditions of Contract Clause 1(1)c the Engineer will be:

Mouchel Limited

The name of the Chartered Engineer who will act on behalf of the Engineer and assume the full responsibilities of the Engineer under the contract will be:

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Tony Brown – BEng, CEng, Eur Ing, MIEI, FICE, SiLC.

In accordance with the Conditions of Contract the Engineer may appoint a “Representative”, in which case his name will be given to the Contractor when the Contract has been awarded.

The Engineer’s Representative shall have no authority:

- (i) to relieve the Contractor of any of his duties or obligations under the contract
- (ii) to order any work not approved by the Engineer or included in the programme submitted by the Contractor in accordance with Clause 14 of the Contract, or included in the priced Bill of Quantities
- (iii) to make any variation of or in the works

The Engineer’s Representative will have the authority

- i) to carry out and agree a measurement of the works with the Contractor
- ii) to query, confirm and sign Contractor’s record sheets.
- iii) to approve the classification of tested excavated material.
- iv) to approve excavation formations.
- v) to issue instructions that may be necessary to enable him to carry out his duties and to secure his acceptance of materials and workmanship as being in accordance with the Contract.

The Engineer will notify the Contractor in writing should these delegated powers need revision.

The names of the assistants appointed by the Engineer in accordance with Clause 2(2) of the Conditions of Contract will be given to the Contractor when the Contract has been awarded.

The Engineer’s Assistants have the same delegated powers as the Engineer’s Representative.

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The Engineer's Representative and Engineer's Assistants will undertake the following principal routine duties:

- a) the organising and phasing of the Engineer's Staff according to the constructional programme supplied by the Contractor
- b) to inspect the Permanent Work to ensure that the Contractor has positioned the works at the correct line and level, and that the materials and workmanship comply with the Specification
- c) to oversee tests carried out on the site, the inspection of materials and manufacture at source
- d) the keeping of a diary constituting a detailed history of the work done during construction and of all happenings at the site, and the submission of regular periodic progress reports to the Engineer
- e) measuring in agreement with the Contractor's staff the quantities of work executed, and checking day work and other accounts in order that the interim and final payments due to the Contractor may be confirmed and certified by the Engineer
- f) in the case of any work for which the Contractor may claim payment as additional work, agreeing with the Contractor methods of recording additional work and recording all relevant circumstances, including cost of labour and materials, in order to ensure that agreement exists on matters of fact before any question of principle has to be decided by the Engineer or arbitrator
- g) recording and checking the progress of the work in comparison with the programme
- h) examination of the methods proposed by the Contractor for the execution of the work of the Temporary Works undertaken by him, the primary object being to ensure the safe and satisfactory execution of the permanent work by the Contractor.
- i) any necessary redesign of work for submission to and approval by the Engineer

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j) ensuring that the Contractor is recording on the working drawings, or on drawings prepared for the purpose, the actual level and nature of all foundations, the character of the strata encountered in excavation and full details of any deviations from the working drawings which may have been made during the execution of the Works, so as to permit the Engineer to approve the Contractor's "as built" drawings.

A720 Information Boards (Provided by Contractor)

The Contractor shall provide, maintain and remove on completion of the Works, information boards as shown on Drawing 1021927/PHASE 1 - TENDER/OD/010.

The main information board shall be provided at both entrances (as indicated on Drawing 1021927/PHASE 1 – TENDER/OD/002). They shall be of sufficient size to accept the Bord Gais Information Board (2440mm x 1210mm) in addition to the Contractor's and Consultant's name boards, each to be 2440mm x 610mm in size.

The Contractor shall also provide at each site access/and egress, a secondary board clearly showing the information required to be displayed under the terms of the Waste Licence (800mm X 1200mm minimum in size).

The board shall clearly show:

- a) the name and telephone number of the facility;
- b) the normal hours of opening;
- c) the name of the licence holder;
- d) an emergency out of hours contact telephone number;
- e) the waste licence reference number; and
- f) where environmental information relating to the facility can be obtained.

A730 Answerphone

The Contractor shall provide a dedicated phone line for queries/complaints regarding the siteworks. The number of this shall be shown on the board provided at each site access.

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The phone line shall include an answerphone facility to enable calls to be taken outside working hours. The Contractor shall arrange for all queries to be answered within 72 hours of their receipt.

The phonenumber shall remain on site at the end of the contract for reuse during the second phase of remedial works.

A740 Survey Information

a) A copy of the original topographic survey will be issued to the Contractor in digital format as an AutoCAD (2009) file to permit the Contractor to confirm the information provided. The Contractor shall then use this survey as the base data for all other survey information.

b) The Contractor shall, within two days of the commencement of the works, carry out a check of the co-ordinates and levels of all Bench Marks, permanent ground markers and survey stations identified on Drawing 1021927/PHASE 1 - TENDER/OD/012. He shall supply details of their positions and levels to the Engineer, in order that he may check and agree any revised levels and co-ordinates, if necessary.

The Contractor shall satisfy himself that the ground levels and site boundary as described in the Contract are correct. Should the Contractor wish to dispute any levels he shall submit to the Engineer a schedule of the position of levels considered to be in error and a set of revised levels. The existing ground relevant to the disputed levels shall not be disturbed before the Engineer's decision as to the correct levels is given.

The Contractor shall keep updated schedules and drawings of all Bench Marks used in the setting out and shall make these available to the Engineer when required.

The Contractor shall ensure that where necessary in order to maintain his programme, lines and levels of any necessary parts of the Works are set out in such time as to enable Statutory Undertakers plant and other publicly or privately owned services or supplies to be installed, altered or removed.

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c) A minimum of six ground reference points are to be maintained during the course of the works, these will comprise of steel pins set on 0.2m³ concrete at agreed locations on the site and protected by suitable fencing. New ground reference points must be established before existing points are removed as the work proceeds, to maintain site setting out control.

d) During the course of the remediation works, the Contractor shall provide the Engineer with up to date survey information, or as indicated by the Engineer. The survey should be undertaken using the same grid and bench mark to the topographic survey provided with the Contract. It should show the ground reference point locations/co-ordinates. The survey information shall be supplied on a stable medium with grid markings relating to the existing site survey at a horizontal scale of 1:250, or as agreed with the Engineer. In addition, the survey information shall be supplied on compact disc in a Microsoft ExcelTM spreadsheet format.

Separate sheets shall be provided for the following:-

- i) Locations of all pump and treat and monitoring wells
- ii) New construction (i.e. drains, roads or other new structures) (as required)
- iii) Locations of all validation tests, trial pits and boreholes (as required)

Two draft paper copies of the updated drawings shall be provided to the Engineer within three working days of the survey. The drawing shall also be provided on compact disc in a format compatible with AutoCAD 2009. A complete set of drawings and compact disc showing the works as constructed shall be supplied to the Engineer within two weeks of completion of the works.

A750 Licences, Notices and Other Documents (Provided by Contractor)

A751 Waste Licence

A Waste Licence application has been submitted to the Agency. It is unlikely that the Conditions will be received before the tender return date. The tenderers shall assume that the following Conditions will be stated in the Waste Licence and shall ensure compliance with them, except where otherwise stated.

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1. Management Structure

Prior to the commencement of waste activities the contractor shall submit written details of the management structure of the facility to The Agency. Any proposed replacement in the management structure shall be notified in advance in writing to The Agency. Written details of the management structure shall include the following information:-

- a) The names of all persons who are to provide the management and supervision of the waste activities authorised by the licence, in particular the name of the facility manager and any nominated deputies.
- b) Details of the responsibilities for each individual named under a) above; and
- c) Details of the relevant education, training and experience held by each of the persons nominated under a) above.

2. Environmental Management System (EMS)

The contractor shall submit to The Agency for its agreement an EMS system for the facility one month prior to waste activities commencing. The EMS shall be updated as required with amendments being submitted to The Agency for its agreement.

The EMS shall include as a minimum the following elements:-

- a) Environmental Management Plan (EMP): The EMP shall include any items required by written guidance issued by the Agency.
- b) Corrective Actions Procedures: The Corrective Action Procedures shall detail the corrective actions to be taken should any of the procedures detailed in the EMS not be followed.
- c) Awareness and Training Programme: The Awareness and Training Programme shall identify training needs, for personnel who work in or have responsibility for the licensed facility.
- d) Schedule of Environmental Objectives and Targets.

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3. Proposals for Specified Engineering Works (Method Statements)

The contractor shall submit proposals for all Specified Engineering Works to the Agency for its agreement at least one month prior to the intended date of commencement of any such works. No such works shall be carried out without prior agreement of the Agency.

4. Validation Report

(Note: The Validation Report will be prepared and provided by the Engineer but the Contractor will be required to supply the Engineer with the details and data required for this Report).

5. Records of Materials Entering and Leaving Site

The Contractor shall arrange for the weights of materials entering and leaving the site to be recorded to the satisfaction of the Agency.

6. Tank and Drum Storage

The Contractor shall submit a Report to the Agency confirming the integrity and water tightness of bunds required to tank and drum storage areas.

7. Decommissioning Plan

At least three months prior to the cessation of waste activities at the facility, the Contractor shall submit a detailed decommissioning plan to the Agency for its agreement.

8. Off-Site Disposal and Recovery Facilities

The Contractor shall submit details of those waste disposal facilities off site, which he intends to use, to the Agency for approval, prior to their use.

9. Monthly Monitoring Results for Foul Water Discharge

The Contractor shall submit monitoring results of the discharges to the foul sewer to the Agency on a monthly basis.

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10. Monitoring Personnel

The Contractor shall report to the Agency within one month prior to the start on site with the names, qualifications and experience of all persons carrying out the sampling and monitoring required under the Licence. Any proposed changes shall be similarly advised.

11. Changes to Monitoring Equipment.

Any changes to monitoring or sampling equipment shall be agreed within writing with the Agency in advance.

12. Emergency Response Procedure (ERP)

The Contractor shall, prior to commencement of waste activities, submit a written ERP to the Agency for its agreement. The ERP shall address any emergency situations which may originate on the facility and shall include provision for minimising the effects of any emergency on the environment. This shall include a risk assessment to determine the requirements at the facility for fire fighting and fire water retention facilities. The Fire Authority shall be consulted by the licensee during this assessment.

13. Records

The Contractor shall keep the following records.

- a) On site
 - Current Waste Licence
 - Current EMS/EMP
 - The Annual Environmental Report (AER) (see item 17).
 - All written procedures produced by the Contractor/Employer/Engineer relating to licensed activities.
- b) Written records of each load of waste arriving or leaving the facility.
- c) Written records of the type and quantities of waste recovered at the facility, including European Waste Catalogue (EWC) codes.

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- d) Written records of training undertaken by facility staff.
- e) Written records of results of all integrity test on bunds etc and associated works to them.
- f) Written records of all nuisance inspections.
- g) Written records of details of personnel carrying out and interpreting sampling and monitoring results.
- h) Written records of all complaints received relating to the site operations.

14. Reports and Notifications

Any changes to site processes, or site management and control with adverse environmental significance to be advised and agreed in advance with the Agency.

15. Incident Report

In the event of an incident occurring on the site, the Contractor shall notify the Agency as soon as practical, and no later than 10.00am on the following working day. A written Report shall also be provided to the Agency within 5 working days detailing all aspects including:-

- a) identify the date, time and place of the incident;
- b) carry out an immediate investigation to identify the nature, source and cause of the incident and any emission arising therefrom;
- c) isolate the source of any emission;
- d) evaluate the environmental pollution, if any, caused by the incident;
- e) identify and execute measures to minimise the emissions / malfunction and the effects thereof; and
- f) provide a proposal to the Agency for its agreement within one month of the incident occurring to :-

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- i) identify and put in place measures to avoid reoccurrence of the incident; and
- ii) identify and put in place any other appropriate remedial action.

16. Monitoring Locations

The Contractor shall submit to the EPA no later than four weeks prior to the commencement of waste activities on site a scaled drawing showing the location of all monitoring locations required under the Licence.

17. Annual Environmental Report

The Contractor shall submit to the Engineer for agreement an Annual Environmental Report (AER) to include:-

- i) Recap on remediation strategy;
- ii) Recap on Remediation Target Values (RTV's);
- iii) Diary of excavations based on a grid system;
- iv) Summary table of wastes exported;
- v) Summary of waste processing and recovery;
- vi) Restoration works described;
- vii) Environmental monitoring statement;
- viii) Reporting period;
- ix) Waste activities carried out at the facility;
- x) Quantity and composition of waste handled during the reporting period and each previous year (relevant EWC codes to be used);
- xi) Summary report on emissions;
- xii) Summary of results and interpretation of environmental monitoring, including a location plan of all monitoring locations;
- xiii) Resource and energy consumption summary. Energy Efficient Report;
- xiv) Full title and a written summary of any procedures developed by the licensee in the year which relates to the facility operation;
- xv) Tank, drum, pipeline and bund testing and inspection report;
- xvi) Reported Incidents and Complaints summaries;
- xvii) Review of Nuisance Controls.

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- xviii) Reports on financial provision made under this licence, management and staffing structure of the facility and a programme for public information;
 - xix) Volume of foul water produced and volume of foul water transported off-site;
 - xx) Any other items specified by the Agency
18. Facility Operation

The Contractor shall submit to the Agency a process flow diagram and details of any proposed emissions.

19. Energy Efficiency

The Contractor shall submit to the Agency details of any energy efficiencies incorporated into the operation of his plant and machinery.

A copy of all documentation and reports required under the Licence shall be provided to the Engineer for comment at least 3 days prior to submission to the Agency or as appropriate. Any discrepancies between the requirements of the Waste Licence and the Specification shall be referred to the Engineer for confirmation; the Waste Licence shall generally take precedence.

Copies of the waste carrier registration and receiving waste facility licences shall be provided to the Engineer before any material is removed from site.

Copies of all complete Waste Transfer Notes shall be provided to the Engineer at regular intervals of less than one month.

The Contractor will be responsible for obtaining and all payments in respect of complying with the Waste Management (Collection Permit) Regulations 2007 (as amended).

A752 Planning Application

A planning application has been made to Limerick City Council. A copy of the conditions attached to the consent shall be forwarded to the Contractor when it has been received from the Council. It is unlikely that the conditions will be received before the tender return date. Therefore, any planning conditions relating to Phase 1 will be forwarded to the Preferred Contractor(s) who will be asked to confirm that there will be no changes to their programme, methodology or rates. Should there be any changes, Bord Gais reserve the right to consult with other tenderers.

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A753 Site Waste Management Plan

a) The Contractor shall follow current best-practice with regard to waste management and minimisation, based on a hierarchy in which the order of preference is as follows:

- i) Reduction - the aim should be to reduce the generation of waste, as far as reasonably practicable.
- ii) Re-use - re-use of waste within the project, subject to the requirements of the waste management and environmental permitting regimes.
- iii) Recover (including re-cycling) - where the waste cannot be reused then recovery options should be considered.
- iv) Disposal - the final option will mean that the waste is either disposed of at the site (subject to the requirements of the permitting regimes) or removed to an appropriately licensed facility.

The above shall apply to contaminated soils and to other waste arisings, including domestic type waste generated within the temporary site accommodation. In all circumstances, attempts should be made to 'design-out' the generation of waste in the first instance.

b) In conjunction with his Environmental Management Plan (see Waste Licence requirements – Clause A751) the Contractor shall prepare a 'Site Waste Management Plan'.

c) The Contractor shall comply with this 'Site Waste Management Plan' and shall demonstrate compliance by undertaking a number of audits (minimum one) during the Works.

d) No work involving off-site disposal shall commence until the Engineer, on behalf of Bord Gais, has confirmed that the 'Site Waste Management Plan' is adequate.

e) The Contractor shall comply with current legislation and guidance relating to the management of wastes (including classification, handling, transportation and disposal).

f) The Contractor shall also comply with other requirements in relation to waste management, under other clauses of this Specification.

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A760 Service Location, Diversion and Special Requirements for Statutory Authorities

a) No excavation works shall be carried out unless suitable and sufficient steps have been taken by the Contractor to identify and, so far as is reasonably practicable, prevent any risk of injury arising from any underground cable or other underground service or overhead service. This shall include the verification of the position of Statutory Undertaker's, publicly and privately owned services by the excavation of hand dug trial holes, verified in advance by electro magnetic detection devices. All works undertaken must be in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 and also the HSA publication - Code of Practice for Avoiding Danger from Underground Services.

b) If any privately owned service of supply for water, electricity, gas, drainage, cabling etc, is affected by the Remediation works, then the Contractor shall locate it and provide a satisfactory alternative before cutting the existing service or supply.

c) The Contractor shall, during the progress of the Remediation works take all measures required by any Statutory Undertaker, the management of other publicly owned service, or owners of privately owned services for the support and full protection of all such services and supplies during the progress of the Remediation works and shall ensure that no such services or supplies are interrupted without the written consent of the appropriate authority or owner.

d) Should any mains or services be uncovered during the course of the remediation works, or be found to interfere with the remediation works which were not anticipated, the Contractor shall inform the Statutory Authority and also the Engineer who will give notice to the undertaking concerned of any alterations or diversions that in this opinion are necessary.

e) The Contractor will be responsible for gaining any permissions necessary from the relevant Utility for working adjacent to, under or over their plant. The Contractor shall be responsible for ensuring the work in such areas is carried out in accordance with the required working practice and safety requirements of the relevant Utility. The Contractor shall be responsible for any damage caused and shall repair, or allow the Utility Undertaker to repair the apparatus at the Contractor's expense.

The Contractor shall co-ordinate his remediation works with any works carried out by Public Utility Undertakers.

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f) Prior to commencing any drilling or excavations, the Contractor will mark out the location of all known services and provide a service plan to excavator operatives/ drillers to ensure they are aware of all service hazards within the influence of the excavation. A service incident response plan shall be written and communicated to all site personnel.

A770 Health and Safety Requirements

a) The Contractor shall carry out the duties of the Project Supervisor (Construction Phase) in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010. All work will be undertaken in accordance with the Health and Safety Policy of Bord Gais.

No work shall commence on site until the following are in place:-

- i) Written notification, to the Health and Safety Authority has been made by the Project Supervisor (Construction Phase).
- ii) The Project Supervisor (Construction Phase) confirms in writing to the Engineer that the Construction Safety and Health Plan has been sufficiently developed.

b) The Contractor shall provide COSHH assessments and take appropriate measurements for handling/storage of any hazardous substances brought to site in conjunction with these works.

c) The Project Supervisor (Construction Phase) shall issue written notification to the Employer, the Engineer and all named Designers within 24 hours of the action in the event of any Health and Safety Authority action with respect to the issue of any of the following to any contractor on site:

- i) improvement notice
- ii) prohibition notice
- iii) summons

The Project Supervisor (Construction Phase) is also required to include one copy of the employee liability and third party liability insurance policies for each contractor working on site in the Construction Phase Safety and Health Plan and Safety File.

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d) The Contractor shall prepare a Designer's Risk Assessment and provide a copy to the Project Supervisor (Design Phase) for those items of Work for which he has design responsibility.

e) The Preliminary Safety and Health Plan drafted by the Project Supervisor (Design Phase) (ref Report 1021927/R/11) is included with the tender documents. The Contractor shall comply with the requirements contained in the Preliminary Safety and Health Plan.

A771 General Health & Safety and Environmental Management Considerations

a) It is envisaged that the site shall be designated into clean and dirty areas and that these areas shall have restricted interaction. The 'clean' area being defined as a zone not directly involved with the workings of the site. This zone shall include the site compound containing the Contractor's and Resident Engineer's accommodation, and third party occupants of the site, whose accommodation is not included in the working areas.

The working areas shall be designated as 'dirty' and shall be fenced along their perimeters.

The Contractor shall ensure that all personnel entering the designated 'dirty' areas have attended an induction course given by the Project Supervisor (Construction) describing the presence, location and significance of potential contaminants on site or they are escorted by inducted personnel. They shall wear appropriate personal, protective, equipment (PPE) and shall pass through the hygiene unit to enter or exit the designated dirty area.

b) The Contractor shall provide and make mandatory the wearing of protective clothing and equipment for all persons working on or adjacent to hazardous operations.

c) The Contractor's attention is drawn to the risks of smoking and use of mobile phones on contaminated land and should address such issues in his Risk Assessment and Safety and Health Plan. No smoking shall be allowed on site, in accordance with the likely Waste Licence requirements.

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d) The Contractor shall comply with all applicable legislation for the safety, health and welfare of its employees, or any other person in or near the site of the works and of members of the public.

e) The Contractor shall provide to the Engineer, a copy of the Contractor's current safety and environmental policy statements and safety codes of practice.

The Contractor shall comply with all the relevant legislation within Irish law, as applicable to these works.

f) The Contractor shall provide first aid facilities, materials and personnel trained in first aid, for the benefit of his own employees, those of his sub-Contractors and the Site staff of the Engineer and any visitors.

The Contractor shall provide to the Engineer the names and details, including training records, of the designated 'first aiders' and Site safety officers. The Contractor shall not rely on the Engineer's staff to undertake these roles in any way.

g) All stored material and materials containers (e.g. skips, IBC's etc) shall be suitably and clearly labelled.

h) Appropriate safety equipment must be provided by the Contractor and worn by all personnel whilst working on or visiting the site.

i) The Contractor shall provide adequate lighting if working during the hours of darkness.

A772 Traffic Safety and Management (provided by the Contractor)

a) All traffic safety and management measures necessitated by the Remediation works must be fully operational and have the written consent of the Engineer, the Highway Authority and Garda (where applicable) before the Contractor shall commence any remediation works including the removal of materials from the Site.

b) The Contractor shall take all reasonable measures at his own cost to ensure that no mud or other material is deposited on the local road network. All vehicles leaving site shall pass through a designated area where they shall be inspected and if necessary jet-washed to remove any mud or debris, with particular attention paid to the wheels, wheel arches and underbody.

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c) The Contractor will be liable for cleaning at his cost the local road network in the event of any material getting onto the public highway, with the agreement of the Garda and/or highways authority.

d) All lorries leaving the Site to a recycling or disposal facility shall have records taken of vehicle registration, volume, date, time destination and that each loaded lorry (if transporting soil) is sheeted. These shall be supplied to the Engineer at the end of each working day, together with details of the net weight recorded at the landfill site for each load.

e) The Contractor shall comply with the relevant provisions of road traffic guidance and appropriate legislation.

f) All vehicles shall adhere to an on-site speed limit of 10mph.

g) The Contractor shall also ensure that hauliers carry appropriate Employer and Public Liability Insurance.

h) As far as reasonably practicable waste shall be delivered to the designated recycling or disposal facility on the same day it leaves the Site. In the event that material has to be stored over night, the loaded lorry shall either be stored at a suitably licensed premises or return to Site.

i) The Contractor shall agree the route to the selected receiving facility with the Engineer, prior to transport of material off Site. Temporary signing is to be provided as deemed necessary by the Engineer, the Employer or Limerick City Council.

j) The Contractor shall implement procedures to ensure, as far as reasonably practicable, that lorries leave and return to the Site at staggered intervals.

k) The Contractor shall arrange for the use of a certified weighbridge, either on or offsite, to weigh all materials disposed of off-site.

A773 Tidiness of the Site (Provided by Contractor)

a) The Contractor shall remove and dispose of at his own expense any surplus materials, rubbish and other items brought onto Site by him in the course of undertaking the remediation works. The Contractor shall collect and separately dispose of all domestic type waste arising from the Remediation works.

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- b) The Contractor shall maintain the Site in a tidy and workmanlike manner at all times. Any skips used on Site will be in good condition (no holes present at the base), stored on an area of hard standing away from any surface drainage and/or sensitive water bodies. All skips must be labelled and waste segregated in accordance with the labelling system. Any skips designated to special waste should have lockable covers. The lighting of fires to burn rubbish is not permitted.
- c) The Contractor shall ensure that any liquids, including fuel oil used on Site in connection with the remediation works are stored in appropriate, fully labelled containers, including "Hazchem" notices. Such containers shall be stored on an impermeable hard standing, surrounded with a suitable bund of capacity of 110% of the capacity of the largest container therein, or stored on proprietary spill trays of a similar capacity. An inspection schedule should be in place to ensure that bunds and drip trays are regularly emptied, especially after heavy rainfall. Any spillages in bunded areas shall be disposed of to an appropriate disposal site and reported to the Engineer. Any refuelling of vehicles must be done in an appropriate manner which will include the use of drip trays and easily accessible spill kits as a minimum.
- d) Any spillages of liquids, including near-miss incidents, which may give rise to an environmental pollution incident shall be reported to the Engineer, contained and removed immediately to an appropriate landfill site. The Contractor shall provide and maintain an appropriate spill kit appropriate for the methodology he is undertaking.
- e) The Contractor shall undertake the remediation works in such a way that the likelihood of a spillage is minimised. Should a spillage occur, the Contractor shall ensure appropriate equipment and plant shall be available on Site to contain and treat any such incident.
- f) Mobile and fixed fuel storage tanks shall not be sited at a location where a spillage could result in a direct discharge to any drain or watercourse. All fuel tanks, including those with twin skins shall be surrounded with a bund at all times to provide storage capacity at least equal to 110% of the capacity of the tank.
- g) The Contractor shall, at a minimum of one week intervals, inspect the facility and its immediate surrounds for nuisances caused by litter, vermin, birds, flies, mud, dust and odours and record the findings.

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A780 Self-Audit of Procedure (Provided by Contractor)

The Contractor shall demonstrate compliance with his safety, health and environmental management plans and procedures through a process of self-audit. The Contractor shall provide the Engineer with details on how this audit process will be undertaken, shall forward the findings of each audit promptly to the Engineer and shall implement any corrective actions considered necessary, as a result of the audit. Audits shall be undertaken at least every 2 months.

A800 Noise, Vibration, Dust and Odour

A810 Control of Noise and Vibration (Provided by Contractor)

a) The Contractor shall employ the best practical means to minimise noise and vibration produced by his operations. He shall have regard to the recommendations in the EPA Environmental Noise Survey – Guidance Document (2003) and BS 5228:2009 Code of practice for noise and vibration control on construction and open sites.

b) Without prejudice to the generality of the Contractor's obligations under the preceding paragraph, the Contractor shall comply in particular with the following requirements.

(i) All vehicles and mechanical plant used for the purpose of the Works shall comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels)(amendment) Regulations 1996, be fitted with effective exhaust silencers and be maintained in good and efficient working order.

(ii) All compressors and pumps shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use. All pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Any equipment or panel fitted for the purposes of noise reduction shall be maintained and operated so as to minimise noise.

(iii) Machines in intermittent use shall be shut down in the intervening period between work or, where this is impractical, throttled down to a minimum.

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(iv) All pumps shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order. All dewatering pumps shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers.

(v) All stationary plant shall be covered where possible.

c) The Contractor shall pay special regard to minimise noise at the site boundaries. Such measures include:-

- (i) limits on the amount of plant at work
- (ii) silencing of plant as described above

d) The Contractor shall take suitable steps in his method of working to prevent damage to adjacent properties due to vibrations caused by executing the works.

e) Working hours of the site shall be restricted to 08:00 to 18:00 hours Monday to Friday.

A820 Monitoring Noise (undertaken by Contractor)

a) Noise monitoring equipment should comprise of the following:-

- Portable weatherproof Type 1 sound level meter, (Bruel and Kjaer model or similar) and external microphone capable of:-
 - i) Measuring sound levels in the range 40 to 140 dB(A).
 - ii) Programmed recording times.
 - iii) Calculating and recording percentiles of LAeq, Lmax and Lmin.
 - iv) Direct printing of results to printer or via computer.
- Computer software and any associated cables for the purpose of downloading data and converting into a Microsoft Excel compatible format.
- Extension cable for microphone.
- Acoustic calibration device.

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- Windshield for microphone.
- Tripod for mounting microphone at a variable height up to 2m above ground level.
- All batteries or charging devices as required.
- Waterproof case for equipment.

b) All equipment shall be calibrated maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

c) Noise monitoring is to be carried out by an experienced technician provided by the Contractor and generally in accordance with BS EN ISO 11202:2010 - Acoustics.

d) Methods, times, background and noise levels are to be agreed by the Engineer with the Agency, before monitoring commences. Monitoring of 'background noise levels' has been undertaken by Mouchel and the results are presented in the Environmental Summary Report presented in Appendix A. Monitoring of the works noise levels shall be compared to that reference level, unless otherwise agreed with the Engineer and the Agency.

A830 Monitoring Vibration (undertaken by the Contractor)

a) The Contractor shall provide equipment and undertake vibration monitoring of the following potentially unstable structures when drilling in their vicinity; Dock Road boundary wall, AGI wall, slopes at O'Curry Street boundary and No 5 Generator Store. In addition, vibration monitoring shall also be undertaken on the boundaries with adjacent residential / commercial premises as indicated on Drawing 1021927/PHASE 1 - TENDER/OD/011 – Dust and Vibration Monitoring Locations and also at locations as directed by the Engineer.

b) Ground borne vibration is to be assessed using the guidelines provided in BRE Digest 403, Damage to Structures from Ground Borne Vibration.

c) Vibration monitoring equipment shall be capable of monitoring vibration dose values in compliance with BS EN ISO 8041:2005 and shall be able store at least one weeks data.

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d) Vibration monitoring equipment shall comprise a portable weatherproof seismic recording instrument, such as the Vibrock V901 or similar approved, set to run in continuous mode and able to digitally record vibration levels up to 20 mm/s peak particle velocity for frequencies between 5 and 250 Hz. All necessary software and cables shall be supplied to enable the data to be downloaded and converted into a Microsoft Excel compatible format.

e) The Contractor shall provide suitable monitoring points, either:

- on a spike to appropriate strata
- on a resin anchor to hard surface, or
- on a sand bag covering on general surface

f) Vibration monitoring is to be carried out by an experienced technician provided by the Contractor.

g) All equipment shall be calibrated, maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

h) Vibration monitoring may be used to protect people and vibration sensitive equipment and adjacent structures. The requirements and limits for vibration will be agreed with the Agency by the Engineer prior to work commencing.

A840 Control of Dust (Provided by Contractor)

a) Dust control is the Contractor's responsibility. The Contractor shall conduct his operations so that any dust settles within the Site and is not carried beyond its periphery. The Engineer will retain the right to instruct more intensive dust control measures when considered necessary.

b) The Contractor shall adjust the location of any works having regard to the wind direction and speed, and shall suspend such operations altogether, in the event that any such adjustment fails to prevent dust from being carried beyond the periphery of the Site.

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c) The Contractor shall ensure that airborne dust is kept to a minimum by the regular use of water bowsers, with sprinklers, during periods of dry weather.

d) Open excavations will be backfilled as soon as practicable after excavation has been completed;

e) The Contractor shall ensure that dust masks are readily available for all Site personnel. The masks will have P2 filters to protect against the fine respirable dusts, fibres (including asbestos) and aqueous mists. The masks may either be single face masks that confirm to BS EN149 or Twin Cartridge Respirators that conform to BS EN140. Filters should conform to EN143, BS EN 14387:2004+A1:2008 and BS EN12083.

A850 Monitoring of Dust (Provided by Contractor)

It is likely to be a requirement of the Waste Licence that the Contractor undertakes dust monitoring. Exact requirements are yet to be confirmed but are likely to require dust emissions from remediation activities to be measured using 'frisbee' type dust gauges at 4 No. locations, one at each boundary of the site as indicated on Drawing 1021927/PHASE 1 – TENDER/CD/011.

All dust monitoring stations shall be monitored at weekly intervals for the duration of the Site remediation works.

All results shall be supplied to the Engineer as soon as they become available. The results shall also be summarised and reported at each progress meeting.

In addition the Contractor shall record daily the location of working areas and atmospheric conditions (temperature, relative humidity, precipitation, mean wind speed and wind direction) and issue all results to the Engineer on a weekly basis.

All equipment shall be calibrated, maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

A860 Control of Odours (Provided by Contractor)

a) Control of odours shall be the responsibility of the Contractor.

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b) The plant and equipment for the injection, extraction and treatment of process water must operate within a closed system so that odours do not escape. If emissions are to be into the air, the appropriate filtering must be undertaken to ensure that odours are minimised.

c) The contractor shall ensure that experienced engineers are provided during all operations where there is a potential for odours to be created, to ensure that odourous materials are handled in a way that minimises odour generation, and that odour suppression equipment is utilised effectively in such areas.

A870 Monitoring of Odours (Provided by Contractor)

a) Monitoring of odours is the Contractors responsibility. Observational daily monitoring of air quality will be undertaken at sensitive Site boundaries, depending on the Site operations occurring, for volatile organic compounds.

b) The odour monitoring will be undertaken in general accordance with the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 and associated 2010 Code of Practice.

A900 Condition Survey and Protection of Features

A910 Condition Survey

a) Before the commencement of any site works, the Contractor shall inspect the conditions of existing buildings, roads, footways, installations, kerbs, verges, fences, walls and street furniture etc. within and adjacent to the site (other than those buildings and/or features identified for demolition or removal) and shall prepare a schedule noting all existing defects, with supporting sketches and photographs, where necessary. This shall also include the Dock Road boundary wall, the AGI wall and the No 5 Generator Store all of which have Protected Status. The schedule shall be agreed with the Engineer and any owner or Public Authority, as applicable, prior to the commencement of any site activity.

b) The Contractor, on completion of the Works, or at such earlier time as may be required, shall make good to the satisfaction of the Engineer and any owner or Public Authority concerned, all damage additional to that agreed in the schedule, where such damage has been caused by the Contractor, or any of his sub-contractors, in connection with the execution of the Works.

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c) In the event of the Contractor failing to prepare and agree a 'Schedule of Condition', the property in question shall be deemed to have been undamaged prior to the execution of the Works.

d) If, in the opinion of the Engineer, the Contractor has failed to repair and make good within a reasonable time any damage attributed to the Contractor's actions, or has likewise failed to arrange for the repairs to be carried out, the Employer may arrange for the repairs to be carried out and deduct the expenses incurred from money due to the Contractor under the Contract.

A920 Protection and Preservation of Features

a) The Contractor shall protect and preserve the following features (some of which have Protected Status) also indicated on Drawing 1021927/PHASE 1 - TENDER/OD/008;

- i) The Dock Road boundary wall (Protected Status).
- ii) AGI wall (Protected Status).
- iii) The No 5 Store Generator Building
- iv) The site offices building
- v) The new DR and ESB Electricity sub-station structures on the O'Curry Street boundary.
- vi) Existing borehole monitoring well installations.

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5.3 CLASS C: GEOTECHNICAL AND OTHER SPECIALIST PROCESSES

C900 Remediation

The Contractor shall consider and adopt, as appropriate, relevant regulatory guidance in relation to the suitability, design, operation and management of remediation treatment processes, including any applicable Agency guidance.

Daily reports of any site investigation works shall be completed in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland.

It is not envisaged that major earthworks or excavation will be required during the pump and treat works. In the event that major earthworks/excavation are required, they shall be undertaken in accordance with a suitable specification such as the Manual of Contract Documents for Road Works published by the National Roads Authority.

Details of any materials imported to site shall be agreed with the Engineer in advance and shall not comprise any deleterious or contaminated material.

C910 Pilot Study

a) As part of his tender, the Contractor shall prove to the Engineer the suitability of his chosen pump and treat methodology and its application to the circumstances of the site and to the objectives of the remediation project, including any remedial targets/objectives.

The pilot study shall be a trial of the treatment process in which the process is either operated at partial scale on site or in bench trials on representative materials off site (following acquisition of suitable representative materials from site). The aim of which is to establish operating parameters and evaluate the treated material and any by-product material stream(s).

In this regard, the Contractor shall pay due regard to cost, health and safety, environmental and other considerations, including the following, as applicable:

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- i) Site ground conditions and the nature and variability of the materials requiring treatment.
- ii) Generation of noise, vibration, dust and/or odour by the process, having regard to on-site and off-site receptors (including humans and property), and monitoring requirements.
- iii) Creation of bi-products from the process, likely to pose a risk to health, safety and/or the environment throughout and at the conclusion of treatment operations.
- iv) Anticipated productivity rates for the treatment process (or processes).
- v) Working space constraints
- vi) Preparatory works requirements (i.e. the need to prepare process areas).
- vii) Suitability for use of any existing on-site features, such as hard standing, slabs and/or tanks.
- viii) Use of energy.
- ix) Use of 'clean' water and disposal of process water.
- x) Use of consumables during the process (e.g. flocculants, coagulants, surfactants, microbiological colonies, fertilisers, catalysts etc.).
- xi) Type and quantity of reagents required, if any, and use of less environmentally damaging or energy consuming reagents (e.g. the selection of bio-degradable surfactants etc.).
- xii) Potential impact on or interaction with site infrastructure and below ground services (e.g. heat and/or pressure generation by in situ processes and potential corrosion of gas mains).
- xiii) Any known or likely planning issues/constraints.

A maximum budget of €30,000 is available. The Contractor shall insert costs for his pilot study which can be anything up to €30,000. Any additional costs incurred during this period shall be borne by the Contractor.

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The cost is to include for provision, maintaining and removal of all necessary welfare and hygiene facilities for the period.

b) The Contractor shall document in his tender the basis for recommending the use of his chosen pump and treat methodology and the specific process plant, as applicable. The information provided shall address the matters listed in sub-clause a), above, as applicable. It shall also clearly identify the variables that would be expected to have a significant effect on the efficiency of the process(es) and the range/assumptions made, with supporting calculations/reasoning (e.g. temperature of the injected water).

c) The Contractor shall be aware that information provided as part of the Contractor's Tender is likely to be used by the Engineer and may be submitted to the regulators for comment/approval. The Contractor shall also recognise that following this stage, any change to the selected remediation process(es) is likely to require further regulatory consultations, which could delay implementation of the remediation process(es).

d) A period of up to 2 months (from the award of Preferred Contractor status and including reporting) shall be available to the Preferred Contractor in order to prove that the chosen methodology will successfully remove the free product and to demonstrate that appropriate disposal / recycling facilities are available. At the Contractors discretion, the 2 month period may be shortened if the Contractor is confident any works can be progressed to a suitable point that he can prove to the Engineer that the process is suitable (including any necessary reporting).

e) As part of the pilot study, the Contractor shall:

- i) Define the sampling regime to be carried out as part of the works, including any requirements of the Engineer.
- ii) Allow the Engineer's staff reasonable access to the process plant for the purpose of witnessing any pilot works.
- iii) Prepare a report on the works undertaken during the pilot period, including any analytical data required by the Engineer to validate the performance of the works. The report shall be provided to the Engineer within two months of the award of Preferred Contractor status.

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iv) Provide, maintain (and remove, unless required for the DNAPL recovery works) all welfare, decontamination and safety and health requirements for the purposes of undertaking the pilot works safely and in accordance with current legislation and guidance.

f) A period of two weeks maximum from submission of the Contractors report on the pilot works shall be required by the Engineer to assess the suitability of the process. This two week period shall be in addition to the maximum 2 month allowable pilot period. The cost of maintaining the DNAPL treatment plant in stand-by mode for this period shall be included within the Contractors tender sum for the pilot period.

g) The Contractor shall take account of the results and conclusions of the process trial when assessing the full treatment process works and methodologies.

C920 DNAPL Recovery

a) A waste licence and planning permission has been applied for by Bord Gais for the pump and treat remediation processes. The Contractor shall comply with all regulatory requirements and shall obtain all necessary authorisations (see Clause A750).

b) The Contractor shall design the treatment process (including any works undertaken during the pilot period) and working methodology in order to meet criteria for the successful removal of free product and DNAPL as set-out in Section 2.4.

c) The Contractor shall provide appropriate management of any specialist remediation treatment process(es) used, as appropriate to the technique to be implemented, including plant, equipment and personnel. The Contractor shall provide services for use by any specialist subcontractor, including water and electricity, and all necessary welfare facilities for the use of the specialist sub-contractor's staff.

d) The Contractor shall ensure that the treatment process is carried out with due regard to health and safety and environmental considerations.

e) The Contractor shall manage and monitor the health, safety and environmental performance of any specialist sub-contractor used.

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f) The Contractor shall review and up-date, as necessary, the 'construction phase safety and health plan' and the 'environmental management system' when changes to the configuration of any process plant are proposed/implemented. The Contractor shall also up-date risk assessments and method statements if and when plant/processes are reconfigured.

g) The Contractor shall prepare a detailed method statement (or management plan) for the remediation process. This shall:

i) Identify the individuals involved.

ii) Define the day-to-day responsibilities of the various parties and individuals involved, including maintenance of the working area.

iii) Identify the factors that could influence the efficiency of the process and the quality of the treated groundwater and define the operating window for the process in relation to the chemical and geotechnical properties of the materials requiring treatment.

iv) Include a strategy for completing the work in the most efficient manner, having regard to the factors identified above.

v) Define the sampling regime to be carried out during the commissioning stage and during the treatment operations, including sampling for performance monitoring, waste classification and validation purposes, as applicable, and any specific requirements of the Engineer.

vi) Provide other pertinent information, including any other items/ requirements set out below. Where more than one treatment process is to be used, the plan shall describe the interaction and dependencies between the several treatment processes and the management actions that the Contractor will take to ensure the efficient operation of the treatment train. A draft copy of the management plan shall be supplied to the Engineer for review and comment. The Contractor shall address any comments made by the Engineer and shall finalise and re-issue the plan, as appropriate.

h) The Contractor shall provide a suitably prepared working area for the process plant, adopting existing hard-standing, where appropriate, and incorporating impermeable layers/barriers, perimeter bunds and managed drainage, as necessary.

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- i) The Contractor shall undertake sampling and analysis of the materials requiring treatment, the treated material and, if applicable, any intermediate stage material, in order to demonstrate the effectiveness of the treatment process. The Contractor shall manage the acquisition and recording of samples in a manner appropriate to the method of operation of the process (i.e. batch or continuous flow, progressive in-situ treatment, etc.). The Contractor shall give the Engineer reasonable notice of his intention to undertake sampling and shall supply the results of such sampling to the Engineer, as soon as they become available.
- j) The Contractor shall allow the Engineer's staff reasonable access to the process plant for the purposes of inspecting on-going material processing and sampling.
- k) The Contractor shall keep a detailed record of any unproductive time relating to the treatment process, including date, time, reason and, if applicable, corrective action taken.
- l) The Contractor shall be responsible for collecting, treating and disposing of any process water resulting from the treatment process.
- m) The Contractor shall review the progress of the treatment process, in consultation with the Engineer, on a frequent basis (minimum weekly) and, if requested, prepare a report for the Engineer every 2 weeks, describing the performance of the treatment process.
- n) In addition to the above, the Contractor shall ensure that all the requirements of Section 2.4 of this Specification are met.
- o) The Contractor shall ensure that the existing ground water monitoring wells are not damaged during the works. If any wells are damaged, they shall be replaced by the Contractor at his own cost

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C921 Plant (Provided by Contractor)

The Contractor shall provide, operate, maintain and remove on completion all items of plant and equipment necessary in order for him to complete the remediation works within the programme period, including for the provision of road sweeping/cleaning facilities. It is envisaged that the following main items of work would also be undertaken by the Contractor:-

- Liaison with Limerick City Council Water Services Department.
- All fees associated with the works
- Installation of all injection and extraction wells.
- Establishment of DNAPL plant
- Any other work required to successfully remove DNAPL.

All plant and equipment shall be provided and maintained in a safe condition with all maintenance and service documentation available for inspection by the Engineer.

The Contractor shall determine his own plant requirements to allow the satisfactory and timely completion of the Remediation works.

A DNAPL Removal and Recovery Plant, which will be under the control of the Contractor is anticipated to be required and is considered likely to comprise the following components as necessary to remove free product:

- Pre-treatment of the lagoon to keep it in the range pH 7.5 to 9
- Oil/water separation (two stage);
- Filtration, to remove suspended solids;
- Granular activated carbon, or similar, treatment to remove polar organic compounds
- Flow meter and discharge arrangements.

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The removal and recovery plant shall be sized to be capable of operating 24 hours per day and treating contaminated water. The treated water shall meet all discharge criteria set under the trade effluent/discharge consent (see Appendix E) and the Waste Licence. All water removed from the ground shall pass through the water treatment plant, unless agreed otherwise with the Engineer.

All moving plant is to be fitted with and use flashing amber lights and reversing beepers.

C922 Pumping, Injection and Monitoring Wells

a) All Ground Investigation works and well installation on site shall be carried out in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland and BS10175:2011 Investigation of Potentially Contaminated Sites: Code of Practice.

b) The Contractor shall procure and arrange for a specialist site investigation contractor to install the pumping / injection / monitoring wells as required for his chosen methodology with particular attention to the ground conditions and the required programme.

c) The construction of the wells (including cable percussive boreholes, sonic, rotary boreholes and/or window-sampler boreholes, as applicable) is to be carried out in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland and BS10175:2011 subject to the following specific requirements:

i) At the Contractors discretion, locations shall be started by means of a hand-excavated inspection pit to 1.2 m bgl. The base of the inspection pit shall be scanned using a cable avoidance tool and probed by hand (using a suitable tool (insulated bar or similar)), prior to continuing. The cost of such measures shall be deemed to be included within the Contractors rates.

ii) All drilling equipment, including casing, shall be clean before arriving on site, and shall be washed using a hot-water or steam cleaner prior to commencement of each exploratory hole.

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iii) The arisings and any flush medium must be contained within the drilling area.

iv) Any water used to assist boring shall be kept to a minimum and shall be of drinking water mains quality.

v) Petroleum based oils and lubricants shall not be used on any boring or drilling equipment, including casing. Vegetable or silicone based grease and oils or similar, from a clearly identifiable source, or a non-leachable PTFE spray, may be used.

vi) The need for 'nested casing' to avoid the creation of potential contaminant migration pathway shall be discussed and agreed with the Engineer, as applicable.

vii) Where groundwater monitoring well installation is required, reference should be made to BS10175:2011.

viii) The location of the response zone (i.e. slotted section) of any borehole standpipe shall be agreed with the Engineer's Representative before installation.

ix) The Contractor shall ensure that the drillers hold appropriate accreditation, and shall check and obtain copies of all such certification for operators before work commences.

x) The Contractor shall also check and obtain copies of all certification for plant before starting work, including any requirements under the Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2010.

xi) Any water arising from boreholes, either during drilling operations, or in preparation for or during groundwater sampling work, shall be managed appropriately.

xii) All drill arisings to be stored in sealed skips or similar and subsequently removed from site.

d) On completion of the pump and treat works the Contractor shall decommission the wells as directed by the Engineer on site. Closure/decommissioning shall comply with the methodology set-out below.

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- i) The permeability of the infill material used shall match the surrounding stratum as far as reasonably practicable, i.e. sand and/or gravel of suitable particle size shall be used in highly permeable material, and cement-bentonite grout shall be used in low permeability soils.
- ii) Cement-bentonite grout shall comprise 1 part Ordinary Portland cement, 3 parts of sodium bentonite powder and potable water. It shall be mixed by hand or using suitable equipment to a uniform consistency, with a moisture content not exceeding 250%.
- iii) The grout shall be pumped into each well, delivered through a tremmie pipe, which shall be raised as filling proceeds. The well shall be filled up to the specified level. The volume of grout used is to be monitored and recorded.
- iv) Measures should be taken to prevent spillage of grout and any spillage is to be removed and the area made good.

C930 Samples

- a) All samples for chemical analysis shall be taken and prepared in accordance with BS10175:2011 and the requirements of the accredited chemical testing laboratory.
- b) The Contractor shall be responsible for handling, packing and dispatching the samples (to the selected analytical laboratory) in accordance with the accredited chemical testing laboratories requirements for sample preservation and handling, which shall include the use of cool boxes and frozen ice packs. He shall also be responsible for checking that the samples dispatched comply with the 'chain of custody documentation' (agreeing any discrepancies with the Engineer); sign the 'chain of custody' documentation; and supply a copy of the signed document to the Engineer.
- c) Liquid samples from a point immediately before the DNAPL Recovery Plant shall be taken weekly and as directed by the Engineer.
- d) Soil samples shall be taken as directed by the Engineer.

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C940 Chemical Tests for Soils and Liquids

Depending upon the Contractors methodology / validation / verification requirements, it may be necessary for the Contractor to undertake chemical testing of soil and/or liquid samples. Should it be necessary, the following shall apply:

- a) The chemical content of solids and liquids shall be determined in accordance with MCERTS/UKAS accredited procedures. Any laboratory proposed by the Contractor must be approved in writing by the Engineer during the tender period, and details submitted with the Contractor's tender submission. Where test methods for determinands are not appropriately accredited, the test method shall be issued to the Engineer for approval prior to the commencement of sampling and testing.
- b) Alternative methods of analysis shall be employed, with the agreement of the Engineer, if necessary to achieve any specified detection limits, which are not achievable by the methodology stated in the above specification or where liquid samples are required for assessment of compliance with the discharge consent.
- c) Results of analysis of samples shall be provided to the Engineer within 10 working days of sampling unless otherwise directed by the Engineer.
- d) Soil samples shall be analysed for the 'standard' and / or 'additional' suite of determinands for soils indicated in Appendix C as directed by the Engineer.
- e) Soil samples shall be analysed for the 'standard' and / or 'additional' suite of determinands for soil leachability indicated in Appendix C as directed by the Engineer.
- f) Water samples shall be analysed for the 'standard' and / or 'additional' suite of determinands for waters indicted in Appendix C as directed by the Engineer.
- g) The results shall be tabulated in the format specified in Appendices C and E. When all analysis is completed the final results shall be supplied in a bound report. The report shall include colour copies of Shewhart Charts for ammonium, phenol, naphthalene, benzo(a)pyrene and BTEX in soils and water, and a description of the methods of analysis employed for all determinands reported. The report shall be signed by a senior representative of the laboratory. Two copies of the report shall be supplied to the Engineer.

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In addition, the results, tabulated in Microsoft Excel™ format, and electronic copies of all Shewhart Charts shall be supplied to the Engineer.

C950 Contaminated Materials and Removal from Site

It is envisaged that majority of material requiring removal off site as part of this contract shall be DNAPL, removed from the groundwater by the DNAPL recovery and treatment plant. A volume of 340m³ is roughly estimated from previous investigations, however, the Contractor shall satisfy himself through his own calculations of the anticipated volume.

Depending upon the Contractors methodology, it is possible that contaminated drill arisings will be generated that shall require off site disposal.

As part of his tender the Contractor shall provide details of his chosen recycling or disposal route including details of the receiving facility (operator, location, licence etc). In addition, the Contractor shall provide details of the handling and transportation of the material from the site to the receiving facility.

- a) The Contractor shall comply with all current legislation and guidance concerning the transportation and disposal of contaminated materials.
- b) The Contractor shall supply weekly records to the Engineer, detailing volumes, and any treatment details for all contaminated materials encountered on Site.
- c) Prior to dispatching any material off site, the Contractor shall provide documentary evidence to the Engineer that all carriers are licensed to carry waste and that the receiving facilities are licensed to accept the type and quantity of material being removed from site.
- d) The Contractor shall supply to the Engineer a copy of the 'receiving facility ticket' for each load of material removed from site during the contract. Each ticket shall show the following information:

- i) name and address of the receiving facility and site the licence number;
- ii) time and date of acceptance by the receiving facility;
- iii) tip ticket number;
- iv) vehicle registration number;

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- v) gross and tare weight of the vehicle and the weight of removed tipped material.
- e) The ticket copies for each day shall be supplied to the Engineer in sequential order, together with a daily summary sheet, which shall contain the following information:
- i) site address, day and date;
 - ii) vehicle type and registration number, and time leaving the site for each load;
 - iii) receiving facility ticket number and consignment number (if applicable), for each load;
 - iv) volume and weight of material transported, for each load;
 - v) total volume and weight of material removed each day.
- f) The summary sheets shall be prepared in Microsoft Excel™ and shall be supplied to the Engineer in paper and digital format as requested.
- g) The ticket copies and summary sheets are to be provided on a weekly basis.
- h) The Contractor shall provide the Engineer with details of his proposed sampling and analysis regime, required for treatment of the contaminated material, to ensure compliance with all waste management regulations/legislation.
- i) The above shall apply for any drilling arisings requiring appropriate storage in sealed skips or similar prior to removal from site. The Contractor shall carry out any special requirements necessary for the handling of drilling arisings, including that of any leachate emanating from them after consultation with the Engineer.

C960 Discharge Consent

A discharge consent shall be required for any water discharged off site via the foul sewer. The Contractor shall be responsible for gaining the consent from Limerick City Council Water Services Department including payment of all fees, the management and monitoring of the works (including liquid sampling and testing) to ensure compliance with the consent.

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Discharge consent criteria have been agreed with Limerick City Council Water Services Department and are presented in Appendix E.

Where confirmatory water samples are required for the discharge consent, these shall be tested for the 'discharge consent' suite indicated in Appendix E.

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5.4 CLASS X: MISCELLANEOUS ITEMS

X100 Fences and Gates

X194 2.0m High Temporary Mesh Panel Fencing

2.0m high temporary mesh panel fencing for segregating clean and dirty areas of the site shall comply with the guidance provided in HS (G) 151 by the HSE. The gap under the fence should be kept to a minimum by fitting a mesh skirt if necessary. Panels shall be back braced to provide stability from winds. Bases shall not protrude into pedestrian areas.

If mesh panels are used, the mesh must be close enough to prevent children climbing the panels.

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Appendix A Previous Reports

The following reports are presented on the enclosed CD:

- Summary Report on Limerick Site – O’ Conner, Sutton, Cronin, August 1995,
- Site Investigation Report: Volume 1 Report - Ove Arup, April 1996,
- Site Investigation Report: Volume 2 Factual Site Investigation Data - Ove Arup, April 1996,
- Desk Study Phase 1 Report – Parkman, April 2001 (report reference 25837/OR/01B),
- Site Investigation Factual Report Volumes 1A and B – Parkman October 2001 (report reference 25827/OR/03B),
- Site Investigation General Report Volume 2 – Parkman October 2001 (report reference 25837/OR/04B),
- Ground Investigation into Boundary Conditions and Quarry Backfill – Parkman 2003 (report reference 25837/R/11A),
- Preliminary Vibration Monitoring 18th May to 24th June 2009 – Reference NV/09/3857NL01. Dated 13th August 2009 – AWN Consulting,
- Site Characterisation Factual Report 1021927/R/02C November 2011- Mouchel.
- Site Vibration Monitoring 4th to 27th November 2009 – Reference NV/09/3857NL03. Dated 4th December 2009 – AWN Consulting,
- Former Gasworks, Dock Road, Limerick: Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 March 2010 – Mouchel. And Addendum report 1021927/R/18 January 2012- Mouchel.
- Environmental Impact Statement 1021927/R/07- Mouchel.

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- Natura Impact Statement 1021927/R16- Mouchel.
- Quarterly Groundwater Monitoring Report – Annual Summary 2009/10 1021927/R/14, November 2010 – Mouchel.
- Quarterly Groundwater Monitoring Report- Annual Summary 2011 1034973/R/04, November 2011- Mouchel.

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Appendix B Preliminary Safety and Health Plan

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Appendix C Chemical Testing Suites and Reporting Order

'STANDARD' SOILS SUITE comprising metals and non metals, BTEX and MTBE, TPHCWG, speciated PAH and speciated phenols.

Metals and non-metals	Limit of Detection
arsenic	0.6 mg/kg
cadmium	0.2 mg/kg
chromium (III)	0.9 mg/kg
chromium (VI)	0.6 mg/kg
copper	1.4 mg/kg
lead	0.7 mg/kg
mercury	0.14 mg/kg
nickel	0.2 mg/kg
selenium	1 mg/kg
zinc	1.9 mg/kg
Total cyanide	1 mg/kg
sulphate	48 mg/kg
sulphide	15 mg/kg
ammoniacal nitrogen	15 mg/kg
asbestos	n/a

BTEX and MTBE	Limit of Detection
MTBE	5 µg/kg
Benzene	10 µg/kg
Toluene	2 µg/kg
Ethylbenzene	3 µg/kg
o Xylene	3 µg/kg
p&m-Xylene	6 µg/kg

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TPHCWG	Limit of Detection
Aliphatic EC5-EC6	0.01 µg/kg
Aliphatic EC6-EC8	0.01 µg/kg
Aliphatic EC8-EC10	0.01 µg/kg
Aliphatic EC10-EC12	0.01 µg/kg
Aliphatic EC12-EC16	0.1 mg/kg
Aliphatic EC16-EC21	0.1 mg/kg
Aliphatic EC21-EC35	0.1 mg/kg
Aliphatic EC35-EC44	0.1 mg/kg
Aromatic EC5-EC7	0.01 µg/kg
Aromatic EC7-EC8	0.01 µg/kg
Aromatic EC8-EC10	0.01 µg/kg
Aromatic EC10-EC12	0.01 µg/kg
Aromatic EC12-EC16	0.1 mg/kg
Aromatic EC16-EC21	0.1 mg/kg
Aromatic EC21-EC35	0.1 mg/kg
Aromatic EC35-EC44	0.1 mg/kg

Speciated PAH (US EPA 16)	Limit of Detection
Naphthalene	9 µg/kg
Acenaphthylene	12 µg/kg
Acenaphthene	8 µg/kg
Fluorene	10 µg/kg
Phenanthrene	15 µg/kg
Anthracene	16 µg/kg
Fluoranthene	17 µg/kg
Pyrene	15 µg/kg
Benzo[a]anthracene	14 µg/kg
Chrysene	10 µg/kg
Benzo[b]fluoranthene	15 µg/kg
Benzo[k]fluoranthene	14 µg/kg
Benzo[a]pyrene	15 µg/kg
Indeno[1,2,3-c,d]pyrene	18 µg/kg
Dibenzo[a,h]anthracene	23 µg/kg
Benzo[g,h,i]perylene	24 µg/kg

Speciated Phenol	Limit of Detection
total cresol,	0.01 mg/kg
total xylene	0.01 mg/kg
2,3,5-trimethyl phenol	0.01 mg/kg
2-isopropyl phenol	0.01 mg/kg

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'ADDITIONAL' SOIL SUITES comprising VOC's, SVOC's and PCB's.

	Limit of Detection (µg/kg)
Polychlorinated Biphenyls (EC7)	3

Volatile Organic Compounds	Limit of Detection (µg/kg)
1.1.1.2-Tetrachloroethane	11
1.1.1-Trichloroethane	12
1.1.2.2-Tetrachloroethane	15
1.1.2-Trichloroethane	9
1.1.2-trichloro-1,2,2-trifluoroethane	25
1.1-Dichloroethane	8
1.1-Dichloroethene	9
1.1-Dichloropropene	13
1.2.3-Trichlorobenzene	12
1.2.3-Trichloropropane	13
1.2.4-Trichlorobenzene	9
1.2.4-Trimethylbenzene	10
1.2-Dibromo-3-chloropropane	11
1.2-Dibromoethane	14
1.2-Dichlorobenzene	8
1.2-Dichloroethane	10
1.2-Dichloropropane	10
1.3.5-Trimethylbenzene	8
1.3-Dichlorobenzene	8
1.3-Dichloropropane	7
1.4-Dichlorobenzene	11
2.2-Dichloropropane	10
2-Chlorotoluene	14
4-Bromofluorobenzene	1
4-Chlorotoluene	9
4-Isopropyltoluene	8
Benzene	9
Bromobenzene	14
Bromochloromethane	10
Bromodichloromethane	11
Bromoform	12
Bromomethane	9
Carbon Disulphide	9
Carbontetrachloride	11
Chlorobenzene	7
Chloroethane	12
Chloroform	10
Chloromethane	12
cis-1-2-Dichloroethene	9
cis-1-3-Dichloropropene	25
Dibromochloromethane	9
Dibromofluoromethane	1

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Volatile Organic Compounds	Limit of Detection (µg/kg)
Dibromomethane	12
Dichlorodifluoromethane	13
Dichloromethane	10
Ethylbenzene	9
Hexachlorobutadiene	15
Isopropylbenzene	9
Methyl Tertiary Butyl Ether	9
Naphthalene	7
n-Butylbenzene	7
o-Xylene	11
p/m-Xylene	13
Propylbenzene	6
sec-Butylbenzene	8
Styrene	11
Tertiary amyl methyl ether	15
tert-Butylbenzene	12
Tetrachloroethene	9
Tert-amyl methyl ether	
Toluene	6
trans-1-2-Dichloroethene	12
trans-1-3-Dichloropropene	27
Trichloroethene	9
Trichlorofluoromethane	7
Vinyl Chloride	10

Semi-Volatile Organic Compounds	Limit of Detection (µg/kg)
1,2,4-Trichlorobenzene	100
1,2-Dichlorobenzene	100
1,3-Dichlorobenzene	100
1,4-Dichlorobenzene	100
2,4,5-Trichlorophenol	100
2,4,6-Trichlorophenol	100
2,4-Dichlorophenol	100
2,4-Dimethylphenol	100
2,4-Dinitrotoluene	100
2,6-dichlorophenol	20
2,6-Dinitrotoluene	100
2-Chloronaphthalene	100
2-Chlorophenol	100
2-Methylnaphthalene	100
2-Methylphenol	100
2-Nitroaniline	100
2-Nitrophenol	100
3-Nitroaniline	100
4-Bromophenylphenylether	100
4-Chloro-3-methylphenol	100

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Semi-Volatile Organic Compounds	Limit of Detection (µg/kg)
4-Chloroaniline	100
4-Chlorophenylphenylether	100
4-Methylphenol	100
4-Nitroaniline	100
4-Nitrophenol	100
Acenaphthene	100
Acenaphthylene	100
Aniline	40
Anthracene	100
Azobenzene	100
Bis(2-chloroethyl)ether	100
Bis(2-chloroethoxy)methane	100
Bis(2-chloroisopropyl)ether	10
Bis(2-ethylhexyl) phthalate	100
Butylbenzyl phthalate	100
Benzo(a)anthracene	100
Benzo(b)fluoranthene	100
Benzo(k)fluoranthene	100
Benzo(a)pyrene	100
Benzo(ghi)perylene	100
Bromo-phenylphe ethernyl	30
Chrysene	100
Carbazole	100
Dibenzofuran	100
Di-n-butyl phthalate	100
Diethyl phthalate	100
Dibenzo(a,h)anthracene	100
Dimethyl phthalate	100
Di-n-Octyl phthalate	100
Fluoranthene	100
Fluorene	100
Hexachlorobenzene	100
Hexachlorobutadiene	100
Hexachlorocyclopentadiene	100
Hexachloroethane	100
Indeno(1,2,3-cd)pyrene	100
Isophorone	100
Naphthalene	100
Nitrobenzene	100
N-nitrosodi-n-propylamine	100
Pentachlorophenol	100
Phenanthrene	100
Phenol	100
Pyrene	100

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‘STANDARD’ WATERS SUITE and SOIL LEACHABILITY SUITE comprising metals and non metals, speciated phenols, BTEX and MTBE, TPHCWG, speciated PAH.

Metals and non-metals	Limit of Detection
Arsenic (dissolved)	0.75 µg/l
Cadmium (dissolved)	0.22 µg/l
Chromium (dissolved)	3 µg/l
Hexavalent Chromium	0.03 mg/l
Copper (dissolved)	1.6 µg/l
Lead (dissolved)	0.4 µg/l
Nickel (dissolved)	1.5 µg/l
Selenium (dissolved)	1 µg/l
Zinc (dissolved)	5 µg/l
Mercury (dissolved)	0.01 µg/l
Ammoniacal Nitrogen as N	0.2 mg/l
Sulphate (soluble)	3 mg/l
Total Cyanide	0.05 mg/l
pH Value	1 pH unit

Speciated Phenol	Limit of Detection
total cresol	0.008 mg/l
total xylenol	0.008 mg/l
2,3,5-trimethyl phenol	0.008 mg/l
2-isopropyl phenol	0.008 mg/l

BTEX and MTBE	Limit of Detection
Benzene	7 µg/l
Toluene	4 µg/l
Ethyl benzene	5 µg/l
M & p xylene	8 µg/l
O Xylene	3 µg/l
GRO (C5-C12)	42 µg/l
MTBE	3 µg/l

TPHCWG	Limit of Detection
Aliphatics C5-C6	10 µg/l
Aliphatics C6-C8	10 µg/l
Aliphatics C8-C10	10 µg/l
Aliphatics C10-C12	10 µg/l
Aliphatics C12-C16	10 µg/l
Aliphatics C16-C21	10 µg/l
Aliphatics C21-C35	10 µg/l

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TPHCWG	Limit of Detection
Aromatics C6-C7	10 µg/l
Aromatics C7-C8	10 µg/l
Aromatics C8-C10	10 µg/l
Aromatics C10-C12	10 µg/l
Aromatics C12-C16	10 µg/l
Aromatics C16-C21	10 µg/l
Aromatics C21-C35	10 µg/l

Speciated PAH (US EPA 16)	Limit of Detection
Acenaphthene	0.011 µg/l
Acenaphthylene	0.015 µg/l
Anthracene	0.015 µg/l
Benzo[a]anthracene	0.017 µg/l
Benzo[a]pyrene	0.009 µg/l
Benzo[b]fluoranthene	0.023 µg/l
Benzo[g,h,i]perylene	0.016 µg/l
Benzo[k]fluoranthene	0.027 µg/l
Chrysene	0.013 µg/l
Dibenzo[a,h]anthracene	0.016 µg/l
Fluoranthene	0.014 µg/l
Fluorene	0.014 µg/l
Indeno[1,2,3-c,d]pyrene	0.014 µg/l
Naphthalene	0.1 µg/l
Phenanthrene	0.022 µg/l
Pyrene	0.015 µg/l

'ADDITIONAL' WATER SUITE comprising VOC's.

Volatile Organic Compounds	Limit of Detection (µg/l)
1.1.1.2-Tetrachloroethane	1
1.1.1-Trichloroethane	1
1.1.2.2-Tetrachloroethane	5
1.1.2-Trichloroethane	2
1.1.2-trichloro-1,2,2-trifluoroethane	25
1.1-Dichloroethane	1
1.1-Dichloroethene	1
1.1-Dichloropropene	1
1.2.3-Trichlorobenzene	3
1.2.3-Trichloropropane	9
1.2.4-Trichlorobenzene	2
1.2.4-Trimethylbenzene	1
1.2-Dibromo-3-chloropropane	10
1.2-Dibromoethane	2
1.2-Dichlorobenzene	3
1.2-Dichloroethane	4

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Volatile Organic Compounds	Limit of Detection (µg/l)
1.2-Dichloropropane	3
1.3.5-Trimethylbenzene	1
1.3-Dichlorobenzene	2
1.3-Dichloropropane	2
1.4-Dichlorobenzene	1
2.2-Dichloropropane	1
2-Chlorotoluene	2
4-Chlorotoluene	2
4-Isopropyltoluene	3
Benzene	1
Bromobenzene	1
Bromochloromethane	2
Bromodichloromethane	1
Bromoform	3
Bromomethane	2
Carbon Disulphide	2
Carbontetrachloride	1
Chlorobenzene	4
Chloroethane	2
Chloroform	2
Chloromethane	1
cis-1-2-Dichloroethene	2
cis-1-3-Dichloropropene	2
Dibromochloromethane	2
Dibromomethane	3
Dichlorodifluoromethane	1
Dichloromethane	3
Ethylbenzene	2
Hexachlorobutadiene	3
Isopropylbenzene	2
Methyl Tertiary Butyl Ether	2
Naphthalene	4
n-Butylbenzene	2
o-Xylene	1
p/m-Xylene	2
Propylbenzene	3
sec-Butylbenzene	1
Styrene	1
Tertiary amyl methyl ether	15
tert-Butylbenzene	2
Tetrachloroethene	2
Tert-amyl methyl ether	1
Toluene	1
trans-1-2-Dichloroethene	2
trans-1-3-Dichloropropene	3
Trichloroethene	2
Trichlorofluoromethane	2
Vinyl Chloride	1

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Appendix D Service Drawings

The following drawings are provided for information in hard copy:-

- Services Plan- Drawing Reference 1021927/WL/004
- Unlabelled A3 drawing on graph paper of the Pressure Reduction Facility at Dock Road, Limerick. (It is envisaged that these will have been removed prior to commencement on site).
- Gas Mains Layout, Limerick Gasworks – Bord Gais Networks dated 08/07/10. (It is envisaged that these will have been removed prior to commencement on site).
- Unlabelled A2 drawing of the ESB layout dated 09-Mar-09. (It is envisaged that these will have been removed prior to commencement on site).

A CD is also attached which contains the Bord Gais Networks' Safety Booklet DO/SQ/IS/002 Rev 0, dated 01.03.09 and the Code of Practice for Working in the Vicinity of Pipelines – BGE/WJ/48.

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Appendix E Criteria for Discharge Consent to Foul Sewer / Re-injection into the Ground

Temperature	<25°C
pH	6-10
BOD	<50 mg/l
COD	<300 mg/l
Nitrates (as N)	<10 mg/l
Sulphates (as SO ₄)	<500 mg/l
Phenols (as C ₆ H ₅ OH)	<3 mg/l
Arsenic	<0.6 mg/l
Mercury	<0.01 mg/l
Cadmium	<0.05 mg/l
Cyanide (total, free)	<3.0 mg/l
Lead	<0.5 mg/l
Copper	<5 mg/l
Zinc	<10 mg/l
Chromium	<0.5 mg/l
Total Polyaromatic Hydrocarbons (PAH)	<0.2 mg/l
Mineral Oils	<50 mg/l
Toxicity Units (as T.U)	<30 t.u

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**LIMERICK GASWORKS
PUMP AND TREAT (PHASE 1) REMEDIATION**

Part 3

SPECIFICATION AND DRAWINGS

Tender Reference no.: 10/054

Report Number: 1021927/R/22A

Rev. No.	Purpose	Originated	Checked	Approved	Date
1.0	Tender	NB	DW	TB	April 2012

Invitation to Tender		Limerick Gasworks Pump and Treat (Phase 1) Remediation
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- Appendix A Previous Reports**
- Appendix B Preliminary Safety and Health Plan**
- Appendix C Chemical Testing Suites and Reporting Order**
- Appendix D Service Drawings**
- Appendix E Criteria for Discharge Consent to Foul Sewer / Re-injection into the Ground**

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1 Introduction

1.1 Documentation Description

This specification details the pump and treat remediation works (Phase 1) to be undertaken at Limerick Gasworks. It is arranged using series letters and clause numbers generally in accordance with the divisions in Civil Engineering Standard Method of Measurement (3rd Edition) published by Thomas Telford, 1991 (CESMM3).

This introduction, (together with the Remediation Strategy detailed in Section 2) provides a general description of the site in order to assist the Contractor in his overall appreciation of the data and requirements. However, because of the generalisation it is not definitive and the requirements of the Specification (Section 5) shall take precedence if there is any ambiguity.

The specification is one of the documents which will comprise the Tender documents. The list of Tender documents for the project are detailed in Table 1.

Table 1. Tender Documents for the Project

Document Title	Reference	Prepared by
Instructions to Tenderers, Form of Tender and Appendix to the Form of Tender – Part 1	1021927/R/20	McCann FitzGerald
Conditions of Contract – Part 2	1021927/R/21	McCann FitzGerald
Specification and Drawings (this document) – Part 3	1021927/R/22	Mouchel
Bill of Quantities – Part 4	1021927/R/23	Mouchel

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1.1.1 Project Directory

Table 2 below identifies the project directory including emergency contact numbers.

Table 2 Project Directory

Role	Organisation	Contact Name(s)	Title	Address
Employer	Bord Gais Eireann	Declan Burke	Project Manager	(T) +353 (0) 21 453 4420 Email dburke@bge.ie
Engineer	Mouchel Ltd	Tony Brown	Technical Director	(T) +44 (0) 151 348 8112 (M) +44 (0) 7740 763238 Email tony.brown@mouchel.com
Project Supervisor (Design Phase)	Mouchel Ltd	Charlie Parkinson	Project Supervisor (Design Phase)	(T) +44 (0) 113 203 5632 (M) +44 (0) 7976 343938 Email charlie.parkinson@mouchel.com
Project Supervisor (Construction Phase)	Remediation Contractor – when appointed	TBC	TBC	TBC
Public Liaison	Bord Gais Eireann	Linda O'Brien	Liaison Officer	(T) +353 (0) 21 453 4183 Email liobrien@bge.ie
Main Contractor	Remediation Contractor – when appointed	TBC	TBC	TBC
Land Surveyors (original survey)	Murphy Global Consulting Surveyors	-	-	(T) +353 (0) 21 489 5704 Email cork@murphysurveys.ie
Regulators	Environmental Protection Agency	Brian Meaney	Senior Scientific Officer	(T) +353 (0) 53-9160600 Email B.Meaney@epa.ie
Local Authority	Limerick City Council	Kieran Reeves	Senior Executive Planner	(T) +353 (0) 61 407210 Email kreeves@limerickcity.ie www.limerickcorp.ie
Sanitation Authority	Limerick City Council	Ursula Ahern	Assistant Scientist	(T) +353 (0) 61 407190 Email uahern@limerickcity.ie

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Table 3 below identifies the utilities directory.

Table 3 Project Directory - Utilities

Utility	Organisation	Address
Public Sewers	Limerick City Council Water Services Department	Water Services Department (Water Supply, Sewerage), 2nd Floor, City Hall, Merchants Quay, Limerick, IRELAND (T) +353 (0) 61 407 229 www.limerickcorp.ie/Water/
Water	Limerick City Council Water Services Department	Water Services Department (Water Supply, Sewerage), 2nd Floor, City Hall, Merchants Quay, Limerick, IRELAND (T) +353 (0) 61 407 229 www.limerickcorp.ie/Water/
Electricity	ESB Network	www.esb.ie/esbnetworks/en/home/index.jsp (T) 1850 372 757 Email: esbnetworks@esb.ie
Gas	Bord Gais Networks	www.bordgais.ie/networks/
Telecoms	Eircom	www.eircom.ie

1.2 Site Location and Description

The 1.4 ha site is located in the City of Limerick approximately 100 m south east of the River Shannon and immediately south east of the Dock Road. The national grid co-ordinates for the site are E156950 N156650. A location plan is included as Drawing 1021927/PHASE 1 - TENDER/OD/001.

The site, roughly rectangular in shape, is generally level at approximately 5 m MHD (Malin Head Datum) but rises to approximately 8 m MHD towards the south and east boundaries.

The site is surrounded by housing and light industry to the northeast and housing to the southeast and southwest. To the northwest are Limerick docks comprising industrial properties, a graving dock, wet dock and the River Shannon.

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The site is currently not in use and access is managed by Bord Gais. The site includes a two-storey office block and other ancillary buildings (including No 5. store), none of which are used on a permanent basis. The No. 5 store (also known as the Generator Building), the walls around the AGI site and the masonry wall at the Dock Road boundary have Protected Status.

The remediation works are to be split into two phases. Phase 1 Pump and Treat remediation (this Phase) and Phase 2 Stabilisation / Solidification.

Drawing 1021927/PHASE 1 - TENDER/OD/002 presents the site layout (indicating historic structures and existing above ground structures).

Where grid cells are referenced in this report, the grid labels are indicated on Drawings 1021927/PHASE 1 - TENDER/OD/003 and 1021927/PHASE 1 - TENDER/OD/008.

1.3 Site History

The site history is summarised below:

- in the 1830's a limestone quarry was situated in the eastern part of the site, with a small gas works located on-site immediately to the north west of the quarry;
- by 1872 the gas works occupied the majority of the site, with a water feature located within the remaining quarry;
- the quarry had been backfilled by 1938, and an electricity substation was located on-site along the north east boundary;
- coal gas manufacture ceased in 1974 and the works became an oil gas plant until 1986 when natural gas was introduced;
- demolition and site clearance took place between 1988 and 1995.

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Site clearance (2009) was undertaken to facilitate access for the characterisation works undertaken in November 2009. Works also included the placement of gabion baskets along a short length of the south boundary wall (grid cells G12, H12, and I12 and grid cells L10, L11 and L12) as it was considered to be unstable. Shoring was also provided to the Dock Road wall.

The former Quarry and gasholder wells/ tar tanks etc are identified and numbered (T1, T2, T3 etc) on Drawing 1021927/PHASE 1 - TENDER/OD/008.

1.4 Definitions

For the purposes of these tender documents (Table 1), the following technical definitions apply:-

'NAPL' – Non Aqueous Phase Liquid – A liquid that is present in concentrations in excess of the saturation limit, is immiscible in water and is present as a discrete product.

'DNAPL' – Dense Non Aqueous Phase Liquid – A non aqueous phase liquid that is denser than water. It refers to liquid that is present either as free product or in pore space or adsorbed onto the surface of soil or other particles. It is not necessarily easily liberated or pumpable without thermal or chemical assistance.

'Free Product' – This refers to NAPL that is not locked into pore space or adsorbed onto the surface of soil or other particles.

'The Agency' – This refers to the Environmental Protection Agency.

1.5 Previous Assessments

The site has been subject to a number of previous assessments. These comprise:-

- five ground investigations - O'Connor, Sutton, Cronin (1995); Arup (1996); Parkman (2001 and 2003), Mouchel (2009 site characterisation, reported 2010)
- one desk study – Parkman (2001). But some desk based assessment undertaken by O'Connor, Sutton, Cronin (1995) and Arup (1996)

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- one quantitative risk assessment – Mouchel (2010 – based on the 2009 site characterisation).

These assessments are reported in the following documents which are provided for information on CD in Appendix A.

- i. Summary Report on Limerick Site – O’ Conner, Sutton, Cronin, August 1995,
- ii. Site Investigation Report: Volume 1 Report - Ove Arup, April 1996,
- iii. Site Investigation Report: Volume 2 Factual Site Investigation Data - Ove Arup, April 1996,
- iv. Desk Study Phase 1 Report – Parkman, April 2001 (report reference 25837/OR/01B),
- v. Site Investigation Factual Report Volumes 1A and B – Parkman, October 2001 (report reference 25827/OR/03B),
- vi. Site Investigation General Report Volume 2 – Parkman, October 2001 (report reference 25837/OR/04B),
- vii. Ground Investigation into Boundary Conditions and Quarry Backfill – Parkman, 2003 (report reference 25837/R/11A),
- viii. Preliminary Vibration Monitoring 18th May to 24th June 2009 – Reference NV/09/3857NL01. Dated 13th August 2009 – AWN Consulting,
- ix. Site Characterisation Factual Report 1021927/R/02 November 2011- Mouchel,
- x. Site Vibration Monitoring 4th to 27th November 2009 – Reference NV/09/3857NL03. Dated 4th December 2009 – AWN Consulting,
- xi. Former Gasworks, Dock Road, Limerick: Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 March 2010 – Mouchel, and Addendum Report 1021927/R/18 January 2012- Mouchel,
- xii. Environmental Impact Statement 1021927/R/07 – Mouchel,
- xiii. Natura Impact Statement 1021927/R/16- Mouchel,

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- xiv. Quarterly Groundwater Monitoring Report – Annual Summary 2009/10, 1021927/R/14, November 2010 – Mouchel,
- xv. Quarterly Groundwater Monitoring Report – Annual Summary 2011, 1034973/R/04, November 2011 – Mouchel,

1.6 Geology, Hydrology and Hydrogeology

This Section summarises the Mouchel 2009 Site Characterisation Factual Report 1021927/R/02 February 2010 and the Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 February 2010. More detailed information can be obtained from these reports, presented on CD in Appendix A.

1.6.1 Published Geology

The Geological Survey of Ireland, Sheet 17, Limerick, 1:100,000 Scale; the Geological Survey of Ireland publication “Geology of the Shannon Estuary” and the local geological memoir were consulted and indicated that the bedrock beneath the site comprises the Visean Limestones of the Lower Carboniferous Period.

1.6.2 Site Specific Geology

From the five previous site investigations (including the 2009 characterisation), the general sequence of ground conditions comprised; Made ground underlain by limestone, with localised alluvium around the site boundary extending from the north west to the south west of the site.

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The sequence encountered is summarised in Table 2.

Table 4: Summary of encountered ground conditions during the 2009 Site Characterisation.

Stratum	Range of depth strata encountered (m bgl)	Average thickness (m)
Made Ground	0 – 10	4.3
Alluvium	0 – 5.5	1.8
Limestone bedrock	0 - 10	-
Limestone quarry feature over the eastern half of the site – up to 10m deep.		

Limestone outcrops on the north east and south east boundaries.

1.6.3 Hydrology

The site is situated on the southern side of the River Shannon estuary, which flows westerly into the Atlantic. At the site, the estuary is approximately 200 m in width and subject to tidal influence.

The average rainfall for the area is between 800mm and 1000mm per year (taken from www.met.ie).

The site currently comprises approximately 60 % hard cover and 40 % free draining material (with many underground structures that may impinge on the infiltration and flow of rainwater/perched water through the made ground). There is a fall in the site level from the south east (8 m MHD) to the west and north west (5 m MHD), directing surface run-off in this direction. The River Shannon's water level is typically 0 m MHD near to the site.

1.6.4 Hydrogeology

The Groundwater Protection Maps for County Limerick (Maps 1-6) indicate that the underlying limestone is a 'Locally Important Aquifer' that is generally Moderately Productive (40-100 m³/d).

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The hydraulic properties of the aquifer are dominated by fissure flow and well-developed karst features have been observed in the area.

The nearest abstraction well is 6 km to the south east of the site. The oolitic limestones of the Limerick syncline are known to have relatively high permeabilities. The aquifer is classified as 'Vulnerable' due to the lack of impermeable cover or thick unsaturated zone.

There are no recorded active wells or boreholes in the vicinity of the site; although the historical site plan dated 1977 shows a well 5 m to the north west of Gasholder No.3 (T11). The well was not identified during any of the ground investigation works.

1.6.5 Site Specific Hydrogeology

The Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy report 1021927/R/03 includes a comprehensive section on site specific hydrogeology (Section 3.7.1).

Occasional pockets of perched water were encountered in trial pits in the made ground during the investigations undertaken at the site. However, these were not generally reported in any of the boreholes in any investigation. During the excavation of the trial pits in the 2009 investigation several pockets of perched water were encountered. As the excavations progressed in some instances the water drained away quickly, indicating the presence of impermeable obstructions within the made ground which have created localised areas of perched water.

One soakaway pit was excavated during the characterisation investigation in the made ground which was described as a sandy gravelly clay. A falling head permeability test was undertaken in the pit. The water dissipated very slowly over a period of several hours during the test.

Localised pockets of 'tarry liquid' were identified by Arups (1996). During the 2009 investigation a 'tarry / hydrocarbon' dense non aqueous phase liquid (DNAPL) was recorded in several locations and within some monitoring wells. Drawings 1021927/PHASE 1 - TENDER/OD/006 and 1021927/PHASE 1 - TENDER/OD/007 show areas of NAPL contamination in the made ground and within the fractured limestone bedrock during the recent (2009) and previous investigations respectively.

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Generally hydraulic continuity exists between the Made Ground and the bedrock due to the granular nature of the made ground, and therefore the groundwater potentially acts as one body.

The water table falls from approximately 7.8m MHD in the south eastern section of the site, to approximately 2.7m MHD on the boundary with Dock Road.

The groundwater data implies that there may be two sources of groundwater entering the site; Source 1 – Originating from the southern corner of the site from within the rock outcrop and Source 2 – Originating from the south east section where water is draining into the site.

The water appears to accumulate in the quarry area and flow in an approximately westerly direction as would be expected close to the river.

Mouchel have been undertaking groundwater monitoring at quarterly intervals since the first two visits in December 2009 and January 2010. The results are presented in Appendix A.

1.7 Identified Contamination Sources

This Section summarises information provided in the Mouchel Quantitative Risk Assessment, Options Appraisal and Remedial Strategy ref 1021927/R/03. This report should be referred to for further assessment.

1.7.1 Site Characterisation Identified Sources

The Mouchel 2009 site characterisation investigation identified several areas of extensive NAPL and ash material and one localised deposit of spent oxide ('Blue Billy').

Based upon visual and olfactory evidence gained during the investigation works, the primary areas of NAPL encountered during the characterisation investigation have been outlined in Table 5.

Post characterisation monitoring results including NAPL thickness are presented in the groundwater monitoring report(s) in Appendix A.

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Table 5. Primary areas of NAPL contamination

General area of site	Cell location	Visually Contaminated horizon from borehole logs (m MHD)	Thickness of heavily contaminated soil (m)	Predominant horizon type	Max Measured thickness of NAPL in BH installation (m)	Approx depth of groundwater (m MHD)
Deep Limestone feature (under Gasholder 2 (T12) and surrounds)	B05	1.48 to 0.98*	0.50	MG: Gravelly clay	-	3.7
	B06	2.65 to 1.45	1.20	MG: Gravelly clay	-	3.7
	B07	2.49 to 1.99	0.50	MG: Gravelly clay	-	3.6
	B08	3.69 to 0.99	2.70	MG: Gravelly clay	-	3.7
	C05	6.37 to 5.87	0.50	MG: Gravelly clay	-	4.5
	C06	4.35 to -0.65*	5.00	MG: Gravelly clay	-	4.1
	C07	4.45 to -0.45*	4.90	MG: Gravelly clay	1.78	4.0
	C08	4.68 to 2.38*	2.30	MG: Clayey gravel	-	3.9
	D05	-	0	-	-	5.2
	D06	-	0	-	-	4.7
	D07	4.60 to 2.30*	<u>2.30</u> Ave = 1.81	MG: Gravelly clay	-	4.3
Pre 1872 tank (T23)	D08	6.22 to 4.22	2.00	MG:Gravelly clay/ gravel	-	4.3
	D09	-	0	-	-	4.1
	E08	-0.16 to -1.16	1.00	Limestone Bedrock	-	4.8
	E09	3.92 to -0.08*	<u>4.00</u> Ave = 1.75	MG: sandy gravel	-	4.7
Former quarry area	E03	3.12 to 1.07	2.05	MG: clayey gravel	-	4.9
	E04	6.10 to 4.68	1.42	MG: gravel with NAPL	-	5.0
	F03	1.35 to 0.35	1.00	MG: gravelly clay	-	5.0
	F06	5.76 to 5.06	0.70	MG: sandy gravel	-	5.5
	F07	6.82 to 6.22	0.60	MG: gravelly clay	-	5.5
	G04	-1.55 to -4.55	3.00	Limestone Bedrock	1.24	5.2
	G05	-0.26 to -3.76*	3.50	Limestone Bedrock	-	5.3
	G06	5.20 to 3.70*	1.50	MG: gravelly sand	-	5.9
	G07	4.24 to 1.24*	3.00	MG: clayey sand	-	6.4
	H06	5.45 to 3.95	1.50	MG: clayey gravel	-	6.5
	I06	6.91 to 1.36*	5.55	MG: clays and gravel	-	6.9
I07	5.04 to 2.04	<u>2.00</u> Ave = 2.20	MG: Gravelly clay	-	7.1	
Booster House	F08	6.98 to 6.48	0.50	MG: gravelly silt	-	6.3
	F09	7.17 to 6.67	0.50	MG: gravelly silt	-	6.1
	F10 WS	6.52 to 6.27	<u>0.25</u> Ave = 0.4	MG: cobbles	-	5.3
Tar tank 7 (T28)	H08	4.15 to 2.95	1.20	MG: gravelly sand	-	6.8
	H09	5.65 to 3.65	0	MG:clayey gravel	-	6.8
	I08	4.11 to 2.81	1.30	MG: gravelly clay	-	7.1
	I09	4.15 to 3.45	<u>0.7</u> Ave = 0.80	MG: gravelly clay	-	7.0
Gasholder 3 (T11) and surrounds	J06	3.48 to 1.98	1.50	MG: cobbles	-	7.4
	K04	1.88 to 0.88	1.00	MG: gravelly clay	-	7.0
	K05	7.64 to 2.64	5.00	MG: gravelly clay	-	7.8
	K06	6.82 to 4.62	2.20	MG: gravelly clay	-	7.6
	L03	3.51 to 2.51	1.00	MG: gravelly clay	-	6.1
	L04	5.26 to -0.74	6.00	MG: cobbles-Limestone	-	6.6
	L05	6.91 to 2.41*	4.50	MG: gravelly clay	-	7.2
	L06	6.91 to 1.61*	5.30	MG: gravelly clay	-	7.3
M05	2.35 to 0.35	<u>2.00</u> Ave = 3.2	MG: gravelly clay	-	6.7	
Pre 1840 tank (T13)	D05	-	0	-	-	5.2
	D06	-	0	-	-	4.7
	E05	-	0	-	-	5.2
	E06	4.83 to 2.83*	<u>2.00</u> Ave = 0.5	MG: gravelly clay	-	5.3
Bord Gais office	F12 WS	0.50 to 1.2	0.70	MG: gravelly clay	-	5.2

*Free product intermittent throughout stated horizon MG = made ground

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During the characterisation investigation it was apparent that dissolved phase and free product may have been transported from these primary sources across the site. Hydrocarbon staining and odours were noted in the majority of locations at the site. Both dissolved phase and free product is known to have migrated into the fractured and weathered limestone.

1.7.2 Historically Identified Sources

The primary sources of contaminants identified during the assessments undertaken prior to the 2009 site characterisation were the underground tanks and gas holder wells, in addition to the backfill material within the former quarry. Secondary sources are sorbed phase contaminants in soil, free product that has leaked from the primary sources into the soil, or pooled there, dissolved phase contamination in groundwater, and free product contaminants in groundwater. Both dissolved phase and free product is known to have migrated into the fractured and weathered limestone.

Identified contaminants typically correlate with the presence of gasworks-derived tars, liquors, TPH, naphthalene and other waste materials located within underground tanks, structures and made ground, together with material used to backfill the quarry.

1.7.3 Known Underground Tanks

Numerous underground tanks are known to be present on site; the significant ones are highlighted on Drawing 1021927/PHASE 1 - TENDER/OD/008. Details of the tanks are presented in Table 6 below. All these tanks with the exception of T34 which straddles the south-western wall of the No.5 Store building (generator building) are known to be backfilled with materials predominantly contaminated with coal tars (sometimes as free product). T34 is known to be partially backfilled with the potential for standing water present.

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Table 6. Details of significant underground tanks

Tank Number & Age	Approximate Diameter	Approximate Depth of tank (source of data)	Approximate Volume of tank	Backfill?
T7 (pre-1919)	6m	1m (Arup 1996 TP14)	30m ³	yes
T11 (Pre-1902)	25m	6.0m (Mouchel 2009 J06, K04, K05, K06, L04, L05, L06, M05, M06)	2,945m ³	yes
T13 (Pre -1840)	10m	3.2m (Mouchel 2009 E06)	250m ³	yes
T14 (Pre-1840)	3m	2m (professional judgment)	14m ³	unknown
T15 (Pre – 1840)	10m	4.8m (Mouchel 2009 E07)	375m ³	yes
T23 (Pre -1872)	19m	5m (Mouchel 2009 E08, E09)	1,420m ³	yes
T28 (Pre-1872)	16m	4m (Mouchel 2009 H09, I08, I09)	800m ³	yes
T34 (Pre-1919)	4m x 13m (rectangular tank)	>2.3m (Connor 1995) 3m (professional judgment)	156m ³	partial
			5,990m³	Total

Based on this conservative assessment (no reduction due to dumpings has been included), it is estimated that the volumes of free product within the buried tanks will be in the order of 200m³, although the Contractor shall make his own assessment of the likely volume of free product present.

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1.7.4 *Former Quarry and Deep Limestone Feature*

An extensive former quarry is known to be present over the eastern half of the site and is up to 10m deep. Free product is present at its base. Drawing 1021927/PHASE 1 TENDER/OD/008 indicates the quarry location.

The quarry is shown as extending outside the boundary of the site in historical maps which appeared to be confirmed during the characterisation investigation as the edge of the quarry could not be located near the O'Curry Street boundary.

A deep area of made ground was identified by the ground investigations under the former large gasholder no. 2 (T12), which was an above ground waterless holder. It appears that a deep limestone feature is present at this location and free product has been identified at the base of the made ground. Anecdotal evidence suggests that a former gasholder well may have existed at this location.

Volumes of heavily contaminated material within the former quarry and deep limestone feature are estimated to be 800m³ and 450m³ respectively. Volumes of free product are estimated to be in the order of 80m³ and 60m³ respectively although the Contractor shall make his own assessment of the likely volume of free product.

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2 Remediation Strategy

2.1 Overview

The comprehensive characterisation site investigation and quantitative risk assessment (QRA) has identified the presence of:-

- total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene and xylenes (BTEX), polyaromatic hydrocarbons (PAH's), cyanide and heavy metals that pose a risk to human health.

Remediation Target Values (RTV's) have been derived for soils. Whilst a theoretical risk to the River Shannon has been identified, it is unlikely that an actual risk exists due to contaminant degradation and increased travel times. However, it should be noted that free phase hydrocarbons were not tested within the water samples. Therefore the models utilised assume no free product is present and the calculations are based on dissolved phase only. Therefore free product will require removal in order to allow justification of the risk assessments.

Further to a detailed options appraisal, the preferred remediation solution is to remove free product by pumping and treating with subsequent removal of DNAPL (for recycling/disposal) followed by ex-situ stabilisation / solidification of the uppermost 3m of made ground.

The remediation is to be undertaken over two separately tendered phases:-

- Phase 1 (this phase) comprises pump and treat works (including a 2 month pilot period);
- Phase 2 (subsequent phase to be tendered separately) is likely to involve excavation to 3m depth (or shallower where rock is present) followed by on site treatment, stabilisation and replacement.

This remediation strategy is relevant to the Phase 1 - Pump and Treat remediation.

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Free product is generally present as coal tars (DNAPL) at the base of several underground tanks, within the quarry area and within a deep limestone feature. At a number of locations, generally within tanks, DNAPL is also present within pore space and adsorbed onto soils and may require thermal or chemical assistance to liberate it. A secondary aim of the pump and treat remediation is to minimise the likelihood of problematic odours during the Phase 2 excavation works.

It is envisaged that the pump and treat works shall comprise a closed system to minimise odour emissions. Groundwater monitoring wells shall be installed with water being pumped into 'injection' wells and a DNAPL/ water mixture pumped from other 'extraction' wells. The DNAPL is then separated from the mixture using gravity settlement tanks and temporarily stored in Intermediate Bulk Containers (IBC's) or similar vessels prior to removal from site for recycling or disposal. As indicated in Sections 1.7.3 and 1.7.4, it is roughly estimated that a volume in the order of 340m³ of free product will require removal from site, although the Contractor shall make his own assessment of the likely volume of free product to present.

Water samples shall be taken as directed by the Engineer from a point immediately before the water treatment plant and tested for the suites as indicated in Appendix C.

Water removed as part of the process shall be passed through a suitable water treatment plant prior to re-injection to the ground or disposal to foul sewer under an appropriate licence in accordance with the criteria identified in Appendix E.

The preferred Contractor who is deemed to provide the most economically advantageous tender shall have a pilot period of no more than 2 months to prove that the chosen pump and treat methodology can successfully remove the free product and to demonstrate that appropriate disposal / recycling facilities are available.

The whole project is expected to last between 8 and 12 months (depending on extraction rates and the proposed methodology) including the 2 month pilot period.

The Contractor shall be required to provide detailed method statements for their proposed methodology including details of the works to be undertaken during the pilot period. Details are provided in Part 1 of the tender documents (Instructions to Tenderers).

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2.1.1 Pilot Study

A pilot study period is available and shall be utilised by the Contractors to prove that their chosen methodology will successfully remove the free product and to demonstrate that appropriate disposal / recycling facilities are available.

The preferred Contractor shall undertake pilot works over a maximum period of 2 months (including reporting) from award of 'Preferred Contractor' status. It is at the Contractor's discretion to shorten the period if he can demonstrate that time and cost savings can be made by doing so without comprising the outcome. The Contractor shall prepare a report on the progress and suitability of his chosen method and submit his findings to the Engineer within the pilot period.

The Contract for the full pump and treat works shall be awarded within 2 weeks of the successful completion of the pilot period.

A maximum allowance of €30,000 has been allocated by Bord Gais for the pilot period and shall include all the Contractor's requirements including welfare, temporary accommodation and health and safety provisions. All works within this period shall be undertaken in accordance with the Contract Documents (including the Specification), except in the case of welfare facilities, accommodation, health and safety and reporting which shall be appropriate for the works undertaken and shall comply with all relevant legislation.

Any additional costs incurred above the €30,000 allowance shall be borne by the Contractor.

2.2 Site Constraints

The following site constraints have been identified as requiring due allowance in the design of the remediation works. Other constraints may exist that have not been identified. Reference should be made to Drawing 1021927/PHASE 1 - TENDER/OD/008 (which indicates the locations of all identified site constraints) and to the Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy report 1021927/R/03 February 2010 for further details of site constraints identified.

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2.2.1 Unstable boundary walls / steep slopes / buildings

A significant proportion of the boundary walls are considered to be potentially unstable. These include the following:-

- 1) Dock Road wall (north western boundary) and the Above Ground Installation (AGI) boundary wall – these are constructed of masonry limestone blocks and are up to 6m in height. They have Protected Status.
- 2) Brick boundary walls (south western and south-east) – these are currently being stabilised by the use of gabion baskets covered in ‘shotcrete’. The walls vary in height between approximately 2 and 4m.
- 3) O’Curry Street wall (north eastern boundary) – this acts as a retaining wall to the pavements/ services on O’Curry Street and has a steep slope in front of it on the site side of the wall.
- 4) In addition to the above, the No 5 Store and buildings adjacent to the south western boundary could be affected by vibration during the works.

Remedial works are to be undertaken under and in the vicinity of the structures in 2) above prior to the pump and treat remediation works commencing. Details will be provided when they are available. It is also likely that a retaining structure will be constructed at the location of the O’Curry Street wall prior to works commencing.

2.2.2 Restricted Access

Currently, all vehicle and pedestrian access/egress is from O’Curry Street. However, there are no known restrictions on use of the Dock Road entrance and the Contractor shall make his own assessment of how to make best use of these two entrances/exits.

2.2.3 Retained and Relocated Structures

Several structures will need to be retained on site and works will need to be designed to allow any remediation required to be undertaken as close as possible to the structures. It is likely that most existing structures on-site such as the Govenor House, Booster House and some internal walls will be demolished prior to remedial works commencing.

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It is anticipated that the retained structures will comprise:-

- 1) ESB electricity sub-station & DRI – to be located at the boundary with O’Curry Street.
- 2) No. 5 Store (Generator Building) - Protected Status. This is a large masonry building which has a large underground tank associated with it that extends to the south-west of the building.
- 3) AGI site walls – Protected Status. This is a large masonry wall around 2 sides of the AGI site.
- 4) Bord Gais offices - to be retained (available for limited use as site accommodation during the remediation works if the Contractor requires).

In addition, a new DRI (District Regulator Installation) and a new ESB sub-station are to be constructed adjacent to the O’Curry Street entrance, and their proposed locations are presented on Drawing 1021927/PHASE1-TENDER/OD/002. Remedial works will be undertaken beneath these two structures and to a distance of 3m from the structures, prior to works commencing.

2.2.4 *Known Underground Tanks*

Refer to Section 1.7.3 of this document.

2.2.5 *Former Quarry and Deep Limestone Feature*

Refer to Section 1.7.4 of this document.

2.2.6 *Limestone Outcrops*

Limestone outcrops near the south-eastern and north-western boundaries of the site and is identified on Drawing 1021927/PHASE 1 - TENDER/OD/008. In particular, a limestone face, up to 8m in height, is present along parts of the south-eastern and north-eastern boundaries.

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2.3 Other Issues for Consideration

2.3.1 Access and shared facilities for Other Contractors

It is unlikely that there will be any other Contractors working on site during the remedial works. However, it is possible that another Contractor or Contractors could be on site if works in the area of the existing ESB sub station, the gabion baskets and the proposed sub station and DRI adjacent to the O'Curry Street entrance are not completed before Phase 1 commences on site. If this is the case it will be necessary for the Remediation Contractor to make appropriate access onto and across the site as well as around the required site feature (sub station, gabion baskets etc). In addition, access shall be made available to welfare and health and safety facilities and allowance shall be made for providing any necessary inductions.

Drawing 1021927/PHASE 1 – TENDER QD/02 indicates the site layout with the site features relevant to this issue highlighted.

2.3.2 Waste Licence

A Waste Licence application has been made to the Environmental Protection Agency (The Agency) in relation to the remediation works (Phases 1 and 2). However, it is unlikely that the licence will be received before the tender return date. Therefore, any conditions attached to the Waste Licence in relation to Phase 1 will be forwarded to the Preferred Contractor (s) who will be asked to confirm that there will be no changes to their programme, methodology and rates. Should there be any changes, Bord Gais reserves the right to consult with other tenderers.

Series A751 of this document lists the Conditions that are likely to be attached to the Waste Licence, based on previous licence applications and the Contractor shall allow for compliance with these conditions within his programme, methodology and rates.

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2.3.3 *Planning*

A planning application has been submitted to Limerick City Council in relation to the remediation works (Phases 1 and 2). However, it is unlikely that the conditions will be received before the tender return date. Therefore, any planning conditions relating to Phase 1 will be forwarded to the Preferred Contractor(s) who will be asked to confirm that there will be no changes to their programme, methodology or rates. Should there be any changes, Bord Gais reserve the right to consult with other tenderers.

2.3.4 *Buried Services*

Underground services may be present at the site. Electricity, water and sewer pipes service the office building. The AGI has been removed and the electricity substation will most likely have been moved and relocated along with a DRI to the O'Curry Street boundary by the time the remedial works commence. Gas and electricity services may still be present on site. For information, as-built details of their locations are provided in Appendix D.

The Contractor shall satisfy himself as to the location of any underground or overhead services in the vicinity of the Works. He shall be responsible for any repair costs to services or losses consequent to their inadvertent disconnection as a result of his works/actions.

The locations of all 'injection' and 'extraction' wells shall be checked for services by the Contractor prior to drilling. Where drilling is to take place in the vicinity/adjacent to possible live services, a trial pit shall be excavated to expose the service prior to drilling, in consultation with the relevant utility provider.

2.3.5 *Traffic Safety and Management*

The Contractor shall take whatever measures are necessary, at his own cost, to ensure that no mud or other material is deposited on the local road network to the satisfaction of the Engineer and Local Authority. Any costs associated with this work (eg road sweepers etc) shall be deemed included in the rates.

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2.3.6 Licenses

The Contractor shall be responsible for the application and procurement of any licences, and the payment of any taxes, duties etc necessary to accomplish the Works (with the exception of the Waste Licence and Planning Application).

2.3.7 Protection of Structures

The Dock Road boundary wall, Generator Building (No. 5 Store) in the eastern corner and the AGI wall have Protected Status.

The Contractor shall take all necessary steps in his method of working to prevent damage to on-site and adjacent structures due to excavations and vibrations caused by executing the Works, and shall be responsible for rectifying any damage caused. Details of how the Contractor shall monitor and prevent damage shall be provided in his tender.

Vibration monitoring shall be undertaken when drilling 'injection' or 'extraction' wells in the vicinity of unstable structures such as the Dock Road wall, the No 5 store and adjacent residential / commercial properties (to the rear of the existing office buildings).

2.3.8 Japanese Knotweed

As far as is known, Japanese Knotweed is not present at the site. However, should the Contractor identify any stands, the area shall be fenced (initially with hazard tape and fence pins), all on-site staff and visitors informed to prevent access and inadvertent spreading and the Engineer shall be informed immediately.

2.3.9 Security

The Contractor shall provide 24hr security at the site for the duration of the contract.

2.3.10 Asbestos

The ground investigation documents have not identified any areas where asbestos has been found in the ground. However, In the event of material suspected to be asbestos being encountered, the Contractor shall deal with the materials in accordance with relevant legislation.

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2.4 Remediation Completion Criteria

The proposed completion criteria for the Phase 1 recovery of DNAPL is as follows:

- 1) The quarterly groundwater monitoring which has been undertaken at the site will provide a set of baseline data for the thickness of the DNAPL present (significant DNAPL detected has been confined to the quarry base, the limestone feature and within some tanks). The average thickness of DNAPL in appropriate wells will be calculated and provided to the Contractor prior to commencement of the works. Reports detailing the findings of the post characterisation groundwater monitoring are presented in Appendix A. In addition, the groundwater monitoring chemical analysis data set will provide baseline information on the chemical composition of the groundwater at the site.
- 2) Method statements will be required from the successful contractor to provide detailed and accurate data on the volume and rate of DNAPL recovery. Samples of pumped water will be taken prior to entering the water treatment plant on a weekly basis by the contractor, to assess the groundwater chemical composition (the suite of analysis is identified in Appendix C). The contractor will also be required to propose the indicator criteria considered most appropriate to assess the recovery methodology, and determine when the recovery operation should cease.
- 3) The DNAPL recovery will be continued until the contractor is instructed to cease by the Engineer. The decision will be based on the appropriate indicator criteria for the recovery methodology (e.g. volume of DNAPL recovered, DNAPL recovery rates and pumped water chemical composition). At this point the DNAPL recovery will cease and the thickness of DNAPL in appropriate wells will be monitored daily (Monday-Friday). Ten successive monitoring results that show the thickness of DNAPL to be equal to or below ten percent of the original average thickness are required to validate the Phase 1 remediation.

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3 Schedule of Drawings

Drawing Title	Drawing No.	Drawing Detail
Site Location	1021927/PHASE 1 -TENDER/OD/001	Site location
Site Layout (including historic structures and existing above ground structures)	1021927/PHASE 1 - TENDER/OD/002	Layout of the site including the location of historic structures and existing above ground features.
Characterisation Exploratory Hole Location Plan	1021927/PHASE 1 - TENDER/OD/003	Locations of exploratory holes from the 2009 site characterisation investigation.
Previous Investigation Exploratory Hole Location Plan	1021927/PHASE 1 - TENDER/OD/004	Locations of exploratory holes from 1995, 1996, 2001 and 2003.
Cross Sections	1021927/PHASE 1 - TENDER/OD/005A to OD/005H	8 No. cross sections NE-SW and NW-SE across the site indicating ground level, made ground type, underlying geology and groundwater level.
Encountered NAPL (Characterisation)	1021927/PHASE 1 - TENDER/OD/006	Encountered extent of NAPL overlying the site layout, exploratory hole locations and rock head contours.
Encountered NAPL (Historic)	1021927/PHASE 1 - TENDER/OD/007	Locations of encountered NAPL from the 1995, 1996 and 2003 investigations.
Constraints Plan	1021927/PHASE 1 - TENDER/OD/008	Identified constraints including unstable walls, above ground structures to be retained, limestone outcrops, known significant underground tanks and the former quarry/deep limestone feature.
Existing Offices Floor Layouts	1021927/PHASE 1 - TENDER/OD/009	Layout of the ground and first floors of the site offices.
Information Boards	1021927/PHASE 1 - TENDER/OD/010	Layout required for the information boards to be erected at the site entrances.
Dust and Vibration Monitoring Locations	1021927/PHASE 1 - TENDER/OD/011	Locations and grid references for dust and vibration monitoring points.
Topographical Survey	1021927/PHASE 1 - TENDER/OD/012	Topographical survey of the site.

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4 Conditions of the Waste Licence

A Waste Licence application has been submitted to the EPA. The final conditions are unlikely to be known before the tender return date. Anticipated conditions are presented in the Specification Series A751. Please note that this list is not considered exhaustive.

For the purpose of pricing his tender, the Contractor should assume that the anticipated conditions will apply. When final conditions are known, clarification will be sought from the Preferred Contractor(s) as per Section 2.3.2 of this Specification.

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5 Specification Series

5.1 Schedule of Items Required

CLASS A: GENERAL ITEMS (Section 5.2)

Clause	Item
100	Contractual Requirements
110	Performance Bond
120	Insurance of the Works
130	Third Party Insurance
140	Professional Indemnity Insurance
200	Requirements of the Engineer
210	Accommodation for the Engineer's Staff
220	Services for the Engineer's Staff
230	Equipment for the Engineer's Staff
240	Attendance upon the Engineer's Staff
280	Reports required by the Engineer
300	Method Related Items
310	Accommodation & Buildings
320	Services
700	General Requirements
710	Duties and responsibilities of the Engineer and their Staff
720	Information Boards
730	Answerphone
740	Survey Information
750	Licences, Notices & other Documents
751	Waste Licence
752	Planning Consent
753	Site Waste Management Plan
760	Service Location, Diversions and Special Requirements for Statutory Authorities
770	Health and Safety Requirements
771	General Health and Safety and Environmental Management Considerations
772	Traffic Safety & Management
773	Tidiness of the Site
780	Self Audit of Procedure
800	Noise, Vibration, Dust and Odours
810	Control of Noise and Vibration
820	Monitoring Noise
830	Monitoring Vibration

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- 840 Control of Dust
- 850 Monitoring of Dust
- 860 Control of Odours
- 870 Monitoring of Odours

900 Condition Survey and Protection of Features

- 910 Condition Survey
- 920 Protection and Preservation of Features

CLASS C: GEOTECHNICAL AND OTHER SPECIALIST PROCESSES (Section 5.3)

900 Remediation

- 910 Pilot Study
- 920 DNAPL Recovery
- 921 Plant
- 922 Pumping, Injection and Monitoring Wells
- 930 Samples
- 940 Chemical Tests for Soils and Liquids
- 950 Contaminated Materials and Removal from Site
- 960 Discharge Consent

CLASS X: MISCELANEOUS WORK (Section 5.4)

100 Fences and Gates

- 194 2.0m High Temporary Mesh Panel Fencing

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5.2 CLASS A: GENERAL ITEMS

A100 Contractual Requirements

A110 Performance Bond

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A120 Insurance of the Works

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A130 Third Party Insurance

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A140 Professional Indemnity

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A200 Requirements of the Engineer

Temporary accommodation for the Engineer's staff (and Contractor) shall be provided on Site. The existing Bord Gais offices are currently unoccupied but could be utilised by the Contractor as he sees fit. They could be utilised as office space, however, they are not in a particularly good state of repair and any proposed use should take this into account. Bord Gais have advised that the following facilities are available, but no reliance is provided as to the accuracy or condition of the equipment / services; male/female toilets, office space with limited chairs and desks, mini fridge, dimplex heaters cold water supply and 220v electricity.

The layout of the Bord Gais offices is shown on Drawing 1021927/PHASE 1- TENDER/OD/009.

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The accommodation and all furnishings, services and equipment shall be ready for occupation and use by the Engineer from the date of commencement of the Phase 1 pump and treat works.

No item supplied under the requirements of A200 shall bear the name of the Contractor.

A210 Accommodation for the Engineer's Staff

The items below will be provided for the duration of the contract. All durable items shall be returned to the Contractor at the end of the contract.

Accommodation for the Engineer, which shall be in the form of shared office and facilities with the Contractor's supervisory staff (items a) to f)), which shall be designated no smoking areas, kept clean and shall comprise:-

a) Engineers's Representative Office

Separate from the Contractor's own accommodation with a floor area no less than 12 square metres, ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum of 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

- 2 desks approximately 2m x 1.5m with lockable drawers
- 2 chairs to suit with arms
- 1 book case
- 1 waste paper basket

b) Secondary Room

Area not less than 8 square metres, ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

- 1 desk approximately 2m x 1.5m with lockable drawers
- 1 chair to suit with arms

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1 book case

1 waste paper basket

c) Meeting Room

Ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

A large table with sufficient space for 10 persons to sit comfortably.

10 chairs to suit with arms

1 waste paper basket

d) Access and hard standing

A hard standing for three cars, adjacent to the accommodation and maintain a clean access to the accommodation at all times, also access must be afforded between the car park areas and accommodation without recourse or need to wear safety boots. Existing areas of hard standing may be suitable for this purpose. The hard standing can remain at the end of the contract period.

e) Sanitary Facilities

A sanitary convenience containing:-

A wash basin with hot and cold running water and supply of soaps or other cleansers

Flushing water closet

Towel rail with clean towels

Shower unit with hot and cold water

f) A Kitchen/Store

Sink unit with combined lower cupboard

Small electric cooker or microwave, with oven and grill

Small electric fridge

Cooking utensils and crockery/cutlery sufficient for all staff and 3 visitors

Toaster

1 electric kettle

1 teapot and sufficient mugs for all staff and up to 10 visitors to allow for meetings.

Supplies of tea, coffee, sugar, milk, soaps, towels etc as required

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A220 Services for the Engineer’s Staff

The Contractor shall provide, maintain and make all payments for the following services to the accommodation identified in Clause A210 for the duration of the remediation works. Connections are to remain on completion of the contract for subsequent remedial phases:

- telecommunications

A230 Equipment for the Engineers’s Staff (Provided by Contractor)

The items below shall be provided for the contract.

The Contractor is to fully insure for the duration of the contract any valuable items listed below as well as any other valuable equipment brought to Site by the Engineer.

a) Stationery

- 2 clipboards
- 1 pencil sharpener
- 1 paper hole punch and stapler
- 2 multiple letter trays
- 1 pin board 1m x 2m with pins
- 10 No. A4 size lever arch files

b) Technical Equipment

- Broadband access
- 1 telephone with answerphone on separate line
- Access to a printer with copying and scanning facilities and sufficient paper.

c) Personal Protective Equipment

- 4 pairs of safety wellingtons to BS EN1870 ‘Dunlop Safety Plus’ or similar sizes to be confirmed
- 4 No white safety helmet to BS EN397, with reduced peak or similar
- 4 No. high visibility waistcoat, to BS EN471 class 2
- 4 No. high visibility jackets to BS EN471 class 3
- 1 No. high visibility over trousers to BS EN471 class
- Blue disposable overalls, (Tyvek pro-tech™ or equivalent) sufficient in quantity for the Engineers staff and visitors as required.

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All personal protection equipment is to be stored in a locker within the changing room of the decontamination area, provided by the Contractor.

d) Testing Equipment

Use of the Contractor's testing equipment suitably maintained and calibrated, including:-

- 1 no Photo Ionisation Detection meter.
- Portable oil/water interface meter.
- Water sampling equipment including bailers, string and bucket with volume increments.

All testing equipment shall be intrinsically safe.

It is anticipated that the equipment will be required on a periodic basis. A programme of when the equipment will be needed will be provided by the Engineer at the start of the contract.

A240 Attendance upon the Engineer's Staff (Provided by Contractor)

The Contractor shall provide at intervals during the Remediation works, a suitably trained and experienced person (or persons) to assist the Engineers staff with the following typical tasks:

- Survey / measurement work;
- Water/soil sampling
- Other tasks, as requested.

The Contractor shall provide the Engineer with the names of persons to assist the Engineers staff with these tasks.

A280 Reports Required by the Engineer (Provided by Contractor)

a) Prior to the commencement of the project, the Contractor shall provide the schedule of proposed recycling/disposal facilities for this project.

The Contractor shall supply reports and information to the Engineer and other members of the project team, as set-out below.

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A 'weekly progress report' shall be completed by the Contractor each Monday morning and e-mailed to the Engineer. The report shall include critical activities, environmental monitoring, downloaded weather information, as well as analytical results from the remediation process. The pro-forma for this report is to be provided by the Engineer before work starts. Record sheets identifying the details of remediation works undertaken shall be attached to the report.

www.met.ie/climate/daily-data.asp presents daily weather information which shall be collated for the week immediately preceding the issue of the weekly progress report. Using the relevant drop down boxes on the right side of the page, select Shannon Airport and then the relevant date to view the data.

Wind direction shall be measured at 9:00, 12:00 and 15:00 each working day and the daily average recorded in the weekly progress report. Record sheets identifying the details of remediation works undertaken shall be submitted to the Engineer on a weekly basis.

Records of work completed to support each monthly valuation submission, shall be supplied to the Engineer in a format to be agreed with the Engineer.

All information relating to the work undertaken by the Contractor, including the Safety and Health File is to be supplied to the Engineer prior to the issue of the Certificate of Substantial Completion.

Details of all complaints, accidents, incidents and near misses which the Contractor may receive including those against which he is required to indemnify the Employer, shall be notified without delay to the Engineer.

Likewise, the Engineer will pass to the Contractor any such complaints or warnings which may be submitted directly to the Engineer or the Engineer's Representative. The Contractor shall undertake appropriate levels of investigation to identify causes and learn lessons, where appropriate. Serious incidents shall be investigated and reported, as directed by the Engineer. All accidents, incidents, near misses and complaints shall be recorded on a summary sheet which shall be issued at each progress meeting. This shall include a summary of corrective actions taken, including investigations.

Two days prior to each monthly progress meeting the Contractor is to prepare a progress report, to include details of the Remediation works under the following headings, as a minimum:

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- Completed Actions from Previous Meeting;
- Progress and Programme;
- Health, Safety and Environment;
- Subcontractors and Suppliers;
- Engineer's Instructions Received;
- Information for the Safety and Health File/Verification Report.

The following information required for the preparation of the Validation Report shall be provided to the Engineer on a monthly basis:

- Surveys and site investigation records
- Waste management/disposal licences.
- Registered waste carriers certificates.
- Records of any consents, authorisations or licences obtained.
- Analytical results from the DNAPL recovery works.
- Waste recycling / disposal records, including DNAPL recycling/disposal summary and daily off site removal records, waste consignment / waste transfer notes
- A record of any validation samples collected including reference by location and depth.
- Air quality monitoring results for dust and organic vapours, including laboratory test results.
- Noise and vibration monitoring results.
- Laboratory QA/QC data report, including Shewart Charts.
- Record of all samples submitted for laboratory testing.

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- Groundwater monitoring results.
- Other information requested by the Engineer.

b) To supplement the downloaded weather data, a 2ft wind sock with bracket shall be obtained from a supplier such as Metcheck - www.metcheck.co.uk/acatalog/Wind_Socks.html and erected at a location on site as agreed with the Engineer. The wind sock shall remain on site on completion of the works.

A300 Method Related Items

A310 Accommodation and Buildings (Provided by Contractor)

The Contractor shall provide, maintain and keep clean facilities for all persons working on the Site in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010, appropriate to the size and duration of the project, including canteen, mess rooms, sanitary facilities, offices and stores. All infrastructure required by the waste licence shall be established prior to commencement of the licensed activities.

In addition the Contractor shall supply the following:

- a) Hygiene facilities to comply with figure 3 of 'Protection of Workers and the General Public during the development of contaminated land' published by HMSO. Fencing shall be provided in such a way that the only non-vehicular accesses between clean and dirty areas shall be through the hygiene facilities.
- b) Canteen, mess rooms and offices for the use of the Contractor.
- c) Provision of shared welfare, first aid and accident emergency cover in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 including:-
 - Washing facilities
 - First aid boxes
 - Sanitary conveniences

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- Ambulance arrangements
- First aid room
- Accommodation for clothing and taking meals
- Appropriate Personal Protection Equipment (PPE) for Contractor's staff. Where disposable overalls are required, these shall be blue in colour, Tyvek protect™ or equivalent.

A320 Services

a) The Contractor shall provide, maintain and make all payments for services to the accommodation identified in Clauses A210 and A310 for the duration of the contract.

The Contractor shall provide at his own cost a continuous temporary water supply solely for the purpose of the accommodation facilities (Clauses A210 and A310). Only clean fresh water from the mains may be used for domestic purposes. He shall make his own arrangements with the water company for obtaining water from the mains and for the provision of any temporary mains, standpipes, stopcocks, meters and hoses and for removal of same at completion.

The Contractor shall not use plastic pipework within the ground, for any temporary water mains which may allow contaminants from the Site to contaminate the water supply.

Sufficient sanitary conveniences for all operatives and Site staff engaged on the Remediation works shall be provided and maintained by the Contractor in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010.

The Contractor shall ensure that all operatives and Site staff are aware that the sanitary convenience provided must be used by all personnel and the Engineer reserves the right to require the dismissal of any person committing nuisance on or about the Site by failing to use the convenience provided.

The Contractor shall arrange for the disposal of sewage effluent arising from Site toilets, the Contractor's office and Engineer's accommodation.

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The Contractor shall supply at his own cost a continuous temporary supply of electricity for the Remediation works.

The Contractor shall provide all other amenities in accordance with the above mentioned Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 and Working Rule Agreement, including adequate heating, lighting, attendance, cleaning and laundry etc.

b) Security is to be provided by the Contractor who shall:-

- i) Maintain gates, walls and fencing to provide adequate site security to the boundary.
- ii) Provide 24 hour security at the site for the duration of the Contract.
- iii) Monitor and maintain a record of all personnel and vehicles entering and leaving the Site.
- iv) Ensure that the access gates are locked at all times unless required for access or egress.

A700 General Requirements

A710 Duties and Responsibilities of the Engineer and their Staff

a) The Conditions of Contract

The Conditions of Contract shall comprise Part 2 of the Tender Documents (ref 1021927/R/21).

b) Staff Duties and Authorities

The names of the staff who will be involved with the supervision of the site works will be given to the Contractor when the Contract has been awarded.

In accordance with the Conditions of Contract Clause 1(1)c the Engineer will be:

Mouchel Limited

The name of the Chartered Engineer who will act on behalf of the Engineer and assume the full responsibilities of the Engineer under the contract will be:

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Tony Brown – BEng, CEng, Eur Ing, MIEI, FICE, SiLC.

In accordance with the Conditions of Contract the Engineer may appoint a “Representative”, in which case his name will be given to the Contractor when the Contract has been awarded.

The Engineer’s Representative shall have no authority:

- (i) to relieve the Contractor of any of his duties or obligations under the contract
- (ii) to order any work not approved by the Engineer or included in the programme submitted by the Contractor in accordance with Clause 14 of the Contract, or included in the priced Bill of Quantities
- (iii) to make any variation of or in the works

The Engineer’s Representative will have the authority

- i) to carry out and agree a measurement of the works with the Contractor
- ii) to query, confirm and sign Contractor’s record sheets.
- iii) to approve the classification of tested excavated material.
- iv) to approve excavation formations.
- v) to issue instructions that may be necessary to enable him to carry out his duties and to secure his acceptance of materials and workmanship as being in accordance with the Contract.

The Engineer will notify the Contractor in writing should these delegated powers need revision.

The names of the assistants appointed by the Engineer in accordance with Clause 2(2) of the Conditions of Contract will be given to the Contractor when the Contract has been awarded.

The Engineer’s Assistants have the same delegated powers as the Engineer’s Representative.

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The Engineer's Representative and Engineer's Assistants will undertake the following principal routine duties:

- a) the organising and phasing of the Engineer's Staff according to the constructional programme supplied by the Contractor
- b) to inspect the Permanent Work to ensure that the Contractor has positioned the works at the correct line and level, and that the materials and workmanship comply with the Specification
- c) to oversee tests carried out on the site, the inspection of materials and manufacture at source
- d) the keeping of a diary constituting a detailed history of the work done during construction and of all happenings at the site, and the submission of regular periodic progress reports to the Engineer
- e) measuring in agreement with the Contractor's staff the quantities of work executed, and checking day work and other accounts in order that the interim and final payments due to the Contractor may be confirmed and certified by the Engineer
- f) in the case of any work for which the Contractor may claim payment as additional work, agreeing with the Contractor methods of recording additional work and recording all relevant circumstances, including cost of labour and materials, in order to ensure that agreement exists on matters of fact before any question of principle has to be decided by the Engineer or arbitrator
- g) recording and checking the progress of the work in comparison with the programme
- h) examination of the methods proposed by the Contractor for the execution of the work of the Temporary Works undertaken by him, the primary object being to ensure the safe and satisfactory execution of the permanent work by the Contractor.
- i) any necessary redesign of work for submission to and approval by the Engineer

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j) ensuring that the Contractor is recording on the working drawings, or on drawings prepared for the purpose, the actual level and nature of all foundations, the character of the strata encountered in excavation and full details of any deviations from the working drawings which may have been made during the execution of the Works, so as to permit the Engineer to approve the Contractor's "as built" drawings.

A720 Information Boards (Provided by Contractor)

The Contractor shall provide, maintain and remove on completion of the Works, information boards as shown on Drawing 1021927/PHASE 1 - TENDER/OD/010.

The main information board shall be provided at both entrances (as indicated on Drawing 1021927/PHASE 1 – TENDER/OD/002). They shall be of sufficient size to accept the Bord Gais Information Board (2440mm x 1210mm) in addition to the Contractor's and Consultant's name boards, each to be 2440mm x 610mm in size.

The Contractor shall also provide at each site access/and egress, a secondary board clearly showing the information required to be displayed under the terms of the Waste Licence (800mm X 1200mm minimum in size).

The board shall clearly show:

- a) the name and telephone number of the facility;
- b) the normal hours of opening;
- c) the name of the licence holder;
- d) an emergency out of hours contact telephone number;
- e) the waste licence reference number; and
- f) where environmental information relating to the facility can be obtained.

A730 Answerphone

The Contractor shall provide a dedicated phone line for queries/complaints regarding the siteworks. The number of this shall be shown on the board provided at each site access.

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The phone line shall include an answerphone facility to enable calls to be taken outside working hours. The Contractor shall arrange for all queries to be answered within 72 hours of their receipt.

The phonenumber shall remain on site at the end of the contract for reuse during the second phase of remedial works.

A740 Survey Information

a) A copy of the original topographic survey will be issued to the Contractor in digital format as an AutoCAD (2009) file to permit the Contractor to confirm the information provided. The Contractor shall then use this survey as the base data for all other survey information.

b) The Contractor shall, within two days of the commencement of the works, carry out a check of the co-ordinates and levels of all Bench Marks, permanent ground markers and survey stations identified on Drawing 1021927/PHASE 1 - TENDER/OD/012. He shall supply details of their positions and levels to the Engineer, in order that he may check and agree any revised levels and co-ordinates, if necessary.

The Contractor shall satisfy himself that the ground levels and site boundary as described in the Contract are correct. Should the Contractor wish to dispute any levels he shall submit to the Engineer a schedule of the position of levels considered to be in error and a set of revised levels. The existing ground relevant to the disputed levels shall not be disturbed before the Engineer's decision as to the correct levels is given.

The Contractor shall keep updated schedules and drawings of all Bench Marks used in the setting out and shall make these available to the Engineer when required.

The Contractor shall ensure that where necessary in order to maintain his programme, lines and levels of any necessary parts of the Works are set out in such time as to enable Statutory Undertakers plant and other publicly or privately owned services or supplies to be installed, altered or removed.

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c) A minimum of six ground reference points are to be maintained during the course of the works, these will comprise of steel pins set on 0.2m³ concrete at agreed locations on the site and protected by suitable fencing. New ground reference points must be established before existing points are removed as the work proceeds, to maintain site setting out control.

d) During the course of the remediation works, the Contractor shall provide the Engineer with up to date survey information, or as indicated by the Engineer. The survey should be undertaken using the same grid and bench mark to the topographic survey provided with the Contract. It should show the ground reference point locations/co-ordinates. The survey information shall be supplied on a stable medium with grid markings relating to the existing site survey at a horizontal scale of 1:250, or as agreed with the Engineer. In addition, the survey information shall be supplied on compact disc in a Microsoft ExcelTM spreadsheet format.

Separate sheets shall be provided for the following:-

- i) Locations of all pump and treat and monitoring wells
- ii) New construction (i.e. drains, roads or other new structures) (as required)
- iii) Locations of all validation tests, trial pits and boreholes (as required)

Two draft paper copies of the updated drawings shall be provided to the Engineer within three working days of the survey. The drawing shall also be provided on compact disc in a format compatible with AutoCAD 2009. A complete set of drawings and compact disc showing the works as constructed shall be supplied to the Engineer within two weeks of completion of the works.

A750 Licences, Notices and Other Documents (Provided by Contractor)

A751 Waste Licence

A Waste Licence application has been submitted to the Agency. It is unlikely that the Conditions will be received before the tender return date. The tenderers shall assume that the following Conditions will be stated in the Waste Licence and shall ensure compliance with them, except where otherwise stated.

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1. Management Structure

Prior to the commencement of waste activities the contractor shall submit written details of the management structure of the facility to The Agency. Any proposed replacement in the management structure shall be notified in advance in writing to The Agency. Written details of the management structure shall include the following information:-

- a) The names of all persons who are to provide the management and supervision of the waste activities authorised by the licence, in particular the name of the facility manager and any nominated deputies.
- b) Details of the responsibilities for each individual named under a) above; and
- c) Details of the relevant education, training and experience held by each of the persons nominated under a) above.

2. Environmental Management System (EMS)

The contractor shall submit to The Agency for its agreement an EMS system for the facility one month prior to waste activities commencing. The EMS shall be updated as required with amendments being submitted to The Agency for its agreement.

The EMS shall include as a minimum the following elements:-

- a) Environmental Management Plan (EMP): The EMP shall include any items required by written guidance issued by the Agency.
- b) Corrective Actions Procedures: The Corrective Action Procedures shall detail the corrective actions to be taken should any of the procedures detailed in the EMS not be followed.
- c) Awareness and Training Programme: The Awareness and Training Programme shall identify training needs, for personnel who work in or have responsibility for the licensed facility.
- d) Schedule of Environmental Objectives and Targets.

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3. Proposals for Specified Engineering Works (Method Statements)

The contractor shall submit proposals for all Specified Engineering Works to the Agency for its agreement at least one month prior to the intended date of commencement of any such works. No such works shall be carried out without prior agreement of the Agency.

4. Validation Report

(Note: The Validation Report will be prepared and provided by the Engineer but the Contractor will be required to supply the Engineer with the details and data required for this Report).

5. Records of Materials Entering and Leaving Site

The Contractor shall arrange for the weights of materials entering and leaving the site to be recorded to the satisfaction of the Agency.

6. Tank and Drum Storage

The Contractor shall submit a Report to the Agency confirming the integrity and water tightness of bunds required to tank and drum storage areas.

7. Decommissioning Plan

At least three months prior to the cessation of waste activities at the facility, the Contractor shall submit a detailed decommissioning plan to the Agency for its agreement.

8. Off-Site Disposal and Recovery Facilities

The Contractor shall submit details of those waste disposal facilities off site, which he intends to use, to the Agency for approval, prior to their use.

9. Monthly Monitoring Results for Foul Water Discharge

The Contractor shall submit monitoring results of the discharges to the foul sewer to the Agency on a monthly basis.

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10. Monitoring Personnel

The Contractor shall report to the Agency within one month prior to the start on site with the names, qualifications and experience of all persons carrying out the sampling and monitoring required under the Licence. Any proposed changes shall be similarly advised.

11. Changes to Monitoring Equipment.

Any changes to monitoring or sampling equipment shall be agreed within writing with the Agency in advance.

12. Emergency Response Procedure (ERP)

The Contractor shall, prior to commencement of waste activities, submit a written ERP to the Agency for its agreement. The ERP shall address any emergency situations which may originate on the facility and shall include provision for minimising the effects of any emergency on the environment. This shall include a risk assessment to determine the requirements at the facility for fire fighting and fire water retention facilities. The Fire Authority shall be consulted by the licensee during this assessment.

13. Records

The Contractor shall keep the following records.

- a) On site
 - Current Waste Licence
 - Current EMS/EMP
 - The Annual Environmental Report (AER) (see item 17).
 - All written procedures produced by the Contractor/Employer/Engineer relating to licensed activities.
- b) Written records of each load of waste arriving or leaving the facility.
- c) Written records of the type and quantities of waste recovered at the facility, including European Waste Catalogue (EWC) codes.

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- d) Written records of training undertaken by facility staff.
- e) Written records of results of all integrity test on bunds etc and associated works to them.
- f) Written records of all nuisance inspections.
- g) Written records of details of personnel carrying out and interpreting sampling and monitoring results.
- h) Written records of all complaints received relating to the site operations.

14. Reports and Notifications

Any changes to site processes, or site management and control with adverse environmental significance to be advised and agreed in advance with the Agency.

15. Incident Report

In the event of an incident occurring on the site, the Contractor shall notify the Agency as soon as practical, and no later than 10.00am on the following working day. A written Report shall also be provided to the Agency within 5 working days detailing all aspects including:-

- a) identify the date, time and place of the incident;
- b) carry out an immediate investigation to identify the nature, source and cause of the incident and any emission arising therefrom;
- c) isolate the source of any emission;
- d) evaluate the environmental pollution, if any, caused by the incident;
- e) identify and execute measures to minimise the emissions / malfunction and the effects thereof; and
- f) provide a proposal to the Agency for its agreement within one month of the incident occurring to :-

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- i) identify and put in place measures to avoid reoccurrence of the incident; and
- ii) identify and put in place any other appropriate remedial action.

16. Monitoring Locations

The Contractor shall submit to the EPA no later than four weeks prior to the commencement of waste activities on site a scaled drawing showing the location of all monitoring locations required under the Licence.

17. Annual Environmental Report

The Contractor shall submit to the Engineer for agreement an Annual Environmental Report (AER) to include:-

- i) Recap on remediation strategy;
- ii) Recap on Remediation Target Values (RTV's);
- iii) Diary of excavations based on a grid system;
- iv) Summary table of wastes exported;
- v) Summary of waste processing and recovery;
- vi) Restoration works described;
- vii) Environmental monitoring statement;
- viii) Reporting period;
- ix) Waste activities carried out at the facility;
- x) Quantity and composition of waste handled during the reporting period and each previous year (relevant EWC codes to be used);
- xi) Summary report on emissions;
- xii) Summary of results and interpretation of environmental monitoring, including a location plan of all monitoring locations;
- xiii) Resource and energy consumption summary. Energy Efficient Report;
- xiv) Full title and a written summary of any procedures developed by the licensee in the year which relates to the facility operation;
- xv) Tank, drum, pipeline and bund testing and inspection report;
- xvi) Reported Incidents and Complaints summaries;
- xvii) Review of Nuisance Controls.

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- xviii) Reports on financial provision made under this licence, management and staffing structure of the facility and a programme for public information;
 - xix) Volume of foul water produced and volume of foul water transported off-site;
 - xx) Any other items specified by the Agency
18. Facility Operation

The Contractor shall submit to the Agency a process flow diagram and details of any proposed emissions.

19. Energy Efficiency

The Contractor shall submit to the Agency details of any energy efficiencies incorporated into the operation of his plant and machinery.

A copy of all documentation and reports required under the Licence shall be provided to the Engineer for comment at least 3 days prior to submission to the Agency or as appropriate. Any discrepancies between the requirements of the Waste Licence and the Specification shall be referred to the Engineer for confirmation; the Waste Licence shall generally take precedence.

Copies of the waste carrier registration and receiving waste facility licences shall be provided to the Engineer before any material is removed from site.

Copies of all complete Waste Transfer Notes shall be provided to the Engineer at regular intervals of less than one month.

The Contractor will be responsible for obtaining and all payments in respect of complying with the Waste Management (Collection Permit) Regulations 2007 (as amended).

A752 Planning Application

A planning application has been made to Limerick City Council. A copy of the conditions attached to the consent shall be forwarded to the Contractor when it has been received from the Council. It is unlikely that the conditions will be received before the tender return date. Therefore, any planning conditions relating to Phase 1 will be forwarded to the Preferred Contractor(s) who will be asked to confirm that there will be no changes to their programme, methodology or rates. Should there be any changes, Bord Gais reserve the right to consult with other tenderers.

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A753 Site Waste Management Plan

a) The Contractor shall follow current best-practice with regard to waste management and minimisation, based on a hierarchy in which the order of preference is as follows:

- i) Reduction - the aim should be to reduce the generation of waste, as far as reasonably practicable.
- ii) Re-use - re-use of waste within the project, subject to the requirements of the waste management and environmental permitting regimes.
- iii) Recover (including re-cycling) - where the waste cannot be reused then recovery options should be considered.
- iv) Disposal - the final option will mean that the waste is either disposed of at the site (subject to the requirements of the permitting regimes) or removed to an appropriately licensed facility.

The above shall apply to contaminated soils and to other waste arisings, including domestic type waste generated within the temporary site accommodation. In all circumstances, attempts should be made to 'design-out' the generation of waste in the first instance.

b) In conjunction with his Environmental Management Plan (see Waste Licence requirements – Clause A751) the Contractor shall prepare a 'Site Waste Management Plan'.

c) The Contractor shall comply with this 'Site Waste Management Plan' and shall demonstrate compliance by undertaking a number of audits (minimum one) during the Works.

d) No work involving off-site disposal shall commence until the Engineer, on behalf of Bord Gais, has confirmed that the 'Site Waste Management Plan' is adequate.

e) The Contractor shall comply with current legislation and guidance relating to the management of wastes (including classification, handling, transportation and disposal).

f) The Contractor shall also comply with other requirements in relation to waste management, under other clauses of this Specification.

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A760 Service Location, Diversion and Special Requirements for Statutory Authorities

a) No excavation works shall be carried out unless suitable and sufficient steps have been taken by the Contractor to identify and, so far as is reasonably practicable, prevent any risk of injury arising from any underground cable or other underground service or overhead service. This shall include the verification of the position of Statutory Undertaker's, publicly and privately owned services by the excavation of hand dug trial holes, verified in advance by electro magnetic detection devices. All works undertaken must be in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 and also the HSA publication - Code of Practice for Avoiding Danger from Underground Services.

b) If any privately owned service of supply for water, electricity, gas, drainage, cabling etc, is affected by the Remediation works, then the Contractor shall locate it and provide a satisfactory alternative before cutting the existing service or supply.

c) The Contractor shall, during the progress of the Remediation works take all measures required by any Statutory Undertaker, the management of other publicly owned service, or owners of privately owned services for the support and full protection of all such services and supplies during the progress of the Remediation works and shall ensure that no such services or supplies are interrupted without the written consent of the appropriate authority or owner.

d) Should any mains or services be uncovered during the course of the remediation works, or be found to interfere with the remediation works which were not anticipated, the Contractor shall inform the Statutory Authority and also the Engineer who will give notice to the undertaking concerned of any alterations or diversions that in this opinion are necessary.

e) The Contractor will be responsible for gaining any permissions necessary from the relevant Utility for working adjacent to, under or over their plant. The Contractor shall be responsible for ensuring the work in such areas is carried out in accordance with the required working practice and safety requirements of the relevant Utility. The Contractor shall be responsible for any damage caused and shall repair, or allow the Utility Undertaker to repair the apparatus at the Contractor's expense.

The Contractor shall co-ordinate his remediation works with any works carried out by Public Utility Undertakers.

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f) Prior to commencing any drilling or excavations, the Contractor will mark out the location of all known services and provide a service plan to excavator operatives/ drillers to ensure they are aware of all service hazards within the influence of the excavation. A service incident response plan shall be written and communicated to all site personnel.

A770 Health and Safety Requirements

a) The Contractor shall carry out the duties of the Project Supervisor (Construction Phase) in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010. All work will be undertaken in accordance with the Health and Safety Policy of Bord Gais.

No work shall commence on site until the following are in place:-

- i) Written notification, to the Health and Safety Authority has been made by the Project Supervisor (Construction Phase).
- ii) The Project Supervisor (Construction Phase) confirms in writing to the Engineer that the Construction Safety and Health Plan has been sufficiently developed.

b) The Contractor shall provide COSHH assessments and take appropriate measurements for handling/storage of any hazardous substances brought to site in conjunction with these works.

c) The Project Supervisor (Construction Phase) shall issue written notification to the Employer, the Engineer and all named Designers within 24 hours of the action in the event of any Health and Safety Authority action with respect to the issue of any of the following to any contractor on site:

- i) improvement notice
- ii) prohibition notice
- iii) summons

The Project Supervisor (Construction Phase) is also required to include one copy of the employee liability and third party liability insurance policies for each contractor working on site in the Construction Phase Safety and Health Plan and Safety File.

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d) The Contractor shall prepare a Designer's Risk Assessment and provide a copy to the Project Supervisor (Design Phase) for those items of Work for which he has design responsibility.

e) The Preliminary Safety and Health Plan drafted by the Project Supervisor (Design Phase) (ref Report 1021927/R/11) is included with the tender documents. The Contractor shall comply with the requirements contained in the Preliminary Safety and Health Plan.

A771 General Health & Safety and Environmental Management Considerations

a) It is envisaged that the site shall be designated into clean and dirty areas and that these areas shall have restricted interaction. The 'clean' area being defined as a zone not directly involved with the workings of the site. This zone shall include the site compound containing the Contractor's and Resident Engineer's accommodation, and third party occupants of the site, whose accommodation is not included in the working areas.

The working areas shall be designated as 'dirty' and shall be fenced along their perimeters.

The Contractor shall ensure that all personnel entering the designated 'dirty' areas have attended an induction course given by the Project Supervisor (Construction) describing the presence, location and significance of potential contaminants on site or they are escorted by inducted personnel. They shall wear appropriate personal, protective, equipment (PPE) and shall pass through the hygiene unit to enter or exit the designated dirty area.

b) The Contractor shall provide and make mandatory the wearing of protective clothing and equipment for all persons working on or adjacent to hazardous operations.

c) The Contractor's attention is drawn to the risks of smoking and use of mobile phones on contaminated land and should address such issues in his Risk Assessment and Safety and Health Plan. No smoking shall be allowed on site, in accordance with the likely Waste Licence requirements.

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d) The Contractor shall comply with all applicable legislation for the safety, health and welfare of its employees, or any other person in or near the site of the works and of members of the public.

e) The Contractor shall provide to the Engineer, a copy of the Contractor's current safety and environmental policy statements and safety codes of practice.

The Contractor shall comply with all the relevant legislation within Irish law, as applicable to these works.

f) The Contractor shall provide first aid facilities, materials and personnel trained in first aid, for the benefit of his own employees, those of his sub-Contractors and the Site staff of the Engineer and any visitors.

The Contractor shall provide to the Engineer the names and details, including training records, of the designated 'first aiders' and Site safety officers. The Contractor shall not rely on the Engineer's staff to undertake these roles in any way.

g) All stored material and materials containers (e.g. skips, IBC's etc) shall be suitably and clearly labelled.

h) Appropriate safety equipment must be provided by the Contractor and worn by all personnel whilst working on or visiting the site.

i) The Contractor shall provide adequate lighting if working during the hours of darkness.

A772 Traffic Safety and Management (provided by the Contractor)

a) All traffic safety and management measures necessitated by the Remediation works must be fully operational and have the written consent of the Engineer, the Highway Authority and Garda (where applicable) before the Contractor shall commence any remediation works including the removal of materials from the Site.

b) The Contractor shall take all reasonable measures at his own cost to ensure that no mud or other material is deposited on the local road network. All vehicles leaving site shall pass through a designated area where they shall be inspected and if necessary jet-washed to remove any mud or debris, with particular attention paid to the wheels, wheel arches and underbody.

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c) The Contractor will be liable for cleaning at his cost the local road network in the event of any material getting onto the public highway, with the agreement of the Garda and/or highways authority.

d) All lorries leaving the Site to a recycling or disposal facility shall have records taken of vehicle registration, volume, date, time destination and that each loaded lorry (if transporting soil) is sheeted. These shall be supplied to the Engineer at the end of each working day, together with details of the net weight recorded at the landfill site for each load.

e) The Contractor shall comply with the relevant provisions of road traffic guidance and appropriate legislation.

f) All vehicles shall adhere to an on-site speed limit of 10mph.

g) The Contractor shall also ensure that hauliers carry appropriate Employer and Public Liability Insurance.

h) As far as reasonably practicable waste shall be delivered to the designated recycling or disposal facility on the same day it leaves the Site. In the event that material has to be stored over night, the loaded lorry shall either be stored at a suitably licensed premises or return to Site.

i) The Contractor shall agree the route to the selected receiving facility with the Engineer, prior to transport of material off Site. Temporary signing is to be provided as deemed necessary by the Engineer, the Employer or Limerick City Council.

j) The Contractor shall implement procedures to ensure, as far as reasonably practicable, that lorries leave and return to the Site at staggered intervals.

k) The Contractor shall arrange for the use of a certified weighbridge, either on or offsite, to weigh all materials disposed of off-site.

A773 Tidiness of the Site (Provided by Contractor)

a) The Contractor shall remove and dispose of at his own expense any surplus materials, rubbish and other items brought onto Site by him in the course of undertaking the remediation works. The Contractor shall collect and separately dispose of all domestic type waste arising from the Remediation works.

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- b) The Contractor shall maintain the Site in a tidy and workmanlike manner at all times. Any skips used on Site will be in good condition (no holes present at the base), stored on an area of hard standing away from any surface drainage and/or sensitive water bodies. All skips must be labelled and waste segregated in accordance with the labelling system. Any skips designated to special waste should have lockable covers. The lighting of fires to burn rubbish is not permitted.
- c) The Contractor shall ensure that any liquids, including fuel oil used on Site in connection with the remediation works are stored in appropriate, fully labelled containers, including "Hazchem" notices. Such containers shall be stored on an impermeable hard standing, surrounded with a suitable bund of capacity of 110% of the capacity of the largest container therein, or stored on proprietary spill trays of a similar capacity. An inspection schedule should be in place to ensure that bunds and drip trays are regularly emptied, especially after heavy rainfall. Any spillages in bunded areas shall be disposed of to an appropriate disposal site and reported to the Engineer. Any refuelling of vehicles must be done in an appropriate manner which will include the use of drip trays and easily accessible spill kits as a minimum.
- d) Any spillages of liquids, including near-miss incidents, which may give rise to an environmental pollution incident shall be reported to the Engineer, contained and removed immediately to an appropriate landfill site. The Contractor shall provide and maintain an appropriate spill kit appropriate for the methodology he is undertaking.
- e) The Contractor shall undertake the remediation works in such a way that the likelihood of a spillage is minimised. Should a spillage occur, the Contractor shall ensure appropriate equipment and plant shall be available on Site to contain and treat any such incident.
- f) Mobile and fixed fuel storage tanks shall not be sited at a location where a spillage could result in a direct discharge to any drain or watercourse. All fuel tanks, including those with twin skins shall be surrounded with a bund at all times to provide storage capacity at least equal to 110% of the capacity of the tank.
- g) The Contractor shall, at a minimum of one week intervals, inspect the facility and its immediate surrounds for nuisances caused by litter, vermin, birds, flies, mud, dust and odours and record the findings.

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A780 Self-Audit of Procedure (Provided by Contractor)

The Contractor shall demonstrate compliance with his safety, health and environmental management plans and procedures through a process of self-audit. The Contractor shall provide the Engineer with details on how this audit process will be undertaken, shall forward the findings of each audit promptly to the Engineer and shall implement any corrective actions considered necessary, as a result of the audit. Audits shall be undertaken at least every 2 months.

A800 Noise, Vibration, Dust and Odour

A810 Control of Noise and Vibration (Provided by Contractor)

a) The Contractor shall employ the best practical means to minimise noise and vibration produced by his operations. He shall have regard to the recommendations in the EPA Environmental Noise Survey – Guidance Document (2003) and BS 5228:2009 Code of practice for noise and vibration control on construction and open sites.

b) Without prejudice to the generality of the Contractor's obligations under the preceding paragraph, the Contractor shall comply in particular with the following requirements.

(i) All vehicles and mechanical plant used for the purpose of the Works shall comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels)(amendment) Regulations 1996, be fitted with effective exhaust silencers and be maintained in good and efficient working order.

(ii) All compressors and pumps shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use. All pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Any equipment or panel fitted for the purposes of noise reduction shall be maintained and operated so as to minimise noise.

(iii) Machines in intermittent use shall be shut down in the intervening period between work or, where this is impractical, throttled down to a minimum.

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(iv) All pumps shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order. All dewatering pumps shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers.

(v) All stationary plant shall be covered where possible.

c) The Contractor shall pay special regard to minimise noise at the site boundaries. Such measures include:-

- (i) limits on the amount of plant at work
- (ii) silencing of plant as described above

d) The Contractor shall take suitable steps in his method of working to prevent damage to adjacent properties due to vibrations caused by executing the works.

e) Working hours of the site shall be restricted to 08:00 to 18:00 hours Monday to Friday.

A820 Monitoring Noise (undertaken by Contractor)

a) Noise monitoring equipment should comprise of the following:-

- Portable weatherproof Type 1 sound level meter, (Bruel and Kjaer model or similar) and external microphone capable of:-
 - i) Measuring sound levels in the range 40 to 140 dB(A).
 - ii) Programmed recording times.
 - iii) Calculating and recording percentiles of LAeq, Lmax and Lmin.
 - iv) Direct printing of results to printer or via computer.
- Computer software and any associated cables for the purpose of downloading data and converting into a Microsoft Excel compatible format.
- Extension cable for microphone.
- Acoustic calibration device.

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- Windshield for microphone.
- Tripod for mounting microphone at a variable height up to 2m above ground level.
- All batteries or charging devices as required.
- Waterproof case for equipment.

b) All equipment shall be calibrated maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

c) Noise monitoring is to be carried out by an experienced technician provided by the Contractor and generally in accordance with BS EN ISO 11202:2010 - Acoustics.

d) Methods, times, background and noise levels are to be agreed by the Engineer with the Agency, before monitoring commences. Monitoring of 'background noise levels' has been undertaken by Mouchel and the results are presented in the Environmental Summary Report presented in Appendix A. Monitoring of the works noise levels shall be compared to that reference level, unless otherwise agreed with the Engineer and the Agency.

A830 Monitoring Vibration (undertaken by the Contractor)

a) The Contractor shall provide equipment and undertake vibration monitoring of the following potentially unstable structures when drilling in their vicinity; Dock Road boundary wall, AGI wall, slopes at O'Curry Street boundary and No 5 Generator Store. In addition, vibration monitoring shall also be undertaken on the boundaries with adjacent residential / commercial premises as indicated on Drawing 1021927/PHASE 1 - TENDER/OD/011 – Dust and Vibration Monitoring Locations and also at locations as directed by the Engineer.

b) Ground borne vibration is to be assessed using the guidelines provided in BRE Digest 403, Damage to Structures from Ground Borne Vibration.

c) Vibration monitoring equipment shall be capable of monitoring vibration dose values in compliance with BS EN ISO 8041:2005 and shall be able store at least one weeks data.

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d) Vibration monitoring equipment shall comprise a portable weatherproof seismic recording instrument, such as the Vibrock V901 or similar approved, set to run in continuous mode and able to digitally record vibration levels up to 20 mm/s peak particle velocity for frequencies between 5 and 250 Hz. All necessary software and cables shall be supplied to enable the data to be downloaded and converted into a Microsoft Excel compatible format.

e) The Contractor shall provide suitable monitoring points, either:

- on a spike to appropriate strata
- on a resin anchor to hard surface, or
- on a sand bag covering on general surface

f) Vibration monitoring is to be carried out by an experienced technician provided by the Contractor.

g) All equipment shall be calibrated, maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

h) Vibration monitoring may be used to protect people and vibration sensitive equipment and adjacent structures. The requirements and limits for vibration will be agreed with the Agency by the Engineer prior to work commencing.

A840 Control of Dust (Provided by Contractor)

a) Dust control is the Contractor's responsibility. The Contractor shall conduct his operations so that any dust settles within the Site and is not carried beyond its periphery. The Engineer will retain the right to instruct more intensive dust control measures when considered necessary.

b) The Contractor shall adjust the location of any works having regard to the wind direction and speed, and shall suspend such operations altogether, in the event that any such adjustment fails to prevent dust from being carried beyond the periphery of the Site.

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c) The Contractor shall ensure that airborne dust is kept to a minimum by the regular use of water bowsers, with sprinklers, during periods of dry weather.

d) Open excavations will be backfilled as soon as practicable after excavation has been completed;

e) The Contractor shall ensure that dust masks are readily available for all Site personnel. The masks will have P2 filters to protect against the fine respirable dusts, fibres (including asbestos) and aqueous mists. The masks may either be single face masks that confirm to BS EN149 or Twin Cartridge Respirators that conform to BS EN140. Filters should conform to EN143, BS EN 14387:2004+A1:2008 and BS EN12083.

A850 Monitoring of Dust (Provided by Contractor)

It is likely to be a requirement of the Waste Licence that the Contractor undertakes dust monitoring. Exact requirements are yet to be confirmed but are likely to require dust emissions from remediation activities to be measured using 'frisbee' type dust gauges at 4 No. locations, one at each boundary of the site as indicated on Drawing 1021927/PHASE 1 – TENDER/CD/011.

All dust monitoring stations shall be monitored at weekly intervals for the duration of the Site remediation works.

All results shall be supplied to the Engineer as soon as they become available. The results shall also be summarised and reported at each progress meeting.

In addition the Contractor shall record daily the location of working areas and atmospheric conditions (temperature, relative humidity, precipitation, mean wind speed and wind direction) and issue all results to the Engineer on a weekly basis.

All equipment shall be calibrated, maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

A860 Control of Odours (Provided by Contractor)

a) Control of odours shall be the responsibility of the Contractor.

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b) The plant and equipment for the injection, extraction and treatment of process water must operate within a closed system so that odours do not escape. If emissions are to be into the air, the appropriate filtering must be undertaken to ensure that odours are minimised.

c) The contractor shall ensure that experienced engineers are provided during all operations where there is a potential for odours to be created, to ensure that odourous materials are handled in a way that minimises odour generation, and that odour suppression equipment is utilised effectively in such areas.

A870 Monitoring of Odours (Provided by Contractor)

a) Monitoring of odours is the Contractors responsibility. Observational daily monitoring of air quality will be undertaken at sensitive Site boundaries, depending on the Site operations occurring, for volatile organic compounds.

b) The odour monitoring will be undertaken in general accordance with the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 and associated 2010 Code of Practice.

A900 Condition Survey and Protection of Features

A910 Condition Survey

a) Before the commencement of any site works, the Contractor shall inspect the conditions of existing buildings, roads, footways, installations, kerbs, verges, fences, walls and street furniture etc. within and adjacent to the site (other than those buildings and/or features identified for demolition or removal) and shall prepare a schedule noting all existing defects, with supporting sketches and photographs, where necessary. This shall also include the Dock Road boundary wall, the AGI wall and the No 5 Generator Store all of which have Protected Status. The schedule shall be agreed with the Engineer and any owner or Public Authority, as applicable, prior to the commencement of any site activity.

b) The Contractor, on completion of the Works, or at such earlier time as may be required, shall make good to the satisfaction of the Engineer and any owner or Public Authority concerned, all damage additional to that agreed in the schedule, where such damage has been caused by the Contractor, or any of his sub-contractors, in connection with the execution of the Works.

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c) In the event of the Contractor failing to prepare and agree a 'Schedule of Condition', the property in question shall be deemed to have been undamaged prior to the execution of the Works.

d) If, in the opinion of the Engineer, the Contractor has failed to repair and make good within a reasonable time any damage attributed to the Contractor's actions, or has likewise failed to arrange for the repairs to be carried out, the Employer may arrange for the repairs to be carried out and deduct the expenses incurred from money due to the Contractor under the Contract.

A920 Protection and Preservation of Features

a) The Contractor shall protect and preserve the following features (some of which have Protected Status) also indicated on Drawing 1021927/PHASE 1 - TENDER/OD/008;

- i) The Dock Road boundary wall (Protected Status).
- ii) AGI wall (Protected Status).
- iii) The No 5 Store Generator Building
- iv) The site offices building
- v) The new DR and ESB Electricity sub-station structures on the O'Curry Street boundary.
- vi) Existing borehole monitoring well installations.

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5.3 CLASS C: GEOTECHNICAL AND OTHER SPECIALIST PROCESSES

C900 Remediation

The Contractor shall consider and adopt, as appropriate, relevant regulatory guidance in relation to the suitability, design, operation and management of remediation treatment processes, including any applicable Agency guidance.

Daily reports of any site investigation works shall be completed in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland.

It is not envisaged that major earthworks or excavation will be required during the pump and treat works. In the event that major earthworks/excavation are required, they shall be undertaken in accordance with a suitable specification such as the Manual of Contract Documents for Road Works published by the National Roads Authority.

Details of any materials imported to site shall be agreed with the Engineer in advance and shall not comprise any deleterious or contaminated material.

C910 Pilot Study

a) As part of his tender, the Contractor shall prove to the Engineer the suitability of his chosen pump and treat methodology and its application to the circumstances of the site and to the objectives of the remediation project, including any remedial targets/objectives.

The pilot study shall be a trial of the treatment process in which the process is either operated at partial scale on site or in bench trials on representative materials off site (following acquisition of suitable representative materials from site). The aim of which is to establish operating parameters and evaluate the treated material and any by-product material stream(s).

In this regard, the Contractor shall pay due regard to cost, health and safety, environmental and other considerations, including the following, as applicable:

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- i) Site ground conditions and the nature and variability of the materials requiring treatment.
- ii) Generation of noise, vibration, dust and/or odour by the process, having regard to on-site and off-site receptors (including humans and property), and monitoring requirements.
- iii) Creation of bi-products from the process, likely to pose a risk to health, safety and/or the environment throughout and at the conclusion of treatment operations.
- iv) Anticipated productivity rates for the treatment process (or processes).
- v) Working space constraints
- vi) Preparatory works requirements (i.e. the need to prepare process areas).
- vii) Suitability for use of any existing on-site features, such as hard standing, slabs and/or tanks.
- viii) Use of energy.
- ix) Use of 'clean' water and disposal of process water.
- x) Use of consumables during the process (e.g. flocculants, coagulants, surfactants, microbiological colonies, fertilisers, catalysts etc.).
- xi) Type and quantity of reagents required, if any, and use of less environmentally damaging or energy consuming reagents (e.g. the selection of bio-degradable surfactants etc.).
- xii) Potential impact on or interaction with site infrastructure and below ground services (e.g. heat and/or pressure generation by in situ processes and potential corrosion of gas mains).
- xiii) Any known or likely planning issues/constraints.

A maximum budget of €30,000 is available. The Contractor shall insert costs for his pilot study which can be anything up to €30,000. Any additional costs incurred during this period shall be borne by the Contractor.

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The cost is to include for provision, maintaining and removal of all necessary welfare and hygiene facilities for the period.

b) The Contractor shall document in his tender the basis for recommending the use of his chosen pump and treat methodology and the specific process plant, as applicable. The information provided shall address the matters listed in sub-clause a), above, as applicable. It shall also clearly identify the variables that would be expected to have a significant effect on the efficiency of the process(es) and the range/assumptions made, with supporting calculations/reasoning (e.g. temperature of the injected water).

c) The Contractor shall be aware that information provided as part of the Contractor's Tender is likely to be used by the Engineer and may be submitted to the regulators for comment/approval. The Contractor shall also recognise that following this stage, any change to the selected remediation process(es) is likely to require further regulatory consultations, which could delay implementation of the remediation process(es).

d) A period of up to 2 months (from the award of Preferred Contractor status and including reporting) shall be available to the Preferred Contractor in order to prove that the chosen methodology will successfully remove the free product and to demonstrate that appropriate disposal / recycling facilities are available. At the Contractors discretion, the 2 month period may be shortened if the Contractor is confident any works can be progressed to a suitable point that he can prove to the Engineer that the process is suitable (including any necessary reporting).

e) As part of the pilot study, the Contractor shall:

- i) Define the sampling regime to be carried out as part of the works, including any requirements of the Engineer.
- ii) Allow the Engineer's staff reasonable access to the process plant for the purpose of witnessing any pilot works.
- iii) Prepare a report on the works undertaken during the pilot period, including any analytical data required by the Engineer to validate the performance of the works. The report shall be provided to the Engineer within two months of the award of Preferred Contractor status.

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iv) Provide, maintain (and remove, unless required for the DNAPL recovery works) all welfare, decontamination and safety and health requirements for the purposes of undertaking the pilot works safely and in accordance with current legislation and guidance.

f) A period of two weeks maximum from submission of the Contractors report on the pilot works shall be required by the Engineer to assess the suitability of the process. This two week period shall be in addition to the maximum 2 month allowable pilot period. The cost of maintaining the DNAPL treatment plant in stand-by mode for this period shall be included within the Contractors tender sum for the pilot period.

g) The Contractor shall take account of the results and conclusions of the process trial when assessing the full treatment process works and methodologies.

C920 DNAPL Recovery

a) A waste licence and planning permission has been applied for by Bord Gais for the pump and treat remediation processes. The Contractor shall comply with all regulatory requirements and shall obtain all necessary authorisations (see Clause A750).

b) The Contractor shall design the treatment process (including any works undertaken during the pilot period) and working methodology in order to meet criteria for the successful removal of free product and DNAPL as set-out in Section 2.4.

c) The Contractor shall provide appropriate management of any specialist remediation treatment process(es) used, as appropriate to the technique to be implemented, including plant, equipment and personnel. The Contractor shall provide services for use by any specialist subcontractor, including water and electricity, and all necessary welfare facilities for the use of the specialist sub-contractor's staff.

d) The Contractor shall ensure that the treatment process is carried out with due regard to health and safety and environmental considerations.

e) The Contractor shall manage and monitor the health, safety and environmental performance of any specialist sub-contractor used.

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f) The Contractor shall review and up-date, as necessary, the 'construction phase safety and health plan' and the 'environmental management system' when changes to the configuration of any process plant are proposed/implemented. The Contractor shall also up-date risk assessments and method statements if and when plant/processes are reconfigured.

g) The Contractor shall prepare a detailed method statement (or management plan) for the remediation process. This shall:

i) Identify the individuals involved.

ii) Define the day-to-day responsibilities of the various parties and individuals involved, including maintenance of the working area.

iii) Identify the factors that could influence the efficiency of the process and the quality of the treated groundwater and define the operating window for the process in relation to the chemical and geotechnical properties of the materials requiring treatment.

iv) Include a strategy for completing the work in the most efficient manner, having regard to the factors identified above.

v) Define the sampling regime to be carried out during the commissioning stage and during the treatment operations, including sampling for performance monitoring, waste classification and validation purposes, as applicable, and any specific requirements of the Engineer.

vi) Provide other pertinent information, including any other items/ requirements set out below. Where more than one treatment process is to be used, the plan shall describe the interaction and dependencies between the several treatment processes and the management actions that the Contractor will take to ensure the efficient operation of the treatment train. A draft copy of the management plan shall be supplied to the Engineer for review and comment. The Contractor shall address any comments made by the Engineer and shall finalise and re-issue the plan, as appropriate.

h) The Contractor shall provide a suitably prepared working area for the process plant, adopting existing hard-standing, where appropriate, and incorporating impermeable layers/barriers, perimeter bunds and managed drainage, as necessary.

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- i) The Contractor shall undertake sampling and analysis of the materials requiring treatment, the treated material and, if applicable, any intermediate stage material, in order to demonstrate the effectiveness of the treatment process. The Contractor shall manage the acquisition and recording of samples in a manner appropriate to the method of operation of the process (i.e. batch or continuous flow, progressive in-situ treatment, etc.). The Contractor shall give the Engineer reasonable notice of his intention to undertake sampling and shall supply the results of such sampling to the Engineer, as soon as they become available.
- j) The Contractor shall allow the Engineer's staff reasonable access to the process plant for the purposes of inspecting on-going material processing and sampling.
- k) The Contractor shall keep a detailed record of any unproductive time relating to the treatment process, including date, time, reason and, if applicable, corrective action taken.
- l) The Contractor shall be responsible for collecting, treating and disposing of any process water resulting from the treatment process.
- m) The Contractor shall review the progress of the treatment process, in consultation with the Engineer, on a frequent basis (minimum weekly) and, if requested, prepare a report for the Engineer every 2 weeks, describing the performance of the treatment process.
- n) In addition to the above, the Contractor shall ensure that all the requirements of Section 2.4 of this Specification are met.
- o) The Contractor shall ensure that the existing ground water monitoring wells are not damaged during the works. If any wells are damaged, they shall be replaced by the Contractor at his own cost

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C921 Plant (Provided by Contractor)

The Contractor shall provide, operate, maintain and remove on completion all items of plant and equipment necessary in order for him to complete the remediation works within the programme period, including for the provision of road sweeping/cleaning facilities. It is envisaged that the following main items of work would also be undertaken by the Contractor:-

- Liaison with Limerick City Council Water Services Department.
- All fees associated with the works
- Installation of all injection and extraction wells.
- Establishment of DNAPL plant
- Any other work required to successfully remove DNAPL.

All plant and equipment shall be provided and maintained in a safe condition with all maintenance and service documentation available for inspection by the Engineer.

The Contractor shall determine his own plant requirements to allow the satisfactory and timely completion of the Remediation works.

A DNAPL Removal and Recovery Plant, which will be under the control of the Contractor is anticipated to be required and is considered likely to comprise the following components as necessary to remove free product:

- Pre-treatment of the lagoon to keep it in the range pH 7.5 to 9
- Oil/water separation (two stage);
- Filtration, to remove suspended solids;
- Granular activated carbon, or similar, treatment to remove polar organic compounds
- Flow meter and discharge arrangements.

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The removal and recovery plant shall be sized to be capable of operating 24 hours per day and treating contaminated water. The treated water shall meet all discharge criteria set under the trade effluent/discharge consent (see Appendix E) and the Waste Licence. All water removed from the ground shall pass through the water treatment plant, unless agreed otherwise with the Engineer.

All moving plant is to be fitted with and use flashing amber lights and reversing beepers.

C922 Pumping, Injection and Monitoring Wells

a) All Ground Investigation works and well installation on site shall be carried out in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland and BS10175:2011 Investigation of Potentially Contaminated Sites: Code of Practice.

b) The Contractor shall procure and arrange for a specialist site investigation contractor to install the pumping / injection / monitoring wells as required for his chosen methodology with particular attention to the ground conditions and the required programme.

c) The construction of the wells (including cable percussive boreholes, sonic, rotary boreholes and/or window-sampler boreholes, as applicable) is to be carried out in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland and BS10175:2011 subject to the following specific requirements:

i) At the Contractors discretion, locations shall be started by means of a hand-excavated inspection pit to 1.2 m bgl. The base of the inspection pit shall be scanned using a cable avoidance tool and probed by hand (using a suitable tool (insulated bar or similar)), prior to continuing. The cost of such measures shall be deemed to be included within the Contractors rates.

ii) All drilling equipment, including casing, shall be clean before arriving on site, and shall be washed using a hot-water or steam cleaner prior to commencement of each exploratory hole.

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iii) The arisings and any flush medium must be contained within the drilling area.

iv) Any water used to assist boring shall be kept to a minimum and shall be of drinking water mains quality.

v) Petroleum based oils and lubricants shall not be used on any boring or drilling equipment, including casing. Vegetable or silicone based grease and oils or similar, from a clearly identifiable source, or a non-leachable PTFE spray, may be used.

vi) The need for 'nested casing' to avoid the creation of potential contaminant migration pathway shall be discussed and agreed with the Engineer, as applicable.

vii) Where groundwater monitoring well installation is required, reference should be made to BS10175:2011.

viii) The location of the response zone (i.e. slotted section) of any borehole standpipe shall be agreed with the Engineer's Representative before installation.

ix) The Contractor shall ensure that the drillers hold appropriate accreditation, and shall check and obtain copies of all such certification for operators before work commences.

x) The Contractor shall also check and obtain copies of all certification for plant before starting work, including any requirements under the Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2010.

xi) Any water arising from boreholes, either during drilling operations, or in preparation for or during groundwater sampling work, shall be managed appropriately.

xii) All drill arisings to be stored in sealed skips or similar and subsequently removed from site.

d) On completion of the pump and treat works the Contractor shall decommission the wells as directed by the Engineer on site. Closure/decommissioning shall comply with the methodology set-out below.

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- i) The permeability of the infill material used shall match the surrounding stratum as far as reasonably practicable, i.e. sand and/or gravel of suitable particle size shall be used in highly permeable material, and cement-bentonite grout shall be used in low permeability soils.
- ii) Cement-bentonite grout shall comprise 1 part Ordinary Portland cement, 3 parts of sodium bentonite powder and potable water. It shall be mixed by hand or using suitable equipment to a uniform consistency, with a moisture content not exceeding 250%.
- iii) The grout shall be pumped into each well, delivered through a tremmie pipe, which shall be raised as filling proceeds. The well shall be filled up to the specified level. The volume of grout used is to be monitored and recorded.
- iv) Measures should be taken to prevent spillage of grout and any spillage is to be removed and the area made good.

C930 Samples

- a) All samples for chemical analysis shall be taken and prepared in accordance with BS10175:2011 and the requirements of the accredited chemical testing laboratory.
- b) The Contractor shall be responsible for handling, packing and dispatching the samples (to the selected analytical laboratory) in accordance with the accredited chemical testing laboratories requirements for sample preservation and handling, which shall include the use of cool boxes and frozen ice packs. He shall also be responsible for checking that the samples dispatched comply with the 'chain of custody documentation' (agreeing any discrepancies with the Engineer); sign the 'chain of custody' documentation; and supply a copy of the signed document to the Engineer.
- c) Liquid samples from a point immediately before the DNAPL Recovery Plant shall be taken weekly and as directed by the Engineer.
- d) Soil samples shall be taken as directed by the Engineer.

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C940 Chemical Tests for Soils and Liquids

Depending upon the Contractors methodology / validation / verification requirements, it may be necessary for the Contractor to undertake chemical testing of soil and/or liquid samples. Should it be necessary, the following shall apply:

- a) The chemical content of solids and liquids shall be determined in accordance with MCERTS/UKAS accredited procedures. Any laboratory proposed by the Contractor must be approved in writing by the Engineer during the tender period, and details submitted with the Contractor's tender submission. Where test methods for determinands are not appropriately accredited, the test method shall be issued to the Engineer for approval prior to the commencement of sampling and testing.
- b) Alternative methods of analysis shall be employed, with the agreement of the Engineer, if necessary to achieve any specified detection limits, which are not achievable by the methodology stated in the above specification or where liquid samples are required for assessment of compliance with the discharge consent.
- c) Results of analysis of samples shall be provided to the Engineer within 10 working days of sampling unless otherwise directed by the Engineer.
- d) Soil samples shall be analysed for the 'standard' and / or 'additional' suite of determinands for soils indicated in Appendix C as directed by the Engineer.
- e) Soil samples shall be analysed for the 'standard' and / or 'additional' suite of determinands for soil leachability indicated in Appendix C as directed by the Engineer.
- f) Water samples shall be analysed for the 'standard' and / or 'additional' suite of determinands for waters indicted in Appendix C as directed by the Engineer.
- g) The results shall be tabulated in the format specified in Appendices C and E. When all analysis is completed the final results shall be supplied in a bound report. The report shall include colour copies of Shewhart Charts for ammonium, phenol, naphthalene, benzo(a)pyrene and BTEX in soils and water, and a description of the methods of analysis employed for all determinands reported. The report shall be signed by a senior representative of the laboratory. Two copies of the report shall be supplied to the Engineer.

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In addition, the results, tabulated in Microsoft Excel™ format, and electronic copies of all Shewhart Charts shall be supplied to the Engineer.

C950 Contaminated Materials and Removal from Site

It is envisaged that majority of material requiring removal off site as part of this contract shall be DNAPL, removed from the groundwater by the DNAPL recovery and treatment plant. A volume of 340m³ is roughly estimated from previous investigations, however, the Contractor shall satisfy himself through his own calculations of the anticipated volume.

Depending upon the Contractors methodology, it is possible that contaminated drill arisings will be generated that shall require off site disposal.

As part of his tender the Contractor shall provide details of his chosen recycling or disposal route including details of the receiving facility (operator, location, licence etc). In addition, the Contractor shall provide details of the handling and transportation of the material from the site to the receiving facility.

- a) The Contractor shall comply with all current legislation and guidance concerning the transportation and disposal of contaminated materials.
- b) The Contractor shall supply weekly records to the Engineer, detailing volumes, and any treatment details for all contaminated materials encountered on Site.
- c) Prior to dispatching any material off site, the Contractor shall provide documentary evidence to the Engineer that all carriers are licensed to carry waste and that the receiving facilities are licensed to accept the type and quantity of material being removed from site.
- d) The Contractor shall supply to the Engineer a copy of the 'receiving facility ticket' for each load of material removed from site during the contract. Each ticket shall show the following information:

- i) name and address of the receiving facility and site the licence number;
- ii) time and date of acceptance by the receiving facility;
- iii) tip ticket number;
- iv) vehicle registration number;

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- v) gross and tare weight of the vehicle and the weight of removed tipped material.
- e) The ticket copies for each day shall be supplied to the Engineer in sequential order, together with a daily summary sheet, which shall contain the following information:
- i) site address, day and date;
 - ii) vehicle type and registration number, and time leaving the site for each load;
 - iii) receiving facility ticket number and consignment number (if applicable), for each load;
 - iv) volume and weight of material transported, for each load;
 - v) total volume and weight of material removed each day.
- f) The summary sheets shall be prepared in Microsoft Excel™ and shall be supplied to the Engineer in paper and digital format as requested.
- g) The ticket copies and summary sheets are to be provided on a weekly basis.
- h) The Contractor shall provide the Engineer with details of his proposed sampling and analysis regime, required for treatment of the contaminated material, to ensure compliance with all waste management regulations/legislation.
- i) The above shall apply for any drilling arisings requiring appropriate storage in sealed skips or similar prior to removal from site. The Contractor shall carry out any special requirements necessary for the handling of drilling arisings, including that of any leachate emanating from them after consultation with the Engineer.

C960 Discharge Consent

A discharge consent shall be required for any water discharged off site via the foul sewer. The Contractor shall be responsible for gaining the consent from Limerick City Council Water Services Department including payment of all fees, the management and monitoring of the works (including liquid sampling and testing) to ensure compliance with the consent.

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Discharge consent criteria have been agreed with Limerick City Council Water Services Department and are presented in Appendix E.

Where confirmatory water samples are required for the discharge consent, these shall be tested for the 'discharge consent' suite indicated in Appendix E.

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5.4 CLASS X: MISCELLANEOUS ITEMS

X100 Fences and Gates

X194 2.0m High Temporary Mesh Panel Fencing

2.0m high temporary mesh panel fencing for segregating clean and dirty areas of the site shall comply with the guidance provided in HS (G) 151 by the HSE. The gap under the fence should be kept to a minimum by fitting a mesh skirt if necessary. Panels shall be back braced to provide stability from winds. Bases shall not protrude into pedestrian areas.

If mesh panels are used, the mesh must be close enough to prevent children climbing the panels.

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Invitation to Tender		Limerick Gasworks Pump and Treat (Phase 1) Remediation
10/054	SPECIFICATION AND DRAWINGS	

Appendix A Previous Reports

The following reports are presented on the enclosed CD:

- Summary Report on Limerick Site – O’ Conner, Sutton, Cronin, August 1995,
- Site Investigation Report: Volume 1 Report - Ove Arup, April 1996,
- Site Investigation Report: Volume 2 Factual Site Investigation Data - Ove Arup, April 1996,
- Desk Study Phase 1 Report – Parkman, April 2001 (report reference 25837/OR/01B),
- Site Investigation Factual Report Volumes 1A and B – Parkman October 2001 (report reference 25827/OR/03B),
- Site Investigation General Report Volume 2 – Parkman October 2001 (report reference 25837/OR/04B),
- Ground Investigation into Boundary Conditions and Quarry Backfill – Parkman 2003 (report reference 25837/R/11A),
- Preliminary Vibration Monitoring 18th May to 24th June 2009 – Reference NV/09/3857NL01. Dated 13th August 2009 – AWN Consulting,
- Site Characterisation Factual Report 1021927/R/02C November 2011- Mouchel.
- Site Vibration Monitoring 4th to 27th November 2009 – Reference NV/09/3857NL03. Dated 4th December 2009 – AWN Consulting,
- Former Gasworks, Dock Road, Limerick: Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 March 2010 – Mouchel. And Addendum report 1021927/R/18 January 2012- Mouchel.
- Environmental Impact Statement 1021927/R/07- Mouchel.

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- Natura Impact Statement 1021927/R16- Mouchel.
- Quarterly Groundwater Monitoring Report – Annual Summary 2009/10 1021927/R/14, November 2010 – Mouchel.
- Quarterly Groundwater Monitoring Report- Annual Summary 2011 1034973/R/04, November 2011- Mouchel.

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Appendix B Preliminary Safety and Health Plan

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Appendix C Chemical Testing Suites and Reporting Order

‘STANDARD’ SOILS SUITE comprising metals and non metals, BTEX and MTBE, TPHCWG, speciated PAH and speciated phenols.

Metals and non-metals	Limit of Detection
arsenic	0.6 mg/kg
cadmium	0.2 mg/kg
chromium (III)	0.9 mg/kg
chromium (VI)	0.6 mg/kg
copper	1.4 mg/kg
lead	0.7 mg/kg
mercury	0.14 mg/kg
nickel	0.2 mg/kg
selenium	1 mg/kg
zinc	1.9 mg/kg
Total cyanide	1 mg/kg
sulphate	48 mg/kg
sulphide	15 mg/kg
ammoniacal nitrogen	15 mg/kg
asbestos	n/a

BTEX and MTBE	Limit of Detection
MTBE	5 µg/kg
Benzene	10 µg/kg
Toluene	2 µg/kg
Ethylbenzene	3 µg/kg
o Xylene	3 µg/kg
p&m-Xylene	6 µg/kg

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TPHCWG	Limit of Detection
Aliphatic EC5-EC6	0.01 µg/kg
Aliphatic EC6-EC8	0.01 µg/kg
Aliphatic EC8-EC10	0.01 µg/kg
Aliphatic EC10-EC12	0.01 µg/kg
Aliphatic EC12-EC16	0.1 mg/kg
Aliphatic EC16-EC21	0.1 mg/kg
Aliphatic EC21-EC35	0.1 mg/kg
Aliphatic EC35-EC44	0.1 mg/kg
Aromatic EC5-EC7	0.01 µg/kg
Aromatic EC7-EC8	0.01 µg/kg
Aromatic EC8-EC10	0.01 µg/kg
Aromatic EC10-EC12	0.01 µg/kg
Aromatic EC12-EC16	0.1 mg/kg
Aromatic EC16-EC21	0.1 mg/kg
Aromatic EC21-EC35	0.1 mg/kg
Aromatic EC35-EC44	0.1 mg/kg

Speciated PAH (US EPA 16)	Limit of Detection
Naphthalene	9 µg/kg
Acenaphthylene	12 µg/kg
Acenaphthene	8 µg/kg
Fluorene	10 µg/kg
Phenanthrene	15 µg/kg
Anthracene	16 µg/kg
Fluoranthene	17 µg/kg
Pyrene	15 µg/kg
Benzo[a]anthracene	14 µg/kg
Chrysene	10 µg/kg
Benzo[b]fluoranthene	15 µg/kg
Benzo[k]fluoranthene	14 µg/kg
Benzo[a]pyrene	15 µg/kg
Indeno[1,2,3-c,d]pyrene	18 µg/kg
Dibenzo[a,h]anthracene	23 µg/kg
Benzo[g,h,i]perylene	24 µg/kg

Speciated Phenol	Limit of Detection
total cresol,	0.01 mg/kg
total xylene	0.01 mg/kg
2,3,5-trimethyl phenol	0.01 mg/kg
2-isopropyl phenol	0.01 mg/kg

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'ADDITIONAL' SOIL SUITES comprising VOC's, SVOC's and PCB's.

	Limit of Detection (µg/kg)
Polychlorinated Biphenyls (EC7)	3

Volatile Organic Compounds	Limit of Detection (µg/kg)
1.1.1.2-Tetrachloroethane	11
1.1.1-Trichloroethane	12
1.1.2.2-Tetrachloroethane	15
1.1.2-Trichloroethane	9
1.1.2-trichloro-1,2,2-trifluoroethane	25
1.1-Dichloroethane	8
1.1-Dichloroethene	9
1.1-Dichloropropene	13
1.2.3-Trichlorobenzene	12
1.2.3-Trichloropropane	13
1.2.4-Trichlorobenzene	9
1.2.4-Trimethylbenzene	10
1.2-Dibromo-3-chloropropane	11
1.2-Dibromoethane	14
1.2-Dichlorobenzene	8
1.2-Dichloroethane	10
1.2-Dichloropropane	10
1.3.5-Trimethylbenzene	8
1.3-Dichlorobenzene	8
1.3-Dichloropropane	7
1.4-Dichlorobenzene	11
2.2-Dichloropropane	10
2-Chlorotoluene	14
4-Bromofluorobenzene	1
4-Chlorotoluene	9
4-Isopropyltoluene	8
Benzene	9
Bromobenzene	14
Bromochloromethane	10
Bromodichloromethane	11
Bromoform	12
Bromomethane	9
Carbon Disulphide	9
Carbontetrachloride	11
Chlorobenzene	7
Chloroethane	12
Chloroform	10
Chloromethane	12
cis-1-2-Dichloroethene	9
cis-1-3-Dichloropropene	25
Dibromochloromethane	9
Dibromofluoromethane	1

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Volatile Organic Compounds	Limit of Detection (µg/kg)
Dibromomethane	12
Dichlorodifluoromethane	13
Dichloromethane	10
Ethylbenzene	9
Hexachlorobutadiene	15
Isopropylbenzene	9
Methyl Tertiary Butyl Ether	9
Naphthalene	7
n-Butylbenzene	7
o-Xylene	11
p/m-Xylene	13
Propylbenzene	6
sec-Butylbenzene	8
Styrene	11
Tertiary amyl methyl ether	15
tert-Butylbenzene	12
Tetrachloroethene	9
Tert-amyl methyl ether	
Toluene	6
trans-1-2-Dichloroethene	12
trans-1-3-Dichloropropene	27
Trichloroethene	9
Trichlorofluoromethane	7
Vinyl Chloride	10

Semi-Volatile Organic Compounds	Limit of Detection (µg/kg)
1,2,4-Trichlorobenzene	100
1,2-Dichlorobenzene	100
1,3-Dichlorobenzene	100
1,4-Dichlorobenzene	100
2,4,5-Trichlorophenol	100
2,4,6-Trichlorophenol	100
2,4-Dichlorophenol	100
2,4-Dimethylphenol	100
2,4-Dinitrotoluene	100
2,6-dichlorophenol	20
2,6-Dinitrotoluene	100
2-Chloronaphthalene	100
2-Chlorophenol	100
2-Methylnaphthalene	100
2-Methylphenol	100
2-Nitroaniline	100
2-Nitrophenol	100
3-Nitroaniline	100
4-Bromophenylphenylether	100
4-Chloro-3-methylphenol	100

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Semi-Volatile Organic Compounds	Limit of Detection (µg/kg)
4-Chloroaniline	100
4-Chlorophenylphenylether	100
4-Methylphenol	100
4-Nitroaniline	100
4-Nitrophenol	100
Acenaphthene	100
Acenaphthylene	100
Aniline	40
Anthracene	100
Azobenzene	100
Bis(2-chloroethyl)ether	100
Bis(2-chloroethoxy)methane	100
Bis(2-chloroisopropyl)ether	10
Bis(2-ethylhexyl) phthalate	100
Butylbenzyl phthalate	100
Benzo(a)anthracene	100
Benzo(b)fluoranthene	100
Benzo(k)fluoranthene	100
Benzo(a)pyrene	100
Benzo(ghi)perylene	100
Bromo-phenylphe ethernyl	30
Chrysene	100
Carbazole	100
Dibenzofuran	100
Di-n-butyl phthalate	100
Diethyl phthalate	100
Dibenzo(a,h)anthracene	100
Dimethyl phthalate	100
Di-n-Octyl phthalate	100
Fluoranthene	100
Fluorene	100
Hexachlorobenzene	100
Hexachlorobutadiene	100
Hexachlorocyclopentadiene	100
Hexachloroethane	100
Indeno(1,2,3-cd)pyrene	100
Isophorone	100
Naphthalene	100
Nitrobenzene	100
N-nitrosodi-n-propylamine	100
Pentachlorophenol	100
Phenanthrene	100
Phenol	100
Pyrene	100

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‘STANDARD’ WATERS SUITE and SOIL LEACHABILITY SUITE comprising metals and non metals, speciated phenols, BTEX and MTBE, TPHCWG, speciated PAH.

Metals and non-metals	Limit of Detection
Arsenic (dissolved)	0.75 µg/l
Cadmium (dissolved)	0.22 µg/l
Chromium (dissolved)	3 µg/l
Hexavalent Chromium	0.03 mg/l
Copper (dissolved)	1.6 µg/l
Lead (dissolved)	0.4 µg/l
Nickel (dissolved)	1.5 µg/l
Selenium (dissolved)	1 µg/l
Zinc (dissolved)	5 µg/l
Mercury (dissolved)	0.01 µg/l
Ammoniacal Nitrogen as N	0.2 mg/l
Sulphate (soluble)	3 mg/l
Total Cyanide	0.05 mg/l
pH Value	1 pH unit

Speciated Phenol	Limit of Detection
total cresol	0.008 mg/l
total xylenol	0.008 mg/l
2,3,5-trimethyl phenol	0.008 mg/l
2-isopropyl phenol	0.008 mg/l

BTEX and MTBE	Limit of Detection
Benzene	7 µg/l
Toluene	4 µg/l
Ethyl benzene	5 µg/l
M & p xylene	8 µg/l
O Xylene	3 µg/l
GRO (C5-C12)	42 µg/l
MTBE	3 µg/l

TPHCWG	Limit of Detection
Aliphatics C5-C6	10 µg/l
Aliphatics C6-C8	10 µg/l
Aliphatics C8-C10	10 µg/l
Aliphatics C10-C12	10 µg/l
Aliphatics C12-C16	10 µg/l
Aliphatics C16-C21	10 µg/l
Aliphatics C21-C35	10 µg/l

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TPHCWG	Limit of Detection
Aromatics C6-C7	10 µg/l
Aromatics C7-C8	10 µg/l
Aromatics C8-C10	10 µg/l
Aromatics C10-C12	10 µg/l
Aromatics C12-C16	10 µg/l
Aromatics C16-C21	10 µg/l
Aromatics C21-C35	10 µg/l

Speciated PAH (US EPA 16)	Limit of Detection
Acenaphthene	0.011 µg/l
Acenaphthylene	0.015 µg/l
Anthracene	0.015 µg/l
Benzo[a]anthracene	0.017 µg/l
Benzo[a]pyrene	0.009 µg/l
Benzo[b]fluoranthene	0.023 µg/l
Benzo[g,h,i]perylene	0.016 µg/l
Benzo[k]fluoranthene	0.027 µg/l
Chrysene	0.013 µg/l
Dibenzo[a,h]anthracene	0.016 µg/l
Fluoranthene	0.014 µg/l
Fluorene	0.014 µg/l
Indeno[1,2,3-c,d]pyrene	0.014 µg/l
Naphthalene	0.1 µg/l
Phenanthrene	0.022 µg/l
Pyrene	0.015 µg/l

‘ADDITIONAL’ WATER SUITE comprising VOC’s.

Volatile Organic Compounds	Limit of Detection (µg/l)
1.1.1.2-Tetrachloroethane	1
1.1.1-Trichloroethane	1
1.1.2.2-Tetrachloroethane	5
1.1.2-Trichloroethane	2
1.1.2-trichloro-1,2,2-trifluoroethane	25
1.1-Dichloroethane	1
1.1-Dichloroethene	1
1.1-Dichloropropene	1
1.2.3-Trichlorobenzene	3
1.2.3-Trichloropropane	9
1.2.4-Trichlorobenzene	2
1.2.4-Trimethylbenzene	1
1.2-Dibromo-3-chloropropane	10
1.2-Dibromoethane	2
1.2-Dichlorobenzene	3
1.2-Dichloroethane	4

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Volatile Organic Compounds	Limit of Detection (µg/l)
1.2-Dichloropropane	3
1.3.5-Trimethylbenzene	1
1.3-Dichlorobenzene	2
1.3-Dichloropropane	2
1.4-Dichlorobenzene	1
2.2-Dichloropropane	1
2-Chlorotoluene	2
4-Chlorotoluene	2
4-Isopropyltoluene	3
Benzene	1
Bromobenzene	1
Bromochloromethane	2
Bromodichloromethane	1
Bromoform	3
Bromomethane	2
Carbon Disulphide	2
Carbontetrachloride	1
Chlorobenzene	4
Chloroethane	2
Chloroform	2
Chloromethane	1
cis-1-2-Dichloroethene	2
cis-1-3-Dichloropropene	2
Dibromochloromethane	2
Dibromomethane	3
Dichlorodifluoromethane	1
Dichloromethane	3
Ethylbenzene	2
Hexachlorobutadiene	3
Isopropylbenzene	2
Methyl Tertiary Butyl Ether	2
Naphthalene	4
n-Butylbenzene	2
o-Xylene	1
p/m-Xylene	2
Propylbenzene	3
sec-Butylbenzene	1
Styrene	1
Tertiary amyl methyl ether	15
tert-Butylbenzene	2
Tetrachloroethene	2
Tert-amyl methyl ether	1
Toluene	1
trans-1-2-Dichloroethene	2
trans-1-3-Dichloropropene	3
Trichloroethene	2
Trichlorofluoromethane	2
Vinyl Chloride	1

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Appendix D Service Drawings

The following drawings are provided for information in hard copy:-

- Services Plan- Drawing Reference 1021927/WL/004
- Unlabelled A3 drawing on graph paper of the Pressure Reduction Facility at Dock Road, Limerick. (It is envisaged that these will have been removed prior to commencement on site).
- Gas Mains Layout, Limerick Gasworks – Bord Gais Networks dated 08/07/10. (It is envisaged that these will have been removed prior to commencement on site).
- Unlabelled A2 drawing of the ESB layout dated 09-Mar-09. (It is envisaged that these will have been removed prior to commencement on site).

A CD is also attached which contains the Bord Gais Networks' Safety Booklet DO/SQ/IS/002 Rev 0, dated 01.03.09 and the Code of Practice for Working in the Vicinity of Pipelines – BGE/WJ/48.

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Appendix E Criteria for Discharge Consent to Foul Sewer / Re-injection into the Ground

Temperature	<25°C
pH	6-10
BOD	<50 mg/l
COD	<300 mg/l
Nitrates (as N)	<10 mg/l
Sulphates (as SO ₄)	<500 mg/l
Phenols (as C ₆ H ₅ OH)	<3 mg/l
Arsenic	<0.6 mg/l
Mercury	<0.01 mg/l
Cadmium	<0.05 mg/l
Cyanide (total, free)	<3.0 mg/l
Lead	<0.5 mg/l
Copper	<5 mg/l
Zinc	<10 mg/l
Chromium	<0.5 mg/l
Total Polyaromatic Hydrocarbons (PAH)	<0.2 mg/l
Mineral Oils	<50 mg/l
Toxicity Units (as T.U)	<30 t.u

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**LIMERICK GASWORKS
SOLIDIFICATION AND STABILISATION (PHASE 2)
REMEDICATION**

Part 3

SPECIFICATION AND DRAWINGS

Tender Reference no.: 10/054

Report Reference: 1021927/R/26A

Rev. No.	Purpose	Originated	Checked	Approved	Date
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Invitation to Tender		Limerick Gasworks Stabilisation and Solidification (Phase 2) Remediation
10/054	SPECIFICATION AND DRAWINGS	

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1021927/PHASE 2 - TENDER/OD/002	Site Layout (indicating historic structures and existing above ground structures).
1021927/PHASE 2 - TENDER/OD/003	Characterisation Exploratory Hole Location Plan
1021927/PHASE 2 - TENDER/OD/004	Previous Investigation Exploratory Hole Location Plan
1021927/PHASE 2 - TENDER/OD/005A-005H	Cross Sections
1021927/PHASE 2 - TENDER/OD/006	Encountered NAPL (Characterisation)
1021927/PHASE 2 - TENDER/OD/007	Encountered NAPL (Historic)
1021927/PHASE 2 - TENDER/OD/008	Constraints Plan
1021927/PHASE 2 - TENDER/OD/009	Existing Offices Floor Layouts
1021927/PHASE 2 - TENDER/OD/010	Information Boards
1021927/PHASE 2 - TENDER/OD/011	Dust and Vibration Monitoring Locations
1021927/PHASE 2 - TENDER/OD/012	Topographical Survey
1021927/PHASE 2 – TENDER/OD/013	Finished Levels

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Appendices

- Appendix A Previous Reports**
- Appendix B Preliminary Safety and Health Plan**
- Appendix C Acceptable Earthworks Criteria**
- Appendix D Service Drawings**
- Appendix E Criteria for Discharge Consent to Foul Sewer**
- Appendix F Planning Conditions**
- Appendix G Remedial Target Values**

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1 Introduction

1.1 Documentation Description

This specification details the stabilisation and solidification remediation works (Phase 2) to be undertaken at Limerick Gasworks. It is arranged using series letters and clause numbers generally in accordance with the divisions in Civil Engineering Standard Method of Measurement (3rd Edition) published by Thomas Telford, 1991 (CESMM3).

This introduction, (together with the Remediation Strategy detailed in Section 2) provides a general description of the site in order to assist the Contractor in his overall appreciation of the data and requirements. However, because of the generalisation it is not definitive and the requirements of the Specification (Section 4) shall take precedence if there is any ambiguity.

The specification is one of the documents which will comprise the Tender documents. The list of Tender documents for the project are detailed in Table 1.

Table 1. Tender Documents for the Project

Document Title	Reference	Prepared by
Instructions to Tenderers, Form of Tender and Appendix to the Form of Tender – Part 1	1021927/R/24	McCann FitzGerald
Conditions of Contract – Part 2	1021927/R/25	McCann FitzGerald
Specification and Drawings (this document) – Part 3	1021927/R/26	Mouchel
Bill of Quantities – Part 4	1021927/R/27	Mouchel

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1.1.1 Project Directory

Table 2 below identifies the project directory including emergency contact numbers.

Table 2 Project Directory

Role	Organisation	Contact Name(s)	Title	Address
Employer	Bord Gais Eireann	Declan Burke	Project Manager	(T) +353 (0) 21 4534420 Email dburke@bge.ie
Engineer	Mouchel Ltd	Tony Brown	Technical Director	(T) +44 (0) 151 348 8112 +44 (0) 7740763238 Email tony.brown@mouchel.com
Project Supervisor (Design Phase)	Mouchel Ltd	Charlie Parkinson	Project Supervisor (Design Phase)	(T) +44 (0) 113 203 5632 (M) +44 (0) 7976 343938 Email charlie.parkinson@mouchel.com
Project Supervisor (Construction Phase)	Remediation Contractor – when appointed	TBC	TBC	TBC
Public Liaison	Bord Gais Eireann	Linda O'Brien	Liaison Officer	(T) +353 (0) 21 453 4183 Email liobrien@bge.ie
Main Contractor	Remediation Contractor – when appointed	TBC	TBC	TBC
Land Surveyors (original survey)	Murphy Global Consulting Surveyors	-	-	(T) +353 (0) 21 4895704 Email cork@murphysurveys.ie
Regulators	Environmental Protection Agency	Brian Meaney	Senior Scientific Officer	(T) +353 (0) 53-9160600 Email B.Meaney@epa.ie
Local Authority	Limerick City Council	Kieran Reeves	Senior Executive Planner	(T) +353 (0) 61 407210 Email kreeves@limerickcity.ie www.limerickcorp.ie
Sanitation Authority	Limerick City Council	Ursula Ahern	Assistant Scientist	(T) +353 (0) 61 407190 Email uahern@limerickcity.ie

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Table 3 below identifies the utilities directory.

Table 3 Project Directory - Utilities

Utility	Organisation	Address
Public Sewers	Limerick City Council Water Services Department	Water Services Department (Water Supply, Sewerage), 2nd Floor, City Hall, Merchants Quay, Limerick, IRELAND (T) +353 (0) 61 407229 www.limerickcorp.ie/Water/
Water	Limerick City Council Water Services Department	Water Services Department (Water Supply, Sewerage), 2nd Floor, City Hall, Merchants Quay, Limerick, IRELAND (T) +353 (0) 61 407229 www.limerickcorp.ie/Water/
Electricity	ESB Network	www.esb.ie/esbnetworks/en/home/index.jsp (T) 1850 372 757 Email: esbnetworks@esb.ie
Gas	Bord Gais Networks	www.bordgais.ie/networks/
Telecoms	Eircom	www.eircom.ie

1.2 Site Location and Description

The 1.4 ha site is located in the City of Limerick approximately 100 m south east of the River Shannon and immediately south east of the Dock Road. The national grid co-ordinates for the site are E156950 N156650. A location plan is included as Drawing 1021927/PHASE 2 - TENDER/OD/001.

The site, roughly rectangular in shape, is generally level at approximately 5 m MHD (Malin Head Datum) but rises to approximately 8 m MHD towards the south and east boundaries.

The site is surrounded by housing and light industry to the northeast and housing to the southeast and southwest. To the northwest are Limerick docks comprising industrial properties, a graving dock, wet dock and the River Shannon.

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The site is currently not in use and access is managed by Bord Gais. The site includes a two-storey office block and other ancillary buildings (including No 5. store), none of which are used on a permanent basis. The No. 5 store (also known as the Generator Building), the walls around the AGI site and the masonry wall at the Dock Road boundary have Protected Status.

The remediation works are to be split into two phases. Phase 1 Pump and Treat remediation and Phase 2 (this Phase) Stabilisation / Solidification.

Drawing 1021927/PHASE 2 - TENDER/OD/002 presents the site layout (including historic structures and existing above ground structures).

Where grid cells are referenced in this report, the grid labels are indicated on Drawings 1021927/PHASE 2 - TENDER/OD/003 and 1021927/PHASE 2 - TENDER/OD/008.

1.3 Site History

The site history is summarised below:

- in the 1830's a limestone quarry was situated in the eastern part of the site, with a small gas works located on-site immediately to the north west of the quarry;
- by 1872 the gas works occupied the majority of the site, with a water feature located within the remaining quarry;
- the quarry had been backfilled by 1938, and an electricity substation was located on-site along the north east boundary;
- coal gas manufacture ceased in 1974 and the works became an oil gas plant until 1986 when natural gas was introduced;
- demolition and site clearance took place between 1988 and 1995.

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Site clearance (2009) was undertaken to facilitate access for the characterisation works undertaken in November 2009. Works also included the placement of gabion baskets along a short length of the south boundary wall (grid cells G12, H12, and I12 and grid cells L10, L11 and L12) as it was considered to be unstable. Shoring was also provided to the Dock Road wall.

The former Quarry and gasholder wells/ tar tanks etc are identified and numbered (T1, T2, T3 etc) on Drawing 1021927/PHASE 2 - TENDER/OD/008.

1.4 Definitions

For the purposes of these tender documents (Table 1), the following technical definitions apply:-

'NAPL' – Non Aqueous Phase Liquid – A liquid that is present in concentrations in excess of the saturation limit, is immiscible in water and is present as a discrete product.

'DNAPL' – Dense Non Aqueous Phase Liquid – A non aqueous phase liquid that is denser than water. It refers to liquid that is present either as free product or in pore space or adsorbed onto the surface of soil or other particles. It is not necessarily easily liberated or pumpable without thermal or chemical assistance.

'Free Product' – This refers to NAPL that is not locked into pore space or adsorbed onto the surface of soil or other particles.

'The Agency' – This refers to the Environmental Protection Agency.

1.5 Previous Assessments

The site has been subject to previous phases of assessment. These comprise:-

- five ground investigations - O'Connor, Sutton, Cronin (1995); Arup (1996); Parkman (2001 and 2003), Mouchel (2009 site characterisation, reported 2010)
- one desk study – Parkman (2001). But some desk based assessment undertaken by O'Connor, Sutton, Cronin (1995) and Arup (1996)

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- one quantitative risk assessment – Mouchel (2010 – based on the 2009 site characterisation).

These assessments are reported in the following documents which are provided for information on CD in Appendix A.

- i. Summary Report on Limerick Site – O’ Conner, Sutton, Cronin, August 1995,
- ii. Site Investigation Report: Volume 1 Report - Ove Arup, April 1996,
- iii. Site Investigation Report: Volume 2 Factual Site Investigation Data - Ove Arup, April 1996,
- iv. Desk Study Phase 1 Report – Parkman, April 2001 (report reference 25837/OR/01B),
- v. Site Investigation Factual Report Volumes 1A and B – Parkman, October 2001 (report reference 25827/OR/03B),
- vi. Site Investigation General Report Volume 2 – Parkman, October 2001 (report reference 25837/OR/04B),
- vii. Ground Investigation into Boundary Conditions and Quarry Backfill – Parkman, 2003 (report reference 25837/R/11A),
- viii. Preliminary Vibration Monitoring 18th May to 24th June 2009 – Reference NV/09/3857NL01. Dated 13th August 2009 – AWN Consulting,
- ix. Site Characterisation Factual Report 1021927/R/02C November 2011- Mouchel,
- x. Site Vibration Monitoring 4th to 27th November 2009 – Reference NV/09/3857NL03. Dated 4th December 2009 – AWN Consulting,
- xi. Former Gasworks, Dock Road, Limerick: Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 March 2010 – Mouchel, and Addendum Report 1021927/R/18 January 2012- Mouchel,
- xii. Environmental Impact Statement 1021927/R/07 – Mouchel,
- xiii. Natura Impact Statement 1021927/R/16- Mouchel,

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- xiv. Quarterly Groundwater Monitoring Report – Annual Summary 2009/10, 1021927/R/14, November 2010 – Mouchel,
- xv. Quarterly Groundwater Monitoring Report – Annual Summary 2011, 1034973/R/04, November 2011 – Mouchel,

The verification report for the phase 1 remediation works (DNAPL pump and treat) will be provided as soon as it is available.

1.6 Geology, Hydrology and Hydrogeology

This Section summarises the Mouchel 2009 Site Characterisation Factual Report 1021927/R/02 February 2010 and the Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 February 2010. More detailed information can be obtained from these reports, presented on CD in Appendix A.

1.6.1 Published Geology

The Geological Survey of Ireland, Sheet 17, Limerick, 1:100,000 Scale; the Geological Survey of Ireland publication “Geology of the Shannon Estuary” and the local geological memoir were consulted and indicated that the bedrock beneath the site comprises the Visean Limestones of the Lower Carboniferous Period.

1.6.2 Site Specific Geology

From the five previous site investigations (including the 2009 characterisation), the general sequence of ground conditions comprised; Made ground underlain by limestone, with localised alluvium around the site boundary extending from the north west to the south west of the site.

The sequence encountered is summarised in Table 2.

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Table 4: Summary of encountered ground conditions during the 2009 Site Characterisation.

Stratum	Range of depth strata encountered (m bgl)	Average thickness (m)
Made Ground	0 – 10	4.3
Alluvium	0 – 5.5	1.8
Limestone bedrock	0 - 10	-
Limestone quarry feature over the eastern half of the site – up to 10m deep.		

Limestone outcrops on the north east and south east boundaries.

1.6.3 Hydrology

The site is situated on the southern side of the River Shannon estuary, which flows westerly into the Atlantic. At the site, the estuary is approximately 200 m in width and subject to tidal influence.

The average rainfall for the area is between 800mm and 1000mm per year (taken from www.met.ie).

The site currently comprises approximately 60 % hard cover and 40 % free draining material (with many underground structures that may impinge on the infiltration and flow of rainwater/perched water through the made ground). There is a fall in the site level from the south east (8 m MHD) to the west and north west (5 m MHD), directing surface run-off in this direction. The River Shannon's water level is typically 0 m MHD near to the site.

1.6.4 Hydrogeology

The Groundwater Protection Maps for County Limerick (Maps 1-6) indicate that the underlying limestone is a 'Locally Important Aquifer' that is generally Moderately Productive (40-100 m³/d).

The hydraulic properties of the aquifer are dominated by fissure flow and well-developed karst features have been observed in the area.

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The nearest abstraction well is 6 km to the south east of the site. The oolitic limestones of the Limerick syncline are known to have relatively high permeabilities. The aquifer is classified as 'Vulnerable' due to the lack of impermeable cover or thick unsaturated zone.

There are no recorded active wells or boreholes in the vicinity of the site; although the historical site plan dated 1977 shows a well 5 m to the north west of Gasholder No.3 (T11). The well was not identified during any of the ground investigation works.

1.6.5 Site Specific Hydrogeology

The Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy report 1021927/R/03 includes a comprehensive section on site specific hydrogeology (Section 3.7.1).

Occasional pockets of perched water were encountered in trial pits in the made ground during the investigations undertaken at the site. However, these were not generally reported in any of the boreholes in any investigation. During the excavation of the trial pits in the 2009 investigation several pockets of perched water were encountered. As the excavations progressed in some instances the water drained away quickly, indicating the presence of impermeable obstructions within the made ground which have created localised areas of perched water.

One soakaway pit was excavated during the characterisation investigation in the made ground which was described as a sandy gravelly clay. A falling head permeability test was undertaken in the pit. The water dissipated very slowly over a period of several hours during the test.

Localised pockets of 'tarry liquid' were identified by Arups (1996). During the 2009 investigation a 'tarry / hydrocarbon' dense non aqueous phase liquid (DNAPL) was recorded in several locations and within some monitoring wells. Drawings 1021927/PHASE 2 - TENDER/OD/006 and 1021927/PHASE 2 - TENDER/OD/007 show areas of free phase contamination in the made ground and within the fractured limestone bedrock during the recent (2009) and previous investigations respectively.

Generally hydraulic continuity exists between the Made Ground and the bedrock due to the granular nature of the made ground, and therefore the groundwater potentially acts as one body.

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The water table falls from approximately 7.8m MHD in the south eastern section of the site, to approximately 2.7m MHD on the boundary with Dock Road.

The groundwater data implies that there may be two sources of groundwater entering the site; Source 1 – Originating from the southern corner of the site from within the rock outcrop; Source 2 – Originating from the south east section where water is draining into the site.

The water appears to accumulate in the quarry area and flow in an approximately westerly direction as would be expected close to the river.

Mouchel have been undertaking groundwater monitoring at quarterly intervals since the first two visits in December 2009 and January 2010. The results are presented in Appendix A.

1.7 Identified Contamination Sources

This Section summarises information provided in the Mouchel Quantitative Risk Assessment, Options Appraisal and Remedial Strategy ref 1021927/R/03. This report should be referred to for further assessment.

1.7.1 Site Characterisation Identified Sources

The Mouchel 2009 site characterisation investigation identified several areas of extensive NAPL and ash material and one localised deposit of spent oxide ('Blue Billy').

Based upon visual and olfactory evidence gained during the investigation works, the primary areas of NAPL encountered during the characterisation investigation have been outlined in Table 5.

Post Characterisation monitoring results including NAPL thickness are presented in the groundwater monitoring reports in Appendix A.

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Table 5. Primary areas of NAPL contamination

General area of site	Cell location	Visually Contaminated horizon from borehole logs (m MHD)	Thickness of heavily contaminated soil (m)	Predominant horizon type	Max Measured thickness of NAPL in BH installation (m)	Approx depth of groundwater (m MHD)
Deep Limestone feature (under Gasholder 2 (T12) and surrounds)	B05	1.48 to 0.98*	0.50	MG: Gravelly clay	-	3.7
	B06	2.65 to 1.45	1.20	MG: Gravelly clay	-	3.7
	B07	2.49 to 1.99	0.50	MG: Gravelly clay	-	3.6
	B08	3.69 to 0.99	2.70	MG: Gravelly clay	-	3.7
	C05	6.37 to 5.87	0.50	MG: Gravelly clay	-	4.5
	C06	4.35 to -0.65*	5.00	MG: Gravelly clay	-	4.1
	C07	4.45 to -0.45*	4.90	MG: Gravelly clay	1.78	4.0
	C08	4.68 to 2.38*	2.30	MG: Clayey gravel	-	3.9
	D05	-	0	-	-	5.2
	D06	-	0	-	-	4.7
	D07	4.60 to 2.30*	<u>2.30</u> Ave = 1.81	MG: Gravelly clay	-	4.3
Pre 1872 tank (T23)	D08	6.22 to 4.22	2.00	MG: Gravelly clay/ gravel	-	4.3
	D09	-	0	-	-	4.1
	E08	-0.16 to -1.16	1.00	Limestone Bedrock	-	4.8
	E09	3.92 to -0.08*	<u>4.00</u> Ave = 1.75	MG: sandy gravel	-	4.7
Former quarry area	E03	3.12 to 1.07	2.05	MG: clayey gravel	-	4.9
	E04	6.10 to 4.68	1.42	MG: gravel with NAPL	-	5.0
	F03	1.35 to 0.35	1.00	MG: gravelly clay	-	5.0
	F06	5.76 to 5.06	0.70	MG: sandy gravel	-	5.5
	F07	6.82 to 6.22	0.60	MG: gravelly clay	-	5.5
	G04	-1.55 to -4.55	3.00	Limestone Bedrock	1.24	5.2
	G05	-0.26 to -3.76*	3.50	Limestone Bedrock	-	5.3
	G06	5.20 to 3.70*	1.50	MG: gravelly sand	-	5.9
	G07	4.24 to 1.24*	3.00	MG: clayey sand	-	6.4
	H06	5.45 to 3.95	1.50	MG: clayey gravel	-	6.5
	I06	6.91 to 1.36*	<u>5.55</u> Ave = 2.20	MG: clays and gravel	-	6.9
	I07	5.04 to 2.04	<u>3.00</u>	MG: Gravelly clay	-	7.1
Booster House	F08	6.98 to 6.48	0.50	MG: gravelly silt	-	6.3
	F09	7.17 to 6.67	0.50	MG: gravelly silt	-	6.1
	F10 WS	6.52 to 6.27	<u>0.25</u> Ave = 0.4	MG: cobbles	-	5.3
Tar tank 7 (T28)	H08	4.15 to 2.95	1.20	MG: gravelly sand	-	6.8
	H09	5.65 to 3.65	0	MG: clayey gravel	-	6.8
	I08	4.11 to 2.81	1.30	MG: gravelly clay	-	7.1
	I09	4.15 to 3.45	<u>0.7</u> Ave = 0.80	MG: gravelly clay	-	7.0
Gasholder 3 (T11) and surrounds	J06	3.48 to 1.98	1.50	MG: cobbles	-	7.4
	K04	1.88 to 0.88	1.00	MG: gravelly clay	-	7.0
	K05	7.64 to 2.64	5.00	MG: gravelly clay	-	7.8
	K06	6.82 to 4.62	2.20	MG: gravelly clay	-	7.6
	L03	3.51 to 2.51	1.00	MG: gravelly clay	-	6.1
	L04	5.26 to -0.74	6.00	MG: cobbles-Limestone	-	6.6
	L05	6.91 to 2.41*	4.50	MG: gravelly clay	-	7.2
	L06	6.91 to 1.61*	5.30	MG: gravelly clay	-	7.3
	M05	2.35 to 0.35	<u>2.00</u> Ave = 3.2	MG: gravelly clay	-	6.7
Pre 1840 tank (T13)	D05	-	0	-	-	5.2
	D06	-	0	-	-	4.7
	E05	-	0	-	-	5.2
	E06	4.83 to 2.83*	<u>2.00</u> Ave = 0.5	MG: gravelly clay	-	5.3
Bord Gais office	F12 WS	0.50 to 1.2	0.70	MG: gravelly clay	-	5.2

*Free product intermittent throughout stated horizon

MG = made ground

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During the characterisation investigation it was apparent that dissolved phase and free product may have been transported from these primary sources across the site. Hydrocarbon staining and odours were noted in the majority of locations at the site. Both dissolved and free phase is known to have migrated into the fractured and weathered limestone.

1.7.2 *Historically Identified Sources*

The primary sources of contaminants identified during the assessments undertaken prior to the 2009 site characterisation were the underground tanks and gas holder wells, in addition to the backfill material within the former quarry. Secondary sources are sorbed phase contaminants in soil, free product that has leaked from the primary sources into the soil, or pooled there, dissolved phase contamination in groundwater, and free phase contaminants in groundwater. Both dissolved and free phase is known to have migrated into the fractured and weathered limestone.

Identified contaminants typically correlate with the presence of gasworks-derived tars, liquors, TPH, naphthalene and other waste materials located within underground tanks, structures and made ground, together with material used to backfill the quarry.

1.7.3 *Known Underground Tanks*

Numerous underground tanks are known to be present on site; the significant ones are highlighted on Drawing 1021927/PHASE 2 - TENDER/OD/008. Details of the tanks are presented in Table 6 below. All these tanks with the exception of T34 which straddles the south-western wall of the No.5 Store building (generator building) are known to be backfilled with materials predominantly contaminated with coal tars (sometimes as free phase).

T34, partially underlying the No 5 Store Building, is known to be partially backfilled (with the potential for standing water to be present). It shall be a requirement of the solidification and stabilisation works that all water is removed from tank T34 before it is filled with grout. The sides and base of this tank are believed to be watertight. Therefore there shall be no requirement to breakout either the sides or the base or to remove any of the existing backfill prior to grouting. Tenders shall include prescriptive method statements for undertaking this procedure.

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Table 6. Details of significant underground tanks

Tank Number & Age	Approximate Diameter	Approximate Depth of tank (source of data)	Approximate Volume of tank	Backfill?
T7 (pre-1919)	6m	1m (Arup 1996 TP14)	30m ³	yes
T11 (Pre-1902)	25m	6.0m (Mouchel 2009 J06, K04, K05, K06, L04, L05, L06, M05, M06)	2,945m ³	yes
T13 (Pre -1840)	10m	3.2m (Mouchel 2009 E06)	250m ³	yes
T14 (Pre-1840)	3m	2m (professional judgment)	14m ³	unknown
T15 (Pre – 1840)	10m	4.8m (Mouchel 2009 E07)	375m ³	yes
T23 (Pre -1872)	19m	5m (Mouchel 2009 E08, E09)	1,420m ³	yes
T28 (Pre-1872)	16m	4m (Mouchel 2009 H09, I08, I09)	800m ³	yes
T34 (Pre-1919)	4m x 13m (rectangular tank)	>2.3m (O'Connor 1995) 3m (professional judgment)	156m ³	partial
			5,990m ³	Total

These tanks are being targeted during the Phase 1 remediation works. Significant quantities of DNAPL are estimated to be present from the characterisation works and it is unlikely that all the DNAPL will be removed during the pump and treat remediation works. The Contractor shall therefore include for dealing with any residual DNAPL in his rates and costs.

1.7.4 Former Quarry and Deep Limestone Feature

An extensive former quarry is known to be present over the eastern half of the site and is up to 10m deep. Free product is present at its base. Drawing 1021927/PHASE 1 TENDER/OD/008 indicates the quarry location.

The quarry is shown as extending outside the boundary of the site in historical maps, which appeared to be confirmed during the characterisation investigation as the edge of the quarry could not be located near the O'Curry Street boundary.

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A deep area of made ground was identified by the ground investigations under the former large gasholder no. 2 (T12), which was an above ground waterless holder. It appears that a deep limestone feature is present at this location and free product has been identified at the base of the made ground. Anecdotal evidence suggests that a former gasholder well may have existed at this location.

1.8 Pump and Treat Remediation (Phase 1)

This Section will summarise the Contractors proposed Pump and Treat remediation methodology and will be completed when the Preferred Contractor has been identified.

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2 Remediation Strategy

2.1 Overview

The comprehensive characterisation site investigation and quantitative risk assessment (QRA) has identified the presence of:-

- total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene and xylenes (BTEX), polyaromatic hydrocarbons (PAH's), cyanide and heavy metals that pose a risk to human health.

Remediation Target Values (RTV's) have been derived for soils. Whilst a theoretical risk to the River Shannon has been identified, it is unlikely that an actual risk exists due to contaminant degradation and increased travel times. However, it should be noted that free phase hydrocarbons were not tested within the water samples. Therefore the models utilised assume no free product is present and the calculations are based on dissolved phase only. Therefore free product will require removal in order to allow justification of the risk assessments.

Further to a detailed options appraisal, the preferred remediation solution was determined to be to remove free product by pumping and treating (Phase 1 works (currently being undertaken by *[insert name of Contractor]* and due for completion in *[insert month]* 2012) followed by ex-situ stabilisation / solidification of the uppermost 3m of made ground (this phase). An additional aim of the Phase 1 works was to reduce the likelihood of problematic odours during the Phase 2 excavation works.

This remediation strategy is relevant to the Phase 2 – Stabilisation / solidification remediation.

Residual free product is likely to be generally present as coal tars (DNAPL) at the base of several underground tanks, within the quarry area and within the deep limestone feature. At a number of locations, generally within tanks, DNAPL is also likely to be present within pore space and adsorbed onto soils where thermal / chemical assistance during the pump and treat works was unable to liberate and remove it.

The stabilisation / solidification works are expected to last between 6 and 8 months (depending on the proposed methodology).

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The Contractor shall be required to provide detailed method statements for their proposed methodology. Details are provided in Part 1 of the tender documents (Instructions to Tenderers). A methodology confirmation period is also available for the preferred bidder to undertake trials (including laboratory testing) to confirm the suitability of their chosen methodology.

2.1.1 Excavation, Stabilisation and Solidification

It is proposed that the upper 3m of soils across the site are excavated except where site constraints preclude excavation to this depth or limestone is encountered at shallower depth.

Excavations shall be undertaken on a 10m x 10m grid cell basis, using the chemical analysis results obtained from the previous assessments to determine treatment streams. These may include:-

- i) 'hard dig material' (concrete, brick etc) requiring no treatment which, following crushing/screening could be used as a capping layer (provided the soil criteria for site won crushed materials are not exceeded – to be tested at a rate of one test per 100m³),
- ii) material requiring stabilisation/ solidification,
- iii) highly contaminated untreatable material. It may be more cost effective to remove this material from site for disposal/ treatment rather than add large quantities of binder to try to stabilise them.

The volume of material for excavation is estimated to be in the order of 33,200m³, while the volume requiring stabilisation / solidification is estimated to be in the order of 20,000m³. The Contractor shall make his own assessment of the volumes. Once stabilised / solidified, that material shall be used for backfill and compacted, providing the soil leachability criteria presented in Appendix G are not exceeded – (to be tested at a rate of one test per 10m grid cell).

Where tanks extend to below 3m depth, the contents shall be excavated to the base of the tank and treated appropriately. The tank shall then be backfilled to a depth of 3m below ground level with suitable fill materials that shall comply with the soil criteria for stabilised / solidified, site won or imported crushed materials. The sides (below 3m depth) and the base do not need to be excavated.

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All buried structures within the 3m excavation depth shall be broken out, excavated and crushed for re-use as appropriate subject to chemical testing. This will result in the majority of underground structures being removed to facilitate the possible future redevelopment of the site.

Any remaining obstructions at the 3m dig depth shall be surveyed to record their exact locations for future reference.

2.1.2 Ground Water

Control of ground water is the responsibility of the Contractor who shall ensure that ground water does not inhibit his ability to excavate or ground water entry into excavations does not re-contaminate material that has been backfilled following treatment or import.

Any ground water removed from excavations would need to pass through a water treatment plant prior to disposal to foul sewer under an appropriate discharge licence obtained from Limerick City Council, providing the criteria specified in Appendix E are not exceeded. Contact details at the Water Services Department are provided in Table 3 (Section 1.1.1).

2.1.3 Backfilling and Capping

Stabilised / solidified material shall be backfilled and compacted in accordance with the compaction specification in Appendix C.

Stabilised / solidified material shall also be tested for soil leachability as detailed in Section 2.4 and shall be required to achieve the leachability remedial target values (RTV's) presented in Appendix G.

Shear strength testing shall be undertaken on one U38 sample from each grid cell at 10 days after backfilling and compaction to provide a record of the strength of the materials.

In order to comply with the RTV's for surface soils as calculated by the human health risk assessment, it will be necessary to provide a cover layer to the site in the form of a minimum 300mm thick capping of 6F2 grade crushed material (see Appendix C). Site won crushed material shall be required to comply with the soil RTV's detailed in Appendix G. Imported 6F2 material shall be tested and shall be required to comply with the imported soil RTV's detailed in Appendix C.

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A geotextile such as Terram 1000 or similar shall be utilised across the site between the backfilled stabilised / solidified material and the 300mm depth of 6F2 granular capping.

Site won 6F2 crushed material and imported 6F2 crushed material can be utilised anywhere as backfill subject to achievement of the relevant RTV's.

2.1.4 Pilot Study

A pilot period is provided and shall be utilised to prove that the Contractor's chosen methodology will successfully stabilise and solidify the soils, resulting in compliance with the RTV's and to demonstrate that appropriate disposal / recycling facilities are available as required.

The preferred Contractor shall undertake pilot works over a maximum period of 2 months (including reporting) from award of 'Preferred Contractor' status. It is at the Contractor's discretion to shorten the period if he can demonstrate that time and cost savings can be made by doing so without comprising the outcome. The Contractor shall prepare a report on the progress and suitability of his chosen method and submit his findings to the Engineer within the pilot period. On submission of the report, the Engineer shall have 2 weeks in which to review the report and make his recommendations to the Client. If the pilot is considered to be a success, the Contract for the stabilisation / remediation works shall be awarded at the end of the Engineers 2 week review period.

A maximum allowance of €20,000 has been allocated by Bord Gais for the pilot study and shall include all the Contractor's requirements including welfare, temporary accommodation and health and safety. All works within this period shall be undertaken in accordance with the Contract Documents and Specification, except in the case of welfare facilities, accommodation, health and safety and reporting which shall be appropriate for the works undertaken and shall comply with all relevant legislation.

Any additional costs incurred above the €20,000 shall be borne by the Contractor.

2.1.5 Drainage

During the works, the Contractor shall ensure surface water run-off is correctly managed and does not cause an environmental nuisance.

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On completion of the works, the Contractor shall provide suitable drainage along the Dock Road boundary and at the Dock Road entrance to ensure surface water run-off does not pond along the lowest points of the site. The Contractor shall make the necessary arrangement for discharge to sewer / surface water drains on Dock Road.

2.2 Site Constraints

The following site constraints have been identified as requiring due allowance in the design of the remediation works. Other constraints may exist that have not been identified. Reference should be made to Drawing 1021927/PHASE 2 - TENDER/OD/008 (which indicates the locations of all identified site constraints) and to the Mouchel Quantitative Risk Assessment, Options Appraisal and Remediation Strategy report 1021927/R/03 February 2010 for further details of identified site constraints.

2.2.1 Unstable boundary walls / steep slopes / buildings

A significant proportion of the boundary walls are considered to be unstable. These include the following:-

- 1) Dock Road wall (north western boundary) and the former Above Ground Installation (AGI) boundary wall – these are constructed of masonry limestone blocks and are up to 6m in height. They have Protected Status.
- 2) Brick boundary walls (south western and south-east) – these are currently being stabilised by the use of gabion baskets covered in ‘shotcrete’. The walls vary in height between approximately 2 and 4m.
- 3) O’Curry Street wall (north eastern boundary) – this acts as a retaining wall to the pavements/ services on O’Curry Street and has a steep slope in front of it on the site side of the wall.
- 4) In addition to the above, the No 5 Store and buildings adjacent to the south western boundary could be affected by vibration during the works.

Remedial works are to be undertaken in the vicinity of the structures in 2) above prior to remediation works commencing. Details will be provided when they are available. It is also likely that a retaining structure will be constructed at the location of the O’Curry Street wall prior to works commencing.

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Stabilisation / solidification will need to be undertaken at the locations in 1), 3) and 4) above to minimise the risk of undermining the structure (e.g. in bays a few metres wide or as a wedge). The tenderers shall provide details within their tender of the proposed methodology for dealing with the excavations in these areas.

2.2.2 *Restricted Access*

Currently, all vehicle and pedestrian access/egress is from O'Curry Street. However, there are no restrictions on use of the Dock Road entrance and the Contractor shall make his own assessment of how to make best use of these two entrances.

2.2.3 *Retained and Relocated Structures*

Several structures will need to be retained on site and works will need to be designed to allow any remediation required to be undertaken as close as possible to the structures. It is likely that most existing structures on-site such as the Governer House, Booster House and some internal walls will be demolished prior to remedial works commencing.

The retained structures will comprise:-

- 1) ESB electricity sub-station & DRI – to be located at the boundary with O'Curry Street.
- 2) No. 5 Store (Generator Building) - Protected Status. This is a large masonry building which has a large underground tank associated with it that extends to the south-west of the building.
- 3) AGI site walls – Protected Status. This is a large masonry wall around 2 sides of the AGI site.
- 4) Bord Gais offices - to be retained for use as site accommodation during the remediation works.

In addition, a new DRI (District Regulator Installation) and a new ESB sub-station are to be constructed adjacent to the O'Curry Street entrance and their proposed locations are presented on Drawing 1021927/PHASE 2 - TENDER/OD/002. Remedial works will be undertaken beneath these two structures and to a distance of 3m from the structures prior to works commencing.

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2.2.4 Known Underground Tanks

Refer to Section 1.7.3 of this document.

2.2.5 Former Quarry and Deep Limestone Feature

Refer to Section 1.7.4 of this document.

2.2.6 Limestone Outcrops

Limestone outcrops near the south-eastern and north-western boundaries of the site and is identified on Drawing 1021927/PHASE 2 - TENDER/OD/008. In particular, a limestone face, up to 8m in height, is present along parts of the south-eastern and north-eastern boundaries.

2.3 Other Issues for Consideration

2.3.1 Access and shared facilities for Other Contractors

It is unlikely that there will be any other Contractors working on site during the remedial works. However, should this be required, the Phase 2 Remediation Contractor shall be informed and shall provide access as necessary to and from site. It may also be necessary for the Contractor to allow use of welfare and decontamination facilities and to provide any required inductions as necessary.

2.3.2 Waste Licence

A Waste Licence has been applied for in connection with the Phase 1 and Phase 2 remediation works. Clause A751 presents the likely conditions attached to the Waste Licence. Please note that this list is not considered exhaustive. For the purpose of pricing his tender, the Contractor should assume that the anticipated conditions will apply and the Contractor shall allow for compliance with these conditions within his programme, methodology and rates.

Any conditions attached to the Waste Licence will be forwarded to the Preferred Contractor(s) who will be asked to confirm that there will be no changes to their programme, methodology and rates. Should there be any changes, Bord Gais reserves the right to consult with other tenderers.

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2.3.3 *Planning*

A planning application has been made to Limerick City Council in relation to both phases of the remediation works. A copy of the conditions are presented in Appendix F and the Contractor shall allow for compliance with these conditions within his programme, methodology and rates and ensure that these conditions are adhered to at all times during the contract period.

2.3.4 *Buried Services*

Underground services may present at the site. Electricity, water and sewer pipes service the office building. The AGI has been removed and the electricity substation will most likely have been moved and relocated along with a DRI to the O'Curry Street boundary by the time the remedial works commence. All gas mains have been removed from site, but other gas and electricity services may still be present on site at other locations. For information, as-built details of the locations of both former and current services are provided in Appendix D.

However, the Contractor shall satisfy himself as to the location of any underground or over head services in the vicinity of the Works. He shall be responsible for any repair costs to services or losses consequent to their inadvertent disconnection as a result of his works/actions.

The locations of all excavations shall be cleared of services by the Contractor prior to works commencing.

2.3.5 *Traffic Safety and Management*

The Contractor shall take whatever measures are necessary, at his own cost, to ensure that no mud or other material is deposited on the local road network to the satisfaction of the Engineer and Local Authority. Any costs associated with this work (eg road sweepers etc) shall be deemed included in the rates.

2.3.6 *Licenses*

The Contractor shall be responsible for the application and procurement of any licences, and the payment of any taxes, duties etc necessary to accomplish the Works (with the exception of the Waste Licence and Planning Application).

2.3.7 *Protection of Structures*

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The Dock Road boundary wall, Generator Building (No. 5 Store) in the eastern corner and the AGI wall have Protected Status.

The Contractor shall take all necessary steps in his method of working to prevent damage to on-site and adjacent structures due to excavations and vibrations caused by executing the Works, and shall be responsible for rectifying any damage caused. Details of how the Contractor shall prevent damage shall be provided in his tender.

Vibration monitoring shall be undertaken when working in the vicinity of unstable structures such as the Dock Road wall, the No 5 store and adjacent residential / commercial properties (to the rear of the existing office buildings).

2.3.8 *Japanese Knotweed*

As far as is known, Japanese Knotweed is not present at the site. However, should the Contractor identify any stands, the area shall be fenced (initially with hazard tape and fence pins), all on-site staff and visitors informed to prevent access and inadvertent spreading and the Engineer shall be informed immediately.

2.3.9 *Security*

The Contractor shall provide 24hr security at the site for the duration of the contract.

2.3.10 *Asbestos*

The ground investigation documents have not identified any areas where asbestos has been found in the ground. However, In the event of material suspected to be asbestos being encountered, the Contractor shall undertake all relevant steps as detailed in this Specification (Section 4) and in accordance with relevant legislation.

2.4 **Remediation Completion Criteria**

The proposed completion criteria for the stabilisation / solidification works are as follows:

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The Mouchel QRA report presents a set of soil leachability criteria that the replaced stabilised material shall be required to meet. These are presented in Appendix G. A minimum of three validation chemical tests shall be undertaken in each 10m grid. (One test from 0m to 1m below ground level, a second test from 1m to 2m below ground level and the third test from 2m to 3m below ground level.

In addition, a record of the shear strength of the stabilised material shall be required and shall comprise a strength test on a sample of the cured material at 10 days after backfilling. One U38 sample from each grid cell shall be tested for shear strength in accordance with BS1377:1990.

Any imported soils will be required to meet the chemical criteria detailed in Appendix C and site won crushed material will be required to meet the chemical criteria detailed in Appendix G.

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3 Schedule of Drawings

Drawing Title	Drawing No.	Drawing Detail
Site Location	1021927/PHASE 2 - TENDER/OD/001	Site location
Site Layout (including historic structures and existing above ground structures)	1021927/PHASE 2 - TENDER/OD/002	Layout of the site including the location of historic structures and existing above ground features.
Characterisation Exploratory Hole Location Plan	1021927/PHASE 2 - TENDER/OD/003	Locations of exploratory holes from the 2009 site characterisation investigation.
Previous Investigation Exploratory Hole Location Plan	1021927/PHASE 2 - TENDER/OD/004	Locations of exploratory holes from 1995, 1996, 2001 and 2003.
Cross Sections	1021927/PHASE 2 - TENDER/OD/005A to OD/005H	8 No. cross sections NE-SW and NW-SE across the site indicating ground level, made ground type, underlying geology and groundwater level.
Encountered NAPL (Characterisation)	1021927/PHASE 2 - TENDER/OD/006	Encountered extent of NAPL overlying the site layout, exploratory hole locations and rock head contours.
Encountered NAPL (Historic)	1021927/PHASE 2 - TENDER/OD/007	Locations of encountered NAPL from the 1995, 1996 and 2003 investigations.
Constraints Plan	1021927/PHASE 2 - TENDER/OD/008	Identified constraints including unstable walls, above ground structures to be retained, limestone outcrops, known significant underground tanks and the former quarry/deep limestone feature.
Dock Road Limerick, Floor Layouts	1021927/PHASE 2 - TENDER/OD/009	Layout of the ground and first floors of the site offices.
Information Boards	1021927/PHASE 2 - TENDER/OD/010	Layout required for the information boards to be erected at the site entrances.
Dust and Vibration Monitoring Locations	1021927/PHASE 2 - TENDER/011	Locations and grid references for dust and vibration monitoring points.
Topographical Survey	1021927/PHASE 2 - TENDER/OD/012	Topographical survey of the site.
Finished Levels	1021927/PHASE 2 - TENDER/OD/013	Approximate site levels on completion.

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4 Specification Series

4.1 Schedule of Items Required

CLASS A: GENERAL ITEMS (Section 4.2)

Clause	Item
100	Contractual Requirements
110	Performance Bond
120	Insurance of the Works
130	Third Party Insurance
140	Professional Indemnity Insurance
200	Requirements of the Engineer
210	Accommodation for the Engineer's Staff
220	Services for the Engineer's Staff
230	Equipment for the Engineer's Staff
240	Attendance upon the Engineer's Staff
244	Occupational Health Tests for Engineer' Staff
280	Reports required by the Engineer
300	Method Related Items
310	Accommodation and Buildings
320	Services
700	General Requirements
710	Duties and Responsibilities of the Engineer and their Staff
720	Information Boards
730	Answerphone
740	Survey Information
750	Licences, Notices & Other Documents
751	Waste Licence
752	Planning Consent
753	Site Waste Management Plan
754	Treatment and Re-use of Waste Materials
760	Service Location, Diversions and Special Requirements for Statutory Authorities
770	Health and Safety Requirements
771	General Health and Safety and Environmental Management Requirements
772	Traffic Safety and Management
773	Tidiness of the Site
774	Stockpile Management
775	Control of Leachate/Surface Water Management
780	Self Audit of Procedure

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- 800 Noise, Vibration, Dust and Odour**
- 810 Control of Noise and Vibration
- 820 Monitoring Noise
- 830 Monitoring Vibration
- 840 Control of Dust
- 850 Monitoring of Dust
- 860 Control of Odours
- 870 Monitoring of Odours
- 880 Asbestos and Asbestos Monitoring

- 900 Condition Survey and Protection of Features**
- 910 Condition Survey
- 920 Protection and Preservation of Features

CLASS C – GEOTECHNICAL AND OTHER SPECIALIST PROCESSES (Section 4.3)

- 900 Remediation**
- 910 Pilot Study
- 920 Stabilisation and Solidification
- 921 Plant
- 930 Samples
- 931 Chemical Samples
- 932 Geotechnical Samples
- 940 Laboratory Testing
- 941 Chemical Tests
- 942 Geotechnical Tests
- 950 Discharge Consent
- 960 Ground Investigation for Characterisation
- 970 Monitoring Wells

CLASS D – DEMOLITION AND SITE CLEARANCE (Section 4.4)

- 400 and 500 Buildings and Other Structures**

CLASS E – EARTHWORKS (Section 4.5)

- 400 General Excavation**
- 460 Classification of Materials
- 470 Excavation Requirements
- 471 Removal of Other Structures

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500 **Excavation Ancillaries**
530 Disposal of Excavated Material

600 **Filling**
650 Tank Grouting

700 **Filling Ancillaries**
730 Geotextiles

CLASS K: DRAINAGE (Section 4.6)

100 **Manholes**

400 **Filter Drains**

800 **Trenches and Supports**

900 **Pipes and Bedding**
950 Cleansing, Testing and Surveys

CLASS X: MISCELLANEOUS WORK (Section 4.7)

100 **Fences and Gates**
194 2.0m High Temporary Mesh Panel Fencing

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4.2 CLASS A: GENERAL ITEMS

A100 Contractual Requirements

A110 Performance Bond

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A120 Insurance of the Works

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A130 Third Party Insurance

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A140 Professional Indemnity

Reference should be made to the Appendix to the Form of Tender (included within Part 1) and also the Conditions of Contract (Part 2).

A200 Requirements of the Engineer

Temporary accommodation for the Engineer's staff (and Contractor) shall be provided on Site. The existing Bord Gais offices are currently unoccupied but could be utilised by the Contractor as he sees fit. They could be utilised as office space, however, they are not in a particularly good state of repair and any proposed use should take this into account. Bord Gais have advised that the following facilities are available, but no reliance is provided as to the accuracy or condition of the equipment / services; male/female toilets, office space with limited chairs and desks, mini fridge, dimplex heaters, cold water supply and 220v electricity.

The layout of the Bord Gais offices is shown on Drawing 1021927/PHASE 2 - TENDER/OD/009.

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The accommodation and all furnishings, services and equipment shall be ready for occupation and use by the Engineer from the date of commencement of siteworks.

No item supplied under the requirements of A200 shall bear the name of the Contractor.

A210 Accommodation for the Engineer's Staff

The items below will be provided for the duration of the contract. All durable items shall be returned to the Contractor at the end of the contract.

Accommodation for the Engineer, which shall be in the form of shared office and facilities with the Contractor's supervisory staff (items a) to f)), which shall be designated no smoking areas, kept clean and shall comprise:-

a) Engineers's Representative Office

Separate from the Contractors own accommodation with a floor area no less than 12 square metres, ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum of 4 No 13 amp power points, a door lock and keys.

Furniture comprising:-

- 2 desks approximately 2m x 1.5m with lockable drawers
- 2 chairs to suit with arms
- 1 book case
- 1 waste paper basket

b) Secondary Room

Area not less than 8 square metres, ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

- 1 desk approximately 2m x 1.5m with lockable drawers
- 1 chair to suit with arms
- 1 book case
- 1 waste paper basket

c) Meeting Room

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Ample lighting, continuous heating capable of maintaining a temperature of 20°C, minimum 4No 13 amp power points, a door lock and keys.

Furniture comprising:-

A large table with sufficient space for 10 persons to sit comfortably.

10 chairs to suit with arms

1 waste paper basket

d) Access and hard standing

A hard standing for three cars, adjacent to the accommodation and maintain a clean access to the accommodation at all times, also access must be afforded between the car park areas and accommodation without recourse or need to wear safety boots. Existing areas of hard standing may be suitable for this purpose. The hard standing can remain at the end of the contract period.

e) Sanitary Facilities

A sanitary convenience containing:-

A wash basin with hot and cold running water and supply of soaps or other cleansers

Flushing water closet

Towel rail with clean towels

Shower unit with hot and cold water

f) A Kitchen/Store

Sink unit with combined lower cupboard

Small electric cooker or microwave, with oven and grill

Small electric fridge

Cooking utensils and crockery/cutlery sufficient for all staff and 3 visitors

Toaster

1 electric kettle

1 teapot and sufficient mugs for all staff and up to 10 visitors to allow for meetings.

Supplies of tea, coffee, sugar, milk, soaps, towels etc as required

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A220 Services for the Engineer's Staff

The Contractor shall provide, maintain and make all payments for the following services to the accommodation identified in Clause A210 for the duration of the remediation works. Connections are to remain on completion of the contract for subsequent remedial phases:

- telecommunications

A230 Equipment for the Engineers's Staff (Provided by Contractor)

The items below shall be provided for the contract.

The Contractor is to fully insure for the duration of the contract any valuable items listed below as well as the other valuable equipment brought to Site by the Engineer.

a) Stationery

- 2 clipboards
- 1 pencil sharpener
- 1 paper hole punch and stapler
- 2 multiple letter trays
- 1 pin board 1m x 2m with pins
- 10 No. A4 size lever arch files

b) Technical Equipment

Broadband access

1 telephone with answerphone on separate line

Access to a printer with copying and scanning facilities and sufficient paper.

c) Personal Protective Equipment

4 pairs of safety wellingtons to BS EN1870 'Dunlop Safety Plus' or similar sizes to be confirmed

4 No white safety helmet to BS EN397, with reduced peak or similar

4 No. high visibility waistcoat, to BS EN471 class 2

4 No. high visibility jackets to BS EN471 class 3

1 No. high visibility over trousers to BS EN471 class

Blue disposable overalls, (Tyvek pro-tech™ or equivalent) sufficient in quantity for the Engineers staff and visitors as required.

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All personal protection equipment is to be stored in a locker within the changing room of the decontamination area, provided by the Contractor.

d) Testing Equipment

Use of the Contractor's testing equipment suitably maintained and calibrated including:-

1 no Photo Ionisation Detection meter.

Portable oil/water interface meter.

Water sampling equipment including bailers, string and bucket with volume increments.

All testing equipment shall be intrinsically safe.

It is anticipated that the equipment will be required on a periodic basis. A programme of when the equipment will be needed will be provided by the Engineer at the start of the contract.

A240 Attendance upon the Engineers's Staff (Provided by Contractor)

The Contractor shall provide at intervals during the Remediation works, a suitably trained and experienced person (or persons) to assist the Engineers staff with the following typical tasks:

Survey / measurement work;

Water/soil sampling

Other tasks, as requested.

The Contractor shall provide the Engineer with the names of persons to assist the Engineers staff with these tasks.

A244 Occupational Health Tests for Engineer's Staff

Occupational health tests shall be carried out at six monthly intervals, on the Engineer's staff by a suitably qualified company approved by the Engineer. Tests should include, at a minimum, blood and urine tests for heavy metals, phenols, human haemoglobin (Hb) and Zinc Protoporphyrin (Zpp). An initial test before commencement and a final test on completion of the works shall also be included.

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A280 Reports Required by the Engineer (Provided by Contractor)

a) Prior to the commencement of the project, the Contractor shall provide the schedule of proposed recycling/disposal facilities for this project.

The Contractor shall supply reports and information to the Engineer and other members of the project team, as set-out below.

A 'weekly progress report' shall be completed by the Contractor each Monday morning and e-mailed to the Engineer. The report shall include critical activities, environmental monitoring, downloaded weather information, as well as analytical results from the remediation process. The pro-forma for this report is to be provided by the Engineer before work starts. Record sheets identifying the details of remediation works undertaken shall be attached to the report.

www.met.ie/climate/daily-data.asp presents daily weather information which shall be collated for the week immediately preceding the issue of the weekly progress report. Using the relevant drop down boxes on the right side of the page, select Shannon Airport and then the relevant date to view the data.

Records of work completed to support each monthly valuation submission, shall be supplied to the Engineer in a format to be agreed with the Engineer.

All information relating to the work undertaken by the Contractor, including the Safety and Health File is to be supplied to the Engineer prior to the issue of the Certificate of Substantial Completion.

Details of all complaints, accidents, incidents and near misses which the Contractor may receive including those against which he is required to indemnify the Employer, shall be notified without delay to the Engineer.

Likewise, the Engineer will pass to the Contractor any such complaints or warnings which may be submitted directly to the Engineer or the Engineer's Representative. The Contractor shall undertake appropriate levels of investigation to identify causes and learn lessons, where appropriate. Serious incidents shall be investigated and reported, as directed by the Engineer. All accidents, incidents, near misses and complaints shall be recorded on a summary sheet which shall be issued at each progress meeting. This shall include a summary of corrective actions taken, including investigations.

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Two days prior to each monthly progress meeting the Contractor is to prepare a progress report, to include details of the Remediation works under the following headings, as a minimum:

- Completed Actions from Previous Meeting;
- Progress and Programme;
- Health, Safety and Environment;
- Subcontractors and Suppliers;
- Engineer's Instructions Received;
- Information for the Safety and Health File/Verification Report.

The following information required for the preparation of the Verification Report shall be provided to the Engineer on a monthly basis:

- Surveys and site investigation records
- Waste management/disposal licences.
- Registered waste carriers certificates.
- Records of any consents, authorisations or licences obtained.
- Analytical results from the water treatment plant.
- Waste recycling / disposal records, including untreatable material recycling/disposal summary and daily off site removal records, waste consignment / waste transfer notes
- A record of any validation samples and test results collected including reference by location and depth.
- Air quality monitoring results for dust and organic vapours, including laboratory test results.
- Noise and vibration monitoring results.

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- Laboratory QA/QC data report, including Shewart Charts.
- Record of all samples submitted for laboratory testing.
- Groundwater monitoring results.
- Other information requested by the Engineer.

b) To supplement the downloaded weather data, a 2ft wind sock was erected on site for the Phase 1 works. Wind direction shall be measured at 9:00, 12:00 and 15:00 each working day and the daily average recorded in the weekly progress report. Record sheets identifying the details of remediation works undertaken shall be submitted to the Engineer on a weekly basis.

A300 Method Related Items

A310 Accommodation and Buildings (Provided by Contractor)

The Contractor shall provide, maintain and keep clean facilities for all persons working on the Site in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010, appropriate to the size and duration of the project, including canteen, mess rooms, sanitary facilities, offices and stores. All infrastructure required by the waste licence shall be established prior to commencement of the licensed activities.

In addition the Contractor shall supply the following:

- a) Hygiene facilities to comply with figure 3 of 'Protection of Workers and the General Public during the development of contaminated land' published by HMSO. Fencing shall be provided in such a way that the only non-vehicular accesses between clean and dirty areas shall be through the hygiene facilities.
- b) Canteen, mess rooms and offices for the use of the Contractor.
- c) Provision of shared welfare, first aid and accident emergency cover in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 including:-
 - Washing facilities

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- First aid boxes
- Sanitary conveniences
- Ambulance arrangements
- First aid room
- Accommodation for clothing and taking meals
- Appropriate Personal Protection Equipment (PPE) for Contractor's and Engineer's staff. Where disposable overalls are required, these shall be blue in colour, Tyvek protect™ or equivalent.

A320 Services

a) The Contractor shall provide, maintain and make all payments for services to the accommodation identified in Clauses A210 and A310 for the duration of the contract.

The Contractor shall provide at his own cost a continuous temporary water supply for the sole purposes of the accommodation facilities (Clauses A210 and A310). Only clean fresh water from the mains may be used for domestic purposes. He shall make his own arrangements with the water company for obtaining water from the mains and for the provision of any temporary mains, standpipes, stopcocks, meters and hoses, and for removal of same at completion.

The Contractor shall not use plastic pipework within the ground, for any temporary water mains which may allow contaminants from the Site to contaminate the water supply.

Sufficient sanitary conveniences for all operatives and Site staff engaged on the Remediation works shall be provided and maintained by the Contractor in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010.

The Contractor shall ensure that all operatives and Site staff are aware that the sanitary convenience provided must be used by all personnel and the Engineer reserves the right to require the dismissal of any person committing nuisance on or about the Site by failing to use the convenience provided.

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The Contractor shall arrange for the disposal of sewage effluent arising from Site toilets, the Contractor's office and Engineer's accommodation.

The Contractor shall supply at his own cost a continuous temporary supply of electricity for the Remediation works.

The Contractor shall provide all other amenities in accordance with the above mentioned Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 and Working Rule Agreement, including adequate heating, lighting, attendance, cleaning and laundry etc.

b) Security is to be provided by the Contractor who shall:-

- i) Maintain gates, walls and fencing to provide adequate site security to the boundary.
- ii) Provide 24 hour security at the site for the duration of the Contract.
- iii) Monitor and maintain a record of all personnel and vehicles entering and leaving the Site.
- iv) Ensure that the access gates are locked at all times unless required for access or egress.

A700 General Requirements

A710 Duties and Responsibilities of the Engineer and their Staff

a) Conditions of Contract

The Conditions of Contract shall comprise Part 2 of the Tender Documents (ref XXXXX).

b) Staff Duties and Authorities

The names of the staff who will be involved with the supervision of the site works will be given to the Contractor when the Contract has been awarded:

In accordance with the Conditions of Contract clause 1(1)c the Engineer will be:

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The name of the Chartered Engineer who will act on behalf of the Engineer and assume the full responsibilities of the Engineer under the contract will be:

Tony Brown – BEng, CEng, Eur Ing, MIEI, FICE, SiLC.

In accordance with the Conditions of Contract the Engineer may appoint a “Representative”, in which case his name will be given to the Contractor when the Contract has been awarded.

The Engineer’s Representative shall have no authority:

- (i) to relieve the Contractor of any of his duties or obligations under the contract
- (ii) to order any work not approved by the Engineer or included in the programme submitted by the Contractor in accordance with clause 14 of the Contract, or included in the priced Bill of Quantities
- (iii) to make any variation of or in the works

The Engineer’s Representative will have the authority

- i) to carry out and agree a measurement of the works with the Contractor
- ii) to query, confirm and sign Contractor’s record sheets.
- iii) to approve the classification of tested excavated material.
- iv) to approve excavation formations.
- v) to issue instructions that may be necessary to enable him to carry out his duties and to secure his acceptance of materials and workmanship as being in accordance with the Contract.

The Engineer will notify the Contractor in writing should these delegated powers need revision.

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The names of the assistants appointed by the Engineer in accordance with Clause 2(2) of the Conditions of Contract will be given to the Contractor when the Contract has been awarded.

The Engineer's Assistants have the same delegated powers as the Engineer's Representative.

The Engineer's Representative and Engineer's Assistants will undertake the following principal routine duties:

- (a) the organising and phasing of the Engineer's Staff according to the constructional programme supplied by the Contractor
- (b) to inspect the Permanent Work to ensure that the Contractor has positioned the works at the correct line and level, and that the materials and workmanship comply with the Specification
- (c) to oversee tests carried out on the site, the inspection of materials and manufacture at source
- (d) the keeping of a diary constituting a detailed history of the work done during construction and of all happenings at the site, and the submission of regular periodic progress reports to the Engineer
- (e) measuring in agreement with the Contractor's staff the quantities of work executed, and checking day work and other accounts in order that the interim and final payments due to the Contractor may be confirmed and certified by the Engineer
- (f) in the case of any work for which the Contractor may claim payment as additional work, agreeing with the Contractor methods of recording additional work and recording all relevant circumstances, including cost of labour and materials, in order to ensure that agreement exists on matters of fact before any question of principle has to be decided by the Engineer or arbitrator
- (g) recording and checking the progress of the work in comparison with the programme

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(h) examination of the methods proposed by the Contractor for the execution of the work of the Temporary Works undertaken by him, the primary object being to ensure the safe and satisfactory execution of the permanent work by the Contractor.

(i) any necessary redesign of work for submission to and approval by the Engineer

(j) ensuring that the Contractor is recording on the working drawings, or on drawings prepared for the purpose, the actual level and nature of all foundations, the character of the strata encountered in excavation and full details of any deviations from the working drawings which may have been made during the execution of the Works, so as to permit the Engineer to approve the Contractor's "as built" drawings.

A720 Information Boards (Provided by Contractor)

The Contractor shall provide, maintain and remove on completion of the Works, information boards as shown on Drawing 1021927/PHASE 2 - TENDER/OD/010.

The main information board shall be provided at both entrances as indicated on Drawing 1021927/PHASE 2 - TENDER/OD/002. They shall be of sufficient size to accept the Bord Gais Information Board (2440mm x 1210mm) in addition to the Contractor's and Consultant's name boards, each to be 2440mm x 610mm in size.

The Contractor shall also provide at each site access/and egress, a secondary board clearly showing the information required to be displayed under the terms of the Waste Licence (800mm X 1200mm minimum in size).

The board shall clearly show:-

- a) the name and telephone number of the facility;
- b) the normal hours of opening;
- c) the name of the licence holder;
- d) an emergency out of hours contact telephone number;
- e) the waste licence reference number; and

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f) where environmental information relating to the facility can be obtained.

A730 Answerphone

The Contractor shall provide a dedicated phone line for queries/complaints regarding the siteworks. The number of this shall be shown on the board provided at each site access.

The phone line shall include an answerphone facility to enable calls to be taken outside working hours. The Contractor shall arrange for all queries to be answered within 72 hours of their receipt.

A740 Survey Information

a) A copy of the original topographic survey will be issued to the Contractor in digital format as an AutoCAD (2009) file to permit the Contractor to confirm the information provided. The Contractor shall then use this survey as the base data for all other survey information.

b) The Contractor shall, within two days of the commencement of the works, carry out a check of the co-ordinates and levels of all Bench Marks, permanent ground markers and survey stations identified on Drawing 1021927/PHASE 2 - TENDER/OD/012. He shall supply details of their positions and levels to the Engineer, in order that he may check and agree any revised levels and co-ordinates, if necessary.

The Contractor shall satisfy himself that the ground levels and site boundary as described in the Contract are correct. Should the Contractor wish to dispute any levels he shall submit to the Engineer a schedule of the position of levels considered to be in error and a set of revised levels. The existing ground relevant to the disputed levels shall not be disturbed before the Engineer's decision as to the correct levels is given.

The Contractor shall keep updated schedules and drawings of all Bench Marks used in the setting out and shall make these available to the Engineer when required.

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The Contractor shall ensure that where necessary in order to maintain his programme, lines and levels of any necessary parts of the Works are set out in such time as to enable Statutory Undertakers plant and other publicly or privately owned services or supplies to be installed, altered or removed.

b) A minimum of six ground reference points are to be maintained during the course of the works, these will comprise of steel pins set on 0.2m³ concrete at agreed locations on the site and protected by suitable fencing. New ground reference points must be established before existing points are removed as the work proceeds, to maintain site setting out control.

c) During the course of the remediation works, the Contractor shall provide the Engineer with up to date survey information, or as indicated by the Engineer. Co-ordinates and levels shall be taken of all well points including any excavations and formations (as required) including top and bottom of all batters and slopes. The survey shall also show any residual areas of old foundations, tanks, basements, remaining services or any other feature, requested by the Engineer. The survey shall be undertaken using the same grid and bench mark to the topographic survey provided with the Contract. It shall show the ground reference point locations/co-ordinates. The survey information shall be supplied on a stable medium with grid markings relating to the existing site survey at a horizontal scale of 1:250, or as agreed with the Engineer. In addition, the survey information shall be supplied on compact disc in Microsoft Excel™ spreadsheet format.

Separate sheets shall be provided for the following:-

- i) Locations of all excavations
- ii) Finished ground levels
- iii) Remaining structures, services or obstructions
- iv) New construction (i.e. drains, roads or other new structures) (as required)
- v) Locations of all validation tests, trial pits and boreholes (as required)

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Two draft paper copies of the updated drawings shall be provided to the Engineer within three working days of the survey. The drawing shall also be provided on compact disc in a format compatible with AutoCAD 2009. A complete set of drawings and compact disc showing the works as constructed shall be supplied to the Engineer within two weeks of completion of the works.

A750 Licences, Notices and Other Documents (Provided by Contractor)

A751 Waste Licence

a) A Waste Licence application has been submitted to the Agency. It is unlikely that the Conditions will be received before the tender return date. The tenderers shall assume that the following Conditions will be stated in the Waste Licence and shall ensure compliance with them, except where otherwise stated.

1. Management Structure

Prior to the commencement of waste activities the contractor shall submit written details of the management structure of the facility to The Agency. Any proposed replacement in the management structure shall be notified in advance in writing to The Agency. Written details of the management structure shall include the following information:-

- a) The names of all persons who are to provide the management and supervision of the waste activities authorised by the licence, in particular the name of the facility manager and any nominated deputies.
- b) Details of the responsibilities for each individual named under a) above; and
- c) Details of the relevant education, training and experience held by each of the persons nominated under a) above.

2. Environmental Management System (EMS)

The contractor shall submit to The Agency for its agreement an EMS system for the facility one month prior to waste activities commencing. The EMS shall be updated as required with amendments being submitted to The Agency for its agreement.

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The EMS shall include as a minimum the following elements:-

- a) Environmental Management Plan (EMP): The EMP shall include any items required by written guidance issued by the Agency.
- b) Corrective Actions Procedures: The Corrective Action Procedures shall detail the corrective actions to be taken should any of the procedures detailed in the EMS not be followed.
- c) Awareness and Training Programme: The Awareness and Training Programme shall identify training needs, for personnel who work in or have responsibility for the licensed facility.
- d) Schedule of Environmental Objectives and Targets.

3. Proposals for Specified Engineering Works (Method Statements)

The contractor shall submit proposals for all Specified Engineering Works to the Agency for its agreement at least one month prior to the intended date of commencement of any such works. No such works shall be carried out without prior agreement of the Agency.

4. Validation Report

(Note: The Validation Report will be prepared and provided by the Engineer but the Contractor will be required to supply the Engineer with the details and data required for this Report).

5. Records of Materials Entering and Leaving Site

The Contractor shall arrange for the weights of materials entering and leaving the site to be recorded to the satisfaction of the Agency.

6. Tank and Drum Storage

The Contractor shall submit a Report to the Agency confirming the integrity and water tightness of bunds required to tank and drum storage areas.

7. Decommissioning Plan

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At least three months prior to the cessation of waste activities at the facility, the Contractor shall submit a detailed decommissioning plan to the Agency for its agreement.

8. Off-Site Disposal and Recovery Facilities

The Contractor shall submit details of those waste disposal facilities off site, which he intends to use, to the Agency for approval, prior to their use.

9. Monthly Monitoring Results for Foul Water Discharge

The Contractor shall submit monitoring results of the discharges to the foul sewer to the Agency on a monthly basis.

10. Monitoring Personnel

The Contractor shall report to the Agency within one month prior to the start on site with the names, qualifications and experience of all persons carrying out the sampling and monitoring required under the Licence. Any proposed changes shall be similarly advised.

11. Changes to Monitoring Equipment.

Any changes to monitoring or sampling equipment shall be agreed within writing with the Agency in advance.

12. Emergency Response Procedure (ERP)

The Contractor shall, prior to commencement of waste activities, submit a written ERP to the Agency for its agreement. The ERP shall address any emergency situations which may originate on the facility and shall include provision for minimising the effects of any emergency on the environment. This shall include a risk assessment to determine the requirements at the facility for fire fighting and fire water retention facilities. The Fire Authority shall be consulted by the licensee during this assessment.

13. Records

The Contractor shall keep the following records.

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- a) On site
 - Current Waste Licence
 - Current EMS/EMP
 - The Annual Environmental Report (AER) (see item 17).
 - All written procedures produced by the Contractor/Employer/Engineer relating to licensed activities.
- b) Written records of each load of waste arriving or leaving the facility.
- c) Written records of the type and quantities of waste recovered at the facility, including European Waste Catalogue (EWC) codes.
- d) Written records of training undertaken by facility staff.
- e) Written records of results of all integrity test on bunds etc and associated works to them.
- f) Written records of all nuisance inspections.
- g) Written records of details of personnel carrying out and interpreting sampling and monitoring results.
- h) Written records of all complaints received relating to the site operations.

14. Reports and Notifications

Any changes to site processes, or site management and control with adverse environmental significance to be advised and agreed in advance with the Agency.

15. Incident Report

In the event of an incident occurring on the site, the Contractor shall notify the Agency as soon as practical, and no later than 10.00am on the following working day. A written Report shall also be provided to the Agency within 5 working days detailing all aspects including:-

- a) identify the date, time and place of the incident;

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- b) carry out an immediate investigation to identify the nature, source and cause of the incident and any emission arising therefrom;
- c) isolate the source of any emission;
- d) evaluate the environmental pollution, if any, caused by the incident;
- e) identify and execute measures to minimise the emissions / malfunction and the effects thereof; and
- f) provide a proposal to the Agency for its agreement within one month of the incident occurring to :-
 - i) identify and put in place measures to avoid reoccurrence of the incident; and
 - ii) identify and put in place any other appropriate remedial action.

16. Monitoring Locations

The Contractor shall submit to the EPA no later than four weeks prior to the commencement of waste activities on site a scaled drawing showing the location of all monitoring locations required under the Licence.

17. Annual Environmental Report

The Contractor shall submit to the Engineer for agreement an Annual Environmental Report (AER) to include:-

- i) Recap on remediation strategy;
- ii) Recap on Remediation Target Values (RTV's);
- iii) Diary of excavations based on a grid system;
- iv) Summary table of wastes exported;
- v) Summary of waste processing and recovery;
- vi) Restoration works described;
- vii) Environmental monitoring statement;
- viii) Reporting period;
- ix) Waste activities carried out at the facility;

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- x) Quantity and composition of waste handled during the reporting period and each previous year (relevant EWC codes to be used);
 - xi) Summary report on emissions;
 - xii) Summary of results and interpretation of environmental monitoring, including a location plan of all monitoring locations;
 - xiii) Resource and energy consumption summary. Energy Efficient Report;
 - xiv) Full title and a written summary of any procedures developed by the licensee in the year which relates to the facility operation;
 - xv) Tank, drum, pipeline and bund testing and inspection report;
 - xvi) Reported Incidents and Complaints summaries;
 - xvii) Review of Nuisance Controls.
 - xviii) Reports on financial provision made under this licence, management and staffing structure of the facility and a programme for public information;
 - xix) Volume of foul water produced and volume of foul water transported off-site;
 - xx) Any other items specified by the Agency
18. Facility Operation

The Contractor shall submit to the Agency a process flow diagram and details of any proposed emissions.

19. Energy Efficiency

The Contractor shall submit to the Agency details of any energy efficiencies incorporated into the operation of his plant and machinery.

A copy of all documentation and reports required under the Licence shall be provided to the Engineer for comment at least 3 days prior to submission to the Agency or as appropriate. Any discrepancies between the requirements of the Waste Licence and the Specification shall be referred to the Engineer for confirmation; the Waste Licence shall generally take precedence.

Copies of the waste carrier registration and receiving waste facility licences shall be provided to the Engineer before any material is removed from site.

Copies of all complete Waste Transfer Notes shall be provided to the Engineer at regular intervals of less than one month.

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The Contractor will be responsible for obtaining and all payments in respect of complying with the Waste Management (Collection Permit) Regulations 2008 (amendment).

A752 Planning Consent

A planning application has been made to Limerick City Council. A copy of the conditions attached to the consent shall be presented in Appendix F. The Contractor shall ensure compliance with all the conditions contained within the planning consent.

A753 Site Waste Management Plan

a) The Contractor shall follow current best-practice with regard to waste management and minimisation, based on a hierarchy in which the order of preference is as follows:

- i) Reduction - the aim should be to reduce the generation of waste, as far as reasonably practicable.
- ii) Re-use - re-use of waste within the project, subject to the requirements of the waste management and environmental permitting regimes.
- iii) Recover (including re-cycling) - where the waste cannot be reused then recovery options should be considered.
- iv) Disposal - the final option will mean that the waste is either disposed of at the site (subject to the requirements of the permitting regimes) or removed to an appropriately licensed facility.

The above shall apply to contaminated soils and to other waste arisings, including domestic type waste generated within the temporary site accommodation. In all circumstances, attempts should be made to 'design-out' the generation of waste in the first instance.

b) In conjunction with his Environmental Management Plan (see Waste Licence requirements – Clause A7510) the Contractor shall prepare a 'Site Waste Management Plan'.

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c) The Contractor shall comply with this 'Site Waste Management Plan' and shall demonstrate compliance by undertaking a number of audits (minimum one) during the Works.

d) No work involving off-site disposal shall commence until the Engineer, on behalf of Bord Gais, has confirmed that the 'Site Waste Management Plan' is adequate.

e) The Contractor shall comply with current legislation and guidance relating to the management of wastes (including classification, handling, transportation and disposal).

f) The Contractor shall also comply with other requirements in relation to wastes management, under other clauses of this Specification, including Clauses A775 and E500 and E600.

A754 Treatment and Re-use of Waste Materials

a) The Contractor shall be aware that the on-site treatment and /or re-use of materials require a Waste Licence from the Environmental Protection Agency which Bord Gais have applied for.

b) The Contractor shall comply with all statutory requirements for the on-site treatment of contaminated soil and/or contaminated controlled waters and/or other relevant treatment operations, in accordance with the Waste Licence and all relevant legislation.

c) Where a trial or pilot is undertaken, all works shall be carried out in accordance with the requirements of the Waste Licence and all relevant guidance / legislation.

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A760 Service Location, Diversion and Special Requirements for Statutory Authorities

a) No excavation works shall be carried out unless suitable and sufficient steps have been taken by the Contractor to identify and, so far as is reasonably practicable, prevent any risk of injury arising from any underground cable or other underground service or overhead service. This shall include the verification of the position of Statutory Undertaker's, publicly and privately owned services by the excavation of hand dug trial holes, verified in advance by electro magnetic detection devices. All works undertaken must be in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010 and also the HSA publication - Code of Practice for Avoiding Danger from Underground Services.

b) If any privately owned service of supply for water, electricity, gas, drainage, cabling etc, is affected by the Remediation works, then the Contractor shall locate it and provide a satisfactory alternative before cutting the existing service or supply.

c) The Contractor shall, during the progress of the Remediation works take all measures required by any Statutory Undertaker, the management of other publicly owned service, or owners of privately owned services for the support and full protection of all such services and supplies during the progress of the Remediation works and shall ensure that no such services or supplies are interrupted without the written consent of the appropriate authority or owner.

d) Should any mains or services be uncovered during the course of the remediation works, or be found to interfere with the remediation works which were not anticipated, the Contractor shall inform the Statutory Authority and also the Engineer who will give notice to the undertaking concerned of any alterations or diversions that in this opinion are necessary.

e) The Contractor will be responsible for gaining any permissions necessary from the relevant Utility for working adjacent to, under or over their plant. The Contractor shall be responsible for ensuring the work in such areas is carried out in accordance with the required working practice and safety requirements of the relevant Utility. The Contractor shall be responsible for any damage caused and shall repair, or allow the Utility Undertaker to repair the apparatus at the Contractor's expense.

The Contractor shall co-ordinate his remediation works with any works carried out by Public Utility Undertakers.

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f) Prior to commencing any excavations or drilling, the Contractor will mark out the location of all known services and provide a service plan to excavator operatives/ drillers to ensure they are aware of all service hazards within the influence of the excavation. A service incident response plan shall be written and communicated to all site personnel.

A770 Health and Safety Requirements

a) The Contractor shall carry out the duties of the Project Supervisor (Construction Phase) in accordance with the Safety, Health and Welfare at Work (Construction) Regulations 2006 to 2010. All work will be undertaken in accordance with the Health and Safety Policy of Bord Gais.

No work shall commence on site until the following are in place:-

- i) Written notification, to the Health and Safety Authority has been made by the Project Supervisor (Construction Phase).
- ii) The Project Supervisor (Construction Phase) confirms in writing to the Engineer that the Construction Safety and Health Plan has been sufficiently developed.

b) The Contractor shall provide COSHH assessments and take appropriate measurements for handling/storage of any hazardous substances brought to site in conjunction with these works.

c) The Project Supervisor (Construction Phase) shall issue written notification to the Employer, the Engineer and all named Designers within 24 hours of the action in the event of any Health and Safety Authority action with respect to the issue of any of the following to any contractor on site

- i) improvement notice
- ii) prohibition notice
- iii) summons

The Project Supervisor (Construction Phase) is also required to include one copy of the employee liability and third party liability insurance policies for each contractor working on site in the Construction Phase Safety and Health Plan and Safety File.

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d) The Contractor shall prepare a Designer's Risk Assessment and provide a copy to the Project Supervisor (Design Phase) for those items of Work for which he has design responsibility.

e) The Preliminary Safety and Health Plan drafted by the Project Supervisor (Design Phase) (ref Report 1021927/R/17) is included with the tender documents. The Contractor shall comply with the requirements contained in the Preliminary Safety and Health Plan.

A771 General Health and Safety and Environmental Management Requirements

a) The site shall be designated into clean and dirty areas. These areas shall have restricted interaction. The 'clean' area being defined as a zone not directly involved with the workings of the site. This zone shall include the site compound containing the Contractor's and Resident Engineer's accommodation, and third party occupants of the site, whose accommodation is not included in the working areas.

The working areas shall be designated as 'dirty' and shall be fenced along their perimeters.

The Contractor shall ensure that all personnel entering the designated 'dirty' areas have attended an induction course given by the Project Supervisor (Construction) describing the presence, location and significance of potential contaminants on site or they are escorted by inducted personnel. They shall wear appropriate personal protective equipment (PPE) and shall pass through the hygiene unit to enter or exit the designated dirty area.

b) The Contractor shall provide and make mandatory the wearing of protective clothing and equipment for all persons working on or adjacent to hazardous operations.

c) The Contractor's attention is drawn to the risks of smoking and use of mobile phones on contaminated land and should address such issues in his Risk Assessment and Safety and Health Plan. No smoking shall be allowed on site, in accordance with the likely Waste Licence requirements.

d) The Contractor shall comply with all applicable legislation for the safety, health and welfare of its employees, or any other person in or near the site of the works and of members of the public.

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Appropriate safety equipment must be provided by the Contractor and worn by all personnel whilst working on or visiting the site.

e) The Contractor shall provide to the Engineer, a copy of the Contractor's current safety and environmental policy statements and safety codes of practice.

The Contractor shall comply with all the relevant legislation within Irish law, as applicable to these works.

f) The Contractor shall provide first aid facilities, materials and personnel trained in first aid, for the benefit of his own employees, those of his sub-Contractors and the Site staff of the Engineer and visitors.

The Contractor shall provide to the Engineer the names and details, including training records, of the designated 'first aiders' and Site safety officers. The Contractor shall not rely on the Engineer's staff to undertake these roles in any way.

g) All stored material and materials containers (e.g. skips, IBC's etc) shall be suitably and clearly labelled.

h) Appropriate safety equipment must be provided by the Contractor and worn by all personnel whilst working on or visiting site.

i) The Contractor shall provide adequate lighting if working during the hours of darkness.

A772 Traffic Safety and Management (Provided by Contractor)

a) All traffic safety and management measures necessitated by the Remediation works must be fully operational and have the written consent of the Engineer, the Local Authority, Highway Authority and Garda (where applicable) before the Contractor shall commence any remediation works including the removal of materials from the Site.

b) The Contractor shall take whatever measures are necessary, at his own cost, to ensure that as little mud as possible is deposited on the local road network and that the roads are kept as clean as is necessary in the interests of highway safety and for good public relations.

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To this end all traffic leaving the designated dirty area, must pass through a wheel wash facility, to be provided by the Contractor. Depending upon the number of vehicles leaving the dirty area, this comprise either a bath with humps or bars to provide vibration, an automatic underbody spray type or a jet wash, the location and nature of which shall be agreed with the Engineer.

The wheel wash facility shall be regularly maintained to ensure its effective operation and incorporate a recycling or treatment facility for the water. Road cleaning plant shall be utilised as necessary. The wheel-wash shall be inspected on a daily basis and drained as required. Silt, stones and other accumulated material shall be removed as required from the wheel-wash.

c) All loaded lorries must be sheeted prior to leaving the site and shall have sealed tailgates to prevent waters or other liquids from spilling to the road. The integrity of the sealed tailgates will be checked by carrying out a water test over the wheelwash, i.e filling the lorries with sufficient water to cover the tailgate when inclined and the external tailgate checked for leakage. These tests will be carried out on 25% of the lorries used with the lorries to be chosen by the Resident Engineer.

After exiting the wheelwash all lorries shall pass through a 'quarantine' area, where the lorries will be checked for external cleanliness and the integrity of sheeting will be confirmed. Any lorries found not to be sufficiently clean or adequately sheeted will be required to pass through the wheelwash again or re-sheeted before being allowed to exit the site.

d) The Contractor will be liable for cleaning at his cost the local road network in the event of any material getting onto the public highway, with the agreement of the Garda and/or highways authority.

e) All lorries leaving the Site to a recycling or disposal facility shall have records taken of vehicle registration, volume, date, time destination and that each loaded lorry (if transporting soil) is sheeted. These shall be supplied to the Engineer at the end of each working day, together with details of the net weight recorded at the landfill site for each load.

f) The Contractor shall comply with the relevant provisions of road traffic guidance and appropriate legislation.

g) All vehicles shall adhere to an on-site speed limit of 10mph.

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h) The Contractor shall also ensure that hauliers carry appropriate Employer and Public Liability Insurance.

i) As far as reasonably practicable waste shall be delivered to the designated recycling or disposal facility on the same day it leaves the Site. In the event that material has to be stored over night, the loaded lorry shall either be stored at a suitably licensed premises or return to Site.

j) The Contractor shall agree the route to the selected receiving facility with the Engineer, prior to transport of material off Site. Temporary signing is to be provided as deemed necessary by the Engineer, the Employer, highways authority, or Limerick City Council.

k) The Contractor shall implement procedures to ensure, as far as reasonably practicable, that lorries return to the Site at staggered intervals.

l) The Contractor shall arrange for the use of a certified weighbridge, either on or offsite, to weigh all materials disposed of off-site.

A773 Tidiness of the Site (Provided by Contractor)

a) The Contractor shall remove and dispose of at his own expense any surplus materials, rubbish and other items brought onto Site by him in the course of undertaking the remediation works. The Contractor shall collect and separately dispose of all domestic type waste arising from the Remediation works.

b) The Contractor shall maintain the Site in a tidy and workmanlike manner at all times. Any skips used on Site will be in good condition (no holes present at the base), stored on an area of hard standing away from any surface drainage and/or sensitive water bodies. All skips must be labelled and waste segregated in accordance with the labelling system. Any skips designated to special waste should have lockable covers. The lighting of fires to burn rubbish is not permitted.

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c) The Contractor shall ensure that any liquids, including fuel oil used on Site in connection with the remediation works are stored in appropriate, fully labelled containers, including "Hazchem" notices. Such containers shall be stored on an impermeable hard standing, surrounded with a suitable bund of capacity of 110% of the capacity of the largest container therein, or stored on proprietary spill trays of a similar capacity. An inspection schedule should be in place to ensure that bunds and drip trays are regularly emptied, especially after heavy rainfall. Any spillages in banded areas shall be disposed of to an appropriate disposal site and reported to the Engineer. Any refuelling of vehicles must be done in an appropriate manner which will include the use of drip trays and easily accessible spill kits as a minimum.

d) Any spillages of liquids, including near-miss incidents, which may give rise to an environmental pollution incident shall be reported to the Engineer, contained and removed immediately to an appropriate landfill site. The Contractor shall provide and maintain an appropriate spill kit appropriate for the methodology he is undertaking.

e) The Contractor shall undertake the remediation works in such a way that the likelihood of a spillage is minimised. Should a spillage occur, the Contractor shall ensure appropriate equipment and plant shall be available on Site to contain and treat any such incident.

f) Mobile and fixed fuel storage tanks shall not be sited at a location where a spillage could result in a direct discharge to any drain or watercourse. All fuel tanks, including those with twin skins shall be surrounded with a bund at all times to provide storage capacity at least equal to 110% of the capacity of the tank.

g) The Contractor shall, at a minimum of one week intervals, inspect the facility and its immediate surrounds for nuisances caused by litter, vermin, birds, flies, mud, dust and odours and record the findings.

A774 Stockpile Management (Provided by Contractor)

a) The Contractor shall locate stockpiles of excavated and processed materials at locations agreed with the Engineer. The stockpiles shall be located to avoid double-handling of materials, as far as reasonably practicable, and to minimise potential nuisance impacts to neighbouring land users.

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b) The Contractor shall manage stockpiles of material arising from the excavations to prevent nuisance impacts and any spreading of contamination, including all necessary environmental controls, such as control of run-off, dust and odours. (See also A775, A840 and A860).

c) Stockpiles of excavated material shall be located only on hard standing or areas identified for remediation, unless agreed otherwise with the Engineer.

Clean stockpiling areas shall be located on a sacrificial layer of 6" of crushed concrete or similar. Material assessed as clean as identified and pre-classified in-situ will be deposited in the "clean" stockpiling area.

Dirty stockpiling areas will be located on areas of bunded impermeable hard standing or on contaminated ground that remains to be remediated under the contract.

d) The Contractor shall ensure that contaminated waters, including run-off from stockpiles, does not leave the site. All such waters shall be pumped to the groundwater treatment plant and processed prior to disposal to foul sewer.

e) Stockpiles shall be limited to 2m height and 250m³ volume.

f) Stockpiles will be shaped and smoothed, rolled or covered with tarpaulins to help limit rain ingress and dust generation.

g) Individual stockpiles shall be composed of materials, as far as reasonably practical, displaying a high degree of homogeneity, both in terms of geotechnical and chemical characteristics.

h) Excavated soils shall be regarded as contaminated or potentially contaminated until reclassified based upon the chemical and/or geotechnical data received.

i) Stockpiles shall be managed by the Contractor to make best use of available space within the Site. This shall include:

- Off-site (landfill) disposal of unsuitable materials at the earliest opportunity, subject to other constraints (eg material to be retained for treatment to minimise the requirement for off-site disposal).
- Use of stabilised / solidified or other suitable material for backfilling excavations at the earliest opportunity.

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j) The Contractor shall be responsible for tracking stockpiles in respect of their location and condition (awaiting test result, Class U1, Class U2) both on site, by suitable labelling and on a plan which shall be updated, at least weekly, and a copy provided to the Engineer.

k) The Contractor shall survey and record the final on-site location of all material arising from temporary stockpiles that is re-used as backfill, including the depth and lateral extent of the material placed. The data, including a drawing shall be provided to the Engineer on a weekly basis.

A775 Control of Leachate/Surface Water Management

a) Effective surface water management infrastructure shall be provided and maintained at the site during the Phase 2 remediation works. As a minimum, the infrastructure shall be capable of the following:

- i) The prevention of contaminated water and leachate discharges into surface water drains and courses;
- ii) The collection/diversion of run off arising from stockpiles as well as capped and restored areas.

b) Whilst excavating, constructing stockpiles of materials or backfilling, the Contractor shall take such measures as are necessary to minimise the generation of leachate and prevent its discharge. Such measures include:

- i) sheeting of stockpiles of class U2 to prevent rainwater ingress.
- ii) constructing cut-off trenches around stockpiles to contain leachate.
- iii) placing stockpiles of unknown quality only on areas with impermeable ground cover.

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A780 Self-Audit of Procedure (Provided by Contractor)

The Contractor shall demonstrate compliance with his safety, health and environmental management plans and procedures through a process of self-audit. The Contractor shall provide the Engineer with details on how this audit process will be undertaken, shall forward the findings of each audit promptly to the Engineer and shall implement any corrective actions considered necessary, as a result of the audit. Audits shall be undertaken at least every 2 months.

A800 Noise, Vibration, Dust and Odour

A810 Control of Noise and Vibration (Provided by Contractor)

a) The Contractor shall employ the best practical means to minimise noise and vibration produced by his operations. He shall have regard to the recommendations in the EPA Environmental Noise Survey – Guidance Document (2003) and BS EN 5228:2009 Code of practice for noise and vibration control on construction and open sites.

b) Without prejudice to the generality of the Contractor's obligations under the preceding paragraph, the Contractor shall comply in particular with the following requirements.

(i) All vehicles and mechanical plant used for the purpose of the Works shall comply with the European Communities (Construction Plant and Equipment) (Permissible Noise Levels)(amendment) Regulations 1996, be fitted with effective exhaust silencers and be maintained in good and efficient working order.

(ii) All compressors and pumps shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use. All pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers. Any equipment or panel fitted for the purposes of noise reduction shall be maintained and operated so as to minimise noise.

(iii) Machines in intermittent use shall be shut down in the intervening period between work or, where this is impractical, throttled down to a minimum.

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(iv) All pumps shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order. All dewatering pumps shall be 'sound reduced' models fitted with properly lined and sealed acoustic covers.

(v) All stationary plant shall be covered where possible.

c) The Contractor shall pay special regard to minimise noise at the site boundaries. Such measures include:-

- (i) limits on the amount of plant at work
- (ii) silencing of plant as described above

d) The Contractor shall take suitable steps in his method of working to prevent damage to adjacent properties due to vibrations caused by executing the works.

e) Working hours of the site shall be restricted to 08:00 to 18:00 hours Monday to Friday.

A820 Monitoring Noise (undertaken by Contractor)

a) Noise monitoring equipment should comprise of the following:-

- Portable weatherproof Type 1 sound level meter, (Bruel and Kjaer model or similar) and external microphone capable of:-
 - i) Measuring sound levels in the range 40 to 140 dB(A).
 - ii) Programmed recording times.
 - iii) Calculating and recording percentiles of LAeq, Lmax and Lmin.
 - iv) Direct printing of results to printer or via computer.
- Computer software and any associated cables for the purpose of downloading data and converting into a Microsoft Excel compatible format.
- Extension cable for microphone.
- Acoustic calibration device.

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- Windshield for microphone.
- Tripod for mounting microphone at a variable height up to 2m above ground level.
- All batteries or charging devices as required.
- Waterproof case for equipment.

b) All equipment shall be calibrated maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

c) Noise monitoring is to be carried out by an experienced technician provided by the Contractor and generally in accordance with BS EN ISO 11202:2010 - Acoustics.

d) Methods, times, background and noise levels are to be agreed by the Engineer with the Agency, before monitoring commences. Monitoring of 'background noise levels' has been undertaken by Mouchel and the results are presented in the Environmental Summary Report presented in Appendix A. Monitoring of the works noise levels shall be compared to that reference level, unless otherwise agreed with the Engineer and the Agency.

A830 Monitoring Vibration (provided by the Contractor).

a) The Contractor shall provide equipment and undertake vibration monitoring of the following potentially unstable structures when working in their vicinity; Dock Road boundary wall, AGI wall, slopes at O'Curry Street boundary and No 5 Generator Store. Vibration monitoring shall also be undertaken for the duration of the works at a location on the Dock Road entrance and on the south east gable end of the Bord Gais office building to assess vibration being transmitted to the adjacent residential / commercial premises. Locations are indicated on Drawing 1021927/PHASE 2 - TENDER/OD/011 Dust and Vibration Monitoring Locations. The Engineer may also require other locations to be monitored as the works progress.

b) Ground borne vibration is to be assessed using the guidelines provided in BRE Digest 403, Damage to Structures from Ground Borne Vibration.

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c) Vibration monitoring equipment shall be capable of monitoring vibration dose values in compliance with BS EN ISO 8041:2005 and shall be able store at least one weeks data.

d) Vibration monitoring equipment shall comprise a portable weatherproof seismic recording instrument, such as the Vibrock V901 or similar approved, set to run in continuous mode and able to digitally record vibration levels up to 20 mm/s peak particle velocity for frequencies between 5 and 250 Hz. All necessary software and cables shall be supplied to enable the data to be downloaded and converted into a Microsoft Excel compatible format.

e) The Contractor shall provide suitable monitoring points, either:

- on a spike to appropriate strata
- on a resin anchor to hard surface
- on a sand bag covering on general surface

f) Vibration monitoring is to be carried out by an experienced technician provided by the Contractor.

g) All equipment shall be calibrated maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

h) Vibration monitoring may be used to protect people and vibration sensitive equipment and adjacent structures. The requirements and limits for vibration are to be agreed with the Agency by the Engineer prior to work commencing.

A840 Control of Dust (Provided by Contractor)

a) Dust control is the Contractor's responsibility. The Contractor shall conduct his operations so that any dust settles within the Site and is not carried beyond its periphery. The Engineer will retain the right to instruct more intensive dust control measures when considered necessary.

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b) The Contractor shall adjust the location of any works having regard to the wind direction and speed, and shall suspend such operations altogether, in the event that any such adjustment fails to prevent dust from being carried beyond the periphery of the Site.

c) The Contractor shall ensure that airborne dust is kept to a minimum by the regular use of water bowsers, with sprinklers, during periods of dry weather.

d) Open excavations shall be backfilled as soon as practicable after excavation has been completed;

e) The Contractor shall ensure that dust masks are readily available for all Site personnel. The masks will have P2 filters to protect against the fine respirable dusts, fibres (including asbestos) and aqueous mists. The masks may either be single face masks that conform to BS EN149 or Twin Cartridge Respirators that conform to BS EN140. Filters should conform to EN143, BS EN 14387:2004+A1:2008 and BS EN12083.

A850 Monitoring of Dust (Provided by Contractor)

a) Environmental Dust Monitoring

i) It is likely to be a requirement of the Waste Licence that the Contractor undertakes environmental dust monitoring. Exact requirements are yet to be confirmed but are likely to require dust emissions from remediation activities to be measured using 'frisbee' type dust gauges at 4 No. locations, one at each boundary of the Site. Anticipated locations are indicated on Drawing 1021927/PHASE 2 -TENDER/OD/011. In addition, the crusher, screening and stabilisation / solidification plant shall also be monitored.

ii) All dust monitoring stations shall be monitored weekly for the duration of the Site remediation works.

iii) All results shall be supplied to the Engineer as soon as they become available. The results shall also be summarised and reported at each progress meeting.

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iv) In addition the Contractor shall record daily the location of working areas and atmospheric conditions (temperature, relative humidity, precipitation, mean wind speed and wind direction) and issue all results to the Engineer on a weekly basis.

v) All equipment shall be calibrated, maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

b) Occupational Dust Monitoring

i) The Contractor shall determine and implement the occupational health monitoring of dust necessary for the circumstances of the site and the operations in hand, in order to comply with current health and safety legislation.

ii) The monitoring results shall be supplied to the Engineer and summarised for the site progress meetings.

iii) All equipment shall be calibrated, maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

A860 Control of Odours (Provided by Contractor)

a) Control of odours shall be the responsibility of the Contractor.

b) The stabilisation / solidification plant and equipment required for the mixing part of the process must operate with closed hoods and air extraction / carbon filtering to minimise odours.

c) The Contractor shall sheet or cover stockpiles and excavations not being worked and erect such screens or bunding necessary to contain odours. Odourless material, tarpaulins or suitable geomembranes may be used as appropriate cover.

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d) The Contractor shall provide, operate and maintain a suitable combination of automatic control spray systems with screens to suppress gas works odours as detailed below. An odour suppression spray shall be applied every two hours to uncovered soil stockpiles during the working day.

e) Mobile odour suppression unit shall comprise a portable fan system capable of producing a mist of finely atomised water and odour neutralisers via a nozzle and directing the mist over an area of odorous material. This shall be a Vortex 440 mobile fan unit manufactured by Air Spectrum Environmental, or similar system approved by the Engineer.

f) Stationary odour suppression system shall comprise a length of hosing with atomiser nozzles spaced at no greater than 1m centres capable of producing a mist of finely atomised water and odour neutraliser at a pressure of not less than 70bar to be placed around an area of odorous material. The system shall be operated by mains or generator supplied power and mains or bowser supplied potable drinking water such as a 'pacific odour control system' manufactured by Air Spectrum Environmental or similar approved by the Engineer.

g) The contractor shall ensure that experienced engineers are provided during all operations where there is a potential for odours to be created, to ensure that odorous materials are handled in a way that minimises odour generation, and that odour suppression equipment is utilised effectively in such areas.

A870 Monitoring of Odours (provided by the Contractor)

a) Environmental Monitoring of Odours

Environmental monitoring of odours / vapour is the Contractors responsibility. Observational daily monitoring of air quality will be undertaken at sensitive site boundaries, depending on the Site operations occurring, for volatile organic compounds, as agreed with the Engineer.

(i) The Contractor shall assess vapours qualitatively at the same four boundary locations as the dust monitoring points and at eight flexible points around the site as agreed with the Engineer. Prior to the works, background levels shall be ascertained for the site. This shall be undertaken twice daily using a portable photoionisation detector (PID), calibrated to an appropriate organic contaminant (eg benzene).

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(ii) The Contractor shall also make a daily assessment of odours using olfactory means at the site boundaries and at the same eight flexible points. A procedure for recording the 'odours' shall be agreed with the Engineer, which will typically use the following 'odour rating':

- 1 - not noticeable;
- 2 - slight odour;
- 3 - moderate odour;
- 4 - unacceptable odour (remedial action required).

He shall record this assessment of noise, dust and vibration in a similar format at the same time.

(iii) The data from the monitoring required under subclauses (i) and (ii) shall be tabulated and supplied to the Engineer on a weekly basis, with a note of any actions taken as a result of the monitoring.

(iv) Should the PID monitoring indicate consecutive high readings, or should odours be deemed unpleasant, or should the excavation of potentially unpleasant odours material be scheduled e.g tar tanks or gas holder basins, then more stringent vapour monitoring should be followed as agreed with the Engineer.

(v) A meeting is to take place prior to the commencement of the Contract to discuss any foreseeable problems with the monitoring specified so that alternatives can be agreed upon by the Engineer.

b) Occupational Monitoring of Odour

Occupational odour / vapour monitoring is the responsibility of the Contractor.

i) The Contractor shall determine and implement the occupational health monitoring of odours and vapours necessary for the circumstances of the site and the operations in hand, in order to comply with current health and safety legislation.

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ii) A dedicated personal organic vapour monitor shall be carried by those site workers at most risk of exposure to contaminated materials during the works – principally excavator drivers and banksmen involved in the excavation of tarry materials. (For excavator drivers the monitor should be located in the vehicle cab close to the breathing zone; for banksmen etc the monitor should be attached to outer clothing).

Each monitor shall be capable of data logging and have an audio/visual alarm set to trigger in response to any exceedance of the occupational guideline value of an appropriate organic contaminant (eg benzene). The data shall be down-loaded at the end of each working day (or period, as necessary) and shall be kept by the Contractor in paper and digital format. The paper records shall be available for inspection by the Engineer and copies of data shall be supplied to the Engineer, if requested.

The data shall include the date; the monitored levels (at intervals not exceeding 15 minutes), showing the time of day and the minimum, average and maximum levels recorded during the period; the current occupational exposure limits as set out in the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 and associated 2010 Code of Practice.

iii) All equipment shall be calibrated maintained and insured for the hire period in accordance with the instructions issued by the manufacturer/supplier or installer. Written records of the calibrations and maintenance shall be made and kept by the contractor.

iv) The data shall be inspected by the Contractor and, as necessary, further actions shall be taken, such as:

- Further monitoring to identify and quantify the organic compounds present (eg Draeger Tubes), for comparison with current occupational exposure limits as set out in the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 and associated 2010 Code of Practice;
- Up-rating of personal protective equipment used;
- Amending working practices, which could include the temporary suspension of some operations and covering exposed materials.

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v) The monitoring shall be undertaken in general accordance with the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 and associated 2010 Code of Practice.

A880 Asbestos and Asbestos Monitoring

- a) The ground investigation documents have not identified any areas where asbestos has been found in the ground. In the event of material suspected to be asbestos being encountered during excavation work, whether foreseen or unforeseen, the work item or area shall be suspended and declared a total exclusion zone, the perimeter of which being 3 m, beyond the limit of the asbestos. A further 3m safety zone shall be established and clearly marked.
- b) If asbestos is found, but the type of asbestos is not known, then it must be considered to be crocidolite (blue asbestos) but it must be identified before any removal starts. All work involving asbestos shall comply with the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006 and 2010.
- c) Samples for identification shall be taken by a competent person named by the Contractor and under the supervision of the Engineer. The sample, depending on size, is to be placed in a double wrapped plastic bag or a securely sealed plastic container and clearly marked as "Asbestos Sample". The number of samples taken will depend on the size of the area and type of material encountered within the ground or trial hole.
- d) If the results prove the samples to be free of asbestos, then both the Total Exclusion and Safety Zones can be removed.
- e) If the results of the sampling confirm the presence of asbestos then the Health and Safety Authority, Bord Gais, Environmental Protection Agency and the Engineer shall be informed.
- f) In all cases the Contractor shall not permit work to be carried out that may be liable to expose workers to asbestos, unless a suitable and sufficient assessment has been prepared, identifying the risks to workers from the exposure and the steps that need to be taken to meet the requirement of the Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006 and 2010.

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The Contractor shall provide a copy of the risk assessment to the Engineer for comment, prior to it being finalised. The Contractor, or his appointed Sub-contractor, shall also prepare a 'plan of work', detailing how the work will be carried out and how identified controls will be implemented. The plan of work must include the following:

- i) The nature and probable duration of the work.
- ii) Detailed method statements, addressing various matters, including the following:
 - proposals for removing the asbestos;
 - health and safety provision for workers;
 - measures to contain the spread of asbestos dust during removal;
 - site security measures;
 - monitoring regime for asbestos dust in the area of operations and at the site boundaries;
 - emergency measures;
 - measures to prevent the escape of asbestos during transport to disposal site;
 - how to meet the requirements of the Specification and the relevant statutory provisions.
- iii) Specifications for decontamination and containment equipment.
- iv) Details of methods employed and PPE to be used to prevent and reduce personal exposure. The associated works shall not commence until the Engineer has confirmed that the plan of work is adequate and a copy of the plan must be maintained on site.

g) The Contractor is solely responsible for giving the statutory 14 days notice, of the intention to work in the vicinity of asbestos, in writing to Health and Safety Authority. The notice shall include:-

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- i) the date(s) and the area(s) where he will work;
- ii) a method statement laying down his proposals for removing the asbestos
- iii) the manner in which he intends to meet the requirements of the Specification and the relevant statutory provision,
- iv) such other information that the Health and Safety Authority may require.

A copy of the above shall at the same time be forwarded to the Engineer.

h) The Contractor shall be aware that notification is not required if the work meets the requirements of Regulation 5(b) of SI 386, 2006.

i) The Contractor shall appoint a competent person to supervise the removal and disposal of asbestos products. He shall be on site at all times during working hours. He/she shall be fully conversant with all statutory regulations applicable to the removal and disposal of asbestos and exercise a high standard of supervision and good housekeeping throughout the period of the Contract. Any changes of staff shall be notified in advance in writing to the Engineer, prior to commencement on site.

The Contractors Method Statement shall detail the following items as a minimum.

- i) Measures to contain the spread of asbestos dust during removal.
- ii) Health and Safety provision for workers.
- iii) Site security measures.
- iv) Monitoring regime for asbestos dust in the area of operations and at the site boundaries.
- v) Emergency measures.
- vi) Measures to prevent the escape of asbestos during transport to disposal site.

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j) Appropriate protective clothing and either a full face filter mask or half mask respirator confirming to the appropriate European Standard shall be provided for all persons involved with asbestos. Disposable protective clothing shall be removed in the open air and placed in a plastic bag. This is to be done with the filter mask still in place. If a full mask has been used it should be washed off with water, whilst still on the face, the filter removed and placed in the disposable bag. Half filter masks should also be removed and placed in a disposable bag. Arrangements shall be made for these bags to be dispatched to a landfill licensed to accept asbestos waste.

k) In the event that asbestos is present on site then the Contractor shall carry out quantitative fibre monitoring throughout the duration of the asbestos removal. This should consist of at least three static monitoring points adjacent to the excavation and one at each of the site boundaries. Any personnel involved directly with asbestos removal, such as sheeters or excavator drivers shall also undergo occupational monitoring.

l) The sampling / monitoring methodology must be in accordance with Health and Safety Authority (HSA) guidance

m) Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006 and 2010 introduces a single exposure limit of 0.1 fibres per cm³ of air for all work activities where exposure to asbestos dust in the air at a place of work may arise.

n) Should the results exceed the exposure limit then the works shall be suspended until the levels are under the control limit or suitable PPE is used. Reduction of asbestos fibre levels may be achieved by damping down the area of work. If levels exceed the exposure limit then work shall be stopped immediately, until the level is below the limit value.

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A900 Condition Survey and Protection of Features

A910 Condition Survey

a) Before the commencement of any demolition, site clearance or site works, the Contractor shall inspect the conditions of existing buildings, roads, footways, installations, kerbs, verges, fences, walls and street furniture etc. within and adjacent to the site (other than those buildings and/or features identified of demolition or removal) and shall prepare a schedule noting all existing defects, with supporting sketches and photographs, where necessary. This shall also include the Dock Road boundary wall, the AGI wall and the No 5 Generator Store all of which have protected status. The schedule shall be agreed with the Engineer and any owner or Public Authority, as applicable, prior to the commencement of any activity that could potentially result in additional damage. A condition survey was prepared at the end of the Phase 1 works and this shall be made available to the Contractor for information.

b) The Contractor, on completion of the Works, or at such earlier time as may be required, shall make good to the satisfaction of the Engineer and any owner or Public Authority concerned, all damage additional to that agreed in the schedule, where such damage has been caused by the Contractor, or any of his sub-contractors, in connection with the execution of the Works.

c) In the event of the Contractor failing to prepare and agree a 'Schedule of Condition', the property in question shall be deemed to have been undamaged prior to the execution of the Works.

d) If, in the opinion of the Engineer, the Contractor has failed to repair and make good within a reasonable time any damage attributed to the Contractor's actions, or has likewise failed to arrange for the repairs to be carried out, the Employer may arrange for the repairs to be carried out and deduct the expenses incurred from money due to the Contractor under the Contract.

A920 Protection and Preservation of Features

a) The Contractor shall protect and preserve the following features (some of which have Protected Status) also indicated on Drawing 1021927/PHASE 2 - TENDER/OD/008;

- i) The Dock Road boundary wall (Protected Status).

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- ii) AGI wall (Protected Status).
- iii) The No 5 Store Generator Building
- iv) The site offices building
- v) The new DRI and ESB Electricity sub-station structures on the O'Curry Street boundary.
- vi) Existing borehole monitoring well installations. These shall be retained for as long as possible, but will need removing as remedial works progress and shall be replaced on completion of the works to allow further monitoring as required by the waste licence.

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4.3 CLASS C: GEOTECHNICAL AND OTHER SPECIALIST PROCESSES

C900 Remediation

The Contractor shall consider and adopt, as appropriate, relevant regulatory guidance in relation to the suitability, design, operation and management of remediation treatment processes, including any applicable Agency guidance.

Details of any materials imported to site shall be agreed with the Engineer in advance and shall not comprise any deleterious or contaminated material.

The Contractor shall not undertake any Works which could affect 'party walls' or any boundaries without first providing to the Engineer a method statement for the required works such that the party wall or boundary shall not be affected by the works.

C910 Pilot Study

a) As part of his tender, the Contractor shall prove to the Engineer the suitability of his chosen stabilisation / solidification methodology and its application to the circumstances of the site and to the objectives of the remediation project, including any remedial targets/objectives.

The pilot study shall be a trial of the treatment process in which the process is either operated at partial scale on site or in bench trials on representative materials off site (following acquisition of suitable representative materials from site). The aim of which is to establish operating parameters and evaluate the treated material and any by-product material stream(s).

In this regard, the Contractor shall pay due regard to cost, health and safety, environmental and other considerations, including the following, as applicable:

- i) Site ground conditions and the nature and variability of the materials requiring treatment.
- ii) Generation of noise, vibration, dust and/or odour by the process, having regard to on-site and off-site receptors (including humans and property), and monitoring requirements.

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- iii) Creation of bi-products from the process, likely to pose a risk to health, safety and/or the environment throughout and at the conclusion of treatment operations.
- iv) Anticipated productivity rates for the treatment process (or processes).
- v) Working space constraints, including stockpiling requirements.
- vi) Preparatory works requirements (i.e. the need to prepare process and stockpiling areas).
- vii) Suitability for use of any existing on-site features, such as hard standing, slabs and/or tanks.
- viii) Use of energy.
- ix) Use of 'clean' water and dewatering of excavations.
- x) Use of consumables during the process (e.g. binders)
- xi) Type and quantity of reagents required, if any, and use of less environmentally damaging or energy consuming reagents (e.g. the selection of bio-degradable surfactants etc.).
- xii) Potential impact on or interaction with site infrastructure and below ground services.
- xiii) Any known or likely planning issues/constraints.

A maximum budget of €20,000 is available. The Contractor shall insert a cost for the pilot study which can be anything up to €20,000. Any additional costs incurred during this period shall be borne by the Contractor. The cost is to include for provision, maintenance and removal of all required welfare and hygiene facilities for the period.

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b) The Contractor shall document in his tender the basis for recommending the use of his chosen stabilisation / solidification methodology and the specific process plant, as applicable. The information provided shall address the matters listed in sub-clause a), above, as applicable. It shall also clearly identify the variables that would be expected to have a significant effect on the efficiency of the process(es) and the range/assumptions made, with supporting calculations/reasoning (e.g. proportions of binder).

c) The Contractor shall be aware that information provided as part of the Contractor's Tender is likely to be used by the Engineer and may be submitted to the regulators for comment/approval. The Contractor shall also recognise that following this stage, any change to the selected remediation process(es) is likely to require further regulatory consultations, which could delay implementation of the remediation process(es).

d) A methodology confirmation period is available to the Preferred Contractor. This comprises a period of up to 2 months (from the award of Preferred Contractor status and including reporting) in order to undertake trials to prove that the chosen methodology will successfully stabilise / solidify the site materials. In addition, it shall be used to demonstrate that appropriate disposal / recycling facilities are available for any unsuitable materials. At the Contractor's discretion, the 2 month period may be shortened if the Contractor is confident that trials can be progressed to a suitable point that he can prove to the Engineer that the process is suitable (including any necessary reporting).

e) As part of the methodology confirmation period, the Contractor shall:

i) Allow the Engineer's staff reasonable access to any bench trials for the purpose of witnessing the trials.

ii) Prepare a report on the trials, including any analytical data required by the Engineer to validate the performance of the trial(s). The report shall be provided to the Engineer within two months of the award of Preferred Contractor status.

iii) Provide, maintain and remove, unless required for the stabilisation / solidification works all welfare, decontamination and safety and health requirements for the purposes of undertaking the methodology confirmation period safely and in accordance with current legislation and guidance.

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f) A period of two weeks maximum from submission of the Contractors report on the trials shall be required by the Engineer to assess the suitability of the process. This two week period shall be in addition to the maximum 2 month allowable period for the trials. The cost of maintaining any plant in stand-by mode for this period shall be included within the Contractors tender sum for the methodology confirmation period.

g) The Contractor shall take account of the results and conclusions of the process trial when assessing the full treatment process works and methodologies.

C920 Stabilisation and Solidification

a) A waste licence and planning permission has been obtained by Bord Gais for the remediation process. The Contractor shall comply with all regulatory requirements and shall obtain all necessary authorisations (see Clause A750).

b) The Contractor shall design the treatment process (including any trials) and working methodology in order to meet criteria for the successful stabilisation / solidification as set-out in Section 2.4.

c) The Contractor shall provide appropriate management of any specialist remediation treatment process(es) used, as appropriate to the technique to be implemented, including plant, equipment and personnel. The Contractor shall provide services for use by any specialist subcontractor, including water and electricity, and all necessary welfare facilities for the use of the specialist sub-contractor's staff.

d) The Contractor shall ensure that the treatment process is carried out with due regard to health and safety and environmental considerations (see Clause A770).

e) The Contractor shall manage and monitor the health, safety and environmental performance of any specialist sub-contractor used.

f) The Contractor shall review and up-date, as necessary, the 'construction phase safety and health plan' and the 'environmental management system' when changes to the configuration of any process plant are proposed/implemented. The Contractor shall also up-date risk assessments and method statements if and when plant/processes are reconfigured.

g) The Contractor shall prepare, in association with the specialist sub-contractor, as applicable, a detailed method statement (or management plan) for the remediation process. This shall:

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- i) Identify the individuals involved.
- ii) Define the day-to-day responsibilities of the various parties and individuals involved, including maintenance of the working area.
- iii) Identify the factors that could influence the efficiency of the stabilisation / solidification process.
- iv) Define the operating window for the process in relation to the chemical and geotechnical properties of the materials requiring treatment.
- v) Include a strategy for completing the work in the most efficient manner, having regard to the factors identified above.
- vi) Define the sampling regime to be carried out during the commissioning stage and during the treatment operations, including sampling for performance monitoring, waste classification and validation purposes, as applicable, and any specific requirements of the Engineer.
- vii) Provide other pertinent information, including any other items/ requirements set out below. Where more than one treatment process is to be used, the plan shall describe the interaction and dependencies between the several treatment processes and the management actions that the Contractor will take to ensure the efficient operation of the treatment train. A draft copy of the management plan shall be supplied to the Engineer for review and comment. The Contractor shall address any comments made by the Engineer and shall finalise and re-issue the plan, as appropriate.
- h) The Contractor shall provide a suitably prepared working area for the process plant, adopting existing hard-standing, where appropriate, and incorporating impermeable layers/barriers, perimeter bunds and managed drainage, as necessary.
- i) The Contractor shall undertake sampling and analysis of the material requiring treatment, the treated material and, if applicable, any intermediate stage material, in order to demonstrate the effectiveness of the treatment process. The Contractor shall manage the acquisition and recording of samples in a manner appropriate to the method of operation of the process (i.e. batch or continuous flow, progressive in-situ treatment, etc.). The Contractor shall give the Engineer reasonable notice of his intention to undertake sampling and shall supply the results of such sampling to the Engineer, as soon as they become available.

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- j) The Contractor shall allow the Engineer's staff reasonable access to the process plant for the purposes of inspecting on-going material processing and sampling.
- k) The Contractor shall keep a detailed record of any unproductive time relating to the treatment process, including date, time, reason and, if applicable, corrective action taken.
- l) The Contractor shall review the progress of the treatment process, in consultation with the Engineer, on a frequent basis (minimum weekly) and, if requested, prepare a report for the Engineer on a bi-weekly basis, describing the performance of the treatment process.
- m) In addition to the above, the Contractor shall ensure that all the requirements of Section 2.4 of this Specification are met.
- n) As the remediation progresses, the existing groundwater monitoring wells will require removal. The Contractor shall replace these wells on completion of the works with wells that replicate the originals with respect to depth and response zone location.
- o) The following specific provisions shall apply during the remedial works:
- i) The Contractor shall constantly monitor the operation of the solidification or stabilisation process to ensure that treated material does not contain clasts or regions of untreated or insufficiently treated material.
 - ii) The Contractor shall identify how mixing and addition of stabilisation ingredients is to be carried out to ensure that the process does not become an exercise in "contaminant dilution" (which is not acceptable).
 - iii) The Contractor shall accurately measure and control volumes of material added as part of the solidification or stabilisation process.

C921 Plant (Provided by Contractor)

a) The Contractor shall provide, operate, maintain and remove on completion all items of plant and equipment necessary in order for him to complete the remediation works within the programme period, including for the provision of road sweeping/cleaning facilities. It is envisaged that the following main items of work would also be undertaken by the Contractor:-

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- Liaison with Limerick City Council Water Services Department.
 - All fees associated with the works.
 - Establishment of stabilisation and solidification plant, groundwater treatment plant and crushing plant
 - Any other work required to successfully solidify and stabilise the soils / liquids encountered.
- b) All plant and equipment shall be provided and maintained in a safe condition with all maintenance and service documentation available for inspection by the Engineer.
- c) The Contractor shall determine his own plant requirements to allow the satisfactory and timely completion of the Remediation works, however, the following plant, all of which will be under the control of the Contractor, is anticipated to be required:
- i) A range of excavators, loading shovels with suitable weighing devices fitted, dump trucks, dozers, vibratory rollers and ground water pumps.
 - ii) Crushing plant to crush concrete, brick etc as required. (This facility may be provided off-site at a suitably licensed facility).
 - iii) Screening machine.
 - iv) Stabilisation / solidification plant.
 - v) Ground water treatment plant
- d) All moving plant is to be fitted with and use flashing amber lights and reversing beepers.
- e) The Contractor shall ensure that the use of crushing, screening and/or stabilisation/solidification plant is appropriately authorised. The Contractor shall supply to the Engineer, site specific details, including a commencement date for the crushing/screening operations, no less than 7 days prior to bringing the crushing/screening plant to site.

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- f) The Contractor shall ensure that crushing, screening and/or stabilisation/solidification plant is operated in accordance with the conditions of the Waste Licence and any other permits/authorisations and shall keep any records that may be required.
- g) Crushing, screening and/or stabilisation/solidification plant shall be located to minimise noise and vibration to off- site receptors and particular care shall be given to noise screening of the plant. (See also Clauses A800, A820 and A830).
- h) The location of the crushing, screening and/or stabilisation / solidification plant shall be monitored as part of the dust monitoring required under Clauses A840 and A850.
- i) The loading of the crushing, screening and/or stabilisation/solidification plant shall be carried out in a manner to minimise wind borne dust. The drop heights of materials shall be minimised and, if necessary, water suppression equipment shall be provided at or before the point of discharge from the conveyor(s). Water suppression equipment shall be used whenever necessary to control dust emissions.
- j) Crushing/screening plant used to process concrete, brick, masonry and the like shall include a moving magnet or similar to remove ferrous metal objects. In addition, the Contractor shall remove all unwanted materials, including non-ferrous metal and timber, as far as reasonably practicable. A suitably trained operative shall be in fulltime attendance at the crushing plant/screening, during its operation, with duties including the removal of unwanted material.
- k) In addition, the Contractor shall arrange for the removal of any remaining foreign objects in the processed material, at the time it is placed.
- l) The Contractor shall be responsible for testing crush material at a frequency of one test per 50m³ for the soil determinands presented in Appendix G.
- m) The Contractor shall provide a temporary water treatment plant for the period of the Works to treat surface and groundwater.

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n) Flow rates are anticipated to be between 50m³ and 100m³ per day at up to 3 litres per second based on a 10 hour day. Discharge criteria are presented in Appendix E and have been initially discussed with Limerick City Council. However, the Contractor shall make his own assessment of flow rates and shall agree both these and the discharge levels with Limerick City Council Water Services Department and the Engineer. He shall design and provide the treatment works to fulfil these requirements.

o) No excavation on site or discharge of waters from site shall take place until written approval has been provided from the Licensing Authorities.

p) The Contractor shall record the volume of water discharged to sewer each day and analyse a minimum of one water sample per day (post treatment) in accordance with the analysis suite presented in Appendix E. Chemical and flow results shall be submitted to the Engineer and Limerick City Council on a weekly basis.

q) The Contractor shall provide a lower explosive limit (LEL) detection system. A sensor shall be mounted at the discharge point to the sewer which will close off a discharge valve to the sewer if levels of 20% LEL are exceeded.

r) An inspection chamber shall be provided and maintained in a suitable position on the sewer discharge to permit taking of samples of the discharge.

C930 Samples

Methods of sample recovery shall be provided by the Contractor with his tender submission and agreed with the Engineer prior to commencement on site.

C931 Chemical Samples

a) Validation samples shall be required to prove:-

i) successful stabilisation / solidification (as detailed in Section 2.4). This shall require a minimum of three soil samples from each 10m grid cell (each sample from a different depth) to be agreed with the Engineer.

ii) imported 6F2 crush material meets the required remedial target values for import presented in Appendix C. This shall require a minimum of three samples per import source with at least one sample to be tested per 50m³ of imported soil.

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iii) site won 6F2 crush material meets the required remedial target values presented in Appendix G. This shall require at least one sample to be tested per 50m³ of crush material.

b) All samples for chemical analysis shall be taken and prepared in accordance with BS10175:2011 and the requirements of the accredited chemical testing laboratory.

c) The Contractor shall be responsible for handling, packing and dispatching the samples (to the selected laboratory) in accordance with the accredited testing laboratories requirements for sample preservation and handling (which for chemical samples shall include the use of cool boxes and frozen ice packs). He shall also be responsible for checking that the samples dispatched comply with the 'chain of custody documentation' (agreeing any discrepancies with the Engineer); sign the 'chain of custody' documentation; and supply a copy of the signed document to the Engineer.

C932 Geotechnical Samples

a) Geotechnical samples shall be required to:-

i) provide a record of the strength of the treated soils 10 days after backfill and compaction. This shall require one U38 sample to be taken from each grid cell.

b) All samples for geotechnical testing shall be taken and prepared in accordance with BS1377 (as amended) and the requirements of the accredited geotechnical testing laboratory.

c) The Contractor shall be responsible for handling, packing and dispatching the samples (to the selected laboratory) in accordance with the accredited testing laboratories requirements for sample preservation and handling. He shall also be responsible for checking that the samples dispatched comply with the 'chain of custody documentation' (agreeing any discrepancies with the Engineer); sign the 'chain of custody' documentation; and supply a copy of the signed document to the Engineer.

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C940 Laboratory Testing

C941 Chemical Tests

a) The chemical content of solids and liquids shall be determined in accordance with MCERTS/UKAS accredited procedures. Any laboratory proposed by the Contractor must be approved in writing by the Engineer during the tender period, and details submitted with the Contractor's tender submission. Where test methods for determinands are not appropriately accredited, the test method shall be issued to the Engineer for approval prior to the commencement of sampling and testing.

b) Alternative methods of analysis shall be employed, with the agreement of the Engineer, if necessary to achieve any specified detection limits, which are not achievable by the methodology stated in the above specification or where liquid samples are required for assessment of compliance with the discharge consent.

c) Results of analysis of samples shall be provided to the Engineer within 10 working days of sampling unless otherwise directed by the Engineer.

d) Soil samples of imported 6F2 crush shall be analysed for the suite of soil determinands indicated in Appendix C.

e) Soil samples of site won 6F2 crush shall be analysed for the suite of soil determinands indicated in Appendix G.

f) Soil samples of treated material shall be analysed for the suite of soil leachability determinands indicated in Appendix G.

g) The results shall be tabulated in the format specified in Appendices C and F. When all analysis is completed the final results shall be supplied in a bound report. The report shall include colour copies of Shewhart Charts for ammonium, phenol, naphthalene, benzo(a)pyrene and BTEX in soils and water, and a description of the methods of analysis employed for all determinands reported. The report shall be signed by a senior representative of the laboratory. Two copies of the report shall be supplied to the Engineer.

The results, tabulated in Microsoft Excel™ format, and electronic copies of all Shewhart Charts shall be supplied to the Engineer.

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C942 Geotechnical Tests

Shear strength testing of the stabilised materials shall be required to be undertaken on U38 samples 10 days after backfilling and compaction to provide a record of the strength of the stabilised materials.

C950 Discharge Consent

A discharge consent shall be required for any water discharged off site via the foul sewer. The Contractor shall be responsible for gaining the consent from Limerick City Council Water Services Department including payment of all fees, the management and monitoring of the works (including liquid sampling and testing) to ensure compliance with the consent.

Discharge consent criteria have been agreed with Limerick City Council Water Services Department and are presented in Appendix E.

Where confirmatory water samples are required for the discharge consent, these shall be tested for the 'discharge consent' suite indicated in Appendix E.

C960 Ground Investigation for Characterisation

It is not envisaged that any further characterisation investigation will be required by the Contractor. However, if they wish to do so, further investigation shall be undertaken in accordance with the Specification and Related Documents for Ground Investigation in Ireland, October 2006, prepared by the Institution of Engineers of Ireland/Geotechnical Society of Ireland and BS10175:2011 Investigation of Potentially Contaminated Sites: Code of Practice.

If further characterisation is to be undertaken, the Contractor shall give the Engineer's Representative reasonable notice of his intention to undertake intrusive works and shall not proceed without a member of the Engineer's staff in attendance, unless agreed otherwise with the Engineer.

The Contractor shall have full responsibility in relation to the clearance of services during any intrusive works (see Clause A760) and shall implement suitable 'permit to dig' arrangements.

The chemical content of solids shall be determined in accordance with MCERTS/UKAS accredited procedures.

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C970 Monitoring Wells

Ground water monitoring standpipes to replace the 24 wells utilised by Mouchel for monitoring and sampling purposes prior to the remediation works shall be installed to replicate the depth and response zone locations of those wells they are replacing.

The works are to be carried out in accordance with the 'Specification and Related Documents for Ground Investigation in Ireland, October 2006', prepared by the institution of Engineers of Ireland/Geotechnical Society of Ireland and BS10175:2011 subject to the following specific requirements:

- i) At the Contractors discretion, locations shall be started by means of a hand-excavated inspection pit to 1.2 m bgl. The base of the inspection pit shall be scanned using a cable avoidance tool and probed by hand using a suitable tool (e.g insulated bar or similar). The cost of such measures shall be deemed to be included within the Contractors rates.
- ii) All drilling equipment, including casing, shall be clean before arriving on site, and shall be washed using a hot water or steam cleaner prior to commencement of each exploratory hole.
- iii) The arisings and any flush medium must be contained within the drilling area.
- iv) Any water used to assist boring shall be kept to a minimum and shall be of drinking water mains quality.
- v) Petroleum based oils and lubricants shall not be used on any boring or drilling equipment, including casing. Vegetable or silicone based grease and oils or similar, from a clearly identifiable source, or a non-leachable PTFE spray, may be used.
- vi) The need for 'nested casing' to avoid the creation of potential contaminant migration pathway shall be discussed and agreed with the Engineer, as applicable.
- vii) The location of the response zone (i.e. slotted section) of any borehole standpipe shall be agreed with the Engineer's Representative before installation.

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viii) The Contractor shall ensure that the drillers hold appropriate accreditation, and shall check and obtain copies of all such certification for operators before work commences.

ix) The Contractor shall also check and obtain copies of all certification for plant before starting work, including any requirements under the Safety, Health and Welfare at Work (General Application) Regulations 2007 to 2010.

x) Any water arising from boreholes, either during drilling operations, or in preparation for or during groundwater sampling work, shall be managed appropriately.

xi) All drill arisings to be incorporated into the managed waste streams as appropriate.

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4.4 CLASS D: DEMOLITION AND SITE CLEARANCE

D400 and D500 Buildings and Other Structures

- a) The Contractor shall demolish, break-up and/or remove existing redundant buildings, structures, superficial obstructions and/or materials as required by the Engineer during the site works. In addition, the Contractor shall remove any internal fences, redundant buildings, shrubs and undergrowth necessary to accommodate the Works.
- b) The Contractor shall retain and/or set-aside for re-use any material arising from site clearance identified by the Employer for retention or incorporation into the Works. Any material to be retained by the Employer shall be moved by the Contractor to a suitable location on the site, as agreed with the Engineer.
- c) The Contractor shall consider the re-use or re-cycling of all materials arising from site clearance and, where appropriate, shall re-use and/or re-cycle such materials.
- d) The Contractor shall not light any bonfires or burn any materials on the site.

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4.5 CLASS E: EARTHWORKS

Earthworks/excavation shall be undertaken in accordance with the Manual of Contract Documents for Road Works published by the National Roads Authority.

The Contractor is reminded that all works will be controlled by a Waste Licence and all operations for the excavation, treatment and disposal of waste must be carried out strictly in accordance with the requirements of the licence.

E400 General Excavation

The risk assessment has identified likely significant risks posed to future site users from shallow soil contaminants. In order to comply with the Remediation Target Values (RTV's) for surface soils (presented in Appendix G), it will be necessary to provide a form of cover layer to the site. To comply with this requirement, it will be necessary to excavate and treat the uppermost 3m of soils across the entire site area except where limestone is encountered at shallower depth or site constraints preclude excavation to this depth.

Where underground tanks are encountered and the tank base is at a greater depth than 3m below ground level, the contents of the tank shall be removed, but the tank walls and base where present below 3m depth shall remain intact. Tank walls and bases shallower than 3m below ground level shall be broken out (where practicable without undermining adjacent structures) and crushed.

A detailed method statement shall be required, as specified in the Instructions to Tenderers (Part 1 of the tender documents), in respect to excavations in the vicinity of existing features and structures listed in Clause A920. It is anticipated that excavations would be stepped back 1m with a 45 degree gradient excavation prior to commencing. Any remnant material would need to be excavated and replaced in discrete bays to prevent undermining any foundations or instability of any structures.

E460 Classification of Materials

a) Earthworks materials shall fall into one or other of the following general classifications:

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- i) Acceptable material: either material excavated from within the site which is suitable for solidification / stabilisation and following treatment meets the requirements of Appendix G for acceptability for use in the permanent works or; concrete, brick and masonry material excavated from within the site which, following crushing meets the requirements of Appendix G for acceptability for use in the permanent works.
- ii) Unacceptable material Class U1 or U2, as defined in sub-Clauses b) and c) of this clause: material which, shall not be used in the permanent works.
- iii) Imported fill material: imported material which meets the requirements of Appendix C for acceptability for use in the permanent works.

b) Unacceptable Material Class U1 shall be further classified as follows:

- i) material or constituents of materials containing any of the following:

peat, materials from swamps, marshes and bogs;

logs, stumps and perishable material;

materials in a frozen condition;

clay having a liquid limit, determined in accordance with BS 1377 (as amended): Part 2 Method 4, exceeding 90 or plasticity index, determined in accordance with BS 1377 (as amended): Part 2 Method 5, exceeding 65;

Steel reinforcement or other metal work.

Unacceptable Material Class U1 is considered to be non-hazardous / inert waste.

c) Unacceptable Material Class U2 shall be further classified as follows:

- i) highly contaminated material which when excavated is not considered suitable for solidification / stabilisation treatment
- ii) material which, when solidified / stabilised, does not meet the required leachability RTV's specified in Appendix G

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- iii) metal pipework and reinforcement coated with tar products.
- iv) crushed site won material which does not meet the requirements of soil RTV's specified in Appendix G.

d) All unacceptable material of Class U1 and U2 shall be removed off site to an approved disposal facility. All off site movements shall take account of relevant legislation.

A process flowchart for information is provided within the Bill of Quantities (Part 4 of the tender documents).

E470 Excavation Requirements

a) Prior to excavation, the site shall be divided into a series of 10m x 10m square grid cells, as per the grid indicated on Drawing 1021927/PHASE 2 – TENDER/OD/003. Excavation shall normally take place at each grid cell in turn.

b) The arisings generated from excavation in each grid square will either be:

- (i) Passed through the stabilisation / solidification treatment plant or;
- (ii) if Class U1 or Class U2, be stored in temporary stockpiles of not greater than 250 m³, with visibly similar materials being stored together or;
- (iii) be stored in stockpiles of hard material for crushing.

This shall be based on the results of the previous ground investigations and visual/olfactory assessment during excavation.

c) The Contractor shall employ only that plant and working methods, which are suited to the material to be handled and traversed. He shall be responsible for maintaining the nature of the acceptable material so that when it is placed and compacted it remains acceptable in accordance with the Contract.

d) Where the excavation reveals a combination of acceptable and unacceptable material or different classes of material, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the materials are excavated separately, without cross contamination.

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e) When removing pipelines and the upper 3m of tank infrastructure, the Contractor shall take measures to ensure that residual free product does not contaminate the surrounding excavations or the groundwater.

f) The Contractor shall ensure that he does not adversely affect the stability or cleanliness of excavations or fills by his methods of loading lorries, stockpiling materials, use of plant or siting of temporary buildings or structures.

Buried pipelines and pits may contain tars or other liquors. The Contractor shall take measures to ensure that tars and liquors do not cause unnecessary atmospheric pollution or contaminate other materials when they are excavated.

g) Excavations shall be adequately supported at all times, in accordance with BS 6031 2009, The Code of Practice for Earthworks. Sheet piling and other excavation supports shall be removed as filling proceeds except where they are required by the Contract to be left in position.

h) Excavations requiring backfilling shall remain open only for the minimum period necessary.

i) The Contractor shall keep earthworks free of all water whatever the source including:

- (i) arranging for the rapid removal of water that is shed onto the earthworks or enters the earthworks from any source;
- (ii) lowering and maintaining by appropriate measures, the water level in excavations, sufficiently to enable the backfill to be laid and compacted.
- (iii) minimise the generation of leachate in accordance with Clause A775.

j) In carrying out the requirements of sub-Clause i) of this Clause the Contractor shall:-

- (i) form and maintain batters and areas of fill with appropriate falls and gradients and sealed surfaces;
- (ii) provide where necessary, temporary storage, in the form of tanks or lined lagoons, watercourses, drains, pumping and the like;

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(iii) discharge accumulated clean water into the permanent outfalls of the drainage system where practicable, subject to the requirements of the discharge licence to foul sewer. The Contractor is responsible for arranging and making payments stipulated in the licences required by the authorities.

(iv) discharge accumulated potentially contaminated surface and ground water into holding tanks or a specially constructed and lined lagoon associated with the groundwater treatment plant. The treated water is to be either utilised for dust control on unreclaimed areas of the site or discharged into the foul sewer subject to chemical testing and the agreement of the drainage authority, or tankered off site to an approved disposal facility. The Contractor is responsible for all costs involved.

(v) ensure oils and settled solids are removed separately. Oils shall be tankered off site to an approved disposal facility. Solids may be incorporated within the general fill subject to test results and the approval of the Engineer.

(vi) provide adequate means of trapping silt to prevent silt generated by the site preparations being discharged into permanent drainage systems from temporary or permanent systems within the works.

(vii) seal with clay, concrete or by grouting as directed by the Engineer any drainage ducts or channels crossing the site boundaries which are not to be re-used and which cannot be removed by excavation, having first recorded their location and informed the Engineer.

(viii) pressure grout or otherwise seal all boreholes, shafts, pits and old workings found to be issuing water, to the satisfaction of the Engineer.

(ix) remove water from wells/sumps, in advance of the general excavation (to reduce the generation of odours and to facilitate excavation in the dry).

(x) The temporary works and associated plant shall be capable of the protection of the underlying bedrock aquifer from pollution by the waste activities; and the protection of buildings from any adverse effects caused by groundwater flow changes or groundwater contamination arising at the site.

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k) The Engineer may occasionally require excavation work to be suspended in a locality for a period of up to five days while materials thus discovered are identified by additional testing/investigation. The Contractor shall allow for diversion to (an)other excavation face(s) without additional cost.

l) Tanks (including the basal tanks of former gas holder) within the excavations are to be retained intact, as far as reasonably practicable, until their contents have been removed, in order to exclude groundwater. If tank walls and base are below the 3m depth of excavation cut-off they are not to be removed. The Contractor shall clean the inside of the tanks, so far as is reasonably practicable, and allow the Engineer opportunity to inspect and photograph the sides and bases of the tank prior to backfilling. Excavation within tanks shall comply with a specific method statement which considers the stability of the tank walls and surrounding ground, backfill sequencing and monitoring of the excavation works. If tank conditions encountered during excavation are different to those anticipated then the method of excavation and backfill shall be reviewed with respect to maintaining adequate stability.

m) The Contractor shall agree the dimensions of exposed foundations or other hard materials encountered within the excavations prior to removal and submit daily records (see Clause A280).

n) The positions and dimensions of any old foundations, basements, obstructions or other structures remaining within the excavations shall to be accurately surveyed and recorded prior to being covered (see Clause A740).

E471 Removal of Other Structures

a) The Contractor shall break-out and demolish all remaining structures, slabs and foundations etc as they are encountered within the excavation to 3m depth. Tanks (except for T34) and/or other underground containers shall be exposed, under the direction of the Engineer, without disturbing the integrity of such. These shall be dewatered first and emptied of their solid contents, under the direction of the Engineer. Emptying and excavation of the tank contents, including any in situ working of the material that may be required for haulage/disposal purposes, as agreed with the Engineer, shall be undertaken in such a way as to safeguard the integrity of the structure. Final breaking-out of the structure shall only be undertaken under the direction of the Engineer.

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b) Other underground structures and chambers, including basements etc shall be demolished to 3m depth (except for Tank T34 where reference shall be made to Clause E650 in relation to the treatment of Tank T34). Any such structure or chamber that is not removed in its entirety shall be cleaned-out and filled with acceptable material.

c) Any resulting voids shall be backfilled in accordance with the Earthworks section of this specification (Clause E600).

d) The Contractor shall re-use and/or re-cycle all suitable materials arising from such works, unless otherwise agreed with the Engineer. Uncontaminated brick, concrete and masonry materials shall be crushed and screened, stockpiled and re-used (with the approval of the Engineer) following receipt of satisfactory chemical and geotechnical testing results (Clause A940).

e) Disused surface water drains, sewers, cables, gas mains, ducts and pipelines, together with any bed and/or haunch, shall be removed if within any defined excavation area or if within 3m depth (from surface). Any deeper such services shall be removed by excavation or dealt with as required by the Engineer. Any trench resulting from such work shall be backfilled in accordance with the Earthworks section of this specification (Clause E600).

f) The ends of existing drains, sewers, gas mains, ducts and/or pipelines not removed (under sub-Clause e) shall be surveyed by the Contractor in respect of diameter, material thickness and type, level and location. The exposed ends, unless adequately sealed by grouting, shall be sealed using either proprietary pipe bungs (for pipes up to 300 mm diameter), concrete-filled sand-bags, well compacted clay or 10:1 PFA:cement grout, as agreed with the Engineer. Appropriate care shall be taken not to cause any blockage to adjoining live drains, sewers, pipelines or ducts, etc.

g) Before commencing any work in relation to sub-Clauses e) and f), the Contractor shall undertake all reasonable actions and enquiries to ensure that such drains, ducts and pipelines etc. are redundant. Appropriate care shall be taken during any grouting or sealing operations not to cause any blockage to adjoining live drains, sewers, pipelines or ducts, etc.

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h) Redundant existing below ground pipes remaining from the gasworks shall be exposed as directed by the Engineer during the site works. These pipes, and any such additional pipes encountered, once exposed, are to be inspected and tested by Bord Gais, unless it is apparent that the pipe is disused, before further actions are taken. The pipes are to be removed or otherwise treated, as directed by the Engineer.

E500 Excavation Ancillaries

E530 Disposal of Excavated Material

a) It is envisaged that the following classes of material will require removal off site:-

- U1 recyclable material, estimated to be in the order of 1,100m³.
- U1 unsuitable material, estimated to be in the order of 1,100m³.
- U2 contaminated material proven to be unsuitable for stabilisation / solidification, estimated to be in the order of 2,800m³.

However, the Contractor shall satisfy himself through his own calculations of the anticipated volume.

As part of his tender the Contractor shall provide details of his chosen recycling and disposal routes including details of the receiving facility (operator, location, licence etc). In addition, the Contractor shall provide details of the handling and transportation of the material from the site to the receiving facility.

b) No excavated acceptable material shall be removed from the site except at the direction of, or with the permission of, the Engineer.

c) All unacceptable material, Class U2 shall be removed by lorry for treatment/disposal at a disposal facility approved by the Engineer. Methods of excavating, handling, treatment, transporting and disposal of this material shall be agreed in advance with the Engineer. The Contractor shall comply with all current legislation concerning the transportation and disposal of contaminated materials.

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d) The Contractor shall be responsible for applying for a Waste Collection Permit as required under the Waste Management (Collection Permit) (amendment) Regulations, 2008 in respect of the transference of waste materials from the site either to any disposal point.

e) The Contractor shall comply with all current legislation and guidance concerning the transportation and disposal of contaminated materials.

f) The Contractor shall supply weekly records to the Engineer, detailing volumes, and any treatment details for all contaminated materials requiring off-site disposal.

g) Prior to dispatching any material off site, the Contractor shall provide documentary evidence to the Engineer that all carriers are licensed to carry waste and that the receiving facilities are licensed to accept the type and quantity of material being removed from site.

h) The Contractor shall supply to the Engineer a copy of the 'receiving facility ticket' for each load of material removed from site during the contract. Each ticket shall show the following information:

- i) name and address of the receiving facility and site the licence number;
- ii) time and date of acceptance by the receiving facility;
- iii) tip ticket number;
- iv) vehicle registration number;
- v) gross and tare weight of the vehicle and the weight of removed tipped material.

i) The ticket copies for each day shall be supplied to the Engineer in sequential order, together with a daily summary sheet, which shall contain the following information:

- i) site address, day and date;
- ii) vehicle type and registration number, and time leaving the site for each load;
- iii) receiving facility ticket number and consignment number (if applicable), for each load;

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- iv) volume and weight of material transported, for each load;
 - v) total volume and weight of material removed each day.
- j) The summary sheets shall be prepared in Microsoft Excel™ and shall be supplied to the Engineer in paper and digital format as requested.
- k) The ticket copies and summary sheets are to be provided on a weekly basis.
- l) The Contractor shall provide the Engineer with details of his proposed sampling and analysis regime, required for treatment of materials to be disposed off site, to ensure compliance with all waste management regulations/legislation.

E600 Filling

- a) Where 'recycled aggregate' is used in this Series, the material shall be aggregate resulting from the processing of material used in a construction process. The content of all foreign materials (including wood, plastic and metal) shall not exceed 0.5% by mass. In addition, the material shall not contain any tar, asphalt, bitumen or similar, including aggregate with a tar or bituminous binder or similar.
- b) The Contractor shall ensure that no deleterious materials are brought onto the Site. In particular, imported fill materials must comply with the requirements of Clause E600. Results of chemical and geotechnical analysis of proposed sources of imported fill materials, tested in accordance with the requirements of Clause C940 must be submitted to the Engineer for his approval in sufficient time to allow additional tests to be specified and carried out, if the Engineer doubts the consistency of the source, before the material is transported to Site.
- c) Where alternative specified materials are permitted, the Contractor shall inform the Engineer of his choice and submit samples to him at least 4 weeks before the material is to be used, or longer if such period is required for testing of the material by the Engineer. The material, and its source, shall not then be changed without the Engineer's approval.
- d) Only granular fills of Class 1 or 6 in Appendix C shall be used when infilling deep basements or other hollows.

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e) Haulage of materials to areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition. The contractor shall be responsible for the provision and maintenance of all temporary haul roads required on site.

f) All fills shall be:

- (i) placed in excavations arising from the remediation process.
- (ii) sourced from stabilised / solidified materials.
- (iii) or if imported, of Classes of materials permitted in the Contract and complying with Appendix C.
- (iv) deposited as soon as practicable after excavation and treatment, in layers to meet the compaction requirements of Table 3, Appendix C as required for each class of material in Table 1, Appendix C.
- (v) to the requirements of this clause and any other requirements for fill in this Specification.

g) Final ground levels and contours are indicated on Drawing 1021927/PHASE 2 – TENDER/OD/013 - Finished Levels. Any shortfall in material shall be made up with imported class 1 no fines material (ie granular) complying with the values for imported material (presented in Appendix C). If necessary the material shall be suitable for use below water.

h) Areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct constructional plant and other vehicular traffic uniformly over them. Damage by constructional plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged. Each of the areas of backfilling shall be properly integrated by benching fills with the areas of previous backfilling and the side slopes of the backfill materials shall be maintained in a stable condition at batters not exceeding 1 in 1.5.

i) Whenever fill is to be deposited against the excavation batter or other fills, such faces shall be benched or otherwise shaped as described in the contract immediately before placing the subsequent fill.

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- j) For each source of imported material the Contractor shall provide for the Engineer's approval, a material statement detailing the chemical testing results, geotechnical testing, material classification, destination of material and proposed method of compaction. This statement shall be supplied before any filling takes place and before material is brought to Site. All testing being in accordance with Clause C940. The statement shall be in a format agreed with the Engineer prior to the commencement of the works.
- k) Unless otherwise agreed by the Engineer the Contractor shall carry out compaction in compliance with this Clause and the tables in Appendix C, as soon as practicable after deposition, on all those Classes of fill in Table 1 of Appendix C which require to be compacted.
- l) The method of compaction shall be undertaken using the equipment and methods in Appendix C Table 3 appropriate to the compaction requirements as listed in Appendix C Table 1 for the Class of material being compacted and shall comply with Clauses m) to o) below.
- m) Earthmoving equipment shall not be accepted as compaction equipment nor shall the use of a lighter category of equipment to provide any preliminary compaction, to assist the use of heavier plant be taken into account when assessing the amount of compaction required for any layer.
- n) If more than one class of material is being used in such a way that it is not practicable to define the areas in which each Class occurs, the Contractor shall compact with plant, operating as if only the material which requires the greater compactive effort is being compacted.
- o) For the purpose of Appendix C Table 3 the following shall apply:-
- (i) The minimum number of passes N is the minimum number of times that each point on the surface of the layer being compacted shall be traversed by the item of compaction plant in its operating mode, or struck by power rammers or falling weight compactors. D is the maximum depth of the compacted layer.
 - (ii) In the column headed N, the number of passes shown is to be doubled for material of Classes 1 and 2 when such materials occur within 600mm of finished level.

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- (iii) The compaction equipment in Appendix C Table 3 is categorised in terms of static mass. The mass per metre width of roll is the total mass on the roll divided by the total roll width. Where a roller has more than one axle the category of the machine shall be determined on the basis of the axle giving the highest value of mass per metre width.
- (iv) A tamping roller is a machine with a roll or rolls from which 'feet' project and where the projected end area of each 'foot' exceeds 0.01m² and the sum of the areas of the feet exceeds 15% of the area of the cylinder swept by the end of the feet. The requirements for tamping rollers apply to machines that have 2 rolls in tandem. If only one tamping roller traverses each point on the surface of the layer on any one pass, the minimum number of passes shall be twice the number given in Appendix C Table 3 plus any further doubling required to satisfy (ii) above.
- (v) For vibratory rollers the following shall apply.

Vibratory rollers are self-propelled or towed smooth-wheeled rollers having means of applying mechanical vibration to one or more rolls, except that vibratory rollers employed for method 5 compaction shall be single roll types.

The requirements for vibratory rollers are based on the use of the lowest gear on a self-propelled machine with mechanical transmission and a speed of 1.5-2.5 km/h for a towed machine, or a self-propelled machine with hydrostatic transmission. If higher gears or speeds are used an increased number of passes shall be provided in proportion to the increase in speed of travel.

Where the mechanical vibration is applied to two rolls in tandem, the minimum number of passes shall be half the number given in Table 3 for the appropriate mass per metre width of one vibrating roll but if one roll differs in mass per metre width from the other the number of passes may be determined by treating the machine as having a single vibrating roller with a mass per metre width equal to that of the roll with the higher value.

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Vibratory rollers operating without vibration will be classified as smooth-wheeled rollers.

Vibratory rollers shall be operated with their vibratory mechanism operating at the frequency of vibration which produces the highest measurement of amplitude unless the manufacturers recommend otherwise for the material being compacted.

Vibratory rollers shall be equipped or provided with devices indicating the frequency at which the mechanism is operating and the speed of travel. Both devices shall be capable of being read by an inspector alongside the machine.

(vi) For items marked * in Appendix C Table 3, the roller shall be towed by track-laying tractors. Self-propelled rollers are unsuitable.

(vii) Where combinations of different types or categories of equipment are used, the following shall apply:-

the depth of layer shall be that for the equipment requiring the least depth of layer, and

the number of passes shall be that for the type of equipment requiring the greatest number of passes.

E650 Tank Grouting

Tank T34, located in the eastern corner of the site partly underlies the No. 5 Store (Generator Building). It is believed that the approximate dimensions are 4m wide by 13m long by 2.3-3.0m deep. It is known to be partially backfilled and standing water is likely to be present.

Tank T34 shall be pumped dry as far as practicable without disturbing the integrity of the Generator Building and then grouted with a cement grout. The sides and base of the tank are believed to be intact and watertight, therefore there is not considered to be any need to remove them. A method statement for this element of the work shall be required as stated in the Instructions to Tenderers

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E700 Filling Ancillaries

E730 Geotextiles

A geotextile shall be utilised across the site between the backfilled stabilised / solidified material and the granular capping and shall be Terram 1000 or equivalent.

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4.6 CLASS K: DRAINAGE

The Specification shall be “Sewers for Adoption 7th Edition” published by the Water Services Association (UK) in 2011 and also the “Civil Engineering Specification for the Water Industry - 7th Edition” published by the Water Research Centre (UK) 2011. Where these two documents conflict, Sewers for Adoption clauses shall prevail. These documents are supplemented by the special clauses contained on the following pages. Where the special clauses conflict with Sewers for Adoption or the Civil Engineering Specification for the Water Industry then the special clauses shall prevail.

K100 Manholes

All manholes shall be in accordance with Sewers for Adoption figures 1 to 3 only.

All manhole covers are to be grade A to BS EN 124:1994.

K400 French Drains, Rubble Drains, Ditches and Trenches

Filter drains shall be composed of the following:-

Clay perforated pipes to BS 65, 20mm single size stone to BS EN 12620:2002+A1:2008 and Geotextile

The geotextile shall:

- i) sustain a tensile load of not less than 5.0 kN/m at break and have a minimum failure strain of 10% when determined in accordance with BS EN ISO 10319:2008.
- ii) have a minimum puncture resistance of 1200N when determined in accordance with BS EN ISO 12236:2006.
- iii) have a minimum tear resistance of 200N when determined in accordance with ASTM Standard D4533-85
- iv) have a size distribution of pore openings, such that the apparent opening size Φ_{90} when determined in accordance with BS EN ISO 12956:2010 is as shown on the drawings.

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v) allow water to flow through, in either direction normal to its principal plane at the rate shown on the drawings, under a constant head of water of 100mm and a maximum break through head of 50mm when determined in accordance with BS EN ISO 12958:2010.

K900 Pipes and Bedding

- a) The preferred materials for pipes shall be:
- i) vitrified clay pipes and fittings in accordance with “Sewers for Adoption”.
 - ii) concrete pipes and fittings in accordance with “Sewers for Adoption” and will be sulphate resisting to class 4.
 - iii) Duct iron pipes and fittings in accordance with “Sewers for Adoption” and comply with the relevant provisions of BS EN 598.
- b) Granular and as dug bedding, sidefill and surround materials for buried pipelines shall comply with the Water Industry Specification No. 4-08-02 and Information Guidance note 4-08-01, published by WRC Publications.
- c) To prevent the flow of groundwater along new trenches, water stops constructed of puddle clay extending up through the bedding and sidefill shall be placed across the trench at a maximum of 30m, at the extents of the trench, or as shown on the drawings produced by the Engineer.

K950 Cleansing, Testing and Surveys

Gravity sewers and drains shall be cleansed and tested in accordance with “Sewers for Adoption”. A CCTV survey to the requirements of “Sewers for Adoption” will be required for all sewers and drains.

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4.7 CLASS X: MISCELLANEOUS ITEMS

X100 Fences and Gates

X194 2.0m High Temporary Mesh Panel Fencing

2.0m high temporary mesh panel fencing for segregating clean and dirty areas of the site shall comply with the guidance provided in HS (G) 151 by the HSE. The gap under the fence should be kept to a minimum by fitting a mesh skirt if necessary. Panels shall be back braced to provide stability from winds. Bases shall not protrude into pedestrian areas.

The mesh must be close enough to prevent children climbing the panels.

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Appendix A Previous Reports

The following reports are presented on the enclosed CD:

- Summary Report on Limerick Site – O’ Conner, Sutton, Cronin, August 1995,
- Site Investigation Report: Volume 1 Report - Ove Arup, April 1996,
- Site Investigation Report: Volume 2 Factual Site Investigation Data - Ove Arup, April 1996,
- Desk Study Phase 1 Report – Parkman, April 2001 (report reference 25837/OR/01B),
- Site Investigation Factual Report Volumes 1A and B – Parkman October 2001 (report reference 25827/OR/03B),
- Site Investigation General Report Volume 2 – Parkman October 2001 (report reference 25837/OR/04B),
- Ground Investigation into Boundary Conditions and Quarry Backfill – Parkman 2003 (report reference 25837/R/11A),
- Preliminary Vibration Monitoring 18th May to 24th June 2009 – Reference NV/09/3857NL01. Dated 13th August 2009 – AWN Consulting,
- Site Characterisation Factual Report 1021927/R/02C November 2011- Mouchel.
- Site Vibration Monitoring 4th to 27th November 2009 – Reference NV/09/3857NL03. Dated 4th December 2009 – AWN Consulting,
- Former Gasworks, Dock Road, Limerick: Quantitative Risk Assessment, Options Appraisal and Remediation Strategy 1021927/R/03 March 2010 – Mouchel. And Addendum report 1021927/R/18 January 2012- Mouchel.
- Environmental Impact Statement 1021927/R/07- Mouchel.

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- Natura Impact Statement 1021927/R16- Mouchel.
- Quarterly Groundwater Monitoring Report – Annual Summary 2009/10 1021927/R/14, November 2010 – Mouchel.
- Quarterly Groundwater Monitoring Report- Annual Summary 2011 1034973/R/04, November 2011- Mouchel.

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Appendix B Preliminary Safety and Health Plan

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Appendix C Acceptable Earthworks Criteria

This Appendix presents three tables of acceptable earthworks criteria, taken from Volume 1 of Manual of Contract Documents for Road Works published by the National Roads Authority.

Table 1 – Acceptable Earthworks Material

Table 2 – Grading Requirements for Table 1

Table 3 – Methods of Compaction for Earthworks

Table 4 – Imported Soils Criteria

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TABLE 1: Acceptable Earthworks Materials: Classification and Compaction Requirements

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance With:	Acceptable Limits Within:		
						Lower	Upper	
GENERAL GRANULAR FILL	1 A - Well graded granular material	General Fill	Any material, or combination of materials, other than Chalk. Recycled aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 2
				(ii) uniformity coefficient	See Note 5	10	-	
				(iii) mc	BS 1377: Part 2	App 6/1	App 6/1	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) contamination	Clause C941	App C – import; App I – site won		
GENERAL GRANULAR FILL	1 B - Uniformly graded granular material	General Fill	Any material, or combination of materials other than Chalk. Recycled aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 3
				(ii) uniformity coefficient	See Note 5	-	10	
				(iii) mc	BS 1377: Part 2	App 6/1	App 6/1	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) contamination	Clause C941	App C – import; App I – site won		
GENERAL GRANULAR FILL	1 C - Coarse granular material	General Fill	Any material, or combination of materials, other than Chalk. Recycled aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 5
				(ii) uniformity coefficient	See Note 5	5	-	
				(iii) Los Angeles Coefficient	Clause 635		50	
				(iv) contamination	Clause C941	App C – import; App I – site won		

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Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance With:	Acceptable Limits Within:		
						Lower	Upper	
GENERAL	2 A - Wet cohesive material	General Fill	Any material, or combination of materials, other than Chalk.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 1 except: (i) for materials with liquid limit greater than 50, determined by BS 1377: Part 2, only deadweight tamping or vibratory tamping rollers or grid rollers shall be used.
				(ii) Plastic limit (PL)	BS 1377: Part 2	-	-	
				(iii) mc	BS 1377: Part 2	PL - 4%	App 6/1	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1	
				(vi) contamination	Clause C941	App C – import; App I – site won		
COHESIVE FILL	2 B - Dry cohesive material	General Fill	Any material, or combination of materials, other than Chalk.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 2
				(ii) Plastic limit (PL)	BS 1377: Part 2	-	-	
				(iii) mc	BS 1377: Part 2	App 6/1	PL - 4%	
				(iv) MCV	Clause 632	App 6/1	App 6/1	
				(v) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1	
				(vi) contamination	Clause C941	App C – import; App I – site won		

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TABLE 1: Acceptable Earthworks Materials: Classification and Compaction Requirements (continued)

Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612
				Property (See Exceptions in Previous Column)	Defined and Tested in Accordance With:	Acceptable Limits Within:		
						Lower	Upper	
2 C -	Stony cohesive material	General Fill	Any material, or combination of materials other than Chalk..	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 2
				(ii) plastic limit (PL)	BS 1377: Part 2			
				(iii) mc	BS 1377: Part 2	App 6/1	App 6/1	
				(iv) MCV	Clause 632	App 6/1		
				(v) Undrained shear strength of remoulded material	Clause 633	App 6/1		
				(iv) contamination	Clause C941	App C – import; App I – site won		
2 D -	Silty cohesive material	General Fill	Any material, or combination of materials, other than Chalk.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 3
				(ii) mc	BS 1377: Part 2	App 6/1	App 6/1	
				(iii) MCV	Clause 632	App 6/1	App 6/1	
				(iv) Undrained shear strength of remoulded material	Clause 633	App 6/1	App 6/1	
				(v) contamination	Clause C941	App C – import; App I – site won		

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Class	General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612
				Property (see excavations in previous column)	Defined and Tested in Accordance With:-	Acceptable Limits Within:-		
						Lower	Upper	
S E L E C T E D	6 A - Selected well graded granular material	Below water	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock), crushed concrete, or any combination thereof. Recycled aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	No compaction
				(ii) uniformity coefficient	See note 5	10	-	
				(iii) plasticity index	BS 1377: Part 2	Non plastic		
				(iv) contamination	Clause C941	App C – import; App I – site won		
G R A N U L A R	6 B - Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, or any combination thereof. Recycled Aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 5
				(ii) plasticity index	BS 1377: Part 2	Non plastic		
				(iii) Los Angeles Coefficient	Clause 635		50	
				(iv) contamination	Clause C941	App C – import; App I – site won		
F I L L	6 C - Selected well graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock or gravel) crushed concrete, or any combination thereof. Recycled Aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 3
				(ii) uniformity coefficient	See note 5		10	
				(iii) plasticity index	BS 1377: Part 2	Non plastic		
				(iv) Los Angeles Coefficient	Clause 635		50	
				(v) mc	BS 1377: Part 2	App 6/1	App 6/1	
				(v) contamination	Clause C941	App C – import; App I – site won		

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Class			General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause 601 and Testing in Clause 631			Compaction Requirements in Clause 612	
						Property (see excavations in previous column)	Defined and Tested in Accordance With:-	Acceptable Limits Within:-		
		Lower	Lower							
6	F	1	Selected granular material (fine grading)	Capping	Any material, or combination of materials other than unburnt colliery spoil, argillaceous rock and Chalk. Recycled Aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 6
						(ii) Optimum mc	BS 1377: Part 4. Vibrating hammer method			
						(iii) mc	BS 1377: Part 2	Optimum mc - 2%.	Optimum mc	
						(iv) Los Angeles Coefficient	Clause 635	-	60	
						(v) contamination	Clause C941	App C – import; App I – site won		
6	F	2	Selected granular material (coarse grading)	Capping	Any material, or combination of materials other than unburnt colliery spoil, argillaceous rock and Chalk. Recycled Aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 6
						(ii) Optimum mc	BS 1377: Part 4 Vibrating hammer method			
						(iii) mc	BS 1377: Part 2	Optimum mc - 2%.	Optimum mc	
						(iv) Los Angeles Coefficient	Clause 635	-	50	
						(v) contamination	Clause C941	App C – import; App I – site won		

Notes:

- 1) App = Appendix
- 2) Tab = Table
- 3) Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in Appendix 6/1 shall apply. Where Appendix 6/1 gives limits for other properties not listed in this table, such limits shall also apply.
- 4) Where BS1377 : Part 2 is specified for mc, this shall mean BS1377 : Part 2 or BS EN 1097-5 as appropriate
- 5) Uniformity coefficient is defined as the ratio of the particle diameters D₆₀ to D₁₀ on the particle-size distribution curve, where:
D₆₀ = particle diameter at which 60% of the soil by weight is finer
D₁₀ = particle diameter at which 10% of the soil by weight is finer

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TABLE 2: Grading Requirements for Acceptable Earthworks Materials

Percentage by Mass Passing the Size Shown																					
Class	Size (mm)		Size (mm) BS Series													Size (microns) BS Series				Size (microns)	Class
	500	300	125	90	75	37.5	28	20	14	10	6.3	5	3.35	2	1.18	600	300	150	63		
1A		100	95-100																<15		1A
1B			100																<15		1B
1C	100		10 - 95													0 - 25			<15		1C
2A & 2B			100											80 - 100					15 - 100		2A & 2B
2C			100											15 - 80					15 - 80		2C
2D			100																80 - 100	0 - 20	2D
6A	100									0 - 100		0 - 85				0 - 45			0 - 5		6A
6B	100		0 - 10																		6B
6C			100			0 - 100					0 - 100		0 - 35	0 - 10		0 - 2			0-10		6C
6F1					100	75 - 100					40-95		30 - 85			10 - 50			<15		6F1
6F2			100	80 - 100	65 - 100	45 - 100					15 - 60		10 - 45			0 - 25			0 - 12		6F2

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Table 3: Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6). This table is to be read in conjunction with Clause E600

Type of Compaction Plant	Ref. No.	Category	Method 1		Method 2		Method 3		Method 4		Method 5		Method 6		
			D	N#	D	N#	D	N#	D	N#	D	N#	N for D = 110 mm	N for D = 110 mm	N for D = 250 mm
Smooth wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll: over 2100 kg up to 2700 kg over 2700 kg up to 5400 kg over 5400 kg	125	8	125	10	125	10*	175	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2		125	6	125	8	125	8*	200	4	unsuitable	16	unsuitable	unsuitable	unsuitable
	3		150	4	150	8	unsuitable	300	4	unsuitable	8	16	unsuitable	unsuitable	
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 2400 kg over 5400 kg up to 8000 kg over 8000 kg	150	10	unsuitable	150	10	250	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
	2		150	8	125	12	unsuitable	325	4	unsuitable	20	unsuitable	unsuitable	unsuitable	
	3		150	4	150	12	unsuitable	400	4	unsuitable	12	20	unsuitable	unsuitable	
Tamping roller	1	Mass per metre width of roll: over 4000 kg	225	4	150	12	250	4	350	4	unsuitable	12	20	unsuitable	
Pneumatic tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg over 1500 kg up to 2000 kg over 2000 kg up to 2500 kg over 2500 kg up to 4000 kg over 4000 kg up to 6000 kg over 6000 kg up to 8000 kg over 8000 kg up to 12000 kg over 12000 kg	125	6	unsuitable	150	10*	240	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	2		150	5	unsuitable	unsuitable	300	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable		
	3		175	4	125	12	unsuitable	350	4	unsuitable	unsuitable	unsuitable	unsuitable		
	4		225	4	125	10	unsuitable	400	4	unsuitable	unsuitable	unsuitable	unsuitable		
	5		300	4	125	10	unsuitable	unsuitable	unsuitable	12	unsuitable	unsuitable	unsuitable		
	6		350	4	150	8	unsuitable	unsuitable	unsuitable	12	unsuitable	unsuitable	unsuitable		
	7		400	4	150	8	unsuitable	unsuitable	unsuitable	10	unsuitable	16	unsuitable	unsuitable	
	8		450	4	175	8	unsuitable	unsuitable	unsuitable	8	unsuitable	12	unsuitable	unsuitable	
Vibratory roller	1	Mass per metre width of a vibratory roll: over 270 kg up to 450 kg over 450 kg up to 700 kg over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	unsuitable	75	16	150	16	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	2		unsuitable	75	12	150	12	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	3		100	12	125	10	150	6	125	10	unsuitable	16	unsuitable	unsuitable	
	4		125	8	150	8	200	10*	175	4	unsuitable	6	16	unsuitable	
	5		150	4	150	4	225	12*	unsuitable	unsuitable	4	6	12	unsuitable	
	6		175	4	175	4	250	10*	unsuitable	400	5	3	5	11	
	7		200	4	200	4	275	8*	unsuitable	500	5	3	5	10	
	8		225	4	225	4	300	8*	unsuitable	600	5	2	4	8	
	9		250	4	250	4	300	6*	unsuitable	700	5	2	4	7	
	10		275	4	275	4	300	4	unsuitable	800	5	2	3	6	
Vibrating plate compactor	1	Mass per m ² of base plate: over 880 kg up to 1100 kg over 1100 kg up to 1200 kg over 1200 kg up to 1400 kg over 1400 kg up to 1800 kg over 1800 kg up to 2100 kg over 2100 kg	unsuitable	unsuitable	75	6	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	2		unsuitable	75	10	100	6	75	10	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	3		unsuitable	75	6	150	6	150	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	4		100	6	75	6	150	6	150	8	unsuitable	unsuitable	unsuitable	unsuitable	
	5		150	6	125	6	150	4	unsuitable	unsuitable	8	unsuitable	unsuitable	unsuitable	
	6		200	6	150	5	200	4	unsuitable	unsuitable	5	8	unsuitable	unsuitable	

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Type of Compaction Plant	Ref. No.	Category	Method 7	
			N for D = 150mm	N for D = 250mm
Smooth wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll: over 2100 kg up to 2700 kg over 2700 kg up to 5400 kg over 5400 kg	unsuitable	unsuitable
	2		unsuitable	unsuitable
	3		12	unsuitable
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 2400 kg over 5400 kg up to 8000 kg over 8000 kg	unsuitable	unsuitable
	2		16	unsuitable
	3		8	unsuitable
Deadweight tamping roller	1	Mass per metre width of roll: Over 4000 kg up to 6000 kg Over 6000 kg	4	8
	2		3	6
Pneumatic-tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg over 1500 kg up to 2000 kg over 2000 kg up to 2500 kg over 2500 kg up to 4000 kg over 4000 kg up to 6000 kg over 6000 kg up to 8000 kg over 8000 kg up to 12000 kg over 12000 kg	unsuitable	unsuitable
	2		12	unsuitable
	3		6	unsuitable
	4		5	unsuitable
	5		4	16
	6		unsuitable	8
	7		unsuitable	4
	8		unsuitable	4
Vibratory tamping roller	1	Mass per metre width of a vibratory roll: over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	unsuitable	unsuitable
	2		unsuitable	unsuitable
	3		16	unsuitable
	4		12	unsuitable
	5		10	unsuitable
	6		8	16
	7		7	14
	8		6	12
Vibratory roller	1	Mass per metre width of a vibratory roll: over 270 kg up to 450 kg over 450 kg up to 700 kg over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	unsuitable	unsuitable
	2		unsuitable	unsuitable
	3		unsuitable	unsuitable
	4		unsuitable	unsuitable
	5		12	unsuitable
	6		10	unsuitable
	7		10	unsuitable
	8		8	unsuitable
	9		8	unsuitable
	10		6	unsuitable
Vibrating plate compactor	1	Mass per m ² of base plate: over 880 kg up to 1100 kg over 1100 kg up to 1200 kg over 1200 kg up to 1400 kg over 1400 kg up to 1800 kg over 1800 kg up to 2100 kg over 2100 kg	unsuitable	unsuitable
	2		unsuitable	unsuitable
	3		unsuitable	unsuitable
	4		10	unsuitable
	5		8	unsuitable
	6		6	unsuitable
Vibro-tamper	1	Mass: over 50 kg up to 65 kg over 65 kg up to 75 kg over 75 kg up to 100 kg over 100 kg	unsuitable	unsuitable
	2		unsuitable	unsuitable
	3		unsuitable	unsuitable
	4		8	unsuitable
Power rammer	1	Mass: 100 kg up to 500 kg over 500 kg	8	unsuitable
	2		6	10
Dropping weight compactor	1	Mass of rammer over 500kg Height drop over 1 m up to 2 m over 2 m	unsuitable	unsuitable
	2		unsuitable	unsuitable

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Table 4. Imported Soil Remediation Target Values (RTV's).

Chemical specification for imported material (soil testing) based on CLEA Soil Guideline Values (SGV) and Mouchel derived Generic Assessment Criteria (GAC) for Residential without gardens end use (based on 1% soil organic matter).

Chemical	Units	Screening value
Inorganics		
Arsenic	mg/kg	35
Antimony	mg/kg	550
Barium	mg/kg	1300
Cadmium	mg/kg	85
Chromium (III)	mg/kg	3000
Chromium (VI)	mg/kg	4.3
Copper	mg/kg	6200
Lead	mg/kg	360
Mercury (inorganic)	mg/kg	240
Mercury (elemental)	mg/kg	0.17
Mercury (methyl)	mg/kg	8.4
Molybdenum	mg/kg	670
Nickel	mg/kg	130
Selenium	mg/kg	600
Zinc	mg/kg	40000
Beryllium	mg/kg	51
Boron	mg/kg	10000
Vanadium	mg/kg	190
Cyanide	mg/kg	760

BTEX TPH

Benzene	mg/kg	0.27
Toluene	mg/kg	610
Ethylbenzene	mg/kg	170
m-Xylene	mg/kg	55
o-Xylene	mg/kg	60
p-Xylene	mg/kg	53
Aliphatic EC5-EC6	mg/kg	30

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Chemical	Units	Screening value
Aliphatic EC6-EC8	mg/kg	73
Aliphatic EC8-EC10	mg/kg	19
Aliphatic EC10-EC12	mg/kg	48
Aliphatic EC12-EC16	mg/kg	24
Aliphatic EC16-EC35	mg/kg	8.48
Aliphatic EC35-EC44	mg/kg	8.48
Aromatic EC5-EC7	mg/kg	260
Aromatic EC7-EC8	mg/kg	610
Aromatic EC8-EC10	mg/kg	33
Aromatic EC10-EC12	mg/kg	180
Aromatic EC12-EC16	mg/kg	169
Aromatic EC16-EC21	mg/kg	1300
Aromatic EC21-EC35	mg/kg	1300
Aromatic EC35-EC44	mg/kg	1300
Aromatic and Aliphatic EC44-EC70	mg/kg	1300

PAH

Naphthalene	mg/kg	1.6
Acenaphthylene	mg/kg	86.1
Acenaphthene	mg/kg	57.0
Fluorene	mg/kg	30.9
Phenanthrene	mg/kg	36.0
Anthracene	mg/kg	1.17
Fluoranthene	mg/kg	970
Pyrene	mg/kg	2300
Benzo[a]anthracene	mg/kg	3.7
Chrysene	mg/kg	8.8
Benzo[b]fluoranthene	mg/kg	7.0
Benzo[k]fluoranthene	mg/kg	10
Benzo[a]pyrene	mg/kg	1.0
Indeno[1,2,3-c,d]pyrene	mg/kg	4.2
Dibenzo[a,h]anthracene	mg/kg	0.86
Benzo[g,h,i]perylene	mg/kg	47

Blue values are soil saturation limit.

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Appendix D Service Drawings

The following drawings are provided for information in hard copy:-

- Services Plan- Drawing Reference 1021927/WL/004
- Unlabelled A3 drawing on graph paper of the Pressure Reduction Facility at Dock Road, Limerick. (It is envisaged that these will have been removed prior to commencement on site).
- Gas Mains Layout, Limerick Gasworks – Bord Gais Networks dated 08/07/10. (It is envisaged that these will have been removed prior to commencement on site).
- Unlabelled A2 drawing of the ESB layout dated 09-Mar-09. (It is envisaged that these will have been removed prior to commencement on site).

A CD is also attached which contains the Bord Gais Networks' Safety Booklet DO/SQ/IS/002 Rev 0, dated 01.03.09 and the Code of Practice for Working in the Vicinity of Pipelines – BGE/WJ/48.

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Appendix E Criteria for Discharge Consent to Foul Sewer

Temperature	<25°C
pH	6-10
BOD	<50 mg/l
COD	<300 mg/l
Nitrates (as N)	<10 mg/l
Sulphates (as SO ₄)	<500 mg/l
Phenols (as C ₆ H ₅ OH)	<3 mg/l
Arsenic	<0.6 mg/l
Mercury	<0.01 mg/l
Cadmium	<0.05 mg/l
Cyanide (total, free)	<3.0 mg/l
Lead	<0.5 mg/l
Copper	<5 mg/l
Zinc	<10 mg/l
Chromium	<0.5 mg/l
Total Polyaromatic Hydrocarbons (PAH)	<0.2 mg/l
Mineral Oils	<50 mg/l
Toxicity Units (as T.U)	<30 t.u

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Appendix F Planning Conditions

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Appendix G Remedial Target Values

Soil Remedial Target Values (RTV's) for site won crushed material. Determinand concentrations shall not exceed the values presented below.

Determinand	Soil (mg/kg)
BTEX and Phenol	
Benzene	75
Toluene	1,920
Ethylbenzene	1,220
Xylene	1,120
Phenol	2,300
Cresol	3,400
Inorganics	
Ammonium	18
Sulphate	-
Chloride	-
Cyanide	2,900
Arsenic	130
Cadmium	290
Chromium III	43,000
Chromium VI	120
Copper	38,000
Lead	450
Mercury (inorganic)	960
Nickel	2,900
Zinc	150,000

Determinand	Soil (mg/kg)
Speciated TPH	
Aliphatic C5-6	558
Aliphatic C6-8	322
Aliphatic C8-10	190
Aliphatic C10-12	118
Aliphatic C12-16	16,000
Aliphatic C16-35	320,000
Aromatic C5-7	2,260
Aromatics C7-8	1,920
Aromatic C8-10	1,500
Aromatic C10-12	6,430
Aromatic C12-16	6,600
Aromatic C16 - 21	5,000
Aromatic C21-35	5,000
PAH	
Naphthalene	1,600
Fluorene	12,000
Fluoranthene	3,800
Phenanthrene	3,700
Pyrene	9,100
Anthracene	90,000
Acenaphthylene	18,000
Benzo(ghi)perylene	210
Benzo(a)pyrene	4.1
Benzo(a)anthracene	26
Dibenzo(ah)anthracene	3.9
Benzo(b)fluoranthene	28
Benzo(k)fluoranthene	42
Chrysene	36
Indeno(123-cd)pyrene	17

Blue values are soil saturation limit.

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Leachability Remedial Target Values (RTV's) for stabilised / solidified materials. Determinand concentrations shall not exceed the values presented below.

	Leachate (mg/l)
BTEX and Phenol	
Benzene	47.8
Toluene	432.8
Ethylbenzene	128
Xylene	118
Phenol	1218
Cresol	4065
Inorganics	
Ammonium	30**
Sulphate	1400*
Chloride	2000**
Cyanide	289
Arsenic	0.26
Cadmium	2.9
Chromium III	9
Chromium VI	6.6
Copper	380
Lead	0.2
Mercury (inorganic)	2
Nickel	5.8
Zinc	3940

	Leachate (mg/l)
Speciated TPH	
Aliphatic C5-6	210
Aliphatic C6-8	77.7
Aliphatic C8-10	26.4
Aliphatic C10-12	9.4
Aliphatic C12-16	315
Aliphatic C16-35	0.027
Aromatic C5-7	6858
Aromatics C7-8	5412
Aromatic C8-10	2182
Aromatic C10-12	8250
Aromatic C12-16	6640
Aromatic C16 - 21	3242
Aromatic C21-35	1.9
Speciated PAH	
Naphthalene	117
Fluorene	202
Fluoranthene	10
Phenanthrene	32
Pyrene	26.71
Anthracene	761
Acenaphthylene	469
Benzo(ghi)perylene	0.02
Benzo(a)pyrene	0.0015
Benzo(a)anthracene	0.0159
Dibenzo(ah)anthracene	0.001
Benzo(b)fluoranthene	0.0127
Benzo(k)fluoranthene	0.0135
Chrysene	0.0312
Indeno(123-cd)pyrene	0.009

*BRE, 2005, 'Concrete in Aggressive Ground', Special Digest 1, Third edition. Based on concrete classification of DC-2

** EA/BRE, 2000 'Risks of contaminated land to buildings, building materials and services: A literature review', Report P331, quotes both ammonium at <30mg/l as slightly aggressive (quoted from an original source of BS EN 206-1, and chloride at 2000mg/l.

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