

Bradford Road, Manchester (0049)

Preliminary Infilling Assessment

National Grid Property Holdings Ltd

September 2022

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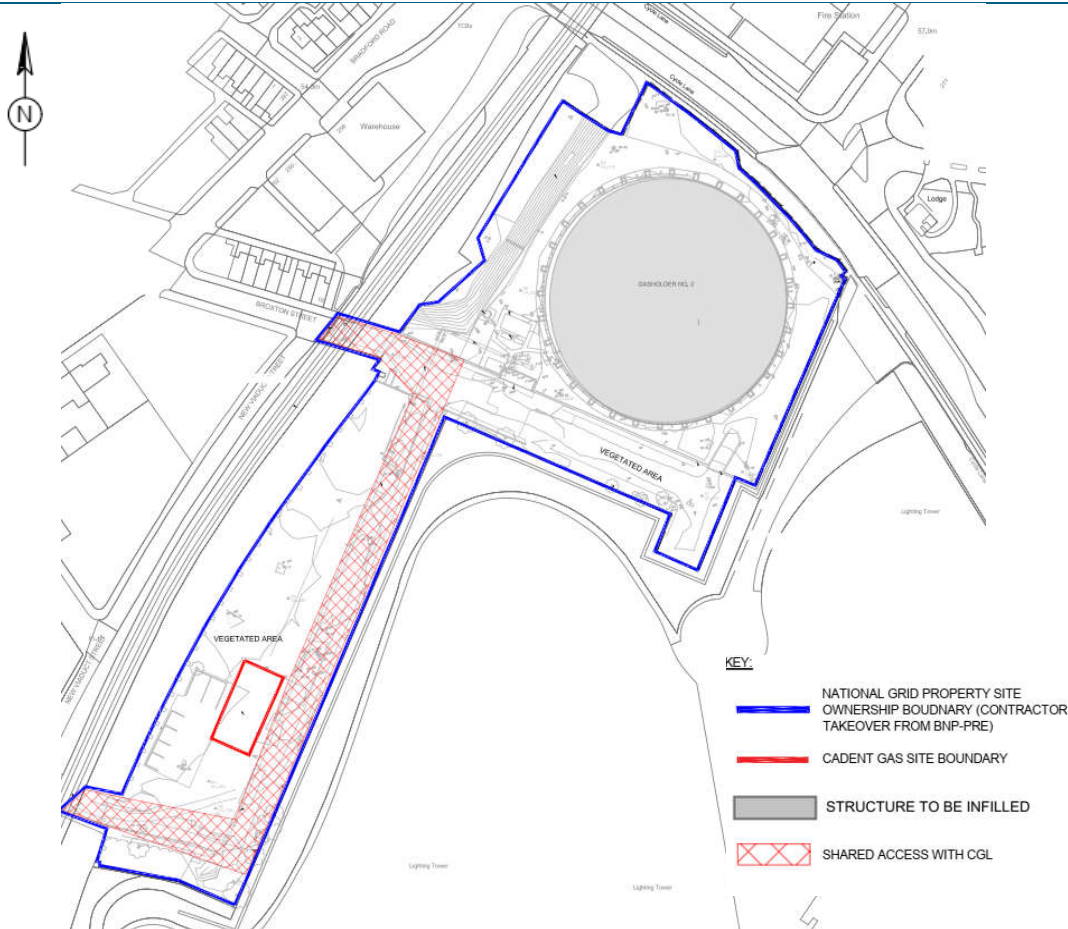
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1. Introduction

1.1. General

Atkins Limited (Atkins) was commissioned by National Grid Property Holdings Limited (NGPH) to establish criteria protective of controlled waters for imported material associated with the infilling of a below ground gasholder (Gasholder No. 2) at Bradford Road Gasholder Station, Broxton Street, Manchester, M40 7BN (0049), herein referred to as the 'site'. A site location plan is presented in Figure 1.

This document presented the derivation of infill criteria, which has been produced in accordance with the NGPH Core Specification [1].

At this stage the source of the material to be used to infill the gasholder is unknown. Consequently, this assessment aims to develop infill acceptance criteria (IAC) mitigating the risk to controlled waters to facilitate the selection of appropriate infill material for the site.

1.2. Scope and Objectives

The primary objective of this report is to establish:

- Hydrological regime on site;
- Soil or groundwater contamination within and surrounding the tank; and
- Derivation of practical site-specific tank IAC.

1.3. Assumptions and Limitations

In line with the scope presented in Section 1.2, the assumptions and limitations of this report are as follows:

- Assessing risks to controlled waters from any other potential sources of contamination on the site are outside of the scope of this report;
- The criteria produced for imported material within this report may vary at other sites;
- Understanding of the ground conditions has been developed based on the findings of published geology and third-party ground investigations; the sources and accuracy of the data provided by third parties are assumed to be correct and have not been verified by Atkins as a part of this report;
- As stated above, at this stage, it is not known what materials are to be used to infill the below ground gasholder. Therefore, where appropriate, this assessment has assumed conservative values for the infill material. When specific infill materials have been selected, a review should be undertaken to ensure that the IAC are appropriate to the material source and type with respect to both the physical parameters used in this assessment and the range of determinants that have been evaluated; and
- The infilling of the gasholder, including the selection of appropriate infill material will be carried out in line with the NGPH Core Specification [1].

2. Site Location & Description

2.1. Site Details

Site Address	Bradford Road Gasholder Station, Broxton Street, Manchester, M40 7BN
Site Code	0049
National Grid Reference	386580E, 399170N
Site Area	NGPH land holding: 2 hectares (ha)
Site Ownership	The site is owned by NGPH. There is a high pressure gas compound (confined within a palisade fence) located within the confines of the site boundary which is owned by Cadent Gas Ltd (CGL), which can only be accessed by NGPH land. The CGL land comprises an area of 0.05 ha.

2.2. Site Setting

Site Location	The site is located along Broxton Street approximately 2.5 km to the east of Manchester city centre. The site is located within mixed a residential and commercial estate and site location plan is presented in Figure 1.
Site Topography and Elevation	The site is generally flat, with an approximate elevation of 52 m above ordnance datum (mAOD) in the south and 54 mAOD in the north of the site surrounding the gasholder. Steps and raised ground, with a retaining wall are present along the southern boundary of the gasholder.
Site Description and Current Use	The site is vacant NGPH land which is approximately 5.054 acres in size and is split into two distinct areas; the north and the south. The north comprises the gasholder compound and ancillary buildings whilst the south is vacant and disused vegetated scrubland housing a Cadent Gas Limited (CGL) high pressure gas compound. The gasholder compound in the northern area comprises one below ground column guided gasholder (Gasholder No. 2), a former boiler house and a chimney stack. A temporary methane extraction unit is situated to the northeast of the gasholder. The CGL compound in the southern area is located within palisade fencing and is considered 'off-site', however access to this area is via the main site entrance located off Broxton Street. A redundant above ground gas main runs from the gasholder compound in the north, past the site entrance and through the southern part of the site where it exits the site at the southern boundary and crosses the railways line adjacent to the Saxon Street gasholder compound. A site layout drawing is presented in Figure 2.
Site Access	There are two points of vehicle access to the site. The main site access is from Broxton Street which has a double metal gate recessed from Bradford Road with IDACS lock. Within the site, access to the gasholder compound is via an internal roadway, which crosses underneath a viaduct and over multiple below ground gas mains and redundant overhead gas mains resulting in a height restriction of 4.80m. There are also multiple low hanging BT cables. The secondary site access is from Saxon Street which has a double metal palisade gate with IDACS lock. Access from this gate is into the southern area of site passing under the viaduct with a height restriction and redundant above ground pipework. Access to the gasholder compound is across a vegetated area, which previously had a haul road installed. The ground is soft and rutted. The gasholder compound and associated boiler house can be accessed through gates located to the southwest and south of the fenced compound.

Adjoining Nearby Land Uses and Ownership	North Alan Turing Way (A6010), fire station, commercial estate and Phillips Park Cemetery.	East Alan Turing Way (A6010), Sports City Car Park and Philips Park Cemetery.	South CGL compound, disused NGPH land, public sports venues, Ashton Canal.	West NGPH land (Miles Platting gasholder compound), railway and New Viaduct Street, residential and commercial properties.
Ground Cover (%)	• 30% buildings and gasholder; • 10% hardstanding • 10% gravel • 40% vegetation			
Live Plant	CGL own and operate a high-pressure gas compound (confined within a palisade fence) in the south of the site.			
Known Live Services and Utilities	There is a low voltage (LV) below ground electricity main that enters the site from the north and traces the north-west perimeter of the gasholder until it terminates at the former boiler house. There is a live 16 inch steel high pressure below ground gas main entering site from the north east corner to the north west around the gasholder and south west around the western side of the gasholder, before exiting the site at the far east site corner. A 12 inch steel intermediate pressure below ground gas main enters the site from Broxton Street and exists in a roughly south east orientation and then north east along the eastern side of the gasholder before exiting the site at the far east site corner, A 15 inch cast iron medium pressure below ground gas main enters the site from the north east site corner and exists south east adjacent to the east side of the gasholder, where it then exists north west parallel to the southern side of the gasholder before trending south past the CGL compound and exiting the site west along the subway. A combined sewer enters the site from Broxton Street and terminates prior to reaching the gasholder. There are two unknown metallic traces both trending roughly southwest in the central area of the site. Redundant gas mains serving the gasholder are present on site. Unrecorded live services may be present on site. Service information is based on third party information. Atkins accepts no liability for its accuracy or the accuracy of indicative service locations presented on any of the drawings or plans contained within this report. Service plans are presented in the PWI [2] and indicative on Figure 4.			

2.3. Boundary Information

Boundary Information		North	East	South
Type		Palisade Fencing	Palisade Fencing	Palisade Fencing
Approx Height (m)		3	3	3
Approx. Length (m)		120	120	350
Internal Site Boundaries	The CGL high pressure gas compound and the gasholder compound are separated from the rest of the site by palisade fencing.			

Retaining Features or Shares / Party Walls	There are general redundant plant bases, concrete structures etc across the site. A retaining wall is present along the southern boundary of the gasholder. The retaining wall is a 2m high galvanised steel palisade fence atop a 2.2m high brick wall with concrete coping. A brick railway viaduct (4.8 m high) is situated at the entrance to the site from Broxton Street.
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2.4. Site History & Heritage

Site History Summary	Information regarding the history of the site has been summarised from the WYG Data Review in 2012 [3] and presented in Figure 3. The site was formally part of the larger coal gas manufacturing and storage facility of Bradford Road Gasworks. Development of the gasworks began in the late 19th century. The first gasworks structures on the site were built by 1922. The main manufacture and processing plant were located to the east and south of the site. The gas works extended to the west of these sites. The River Medlock was culverted around the turn of the 20th century according to the historical Ordnance Survey maps. The gasworks continues to expand until production ceased in the 1970s. The majority of structures were demolished in the late 1970s and 1980s although the gasholder remains on site.
Historic Structure	There are no known historic structures on or buildings within 250 m of the site [4].
Heritage	The Montagu Evans Hertiage Review [5] appended to the WYG interpretative 2017 report [6] recommends that an enhanced Level II historic building recording for the Gasholder should be undertaken in line with English Heritage's <i>Understandings Historic Buildings: A Guide to Good Recording Practice</i> .
Designations on-site/close proximity	Ashton Canal is recorded as a Site of Biological Interest by GMEU for aquatic flora, located 210 m south of the site [4].

2.5. Environmental Setting

Geology	The BGS GeoIndex [7] indicated there is Made Ground on site. Previous site investigations identified Made Ground across the site with an average thickness of 1.5 m comprising gravelly fine to coarse sand with brick, ash and clinker [3]. Superficial Deposits are recorded by the BGS GeoIndex [7] as Glacial Till, described by the BGS lexicon [8] as a heterogenous mixture of clay, sand, gravel and boulders varying widely in size and shape. Previous site investigations identified Glacial Till in the form of a firm, very stiff slightly sandy gravelly clay. The thickness of glacial Till ranged from 7.9 – 9.22 m across the site [3]. The BGS GeoIndex [7] records the bedrock geology as the Pennine Upper Coal Measures Formation (Sandstones, Mudstones and Coal) which is defined as interbedded grey mudstone, siltstone and pale grey sandstone, commonly with coal seams [8]. BH3 in the south of the Gasholder Station was the only exploratory hole to encounter Coal Measures; a weak dark grey, sandy very, clayey shale from 8.5 m bgl to 9 m bgl (42.66-41.36 m AOD), at which point the borehole terminated [3]. A Coal Authority Report issued in 2004 found 14 mine entries within 20 m of the site, none of which are located on-site.
Hydrogeology	The Glacial Till deposits is classified as unproductive strata and the underlying Pennine Upper Coal Measures Formation is classified as a secondary A aquifer [9]. The EA [10] defines unproductive strata as unable to provide usable water supplies and are unlikely to have surface water/wetland ecosystems dependent on them and secondary A aquifers as permeable layers that can support local water supplies and may form an important source of base flow to rivers. There are no Source Protection Zones within 1 km of the site [9]. Groundwater was not encountered in Made Ground or Glacial Till during previous site investigation work. Following groundwater monitoring of boreholes screened within the

	Glacial Till recorded groundwater elevations between 47.97 m AOD (6.4 m bgl) and 48.41 m AOD (3.84 m bgl). On one occasion BH1 was recorded as dry. BH3 screened across the Made Ground and underlying sand and gravel on the southern site boundary recorded a mean groundwater elevation of 46.47 m AOD (4.69 m bgl) [3]. According to WYG Data Review [3], it is anticipated that hydraulic conductivity between the Made Ground and the underlying Secondary Aquifer (Coal Measures) is likely to be limited due to the low permeability Glacial Till present between the two strata (> 9 m thickness in places). In the south of the site, the stratum thins to 1.1 m thickness in BH3 and it is likely that the Glacial Till is breached by structures or services. A groundwater strike was not recorded in BH3 where the Coal Measures were encountered.
Hydrology	The River Medlock is located 200 m to the south of the site and Ashton Canal is located 220 m south of the site. The nearest surface water abstraction is from the Ashton Canal approximately 370 m east of the site operated by British Waterways [4].
Site Drainage	The gasholder overflow points are located on the north-eastern sides of the gasholder. There are three separate foul drain drainage routes. Two flow south of the gasholder, join and flow west to join the combined system on Broxton Street. The third flows north from the interceptor, located on the north/north-east of the gasholder, to join the combined system in Alan Turing Way. There are two storm drains that flow east towards the culverted River Medlock and combined sewer. A methane extraction plant is currently on site in order to reduce methane levels within the gasholder water, prior to the gasholder water being discharged to the outflow.
Contamination	Visual and olfactory observations of contamination including tar, were recorded in Made Ground, natural strata and groundwater during ground investigation works. It is understood that shallow soils adjacent to the gasholder are impacted with total petroleum hydrocarbons (TPH), poly-cyclic aromatic hydrocarbons (PAHs) and lead. Shallow asbestos has been identified within the shallow Made Ground. Due to the former gas works nature of the site, it is considered other contaminants may exist within the Made Ground and groundwater. This may comprise of a wide range of metals, metalloids, organic and inorganic contaminants [3].
Flooding	DEFRA online flood risk mapping [11] indicates the site is located in a Flood Zone 1 area, with a low probability of flooding.
Unexploded Ordnance	According to the WYG 2017 factual report [4], the regional Unexploded Bomb (UXB) map, obtained from Zetica, indicates the site is located in an area of moderate risk from UXB. A Pre-Desk Study Assessment completed in 2017 states that the site is likely to have low unexploded ordnance hazard level, however it is recommended a detailed desk study is carried out prior to the works. The Pre-Desk Study Assessment is included in the Site Information [13].
Ecology	According to the Atkins Preliminary Ecological Appraisal Report [12], the site comprises broadleaved woodland, hardstanding, dense scrub, semi-improved neutral grassland and gravel with ephemeral vegetation, which are habitats suitable for bats, badgers and nesting birds. Several invasive non-native invasive species (INNPS) such as Himalayan balsam, Cotoneaster species, Japanese rose and Japanese knotweed have been identified within and adjacent to the site.

3. Gasholder Information

Information regarding the gasholder void construction and status is included in Appendix B and summarised in Table 3-1 below.

Table 3-1 - Summary of Gasholder Void Parameters

Gasholder No. 2 Information / Description	Year of Construction		1910	
	Tank Diameter		86.87 m	
	Tank Depth		14.0 m (The tank depth has been confirmed at 14.0m However the archive information indicated the tank is 13.6m which is a discrepancy of 400mm. Ref to dumpling survey included in Appendix B).	
	Tank Construction		Brick and puddle clay	
	Tank Volume		83,007 m³	
	Dumpling Size		45.02% of the tank volume (37,367m³)	
	Dumpling Shape		Truncated cone (flat topped)	
	Dumpling Construction		The dumpling is assumed to be of solid construction (brick stone and concrete). A copy of the dumpling survey is included in Appendix B.	
Gasholder Dewatering	The NGPH discharge consent which has been operational since 7 May 2014 . The trade effluent to be discharged consists solely of waste water derived from natural gas storage/distribution. The sewer into which trade effluent may be discharged and the point of discharge is the foul sewer situated northeast of the gasholder. The maximum amount of trade effluent discharged in any one day shall not exceed 15 m³, the highest rate at which the trade effluent may be discharged shall not exceed 4 litres/sec. The gasholder overflow points are located on the north-eastern sides of the gasholder. A copy of the existing discharge consent for the site is presented in Appendix C.			
Condition Survey	A condition survey of Gasholder No. 2 has not been undertaken at the time of reporting. A structural survey of the gasholder tank walls, and base will be undertaken upon completion of the demolition phase of works.			
Holder Infilling	The tank volume requiring fill, following deduction of the dumpling, is estimated to be 45,640 m³. The following material volumes are therefore anticipated for the infilling of the tank if Gasholder No. 2.			
	General Requirement	Acceptable Fill Material Classification	Fill Depth (m bgl)	Approximate Volume
	Below Water Fill	Class 6A	Varies from base to cover, any residual water remaining after pumping has taken place. Assume 250mm above standing water	5,928.3 m³

General Fill (placed within gasholder tank base)	Class 2 General Fill	From top of Below Water Fill to 0.50 m bgl	36,747.5 m ³
500 mm Capping Layer	Class 6f2	From 0.50 m bgl to ground level	2,964.2 m ³
• Infilling should be undertaken in accordance with the requirements of NGPHs Core Specification [1] and the PWI [2]. The infilling sequence for the gasholder is shown on Figure 5.			

4. Infilling Constraints Assessment

The following have been identified as potential constraints associated with the proposed infilling works. A list of potential constraints associated with the wider works is included in the PWI [2].

4.1. Data Gaps

Construction	Construction details of Gasholder No. 2 are inferred from the No. 1 sheets and dumpling survey presented in Appendix B. The historical drawing presented with the dumpling survey indicates the crown rest columns are embedded within the brick dumpling surface. Following the dewatering and demolition phases, the construction of the tank walls, base and dumpling can be confirmed.
Tank Condition	A full structural survey has not been possible at this time and prior to infilling commencing a structural survey will be completed following the demolition phase of works.
Dumpling Condition	The dumpling is inferred to be of solid construction (i.e. brick, stone, concrete), however this assessment was based on very limited data and the methods employed during the dumpling survey may not be able to readily distinguish between a constructed solid formation and stiff clay. Irrespective of the findings of the supplied dumpling survey, it is acknowledged that clay dumpings can also feel solid during the dumpling survey. The condition of the surface of the dumpling is unconfirmed, including the presence and thickness of any concrete skim, and the durability of the dumpling for use as a working platform. A separate working platform maybe required should the dumpling be used to site plant and machinery.
Void Volume	The void volume, and therefore the volume of infill material required is unconfirmed. Following the demolition phase a topographic survey of the void shall be undertaken and included in the Site Information [13], and infill volumes updated.
Groundwater Ingress	The presence of ingress shall be confirmed following dewatering during the demolition phase.

4.2. Design Constraints

Proximity to gas mains	Within proximity to the live gas plant, the tank wall shall remain intact to limit the vibratory activities impacting on gas infrastructure. Ground movement and vibration monitoring will be required for the most sensitive receptors during this phase of the works.
Holder walls	Due to the presence of live gas plant, Cadent Gas Limited (CGL) have requested that the tank walls are not broken down by 1.00 m. Therefore a clay cap cannot be keyed into the surrounding gasholder which would prevent a sufficient seal for rainwater infiltration. Moreover, any clay capping preventing infiltration of rainwater may pose a flood risk during intense rainfall to the neighbouring land uses, therefore a more permeable capping may be required.
Groundwater Ingress	Groundwater ingress may occur with previous investigations recording groundwater at 4.69 m bgl within Glacial Till.
Site levels / reuse of material	The topographical surveys presented in Appendix D of the Site Information [14] of the gasholder compound within the north of the site is approximately between 54.20 m AOD to 54.70 m AOD whilst the rest of the site is lower between 52.20 m AOD and 52.50 m AOD. The level of the raised area in the gasholder compound in the north of the site cannot be reduced to limit the amount of infill material required due to extensive services on-site.
Ecology	It is recommended that vegetation clearance and removal of the gasholder structure is undertaken outside of the core nesting bird season (1 March and 31 August). If this cannot be achieved, then works should be undertaken following a Precautionary Method of Works (PMW) document with respect to nesting birds. If vegetation clearance cannot be avoided, this should be carried out under a PMW.

Cotoneaster, Japanese rose and Himalayan balsam have been identified within the Site and Japanese knotweed has been identified adjacent to the site boundary which are Invasive Non Native Species (INNS) and should be fully avoided (with at least 10m buffer zones).

5. Infill Acceptance Criteria

Given the structure of the former gasholder, the geology beneath the site and the recorded groundwater levels, it is clear that the infill material may come into contact with human health receptors within the upper 300mm (capping layer) or indirectly, with groundwater and therefore potentially leach substances to groundwater. All materials proposed to be used in the gasholder void infilling works shall be analysed and screened against a set of Infill Acceptance Criteria (IAC) prior to being brought to site. The IAC applicable to the surface capping layer (upper 500mm) is presented in Table 5-1 protective of human health receptors and IAC applicable to all imported materials protective of controlled waters receptors are presented in Table 5-2.

5.1. IAC Protective of Human Health Receptors

5.1.1. Methodology

To support the evaluation of potential risks to human health from site soils via direct contact exposure (inhalation of dust, accidental ingestion and dermal contact), soil data will be screened against Environment Agency Soil Guideline Values (SGVs), Category 4 Screening Levels (C4SLs) and Atkins' soil screening values (SSVs) collectively termed generic assessment criteria (GAC).

Atkins has produced SSVs for a variety of land uses based on soil organic matter (SOM) contents of 1 % and 6 %. The 1 % values provide more conservative SSVs and are based on a sandy soil type, whereas the 6 % values are based on a sandy loam soil type (the default within Science Report (SR) 3 [15]). SSV's with a 1% SOM content are used for this IAC as a conservative assessment.

To assess risk to on-site current and future use human health receptors, the residential without plant uptake GACs are considered to be the most appropriate criteria based on the site's current location adjacent to residential areas and the soil placement within a capping layer in the upper 500mm. Only the upper 500mm of soils will be required to be compliant with the IAC protective of human health receptors (Table 5-1) as this is the maximum thickness of soil likely to pose an unacceptable risk to human health receptors.

Category 4 Screening Levels (C4SLs) are modelled using CLEA for standard land uses and are concentrations of contamination in soil (with 6 % SOM) which are considered by DEFRA to represent a 'low risk' derived from updated exposure assessment parameters and toxicological data based on a 'Low Level of Toxicological Concern' [16]. As per the accompanying Policy Statement, DEFRA state that:

"A Low Level of Toxicological Concern represents an exposure equivalent to an intake of low concern but that definitely does not approach an intake level that could be defined as causing a Significant Possibility of Significant Harm to human health" [16].

The C4SLs were derived based on remaining 'strongly precautionary' for the purposes of generic screening and with the exception of benzene the change in SOM (from 1% to 6%) does not affect the derived GAC. Therefore, where considered appropriate, Atkins has adopted C4SLs for arsenic, benzene (at 1% SOM), cadmium, chromium VI and lead.

Atkins has derived SSVs for a number of volatile or potentially volatile contaminants (including PAHs) based on health-based guideline values (using the Contaminated Land Exposure Assessment (CLEA) Model v.1.07).

The potential for exposure from asbestos in soil is based on a number of factors including (amongst others) the quantity and type of asbestos present, the properties of the soil, the presence of any confining or covering layer, bioturbation, and rates of weathering and erosion due to site use or climate, as well as the actions undertaken on-site and exposure scenario [17].

Due to the nature of risk associated with asbestos and key uncertainties associated with the above properties, a GAC cannot be derived. Therefore, for the purposes of this IAC, the presence of asbestos in soil as identified from field observations or laboratory analysis is considered to be an appropriate initial screening criterion.

PAHs have been assessed using benzo(a)pyrene (BaP) as a surrogate marker. The ratio of the concentrations of genotoxic PAH compounds has been compared against the upper and lower limits as set out in the C4SL guidance. The data indicate that the ratios to BaP are within the defined limits. Therefore, BaP has been used as a marker compound for other genotoxic compounds in the assessment.

Potential acute risks resulting from short term exposure of by construction workers to contamination involved with the proposed development cannot be assessed using these GACs because they relate to the long-term (chronic)

risk. Risks to construction workers should be managed by the contractor through their Construction Environmental Management Plans (CEMPs) and as a minimum should include the use of appropriate Personal Protective Equipment (PPE) and appropriate working methods.

It should be noted that the GAC may change as new policy and technical guidance, including toxicological data, are published by the Environment Agency and other authoritative sources, but they are valid at the time of writing.

5.2. Human Health Infill Acceptance Criteria

The GAC protective of human health receptors for a residential without plant uptake land use scenario for soils to be used as infill within the upper 300mm (capping layer) of Gasholder No. 2 are presented in Table 5-1.

Table 5-1 – Human Health Infill Acceptance Criteria – Capping Layer (upper 500mm)

Determinant	Import Acceptance Criteria (mg/kg)
	Residential without Plant Uptake 1% SOM
Asbestos	No Asbestos Detected
Acenaphthene	2680
Anthracene	34300
Antimony	473
Arsenic	39.9
Barium	1340
Benzene	0.31
Benzo(a)pyrene	5.33
Cadmium	149
Carbon disulphide	0.105
Chromium III	16700
Chromium VI	20.5
Copper	9060
Ethylbenzene	85
Fluoranthene	4880
Fluorene	3260
Free Cyanide	34
Lead	313
Naphthalene	0.851
Nickel	188
Phenol	570
Pyrene	3650
Selenium	595
Toluene	312
Total Cresols	4740
TPH aliphatic C10-C12	81.8
TPH aliphatic C12-C16	385
TPH aliphatic C16-C35	212000
TPH aliphatic C5-C6	42.9
TPH aliphatic C6-C8	99.6
TPH aliphatic C8-C10	13.9
TPH aromatic C10-C12	139
TPH aromatic C12-C16	703
TPH aromatic C16-C21	1930
TPH aromatic C21-C35	1930

Determinant	Import Acceptance Criteria (mg/kg)
	Residential without Plant Uptake 1% SOM
TPH aromatic C5-C7 (Benzene)	0.31
TPH aromatic C7-C8 (Toluene)	312
TPH aromatic C8-C10	22.7
Xylene, m-	28
Xylene, o-	30
Xylene, p-	26.8
Zinc	47000

5.3. Controlled Waters Infill Acceptance Criteria

A controlled waters detailed quantitative risk assessment (DQRA) for the site has been undertaken in order to derive an Infill Acceptance Criteria for soil and soil leachate protective of controlled waters receptors [18].

Table 5-2 – Controlled Waters Infill Acceptance Criteria

Determinands	Soil IAC (mg/kg)	Soil-leachate (IAC (mg/l)	Haz/non-haz
Arsenic	35.17	-	Naturally occurring
Cadmium	0.60	-	Naturally occurring
Chromium (total)	306.76	-	Naturally occurring
Lead	380.50	-	Naturally occurring
Nickel	64.12	-	Naturally occurring
Benzene	0.0041	-	Hazardous
Anthracene	0.0031	-	Hazardous
Benzo(a)pyrene	0.011	0.00003	Hazardous
Fluoranthene	0.05	0.00003	Hazardous
Tetrachloroethylene	0.001	-	Hazardous
Trichloroethene	0.00004	0.00003	Hazardous
Aliphatic >C5-C6	0.05	-	Hazardous
Aliphatic >C6-C8	0.21	-	Hazardous
Aromatic >C5-C7	0.004	-	Hazardous
Aromatic >C7-C8	0.011	-	Hazardous
Aromatic >C8-C10	0.07	0.0033	Hazardous
Aromatic >C10-C12	1.14	0.033	Hazardous
Aromatic >C12-C16	2.28	0.033	Hazardous
Asbestos	Detection	-	Hazardous (>0.1%)

5.4. Geotechnical Infill Acceptance Criteria

Geotechnical testing and acceptance criteria are presented in Appendix A. Compaction testing will be carried out in accordance with the NGPH Core Specification [1].

6. References

- [1] National Grid Property Holdings (NGPH) Limited, “Demolition of Structures Core Specification,” 2020.
- [2] Atkins Limited, “Gasholder Demolition and Infilling - Project Works Information, Bradford Road, Manchester,” August 2022.
- [3] WYG, “Data Review Report Bradford Road Gasholder Station and Surplus Land, Manchester,” November 2012.
- [4] WYG, “Factual Preliminary Dismantling Assessment Report for Gasholder No. 2, Bradford Road Gasholder Station, Manchester (Site Code 0049),” September 2017.
- [5] Montagu Evans LLP, “Former Gasworks at Bradford Road, Manchester, M40 7BW,” 2017.
- [6] WYG, “Interpretative Preliminary Dismantling Assessment Report for Gasholders No. 2, Bradford Road Gasholder Station, Manchester (Site Code 0049),” September 2017.
- [7] British Geological Society, “GeoIndex (Onshore) Interactive Mapping,” [Online]. Available: <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>. [Accessed 26 05 2022].
- [8] British Geological Society, “Lexicon of Named Rock Units,” [Online]. Available: <https://webapps.bgs.ac.uk/lexicon/>. [Accessed 26 05 2022].
- [9] DEFRA, “Magic Maps,” [Online]. Available: <https://magic.defra.gov.uk/MagicMap.aspx>. [Accessed 26 05 2022].
- [10] DEFRA, “Protect Groundwater and Prevent Groundwater Pollution,” 2017.
- [11] DEFRA, “Flood Risk Mapping,” [Online]. Available: <https://flood-map-for-planning.service.gov.uk/>. [Accessed 26 05 2022].
- [12] Atkins Limited, “Preliminary Ecological Appraisal Report, Bradford Road Gasholder,” June 2022.
- [13] Atkins Limited, “Gasholder Demolition and Infilling - Site Information,” August 2022.
- [14] Environment Agency, “SR3 Updated Technical Background to the CLEA Model,” 2009.
- [15] DEFRA, “Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination SL: Contaminated Land: Applications in Real Environments,” 2014.
- [16] CIRIA, “Asbestos in soil and Made Ground: A guide to understanding and managing risks. CIRIA C733,” CIRIA, 2014.
- [17] Atkins Limited, “Controlled Waters Gas Holder Infill Acceptance Criteria, Bradford Road, Manchester (Site Code 0049),” June 2022.

Figures

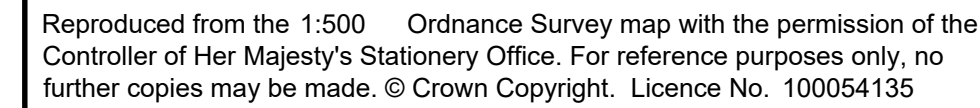
Figure 1 - Site Location

Figure 2 - Site Layout Plan

Figure 3 - Historical Structures

Figure 4 - Constraints Plan

Figure 5 - Infilling Cross Section



1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING SHOULD BE READ IN FULL COLOUR.

Drawing Status	FOR INFORMATION	Suitability	S2
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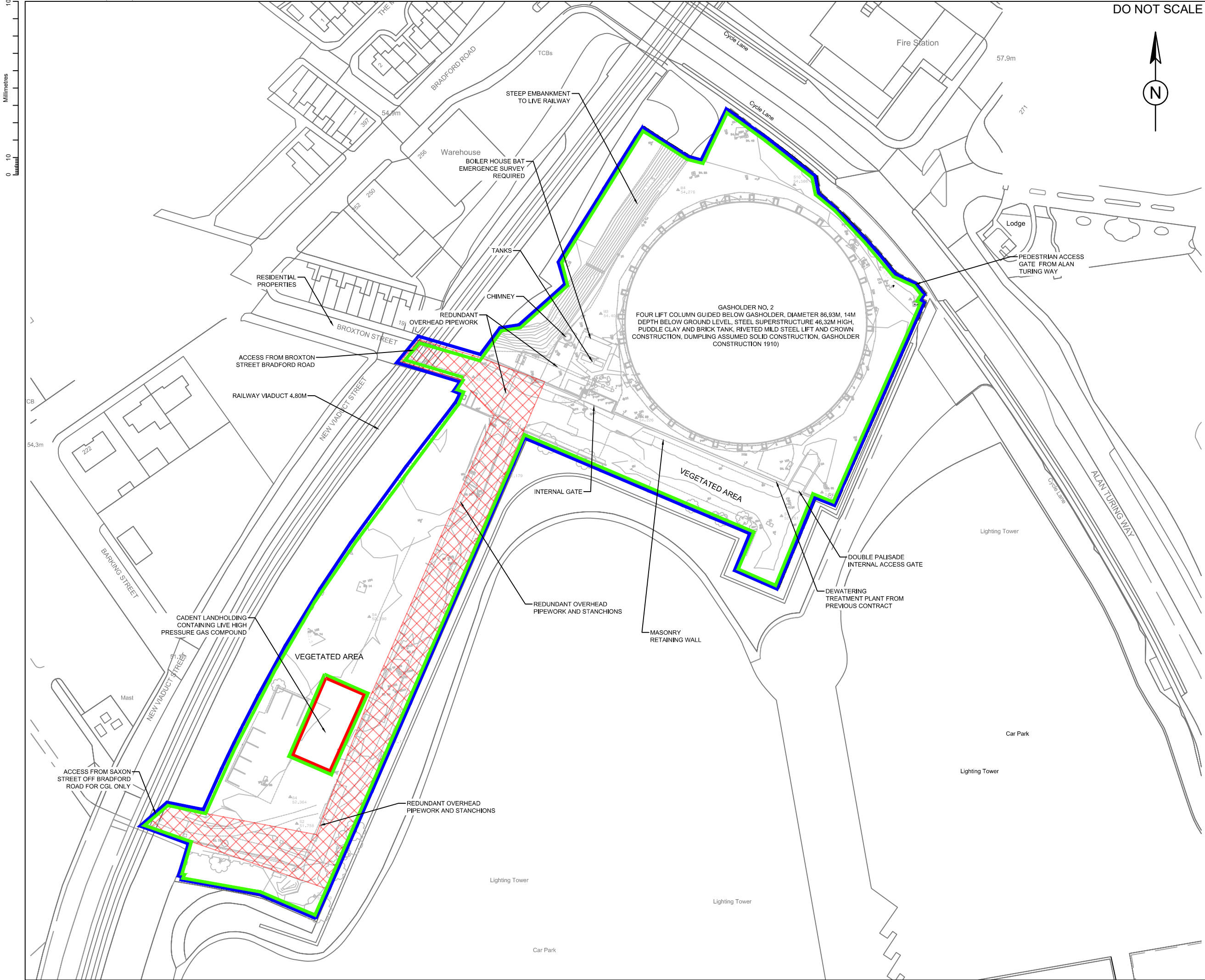
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Drawing Title

SITE LOCATION PLAN

Scale	Designed	Drawn	Checked	Authorised
1:2.500	AD	CW	MC	NS
Original Size	Date	Date	Date	Date
A1	23/05/2022	23/05/2022	23/05/2022	14/07/22
Drawing Number				Revision
FIGURE 1				P02



DO NOT SCALE

KEY:

- NATIONAL GRID PROPERTY SITE OWNERSHIP BOUDNARY (CONTRACTOR TAKEOVER FROM BNP-PRE)
- CADENT GAS SITE BOUNDARY
- CDM AREA
- SHARED ACCESS WITH CGL

- NOTES:**
- DO NOT SCALE FROM THIS FIGURE.
 - THIS DRAWING IS TO BE READ IN FULL COLOUR.

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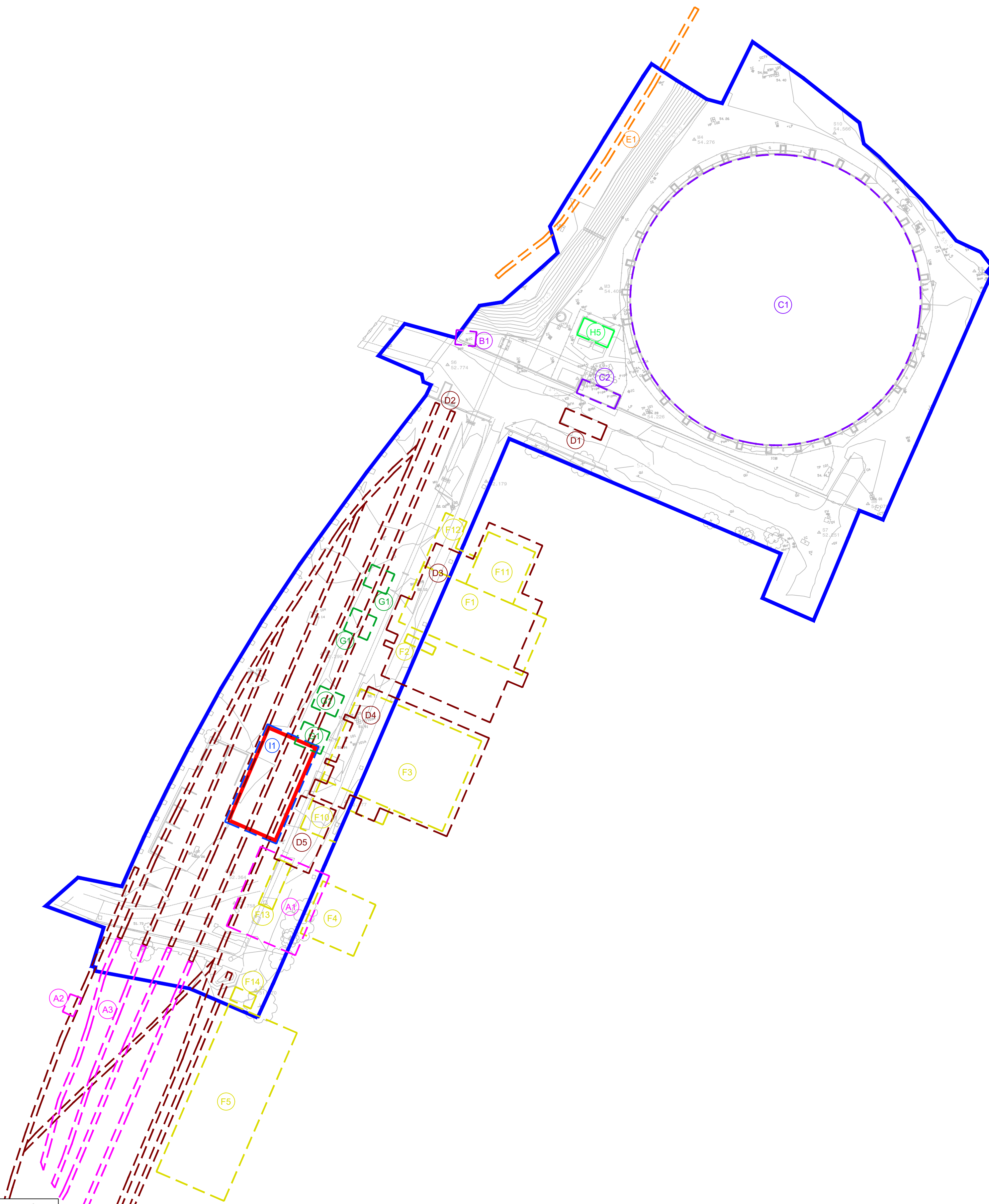
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Client: NATIONAL GRID PROPERTY HOLDINGS

Project Title: NGPH BRADFORD ROAD DEMOLITION AND INFILLING

Drawing Title: SITE LAYOUT PLAN

Scale	Designed	Drawn	Checked	Authorised
1:1,250	-	CW	NS	RG
Original Size	Date	Date	Date	Date
A3	-	06/05/2022	11/05/2022	11/05/2022
Drawing Number	FIGURE 2			Revision
				P02



KEY:

-  NATIONAL GRID PROPERTY HOLDINGS
BOUNDARY
-  HIGH PRESSURE COMPOUND CADENT
GAS LTD OWNED

HISTORICAL LAYOUT:

- | | | | |
|---|---|---|------|
| | | | 1893 |
|  |  | | 1908 |
|  |  | | 1922 |
| | | | 1948 |
| | | | 1951 |
|  |  | | 1956 |
|  |  | | 1958 |
| | | | 1974 |
|  |  | | 1992 |

HISTORICAL STRUCTURES:

- 1893
- | | |
|-----|---|
| A1. | UNKNOWN STRUCTURE |
| A2. | UNKNOWN STRUCTURE |
| A3. | RAILWAY |
| A4. | UNKNOWN STRUCTURE |
| A5. | APPROXIMATE LINE OF CULVERTED RIVER MEDLOCK |

- 1908
B1. UNKNOWN STRUCTURE

- 1922
C1. GASHOLDER (OPERATIONAL)
C2. AREA OF UNDERGROUND INLET TO GASHOLDER

- 1948
D1. COKE OFFICE
D2. RAILWAY
D3. UNKNOWN STRUCTURE
D4. UNKNOWN STRUCTURE
D5. UNKNOWN STRUCTURE
D6. HORIZONTAL RETORT HOUSE
D7. RAILWAY EXTENSION
D8. HORIZONTAL RETORT HOUSE
D9. UNKNOWN STRUCTURE
D10. OVERHEAD TANKS
D11. TANK
D12. RAILWAY
D13. CANTEN & MESS ROOM

- 1951
E1. RAILWAY

- | | |
|------|--|
| F1. | RETORT HOUSE D |
| F2. | UNKNOWN STRUCTURE |
| F3. | RETORT HOUSE C |
| F4. | COOLING TOWER & PUMP HOUSE |
| F5. | VERTICAL RETORT HOUSE |
| F6. | CAL PLANT |
| F7. | UNKNOWN STRUCTURE |
| F8. | UNKNOWN STRUCTURE |
| F9. | POTENTIAL EFFLUENT TREATMENT / STORAGE |
| F10. | MESS ROOM |
| F11. | BOILER ROOM |
| F12. | MESS ROOM |
| F13. | UNKNOWN STRUCTURE |
| F14. | UNKNOWN STRUCTURE |

- 1958
- G1. COAL BUNKER
 - G2. TAR & LIQUOR STORAGE WELL (1878-81)
 - G3. UNKNOWN STRUCTURE
 - G4. POTENTIAL EFFLUENT TREATMENT / STORAGE

- 1974
- | | |
|-----|-------------------|
| H1. | SERVICES TO PLANT |
| H2. | SERVICES TO PLANT |
| H3. | EFFLUENT TANK |
| H4. | INTERCEPTORS |
| H5. | BOILER HOUSE |

- 1992
11. SAXON STREET HIGH PRESSURE PRS COMPOUND

NOTES

1. THE MAJORITY OF HISTORICAL OFF SITE STRUCTURES ARE NOT INCLUDED ON THIS DRAWING. ONLY THOSE ADJACENT TO OR CROSSING THE SITE BOUNDARY.
2. THE LOCATION OF HISTORICAL STRUCTURES VARIES BETWEEN NATIONAL GRID ARCHIVE DRAWINGS & ORDNANCE SURVEY MAPS.

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CLASSIFICATION - Baseline (Low Risk)

[illegible]

P01	13/09/22	FOR INFORMATION	CW	MC	RG
Rev.	Date	Description	By	Chk'd	App'd

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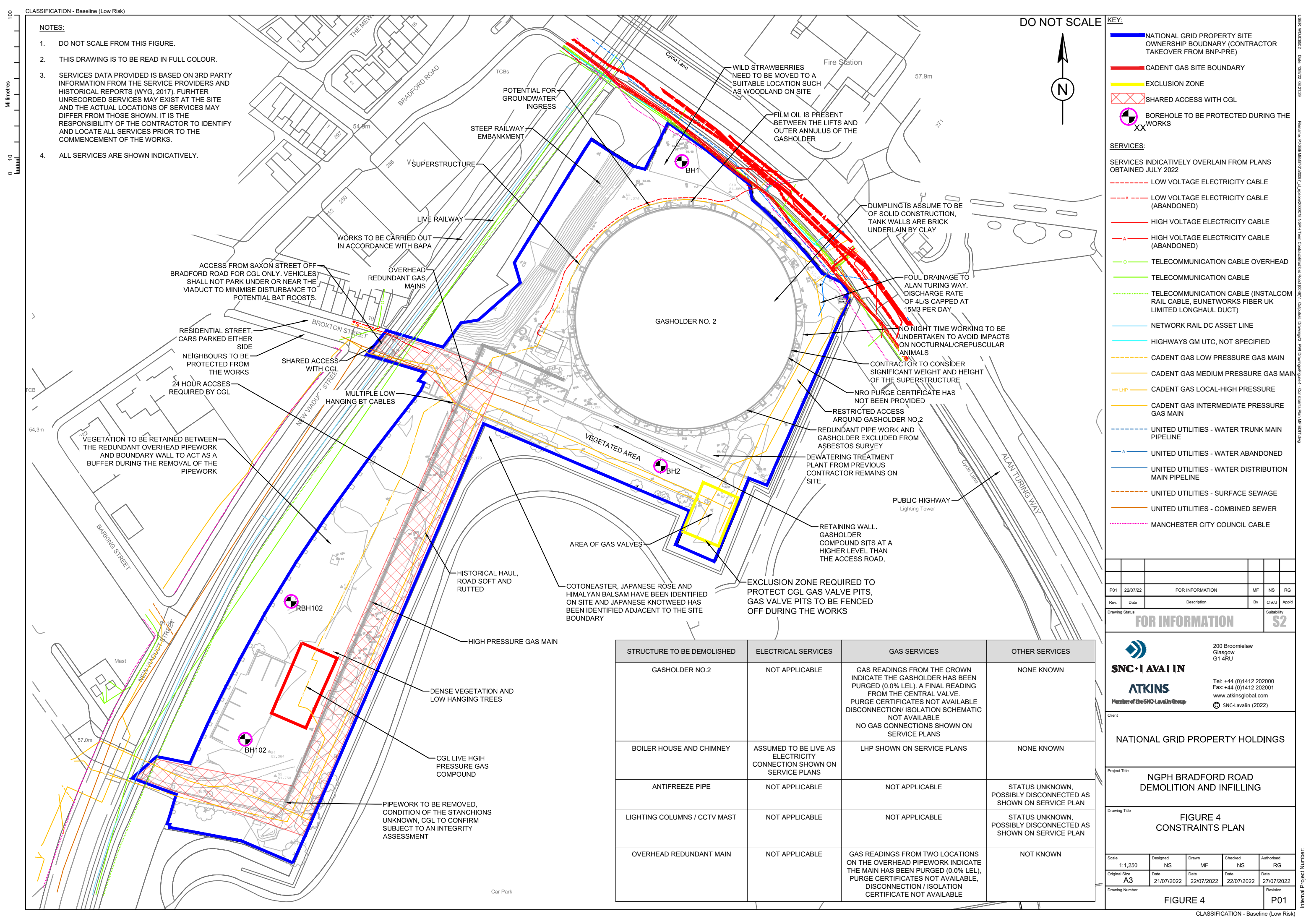
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HISTORICAL STRUCTURES

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Original Size A1	Date 23/05/2022	Date 23/05/2022	Date 23/05/2022	Date 13/09/2022
Drawing Number				Revision P01

FIGURE 3

Internal Project Number:



- NOTES:
- DO NOT SCALE FROM THIS FIGURE.
 - THIS DRAWING IS TO BE READ IN FULL COLOUR.
 - SERVICES DATA PROVIDED IS BASED ON 3RD PARTY INFORMATION FROM THE SERVICE PROVIDERS AND HISTORICAL REPORTS (WYG, 2017). FURTHER UNRECORDED SERVICES MAY EXIST AT THE SITE AND THE ACTUAL LOCATIONS OF SERVICES MAY DIFFER FROM THOSE SHOWN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO IDENTIFY AND LOCATE ALL SERVICES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 - ALL SERVICES ARE SHOWN INDICATIVELY.

DO NOT SCALE

- KEY:
- NATIONAL GRID PROPERTY SITE OWNERSHIP BOUDNARY (CONTRACTOR TAKEOVER FROM BNP-PRE)
 - CADENT GAS SITE BOUNDARY
 - EXCLUSION ZONE
 - SHARED ACCESS WITH CGL
 - BOREHOLE TO BE PROTECTED DURING THE WORKS
- SERVICES:
- SERVICES INDICATIVELY OVERLAIN FROM PLANS OBTAINED JULY 2022
- LOW VOLTAGE ELECTRICITY CABLE
 - LOW VOLTAGE ELECTRICITY CABLE (ABANDONED)
 - HIGH VOLTAGE ELECTRICITY CABLE
 - HIGH VOLTAGE ELECTRICITY CABLE (ABANDONED)
 - TELECOMMUNICATION CABLE OVERHEAD
 - TELECOMMUNICATION CABLE
 - TELECOMMUNICATION CABLE (INSTALCOM RAIL CABLE, EUNETWORKS FIBER UK LIMITED LONGHAUL DUCT)
 - NETWORK RAIL DC ASSET LINE
 - HIGHWAYS GM UTC, NOT SPECIFIED
 - CADENT GAS LOW PRESSURE GAS MAIN
 - CADENT GAS MEDIUM PRESSURE GAS MAIN
 - CADENT GAS LOCAL-HIGH PRESSURE
 - CADENT GAS INTERMEDIATE PRESSURE GAS MAIN
 - UNITED UTILITIES - WATER TRUNK MAIN PIPELINE
 - UNITED UTILITIES - WATER ABANDONED
 - UNITED UTILITIES - WATER DISTRIBUTION MAIN PIPELINE
 - UNITED UTILITIES - SURFACE SEWAGE
 - UNITED UTILITIES - COMBINED SEWER
 - MANCHESTER CITY COUNCIL CABLE

P01	22/07/22	FOR INFORMATION	MF	NS	RG
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Project Title: **NGPH BRADFORD ROAD DEMOLITION AND INFILLING**

Drawing Title: **FIGURE 4 CONSTRAINTS PLAN**

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Drawing Number	FIGURE 4								P01

STRUCTURE TO BE DEMOLISHED	ELECTRICAL SERVICES	GAS SERVICES	OTHER SERVICES
GASHOLDER NO.2	NOT APPLICABLE	GAS READINGS FROM THE CROWN INDICATE THE GASHOLDER HAS BEEN PURGED (0.0% LEL). A FINAL READING FROM THE CENTRAL VALVE. PURGE CERTIFICATES NOT AVAILABLE DISCONNECTION/ ISOLATION SCHEMATIC NOT AVAILABLE NO GAS CONNECTIONS SHOWN ON SERVICE PLANS	NONE KNOWN
BOILER HOUSE AND CHIMNEY	ASSUMED TO BE LIVE AS ELECTRICITY CONNECTION SHOWN ON SERVICE PLANS	LHP SHOWN ON SERVICE PLANS	NONE KNOWN
ANTIFREEZE PIPE	NOT APPLICABLE	NOT APPLICABLE	STATUS UNKNOWN, POSSIBLY DISCONNECTED AS SHOWN ON SERVICE PLAN
LIGHTING COLUMNS / CCTV MAST	NOT APPLICABLE	NOT APPLICABLE	STATUS UNKNOWN, POSSIBLY DISCONNECTED AS SHOWN ON SERVICE PLAN
OVERHEAD REDUNDANT MAIN	NOT APPLICABLE	GAS READINGS FROM TWO LOCATIONS ON THE OVERHEAD PIPEWORK INDICATE THE MAIN HAS BEEN PURGED (0.0% LEL), PURGE CERTIFICATES NOT AVAILABLE, DISCONNECTION / ISOLATION CERTIFICATE NOT AVAILABLE	NOT KNOWN



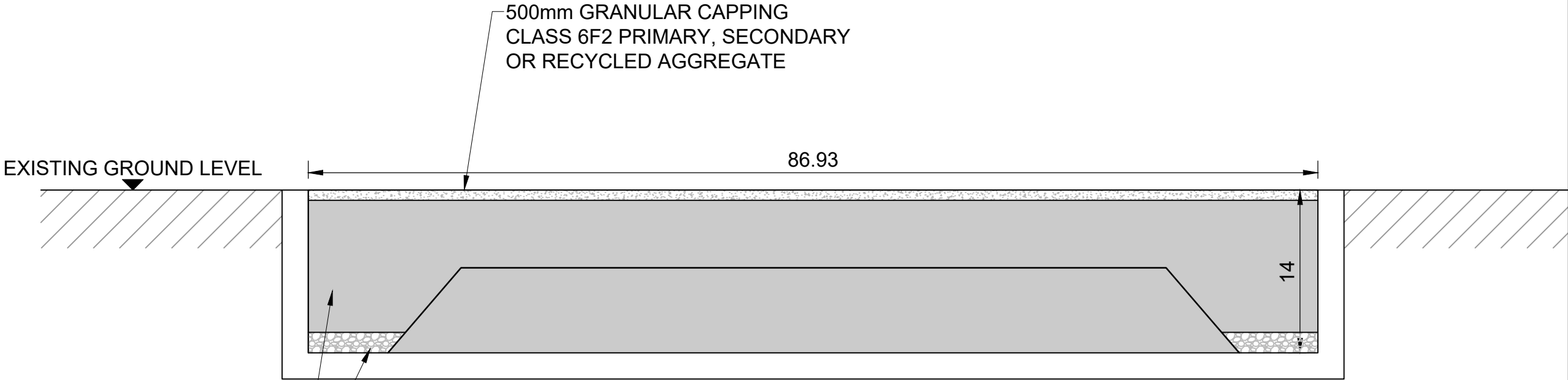
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NOTES:

1. DO NOT SCALE FROM THIS FIGURE.

LEGEND:

- GRANULAR CAPPING CLASS 6FS
- TYPE 6A MATERIAL
- ENGINEERING FILL



EXISTING GROUND LEVEL

ENGINEERED FILL

TYPE 6A MATERIAL

TYPICAL PROPOSED SECTION

NTS

P01	11/05/22	FOR INFORMATION	CW	NS	RG
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Drawing Status	Suitability
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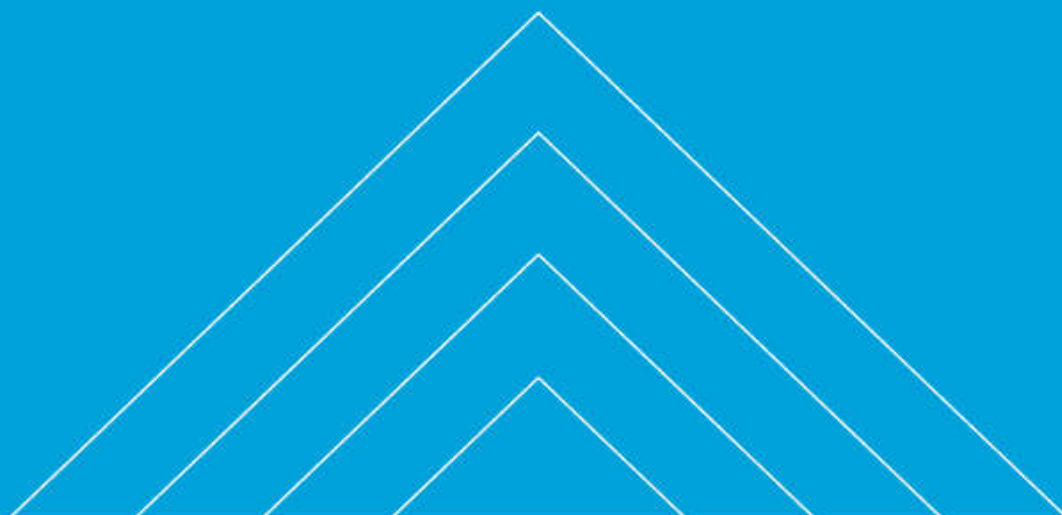
NGPH BRADFORD ROAD
DEMOLITION AND INFILLING

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INFILLING CROSS SECTION

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Original Size	Date	Date	Date	Date
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Drawing Number	FIGURE 5			Revision
				P01

Appendices



Appendix A. Geotechnical Assessment Criteria



GEOTECHNICAL CLASSIFICATION OF FILL MATERIALS

APPENDIX E3	ASSESSMENT, PROJECT MANAGEMENT, AND REMEDIATION CORE SPECIFICATION, 2017
APPENDIX 18	DEMOLITION OF STRUCTURES CORE SPECIFICATION, 2017

Document Name	Appendix E3 and Appendix 18 - Geotechnical Classification of Fill Materials	
Version No.	Issue Date	Revision from previous issue
1.0	01 May 2011	N/A
2.0	01 Jan 2012	N/A
3.0	28 Dec 2015	Updated to include the use of chalk and non-tar based recycled bituminous planings as fill materials and various general revisions. (issued with 2016 LR Consultant RFP)
	16 Feb 2017	Updated to include the use of chalk and non-tar based recycled bituminous planings as fill materials and various general revisions. (issued with 2017 Remediation & Demolition Contractor RFP)
3.1	23 Mar 2018	Appendix number correction in title section.

As noted above, this Appendix applies to two framework contracts and is part of both the Assessment, Project Management, and Remediation Core Specification, 2017, and the Demolition of Structures Core Specification, 2017

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TABLE 1:	ACCEPTABLE EARTHWORKS MATERIAL
TABLE 2:	GRADING REQUIREMENTS FOR TABLE 1
TABLE 3:	METHOD COMPACTION FOR EARTHWORKS MATERIALS: PLANT AND METHODS (METHOD 1 TO METHOD 6)
TABLE 4:	METHOD COMPACTION FOR EARTHWORKS MATERIALS: PLANT AND METHODS (METHOD 7)
TABLE 5:	OFF-SITE GRADING REQUIREMENTS FOR CLASS 6 MATERIALS FOR TABLE 1

Note: On a site-specific basis the engineer may authorise the use of material which falls outside of this specification. This decision can be made on economic and environmental grounds in conjunction with the NGPH Responsible Manager and NGPH Sales Manager.

TABLE 1: Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause E100)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							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 material designated as Class 3 in the Contract. (Properties i, ii and iv in next column, shall not apply to chalk). Recycled aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 2
							(ii) uniformity coefficient		10	-	
							(iii) moisture content	BS 1377: Part 2	OMC - 5%	OMC + 5%	
							(iv) contamination	Clause 3.4	-	Note 1 below	
							(v) IDD of chalk	BS 1377 : Part 2	-	Specified by Permanent Works Designer	
							(vi) SMC of Chalk	BS 1377 : Part 2	-	20%	
	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		-	10	
							(iii) moisture content	BS 1377: Part 2	OMC - 5%	OMC + 5%	
							(iv) contamination	Clause 3.4	-	Note 1 below	
	1	C	-	Coarse granular material	General Fill	Any material, or combination of materials, other than material designated as chalk. Recycled aggregate.	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	Table 3 Method 5
							(ii) uniformity coefficient		5	-	
							(iii) contamination	Clause 3.4	-	Note 1 below	
							(v) Los Angeles Coefficient	BS EN 1097-2	-	<50	

TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause E100)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance With:	Acceptable Limits Within:		
									Lower	Upper	
GENERAL COHESIVE FILL	2	A	-	Wet cohesive material	General Fill	Any material, or combination of materials, other than material designated as 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 tamping or grid rollers shall be used.
							(ii) plastic limit (PL)	BS 1377: Part 2	-	-	
							(iii) moisture content	BS 1377: Part 2	PL - 4%	-	
							(iv) CBR or undrained shear strength of re-moulded material	BS 1377: Part 9	2% (or as specified by the Permanent Works Designer)	-	
							(v) contamination	Clause 3.4	-	Note 1 below	
	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) CBR or undrained shear strength of re-moulded material	BS 1377: Part 9	2% (or as specified by the Permanent Works Designer)	-	
							(iii) moisture content	BS 1377: Part 2	PL - 4%	-	
							(iv) contamination	Clause 3.4	-	Note 1 below	
	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) CBR or undrained shear strength of re-moulded material	BS 1377: Part 9	2% (or as specified by the Permanent Works Designer)	-	
							(iv) contamination	Clause 3.4	-	Note 1 below	
	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) CBR or undrained shear strength of re-moulded material	BS 1377: Part 9	2% (or as specified by the Permanent Works Designer)	-	
							(iii) contamination	Clause 3.4	-	Note 1 below	

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TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

Class					General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause E100)	Material Properties Required for Acceptability (In Additional to Requirements on Use of Fill Materials in Clause E600 and E910)				Compaction Requirements in Clause E600
								Property (See Exceptions in Previous Column)	Defined and Tested in Accordance With:	Acceptable Limits Within:		
										Lower	Upper	
GENERAL CHALK FILL	3	-	-	Chalk	General Fill	Chalk and associated materials all designated as Class 3 in the Contract.	(i) moisture content	BS 1377 : Part 2	-	As defined by Permanent Works Designer	Table 3 Method 4, or Method 1 or 2 if required by the Permanent Works Designer. Vibratory rollers of Categories over 1800 kg shall not be used.	
							(ii) SMC		-	20%		
							(ii) contamination	Clause 3.4	-	Note 1 below		
							(iii) IDD of chalk	BS 1377 : Part 2	-	Specified by Permanent Works Designer		

TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents (all subject to requirements of Clause E100)	Material Properties Required for Acceptability (in addition to requirements on use of fill materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							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 and chalk) crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate.	(i) grading	BS 1377: Part 2 or BS EN 933-2	Tab 2	Tab 2	No compaction
							(ii) uniformity coefficient		10	-	
							(iii) plasticity index	BS 1377: Part 2	Non plastic		
							(iv) contamination	Clause 3.4	-	Note 1 below	
G R A N U L A R	6	B	-	Selected coarse granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock), crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate.	(i) grading	BS 1377: Part 2 or BS EN 933-2	Tab 2	Tab 2	Table 3 Method 5
							(ii) plasticity index	BS 1377: Part 2	Non plastic		
							(iii) contamination	Clause 3.4	-	Note 1 below	
							(iv) Los Angeles coefficient	BS EN 1097-2		50	
F I L L	6	C	-	Selected uniformly graded granular material	Starter layer	Natural gravel, natural sand, crushed gravel, crushed rock (other than argillaceous rock) crushed concrete, well burnt colliery spoil, or any combination thereof. Recycled aggregate.	(i) grading	BS 1377: Part 2 or BS EN 933-2	Tab 2	Tab 2	Table 3 Method 3
							(ii) uniformity coefficient		-	10	
							(iii) plasticity index	BS 1377: Part 2	Non plastic		
							(iv) contamination	Clause 3.4	-	Note 1 below	
							(v) Los Angeles coefficient	BS EN 1097-2		50	

TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents (all subject to requirements of Clause E100)	Material Properties Required for Acceptability (in addition to requirements on use of fill materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							Property (see excavations in previous column)	Defined and Tested in Accordance With:-	Acceptable Limits:-		
									Lower	Upper	
S E L E C T E D G R A N U L A R F I L L	6	F	1	Selected granular material (fine grading)	Capping	Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) grading	BS 1377 : Part 2 or BS EN 933-2	Tab 2	Tab 2	Table 3 Method 6
							(ii) optimum mc	BS 1377 : Part 4 (vibrating hammer)	-	-	
							(iii) mc	BS 1377 : Part 2	Optimum mc -2%	Optimum mc +2%	
							(iv) 10% fines value	BS812 : 1990 Part 111	30 kN	-	
							(v) liquid limit	BS 1377 : Part 2	-	45	
							(vi) plastic limit	BS 1377 : Part 2	-	20	
							(vii) Class Ra (asphalt) content	BS EN 933-11	-	50%	
							(viii) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%	
							(ix) Los Angeles Coefficient	BS EN 1097-2	-	60	
							(x) contamination	Clause 3.4		Note 1 below	
	6	F	2	Selected granular material (coarse grading)	Capping	Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt colliery spoil and argillaceous rock. Property (i) in the next column shall not apply to chalk. Property (vi) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) grading	BS 1377 : Part 2 or BS EN 933-2	Tab 2	Tab 2	Table 3 Method 6
							(ii) optimum mc	BS 1377 : Part 4 (vibrating hammer)	-	-	
							(iii) mc	BS 1377 : Part 2	Optimum mc -2%	Optimum mc +2%	
							(vii) Class Ra (asphalt) content	BS EN 933-11	-	50%	
							(vii) bitumen content	BS EN 12697-1 or BS EN 12697-39	-	2.0%	
							(ix) Los Angeles Coefficient	BS EN 1097-2	-	60	
							(x) contamination	Clause 3.4	-	Note 1 below	

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TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

	Class			General Material Description	Typical Use	Permitted Constituents (all subject to requirements of Clause E100)	Material Properties Required for Acceptability (in addition to requirements on use of fill materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							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 G R A N U L A R F I L L	6	F	4	Selected granular material (fine grading) - imported on to the Site	Capping	Unbound mixture complying with BS EN 13285. Any material, or combination of materials - including recycled aggregates with not more than 50% by mass of recycled bituminous planings and granulated asphalt, but excluding materials that contain tar and tar-bitumen binders, unburnt colliery spoil, argillaceous rock and chalk. Property (x) in the next column shall not apply if the Class Ra (asphalt) content of any recycled aggregate is 20% or less.	(i) Size designation and overall grading category	BS EN 13285 - 0/31.5 and GE	Tab 5	Tab 5	Table 3 Method 6
							(ii) Maximum fines and oversize categories	BS EN 13285 - UF15 and OC75	Tab 5	Tab 5	
							(iii) Los Angeles coefficient	BS EN 13242 - LA60	-	60	
							(iv) Other aggregate requirements	BS EN 13242 - Category NR (no requirement)	-	-	
							(v) Laboratory dry density and optimum water content	BS EN 13285 – Clause 5.3 – Declared Values	-	-	
							(vi) Water content	BS EN 1097 -5	-	-	
							(vii) Class Ra (asphalt) content	BS EN 933-11	-	0%	
							(viii) contamination	Clause 3.4	-	Note 1 below	
							(ix) Volume stability of blast furnace slag	BS EN 13242 - free from dicalcium silicate and iron disintegration	-	-	

TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

	Class				General Material Description	Typical Use	Permitted Constituents (all subject to requirements of Clause E100)	Material Properties Required for Acceptability (in addition to requirements on use of fill materials in Clause E600 and E910)				Compaction Requirements in Clause E600
								Property (see excavations in previous column)	Defined and Tested in Accordance:-	Acceptable Limits Within		
										Lower	Upper	
SELECTED GRANULAR FILL	6	F	5	Selected well graded granular material Selected well graded granular material	Fill to reinforced earth and anchored earth	Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof except that chalk shall not be combined with any other constituent (Properties i ii and v in next column shall not apply to chalk) (Properties viii, ix, x, xi, xii, xiii and xiv only apply when metallic reinforcing or anchor elements, facing units or fastening are used) Natural gravel, natural sand, crushed gravel, crushed rock other than argillaceous rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof except that chalk shall not be combined with any other constituent	(i) Size designation and overall grading category	BS EN 13285 - 0/31.5 and GE	Tab 5	Tab 5	Table 3 Method 6	
							(ii) Maximum fines and oversize categories	BS EN 13285 - UF15 and OC75	Tab 5	Tab 5		
							(iii) Los Angeles coefficient	BS EN 13242 - LA60	-	50		
							(iv) Other aggregate requirements	BS EN 13242 - Category NR (no requirement)	-	-		
							(v) Laboratory dry density and optimum water content	BS EN 13285 – Clause 5.3 – Declared Values	-	-		
							(vi) Water content	BS EN 1097 -5	-	-		
							(vii) Class Ra (asphalt) content	BS EN 933-11	-	0%		
							(viii) contamination	Clause 3.4	-	Note 1 below		

						(Properties i ii and v in next column shall not apply to chalk) (Properties viii, ix, x, xi, xii, xiii and xiv only apply when metallic reinforcing or anchor elements, facing units or fastening are used)	Size designation and overall grading category	BS EN 13285 - 0/31.5 and GE	Tab 5	Tab 5	
S E L E C T E D C O H E S I V E F I L L	7	A	-	Selected cohesive material	Fill to structures	Any material or combination of materials (other than unburnt colliery spoil, slag, argillaceous rock and chalk).	(i) grading	BS 1377: Part 2	Tab 2	Tab 2	End product: 100% of maximum dry density (BS1 1377: Part 4 (2.5 kg rammer) or a dry density corresponding to 5% air voids at field moisture content, which ever is lower.
							(ii) moisture content	BS 1377: Part 2	OMC – 2%	OMC + 2%	
							(iii) undrained shear strength parameters		As specified by the Permanent Works Designer	As specified by the Permanent Works Designer	
							(iv) liquid limit	BS 1377: Part 2	-	45	
							(v) optimum mc	BS 1377 Part 4	-	-	
							(vi) plasticity index	BS 1377: Part 2	-	25	
							(vii) contamination	Clause 3.4	-	Note 1 below	
	7	J	-	Selected wet cohesive material	Clay cut off walls / barrier layer	Selected clay	(i) grading	BS 1377 : Part 2	Tab 2	Tab 2	Table 3 Method 1
							(ii) moisture content	BS 1377 : Part 2	OMC* – 2%	OMC* + 2%	
							(ii) permeability	BS 1377 : Part 6	-	1 x 10 (-9) m/sec	
							(vii) liquid limit	BS 1377 : Part 2	-	90	
							(viii) plasticity index	BS 1377 : Part 2	-	65	
							(vi) optimum moisture content	BS 1377 : Part 4	-	-	
							(viii) contamination	Clause 3.4	-	Note 1 below	

TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents (all subject to requirements of Clause E100)	Material Properties Required for Acceptability(in addition to requirements on use of fill materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							Property (see excavations in previous column)	Defined and Tested in Accordance With:-	Acceptable Limits Within:-		
									Lower	Upper	
S T A B I L I S E D M A T E R I A L S	9	A	-	Cement stabilised well graded granular material	Capping	Class 6E with addition of cement under Clause 3.2	(i) pulverisation	BS 1924:Part 2	60%	-	Table 3 Method 6
							(ii) bearing ratio	BS 1924:Part 2	As specified by the Permanent Works Designer	-	
							(iii) moisture content	BS 1377: Part 2	OMC – 2%	OMC + 2%	
							(iv) contamination	Clause 3.4	-	Note 1 below	
	9	B	-	Cement stabilised silty cohesive material	Capping	Class 7F with addition of cement under Clause 3.2	(i) pulverisation	BS 1924:Part 2	60%	-	Table 4 Method 7
							(ii) bearing ratio	BS 1924:Part 2	As specified by the Permanent Works Designer	-	
							(iii) moisture content	BS 1377: Part 2	OMC – 2%	OMC + 2%	
							(iv) contamination	Clause 3.4	-	Note 1 below	
	9	D	-	Lime stabilised cohesive material	Capping	Class 7E with addition of lime under Clause 3.2	(i) pulverisation	BS 1924:Part 2	30%	-	Table 4 Method 7
							(ii) bearing ratio	BS 1924:Part 2	As specified by the Permanent Works Designer	-	
							(iii) moisture content	BS 1377: Part 2	OMC – 2%	OMC + 2%	
							(iv) contamination	Clause 3.4	-	Note 1 below	
	9	E	-	Cement and lime stabilised cohesive material	Capping	Class 7I with addition of cement and lime under Clause 3.2	(i) pulverisation	BS 1924:Part 2	30%	-	Table4 Method 7
							(ii) bearing ratio	BS 1924:Part 2	As specified by the Permanent Works Designer	-	
							(iii) moisture content	BS 1377: Part 2	OMC – 2%	OMC + 2%	
							(iv) contamination	Clause 3.4	-	Note 1 below	

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TABLE 1(cont.): Acceptable Earthworks Materials: Classification and Compaction Requirements

Class				General Material Description	Typical Use	Permitted Constituents (all subject to requirements of Clause E100)	Material Properties Required for Acceptability (in addition to requirements on use of fill materials in Clause E600 and E910)				Compaction Requirements in Clause E600
							Property (see excavations in previous column)	Defined and Tested in Accordance With:-	Acceptable Limits Within:-		
									Lower	Upper	
S T A B I L I S E D M A T E R I A L S	9	F		Cement and lime stabilised well graded granular material	Capping	Class 6R with addition of cement and lime under Clause 3.2	(i) pulverisation	BS 1924:Part 2	60%	-	Table 3 Method 6
							(ii) bearing ratio	BS 1924:Part 2	As specified by the Permanent Works Designer	-	
							(iii) moisture content	BS 1377: Part 2	OMC – 2%	OMC + 2%	
							(iv) contamination	Clause 3.4	-	Note 1 below	

Notes:

OMC optimum moisture content determined by BS 1377 (1990) Part 4 Method 3.5 or 3.6.

For Class 7J only, OMC shall be that at which permeability is least.

Where BS 1377 : Part 2 is specified for moisture content, this shall mean BS 1377 : Part 2 or BS 812 : Part 3 as appropriate.

Uniformity coefficient is defined as the ratio of the particle diameters D_{60} to D_{10} on the particle-size distribution curve, where:

D_{60} = particle diameter at which 60% of the soil by weight is finer

D_{10} = particle diameter at which 10% of the soil by weight is finer

Chalk shall only be used in free draining situations and not as fill within structures

If recycled bituminous planings are to be used, the chemical test suite shall include leachate testing to confirm the absence of tar and tar-bitumen binders

Note 1: Contamination limit to be Materials Reuse Target Criteria or Imported Material Contamination Limits for the site, as appropriate

TABLE 2: Grading Requirements for Acceptable Earthworks Materials Other Than Classes 6F4, 6F5 and 6S

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	2	
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					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
7A					100														15-100		6C
7J			100		85 - 100				83 - 100					80 - 100		60 - 100			15 - 45	0 - 20	7J

Table 3: Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6)

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	125	8	125	10	125	10*	175	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 2700 kg up to 5400 kg	125	6	125	8	125	8*	200	4	unsuitable		16	unsuitable	unsuitable
	3	over 5400 kg	150	4	150	8	unsuitable		300	4	unsuitable		8	16	unsuitable
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 5400 kg	150	10	unsuitable		150	10	250	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 5400 kg up to 8000 kg	150	8	125	12	unsuitable		325	4	unsuitable		20	unsuitable	unsuitable
	3	over 8000 kg	150	4	150	12	unsuitable		400	4	unsuitable		12	20	unsuitable
Deadweight tamping roller	1	Mass per metre width of roll: over 4000 kg up to 6000 kg	225	4	150	12	250	4	350	4	unsuitable		12	20	unsuitable
	2	over 6000 kg	300	5	200	12	300	3	400	4	unsuitable		8	12	20
Pneumatic tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg	125	6	unsuitable		150	10*	240	4	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 1500 kg up to 2000 kg	150	5	unsuitable		unsuitable		300	4	unsuitable		unsuitable	unsuitable	unsuitable
	3	over 2000 kg up to 2500 kg	175	4	125	12	unsuitable		350	4	unsuitable		unsuitable	unsuitable	unsuitable
	4	over 2500 kg up to 4000 kg	225	4	125	10	unsuitable		400	4	unsuitable		unsuitable	unsuitable	unsuitable
	5	over 4000 kg up to 6000 kg	300	4	125	10	unsuitable		unsuitable		unsuitable		12	unsuitable	unsuitable
	6	over 6000 kg up to 8000 kg	350	4	150	8	unsuitable		unsuitable		unsuitable		12	unsuitable	unsuitable
	7	over 8000 kg up to 12000 kg	400	4	150	8	unsuitable		unsuitable		unsuitable		10	16	unsuitable
	8	over 12000 kg	450	4	175	6	unsuitable		unsuitable		unsuitable		8	12	unsuitable
Vibratory tamping roller	1	Mass per metre width of vibrating roll: over 700 kg up to 1300 kg	100	12	100	12	150	12	100	10	unsuitable		unsuitable	unsuitable	unsuitable
	2	over 1300 kg up to 1800 kg	125	12	125	12	175	12*	175	8	unsuitable		12	unsuitable	unsuitable
	3	over 1800 kg up to 2300 kg	150	12	150	12	200	12*	unsuitable		unsuitable		8	12	unsuitable
	4	over 2300 kg up to 2900 kg	150	9	150	9	250	12*	unsuitable		400	5	6	10	unsuitable
	5	over 2900 kg up to 3600 kg	200	9	200	9	275	12*	unsuitable		500	6	6	10	unsuitable
	6	over 3600 kg up to 4300 kg	225	9	225	9	300	12*	unsuitable		600	6	4	8	unsuitable
	7	over 4300 kg up to 5000 kg	250	9	250	9	300	9*	unsuitable		700	6	3	7	12
	8	over 5000 kg	275	9	275	9	300	7*	unsuitable		800	6	3	6	10
Vibratory roller	1	Mass per metre width of vibrating roll: over 270 kg up to 450 kg	unsuitable		75	16	150	16	unsuitable		unsuitable		unsuitable	unsuitable	unsuitable
	2	over 450 kg up to 700 kg	unsuitable		75	12	150	12	unsuitable		unsuitable		unsuitable	unsuitable	unsuitable
	3	over 700 kg up to 1300 kg	100	12	125	10	150	6	125	10	unsuitable		16	unsuitable	unsuitable
	4	over 1300 kg up to 1800 kg	125	8	150	8	200	10*	175	4	unsuitable		6	16	unsuitable
	5	over 1800 kg up to 2300 kg	150	4	150	4	225	12*	unsuitable		unsuitable		4	6	12
	6	over 2300 kg up to 2900 kg	175	4	175	4	250	10*	unsuitable		400	5	3	5	11
	7	over 2900 kg up to 3600 kg	200	4	200	4	275	8*	unsuitable		500	5	3	5	10
	8	over 3600 kg up to 4300 kg	225	4	225	4	300	8*	unsuitable		600	5	2	4	8
	9	over 4300 kg up to 5000 kg	250	4	250	4	300	6*	unsuitable		700	5	2	4	7
	10	over 5000 kg	275	4	275	4	300	4	unsuitable		800	5	2	3	6

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Table 3 (cont.): Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6)

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
Vibrating plate compactor	1	Mass per m ² of base plate: over 880 kg up to 1100 kg	unsuitable		unsuitable		75	6	unsuitable		unsuitable		unsuitable		unsuitable
	2	over 1100 kg up to 1200 kg	unsuitable		75	10	100	6	75	10	unsuitable		unsuitable		unsuitable
	3	over 1200 kg up to 1400 kg	unsuitable		75	6	150	6	150	8	unsuitable		unsuitable		unsuitable
	4	over 1400 kg up to 1800 kg	100	6	125	6	150	4	unsuitable		unsuitable		8		unsuitable
	5	over 1800 kg up to 2100 kg	150	6	150	5	200	4	unsuitable		unsuitable		5	8	unsuitable
	6	over 2100 kg	200	6	200	5	250	4	unsuitable		unsuitable		3	6	12
Vibro-tamper	1	Mass: over 50 kg up to 65 kg	100	3	100	3	150	3	125	3	unsuitable		4	8	unsuitable
	2	over 65 kg up to 75 kg	125	3	125	3	200	3	150	3	unsuitable		3	6	12
	3	over 75 kg up to 100 kg	150	3	150	3	225	3	175	3	unsuitable		2	4	10
	4	over 100 kg	225	3	225	3	225	3	250	3	unsuitable		2	4	10
Power rammer	1	Mass: over 100 kg up to 500 kg	150	4	150	6	unsuitable		200	4	unsuitable		5	8	unsuitable
	2	over 500 kg	275	8	225	12	unsuitable		400	4	unsuitable		5	8	14
Dropping weight compactor	1	Mass of rammer over 500 kg	600	4	150	8	450	8	unsuitable		unsuitable		unsuitable		unsuitable
	2	Height drop: over 1 m up to 2 m over 2 m	600	2	200	8	unsuitable		unsuitable		unsuitable		unsuitable		unsuitable

Table 4: Method Compaction for Earthworks Materials: Plant and Methods (Method 7)

Type of Compaction Plant	Ref No.	Category	Method 7	
			N for D = 150 mm	N for D = 250 mm
Smooth wheeled roller (or vibratory roller operating without vibration)	1 2 3	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 12	unsuitable unsuitable unsuitable
Grid roller	1 2 3	Mass per metre width of roll: over 2700 kg up to 5400 kg over 5400 kg up to 8000 kg over 8000 kg	unsuitable 16 8	unsuitable unsuitable unsuitable
Deadweight tamping roller	1 2	Mass per metre width of roll: over 4000 kg up to 6000 kg over 6000 kg	4 3	8 6
Pneumatic tyred roller	1 2 3 4 5 6 7 8	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 12 6 5 4 unsuitable unsuitable unsuitable	unsuitable unsuitable unsuitable unsuitable 16 8 4 4
Vibratory tamping roller	1 2 3 4 5 6 7 8	Mass per metre width of vibrating 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 16 12 10 8 7 6	unsuitable unsuitable unsuitable unsuitable unsuitable 16 14 12
Vibratory roller	1 2 3 4 5 6 7 8 9 10	Mass per metre width of vibrating 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 unsuitable unsuitable 12 10 10 8 8 6	unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable 12
Vibrating plate compactor	1 2 3 4 5 6	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 unsuitable 10 8 6	unsuitable unsuitable unsuitable unsuitable unsuitable unsuitable
Vibro-tamper	1 2 3 4	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 unsuitable 8	unsuitable unsuitable unsuitable unsuitable
Power rammer	1 2	Mass: over 100 kg up to 500 kg over 500 kg	8 6	unsuitable 10
Dropping weight compactor	1 2	Mass of rammer over 500 kg Height drop: over 1 m up to 2 m over 2 m	unsuitable unsuitable	unsuitable unsuitable

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TABLE 5: Off-Site Grading Requirements for Class 6 Acceptable Earthworks Materials

Class	Size (mm)		Percentage by Mass Passing the Size Shown Size (mm) BS EN 933-2 Series													Size (microns) BS EN 933-2 Series				Class
	500	300	125	80	63	40	31.5	20	16	10	8	6.3	4	2	1	500	250	125	63	
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				6C
6F4					100		75-99		50-90		30-75		15-60		0-35				<15	6F4
6F5			100	75-99		50-90		30-75		15-60				0-35					0-12	6F5

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Appendix B. Gasholder Tank Information

B.1. No.1 Sheets

BRITISH GAS

COPY SENT TO AREA ON :

REGIONAL PLANT DEPT.

REPORT OF EXAMINATION OF GASHOLDER
WATER-SEALED TYPE — BASIC RECORD

NAME BRITISH GAS NORTH WESTERN EAST AREA
LOCATION BRADFORD ROAD M10 7BL
GASHOLDER No. 2 Date of inspection _____
SITUATION _____
HOLDER BUILT BY Ashmore Benson & Pease Ltd Date of completion 1910
TANK BUILT BY E. Nuttall & Co Date of completion 1910
LIFT ADDED BY _____ Date of completion _____
TYPE (i.e. Column, Spiral or Rope Guided) Column Guided in Brick Tank
CAPACITY (exclusive of Crown) 10,000,000 cu.ft. (283,170 cu.m.)
CAPACITY OF CROWN 589,500 cu.ft. (16,693 cu.m.)

LIFTS	Top	Second	Third	Fourth	Fifth
Diameter	273'0"	276'0"	279'0"	282'0"	
Depth	42'0"	40'6"	40'6"	40'6"	
Pressure (in. w.g.)/(mbar)	4.5	6.5	8.5	10.5	
No. of Columns	32				

GUIDE FRAMING (General Description) 32 Latticed Columns linked together with 6 tier
latticed girders.

CROWN—RISE 20'0" { Number and Type of Manholes 7 Flat Covers
Position and Number of Gas and Air Vents 1 6" & 1 10" Valves in centre plate

SHEETING THICKNESS { Crown: Outer Row _____ Other Rows _____
Sides: Top Row $\frac{5}{8}$ " Intermediate Rows _____
Bottom Row $\frac{1}{2}$ "

CUPS & GRIPS (Size and construction, with sketch) 11 $\frac{1}{2}$ " x $\frac{1}{2}$ " Pressed Cups & Grips

TOP CURB & CROWN FRAMING (Construction—See Sketch Sheet) Top curb 6" x 6" x $\frac{7}{8}$ " angle
Stationary steel crown framing - 32 6" x 5" x 25 lb RSJ main bars with
tie bars and bracing

TYPE OF LADDER Vertical with 6 rest platforms and backages

TANK { Diameter 285'0" Depth 44'6" Construction Brick
Position in Relation to Ground Level: Top curb at ground level
Rest Blocks: Not known Number: _____ Size: _____

MATERIAL USED FOR CONSTRUCTION OF { Gasholder Steel Rivetted
Tank Brick and Puddle Clay

INLET & OUTLET CONNECTIONS { Size: 3'6" dia
Position of Each: South West Together or separated: Together

TYPE OF SAFETY SEAL { On Inlet Connection: None Livesey Box
On Outlet Connection: None Livesey Box

SIGNATURE _____ DATE _____

FORM No. 751/65

BRITISH ENGINE

BOILER & ELECTRICAL INSURANCE CO. LD

THE MANCHESTER STEAM USERS ASSOCIATION
FOUNDED 1884

REPORT OF EXAMINATION OF GASHOLDER

(WATER-SEALED TYPES)

These Report Forms include all the information required on the standard Gasholder Record Sheets published by the Institution of Gas Engineers.

North Western Gas Board,
Manchester Group, Manchester Undertaking

CERTIFICATION NO.

2

PURPOSE

For Supply

SITUATION

Broadford Road, Chorley, Manchester

BUILT IN

1910

by

Holder

Chorley Gas Co. Ltd.

PUT TO WORK

1953

by

Tank

1953

1910

LIFT ADDED IN

TYPE (i.e. Column, Spiral or Rope Guided)

Column Guided in Rivet Tank

CAPACITY

Nominal

10,000,000 cu ft

Working (i.e. Calculated)

10,000,000 cu ft

LIFTS

Top

Second

Third

Fourth

Fifth

Diameter

273'-0"

276'-0"

279'-0"

282'-0"

Depth

42'-0"

40'-6"

40'-6"

40'-6"

Pressure (WG)

4 1/2"

6 1/2"

8 1/2"

10 1/2"

No. and Size of Spiral Guides or Ropes

5"

7 1/4"

7-4"

11-4"

Column Guided and Guide Framed Holders (No. and height of Columns and General Description of Framework).

32 Steel lattice columns, 169' 6" high x 8' 0" x 8' 0" at base.
6 steel lattice guides.
6 steel flat steel diagonal bracing. } R10 for dimensions

CROWN Rise 20'-0"

No. and Type of Manholes 3 Flat covers 2 Lanyard Boxes

SHEETING THICKNESS

Crown: Outer Row 3/4"

Other Rows 8 150

Sides: Top Row 7/8"

Intermediate Rows 8 150

Bottom Row 1/2"

Other lifts 1/2" - 9 150 1/2"

CUPS AND GRIPS (Size and Construction, i.e. Pressed, Channel or Built-up)

11 1/2" x 1/2" Pressed Plate Cups

TOP CURB AND CROWN FRAMING (Construction, from Maker's Drawings)

6' x 6' 3/4" steel angle framing. 32-6' x 5' x 25 lb R.S.J. main beam 22-6' x 5' x 25 lb R.S.J. secondary beam & supporting rafter 6' x 5' x 25 lb R.S.J. 8 Rows 4' x 3' 3/4" steel angle purlins. 12 rows 3' x 3' 3/4" steel angle purlins.

TYPE OF LADDER

Steel ladder 3' x 3/4"

flat plate with 3/4" dia. rungs [expanding 2' x 5' x 25 lb R.S.J.]

TANK

Diameter 285'-0"

Depth 44'-6"

Construction

Rivet Tank

Position in relation to Ground Level

Top level at ground level

MATERIAL USED FOR CONSTRUCTION OF

Gasholder

Tank

Steel
Brick - Portland Clay

INLET AND OUTLET CONNECTIONS—Size

3'-6" dia.

Position: Small End,

Together or Separated Together at SW

BRITISH ENGINE, BOILER & ELECTRICAL INSURANCE COMPANY LIMITED,
24 FENNEL STREET, MANCHESTER 4.

THE INSTITUTION OF GAS ENGINEERS

GASHOLDER RECORD SHEET

(In conformity with Safety Recommendations
IGE/SR/4 Gasholders)

IGE GR/110

(quote this number
when ordering)

WATER-SEALED GASHOLDER RECORD

NAME OF UNDERTAKING BRITISH GAS NORTH WESTERN - EAST AREA
ADDRESS OF SITE BRADFORD ROAD MANCHESTER
GASHOLDER No. 2 GAS STORED NATURAL GAS
SITUATION ASHMOKE, BENSON, PEASE
HOLDER BUILT BY AND CO Date of completion 1910
TANK BUILT BY AS ABOVE Date of completion 1910
LIFT ADDED BY N. A. Date of completion _____
TYPE (i.e. Column, Spiral or Rope Guided) COLUMN GUIDED IN BRICK TANK
CAPACITY (exclusive of Crown) } 10,000,000 SCF.
CAPACITY OF CROWN } -

LIFTS	Top	Second	Third	Fourth	Fifth
Diameter	273' 0"	276' 0"	279' 0"	282' 0"	
Depth	43' 0"	40' 6"	40' 6"	40' 6"	
Pressure (in. w.g.)/(mbar)	4 1/2" w.g.	6 1/2" w.g.	8 1/2" w.g.	10 1/2" w.g.	
No. of Columns					
Spiral Guides or Ropes					

GUIDE FRAMING (General Description) 32 STEEL LATTICE COLUMNS 169' 6" HIGH X 8' 0" X 4' 0" AT BASE, 6 TIERS LATTICE GIRDERS (STEEL), 6 TIERS FLAT STEEL DIAGONAL BRACINGS

CROWN—RISE 20' 0" { Number and Type of Manholes 3 FLAT COVERS, 2 LIVESEY BOXES
Position and Number of Gas and Air Vents _____
Crown: Outer Row 3/4" Other Rows 8 ISWG
SHEETING THICKNESS { Sides: Top Row 5/8" Intermediate Rows 9 ISWG
Bottom Row 1/2"
CUPS & GRIPS (Size and construction, with sketch) 11 1/2" x 1/2" PRESSED PLATE CUPS

TOP CURB & CROWN FRAMING (Construction—See Sketch Sheet) 6" x 6" x 7/8" STEEL ANGLE CURB

STATIONARY FRAMING 32 - 6" x 5" x 25 lbs RST MAIN BARS.

32 6" x 5" x 25 lbs RST SECONDARY BARS

TYPE OF LADDER STEEL LADDER 3" x 5/8" FLAT SIDES 3/4" DIA RINGS

TANK { Diameter 285' 0" Depth 44' 6" Construction BRICK
Position in Relation to Ground Level: TOP CURB AT GROUND LEVEL
Rest Blocks: _____ Number: _____ Size: _____

MATERIAL USED FOR CONSTRUCTION OF { Gasholder STEEL
Tank BRICK AND PUDDLED CLAY

INLET & OUTLET CONNECTIONS { Size: _____
Position of Each: SOUTH WEST Together or separated: _____

TYPE OF SAFETY SEAL { On Inlet Connection: _____
On Outlet Connection: _____

SIGNATURE J. A. Jepson DATE AUGUST 1988

REPORT OF EXAMINATION OF GASHOLDER
WATER-SEALED TYPE — BASIC RECORD

CG 455 7/83

B.2. Dumping Survey

BRADFORD RD. HOLDER SITE – SURVEY No.2

Dumpling Profiling of Holder No. 2

Survey carried out w/c 28th April 2014

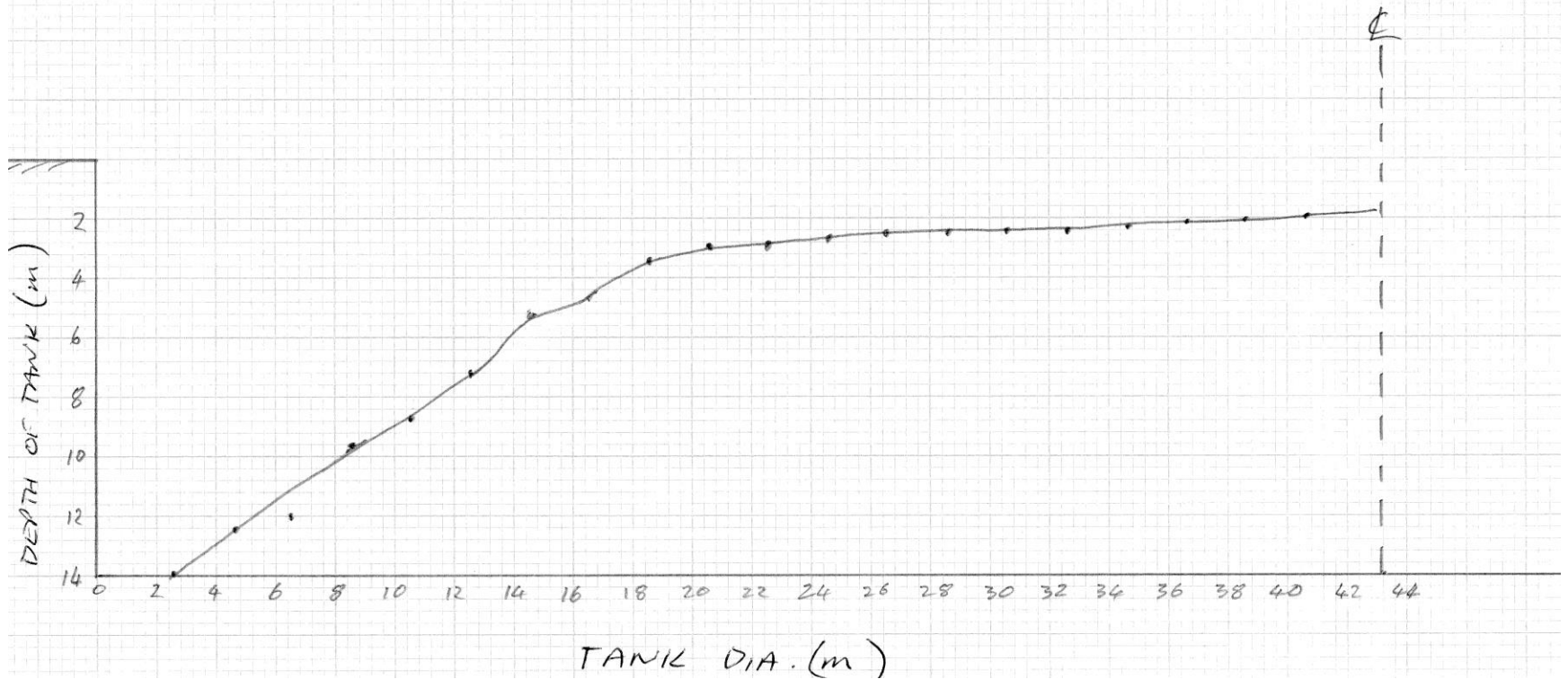
- The dumpling in Holder No. 2 is of a solid construction ie brick, stone, concrete.
- The crown support structure of Holder No. 2 is STEEL.
- Oil is present between the lifts and the outer annulus in Holder No.2.
- Included in the survey is an historical drawing indicating the dumpling which shows the same shape as the recent survey.
- The tank depth has been confirmed at 14m. The historical drawing indicates 13.6m which is only a discrepancy of 400mm.
- The dumpling volume & percentage, in relation to the overall holder tank volume, is as follows :-
- Holder No.2 - Dumpling Volume 37367m³ – 45.02% of Tank Volume.

BRADFORD RD. No. 2. (SURVEY No. 2)

VOL. OF DUMPLING = 37367 m^3

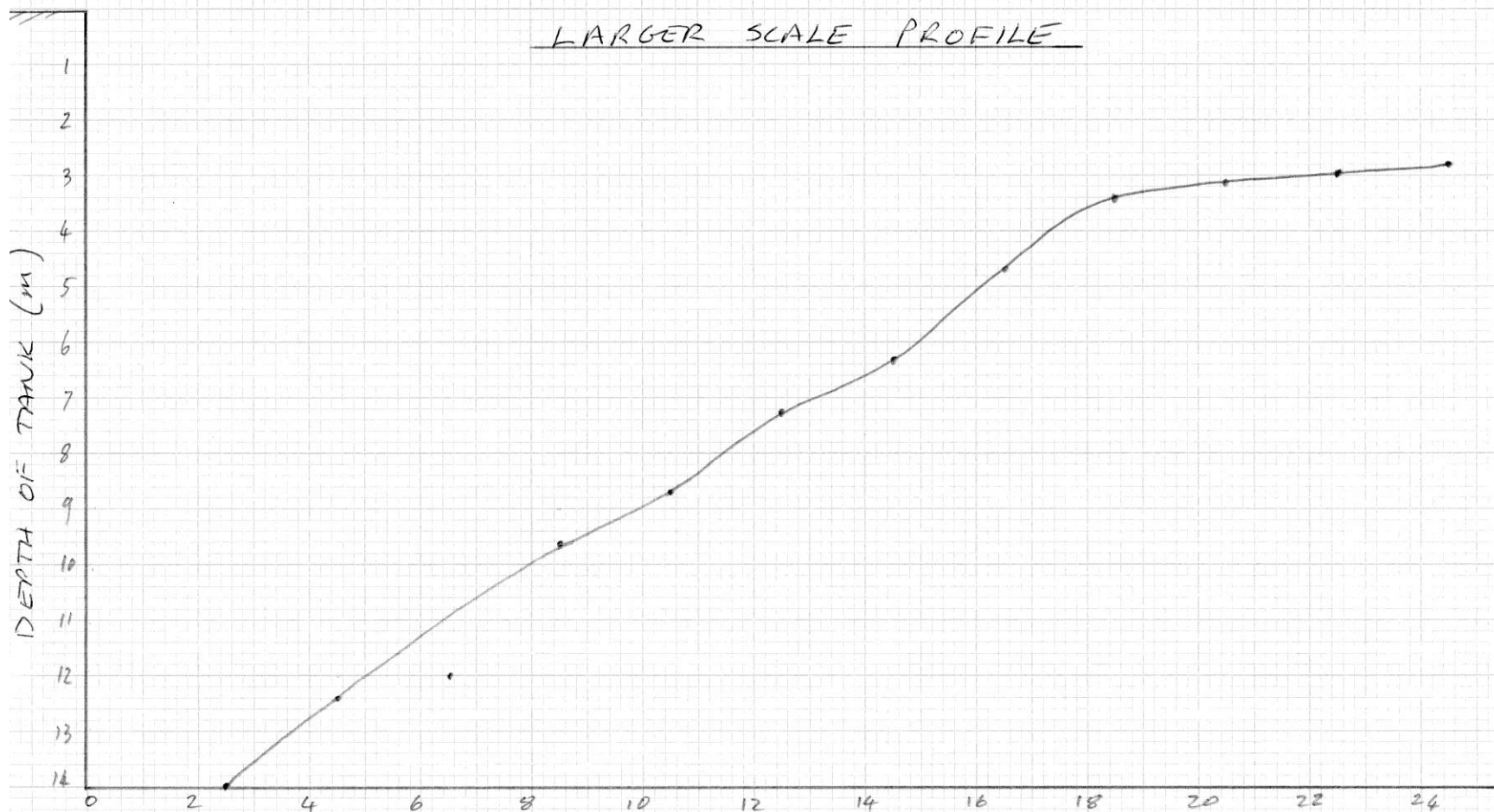
VOL. OF TANK = 83007 m^3

% OF DUMPLING IS 45.02%



BRADFORD RD. No. 2 (SURVEY No. 2)

LARGER SCALE PROFILE



TANK DIA. (m) [OVERALL TANK DIA. IS 86.87m].

M197

DRAWING NO.

MANCHESTER CORPORATION GAS WORKS

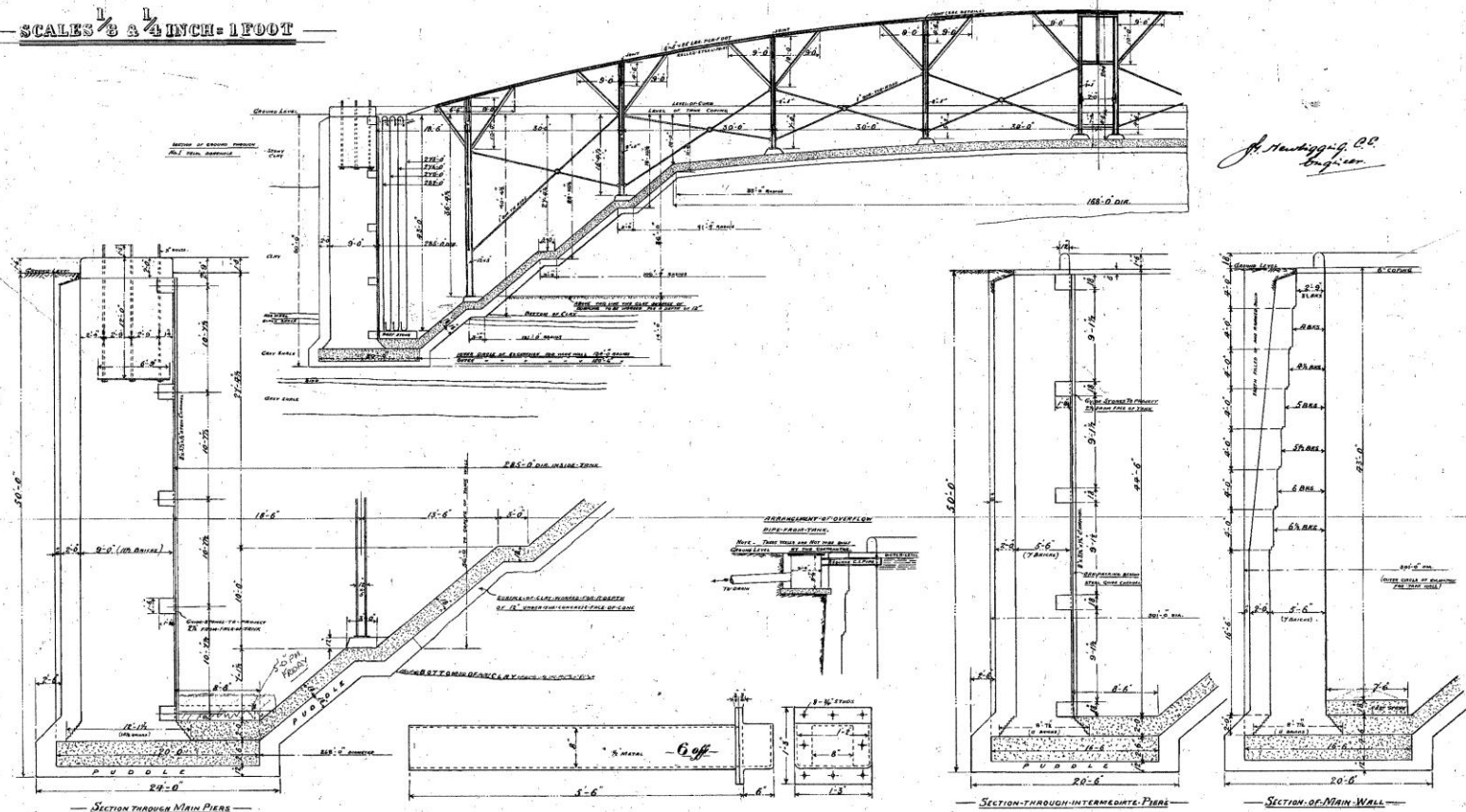
NO. 2 HANDEL,

BRADFORD ROAD STATION

SECTIONAL ELEVATION OF GAS HOLDER TANK 285'-0" DIA X 44'-6" DEEP - DETAILS OF PIERS & WALL

1 1
SCALES 8 & 4 INCH = 1 FOOT

*J. H. Huggins, C.E.
Engineer*



MAC | BRD | ETT/44

B/2021

35

Gas Holder Dumping Survey Record Sheet

Holder Site: BRADFORD RD. Holder Number TWO

Measurement Points	Staff Reading	Extension Length	Total
Ground, Level With Tank Top (datum Point)	4.190 Mtr	3 Mtr	7.190 Mtr
Tank outer anulus	4.200 Mtr	17 Mtr	21.200 Mtr
Distance From Tank Wall			
2.5	4.200 Mtr	17 Mtr	21.200 Mtr
4.5	4.570 Mtr	15 Mtr	19.570 Mtr
6.5	4.200 Mtr	" Mtr	19.200 Mtr
8.5	3.760 Mtr	13 Mtr	16.760 Mtr
10.5	2.890 Mtr	" Mtr	15.890 Mtr
12.5	4.430 Mtr	10 Mtr	14.430 Mtr
14.5	2.530 Mtr	" Mtr	12.530 Mtr
16.5	1.880 Mtr	" Mtr	11.880 Mtr
18.5	1.550 Mtr	9 Mtr	10.550 Mtr
20.5	1.330 Mtr	" Mtr	10.330 Mtr
22.5	1.130 Mtr	" Mtr	10.130 Mtr
24.5	970 Mtr	" Mtr	9.970 Mtr
26.5	830 Mtr	" Mtr	9.830 Mtr
28.5	690 Mtr	" Mtr	9.690 Mtr
30.5	590 Mtr	" Mtr	9.590 Mtr
32.5	530 Mtr	" Mtr	9.530 Mtr
34.5	450 Mtr	" Mtr	9.450 Mtr
36.5	380 Mtr	" Mtr	9.380 Mtr
38.5	310 Mtr	" Mtr	9.310 Mtr
40.5	250 Mtr	" Mtr	9.250 Mtr
LAST HOLE TO CENTRE		Mtr	Mtr
3 MTRS		Mtr	Mtr
		Mtr	Mtr

Distance from tank wall to inner lift

1.800 MTR

Distance from tank top to water level

600mm

Survey team J. BUTTERWORTH. G. ROBERTS.

Date of survey 2/5/14

Gas Holder Dumping Survey Record Sheet

Holder Site: BRADFORD ROAD.	Holder Number TWO
-----------------------------	-------------------

Action		
Drill at 4 points and dip for presence of oil	Oil present ?	Yes/No
Drill to identify crown support material	Structure material type ?	Wood/Steel
Oil present in the tank outer anulus	Depth of oil ?	None/Skim/More

Further information/comments

OIL IN BETWEEN THE LIFTS ON THE OUTER ANULUS.

Appendix C. Discharge Consent

National Grid Property Holdings Limited

1-3 Strand
London
WC2N 5EH

Thirlmere House
Lingley Mere Business Park
Lingley Green Avenue
Great Sankey
Warrington WA5 3LP

Telephone 01925 234000
www.unitedutilities.com
RCTE: K Smethurst
Direct Line: 01925 463254

Date: 30 May 2014

FAO The Company Secretary

Dear Sir

TRADE EFFLUENT – WATER INDUSTRY ACT 1991 - Gas Holder Station Number 2
North Bradford Rd Miles Platting Manchester M40 7AZ

Further to your Duly made application dated 7 May 2014, I enclose your CONSENT TO THE DISCHARGE OF TRADE EFFLUENT.

This document is issued by virtue of Statutory Powers granted by the Water Industry Act 1991 and as such a "true copy" has now been placed on public record. The Consent to Discharge relates solely to the trade effluent described in your application form and you must notify United Utilities Water PLC of:

- a) any proposed changes to the nature and composition of the effluent;
- b) any proposed changes to the rate of discharge and/or daily volume;
- c) any proposed change of name of your Company (or trading name);
- d) permanent termination of the discharge

The conditions laid down in the Consent are the only conditions under which United Utilities Water PLC will undertake to receive your effluent into the foul sewer. Any failure to comply with such conditions is an offence under the Water Industry Act 1991.

In accordance with our Charges Scheme, an application fee of £251 is now payable for this Consent. An invoice will be sent to you shortly.

In respect of clause 10a) of the Consent, I understand that representative samples of the trade effluent may be obtained from the manhole as marked on drainage plan close to site boundary in front of low wall facing Alan Turing Way. You should note that officers designated in writing by United Utilities Water PLC shall have right of safe access at all reasonable hours without notice for the purpose of obtaining a

The volume of trade effluent is a fixed volume of 1,507m³, based on 1m³ per annum rainfall running off one holder of average diameter, 43.8m.

It will not be necessary for you to install additional apparatus to measure the trade effluent as required by clause 10b) of the Consent. If circumstances change I will write to you again revoking this exemption.

The domestic allowance will be used as the volume chargeable for measured sewage charges. You must inform us in writing of any changes, and any alteration to the estimated volume of domestic sewage will take effect (for billing purposes) from the date on which we are informed of such changes.

Yours faithfully



Trade Effluent Manager
Wastewater Services

WATER INDUSTRY ACT 1991

CONSENT TO THE DISCHARGE OF TRADE EFFLUENT

Whereas National Grid Property Holdings Limited

(hereinafter called "the Trader") whose Head Office or Registered Office is at

1-3 Strand London WC2N 5EH

Is the owner/occupier of the trade premises at:

**Gas Holder Station Number 2
North Bradford Rd
Miles Platting
Manchester
M40 7AZ**

and by the Duly made application dated **7 May 2014**

Have applied to UNITED UTILITIES WATER PLC (hereinafter called "the Company") for consent to discharge trade effluent from the said trade premises into the sewers.

Under the provisions of the above mentioned Act the discharge of trade effluent in accordance with the said application form would not be lawful without the consent of the Company.

NOW THEREFORE in exercise of the powers conferred upon them by the above Act the Company HEREBY CONSENT to the discharge of trade effluent by the Trader from the said premises into their sewers SUBJECT TO THE FOLLOWING CONDITIONS:

**Nature of
discharge**

- 1a) Subject to the provisions of conditions 6, 7, 8 and 9 below the nature or composition of the trade effluent to be discharged under this Consent shall be solely as specified in the said application form and shall consist solely of waste water derived from **natural gas storage/distribution**.
- 1b) The trader shall give to the Company prior written notice of any change in the process or the process materials or any other circumstances likely to alter the constituents of the trade effluent as set out in condition 1(a). In such circumstances, no substance of which the Company has not had previous notice, may be discharged unless and until the Company has agreed to accept the substance at a limit imposed by the Company which shall then be deemed to be incorporated in this Consent by agreement and shall not prejudice the right of the Company to serve a Direction earlier than two years from the date of such incorporation.

The Trader shall also give not less than seven days written notice to the Company of any change in the name of the occupier or owner.

**Sewer
affected**

2. The sewer into which the trade effluent may be discharged and the point of discharge is the foul sewer situate at **Alan Turing Way**.

- | | |
|--|---|
| Connections | 3. No connections shall be made to the said sewer without the prior approval of the Company and all such connections shall be constructed and maintained to the satisfaction of the Company at the expense of the Trader. |
| Maximum volume of discharge | 4. The maximum amount of the trade effluent discharged in any one day of twenty four hours shall not exceed 15 m ³ without prior written consent of the Company. |
| Maximum rate of discharge | 5. The highest rate at which the trade effluent may be discharged shall not exceed 4 litre/sec. |
| Matters to be eliminated prior to discharge to sewers | <p>6. The following matters shall be eliminated from the trade effluent before it is discharged into the sewers of the Company:</p> <ul style="list-style-type: none"> a) petroleum spirit; b) calcium carbide; c) carbon disulphide; d) except as provided in paragraph 7 hereof, the prescribed substances listed in Schedule 1 to The Trade Effluents (Prescribed Processes and Substances) Regulations 1989, as amended from time to time, insofar as they are in concentration greater than the background concentration (as defined in the said Regulations); e) where the trade effluent derives from a prescribed process mentioned in Schedule 2 to the said Regulations, and except as provided in paragraph 7 hereof, asbestos (as defined in the said Regulations) and chloroform in concentration greater than the background concentration (as defined in the said Regulations); f) organo-halogen compounds including pesticide residues and degreasing agents; g) any substances which either alone or in combination with each other or with any other matter lawfully present in the said sewers would be likely to; <ul style="list-style-type: none"> i) cause a nuisance or produce flammable, harmful or toxic vapours either in the sewers or at the sewage works of the Company; ii) injure the sewers or interfere with the free flow of their contents or affect prejudicially the treatment and disposal of their contents or have injurious effects on the sewage treatment works to which it is conveyed or upon any treatment plant there; iii) be dangerous to or cause injury to any person working in the sewers or at the sewage treatment works; iv) affect prejudicially any watercourse, estuary or coastal water into which the treated effluent will eventually be discharged. |

**Matters to be
limited prior to
discharge to
sewer**

7. The trade effluent shall not contain

- a) Arsenic as As in excess of 50 ug/l
- b) Chloroform in excess of 100 ug/l
- c) Cyanides and cyanogen compounds which produce hydrogen cyanide on acidification in excess of 1 mg/l
- d) Methane in solution in excess of 0.14 mg/l
- e) Separable grease and oil in excess of 100mg/l
- f) Sulphates as SO₄ in excess of 1,000 mg/l
- g) Sulphides, hydrosulphides, polysulphides and substances producing hydrogen sulphide on acidification in excess of 1 mg/l
- h) Toxic metals in excess of 10,000 ug/l either individually or in total ie Antimony, Beryllium, Chromium, Copper, Lead, Nickel, Selenium, Silver, Tin, Vanadium, Zinc;

Temperature

8. No trade effluent shall be discharged which has a temperature higher than 43.3°C (110°F).

pH value

9. No trade effluent shall be discharged having a pH of less than 6 or greater than 10

**Inspection
Chamber**

10. a) An inspection chamber or manhole shall be provided and maintained by the Trader in a suitable position in connection with each pipe through which the trade effluent is discharged and shall be so constructed and maintained as to enable a person readily to obtain at any time samples of the trade effluent so discharged, to the approval of the Company.
- b) Suitable apparatus for measuring and automatically recording the volume and composition of trade effluent discharged shall be provided and maintained in working order by the Trader in connection with every such pipe, unless otherwise exempted in writing by the Company.
- c) If the measuring and recording apparatus as aforesaid ceases to function satisfactorily, then the Company shall have the right to make estimates of the volume and composition of the trade effluent until such time as the said apparatus is again operating to the satisfaction of the Company.
- d) Records shall be kept by the Trader of the volume, rate of discharge, nature and composition of the trade effluent discharged to the sewer, together with any records required to be kept by the Trader under the provisions of any Notice of Determination issued by the Secretary of State under Sections 120 and 132 of the Water Industry Act 1991. Such records shall be kept available for inspection at all reasonable times by an authorised officer of the Company and copies shall be sent to the Company on demand.

- e) The foregoing provision of this condition shall be deemed to be complied with if other methods of sampling the trade effluent, determining its nature and composition, and measuring and recording the discharge are agreed and confirmed in writing by the Company.

Payment

11. Payment shall be made to the Company on demand of charges in respect of the reception, conveyance, treatment and disposal of the trade effluent in accordance with the Company's Charges Scheme in force from time to time.

Dated 30 May 2014

Issuing Office Wastewater Services
Lingley Mere Business Park
Lingley Green Avenue
Great Sankey
Warrington
WA5 3LP

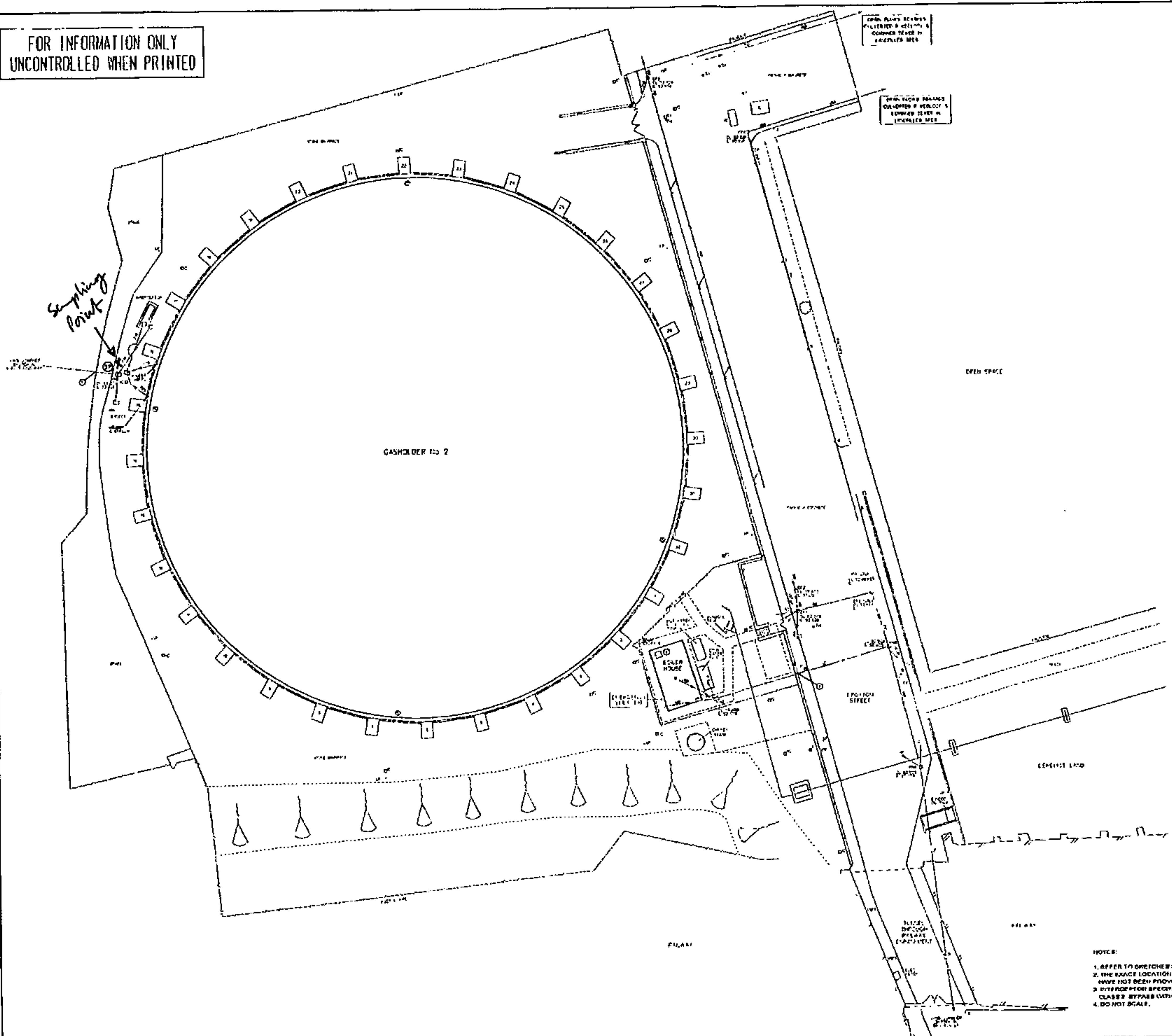
Signed



TRADE EFFLUENT MANAGER
for and on behalf of United Utilities Water PLC

Your attention is drawn to Section 122 of the Water Industry Act 1991 which provides that any person aggrieved by any conditions attached to this Consent may appeal to the Director General of Water Services.

FOR INFORMATION ONLY
UNCONTROLLED WHEN PRINTED



LEGEND

—	PIPE
—	MANHOLE
—	VALVE
—	WATER TOWER
—	WATER PUMP
—	WATER TANK
—	WATER TREATMENT PLANT
—	WATER DISTRIBUTION SYSTEM

SYMBOLS FOR SPECIAL FEATURES

—	PIPE
—	MANHOLE
—	VALVE
—	WATER TOWER

WATER TOWER

—	WATER TOWER
—	WATER TOWER

NOTES:
1. REFER TO SPECIFICATIONS FOR MANHOLE OF TANK B
2. THE EXACT LOCATIONS OF GULLY CONNECTIONS
HAVE NOT BEEN PROVEN.
3. INTERIOR SPECIFICATION: FCO HAS TYPE 187
CLASS 2 BYPASS VALVE IN TANK.
4. DO NOT SCALE.

PROJECT: SHADFORD ROAD NO. 2 PROJECT	DATE: 1977
DRAWING TITLE: PRAIRIE LAYOUT	DATE: 1977
DESIGNED BY: [Name]	CHECKED BY: [Name]
APPROVED BY: [Name]	DATE: 1977
nationalgrid	51615C

- e) The foregoing provision of this condition shall be deemed to be complied with if other methods of sampling the trade effluent, determining its nature and composition, and measuring and recording the discharge are agreed and confirmed in writing by the Company.

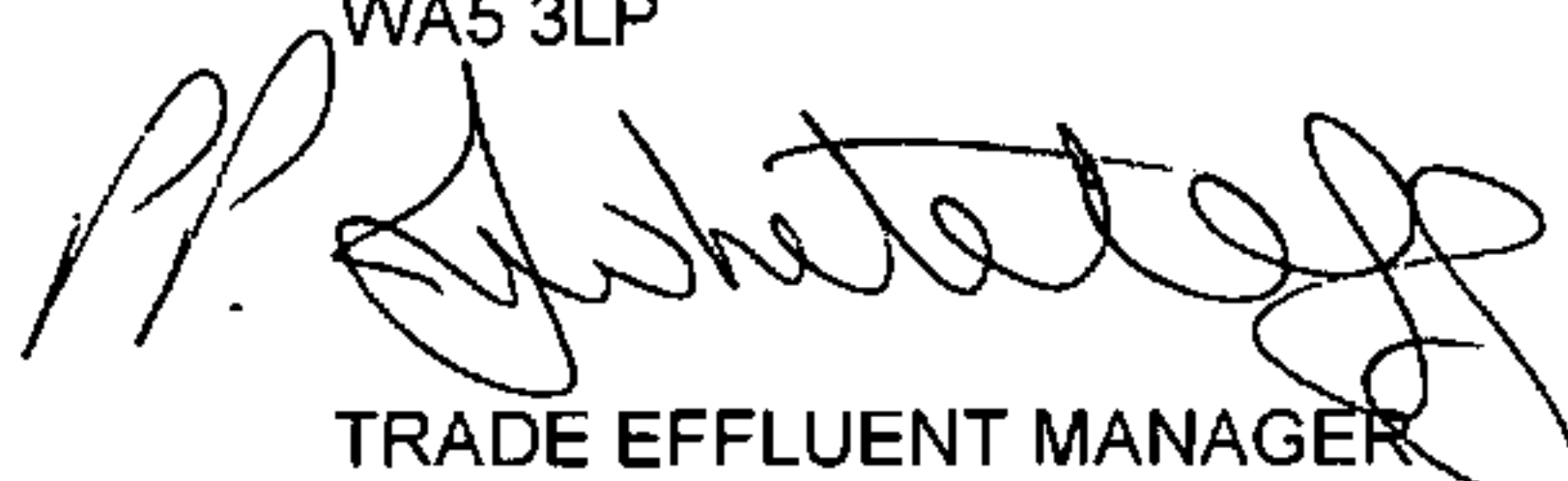
Payment

11. Payment shall be made to the Company on demand of charges in respect of the reception, conveyance, treatment and disposal of the trade effluent in accordance with the Company's Charges Scheme in force from time to time.

Dated 16 May 2014

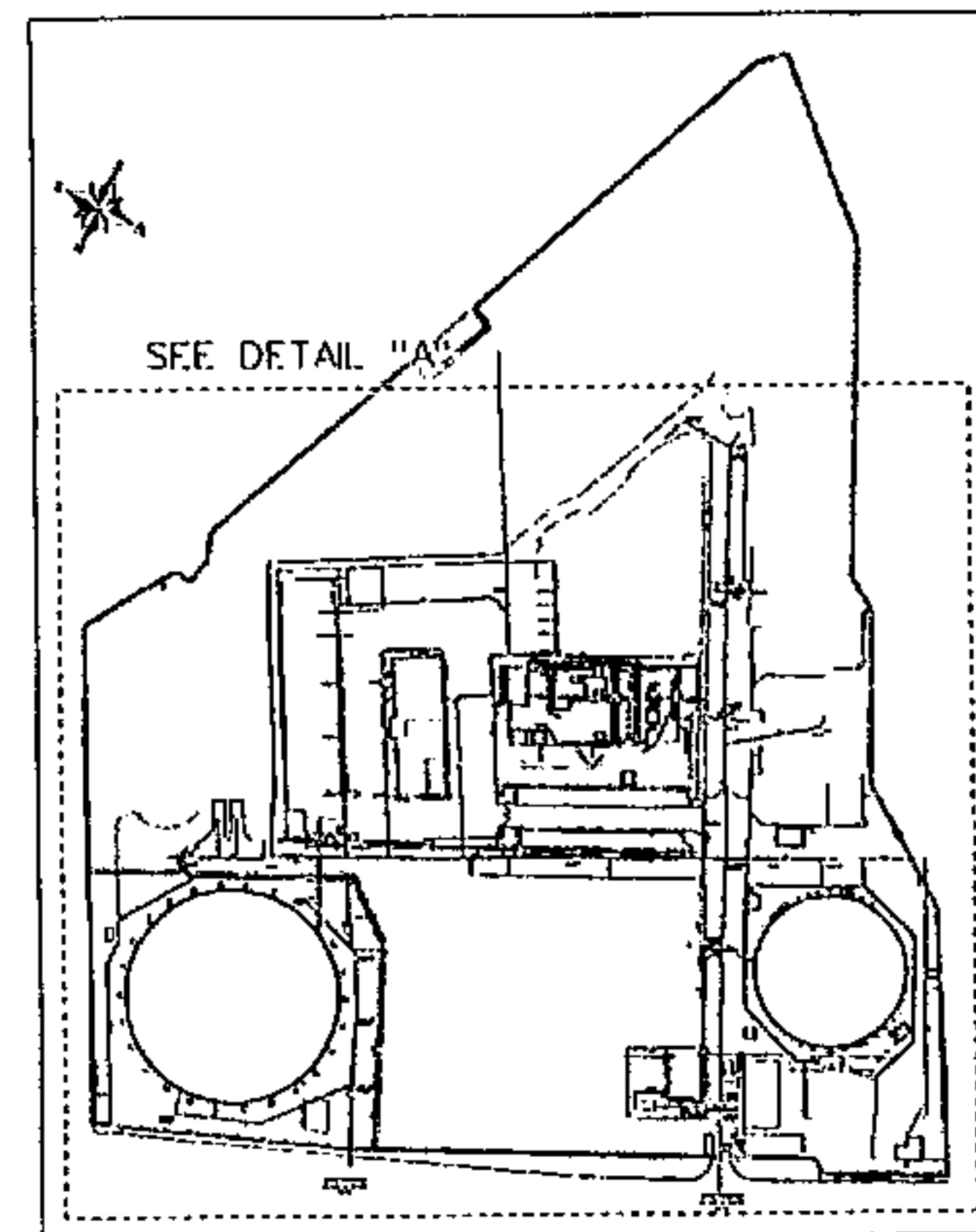
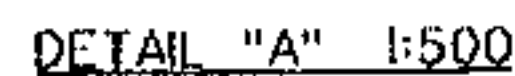
Issuing Office Wastewater Services
Lingley Mere Business Park
Lingley Green Avenue
Great Sankey
Warrington
WA5 3LP

Signed



TRADE EFFLUENT MANAGER
for and on behalf of United Utilities Water PLC

Your attention is drawn to Section 122 of the Water Industry Act 1991 which provides that any person aggrieved by any conditions attached to this Consent may appeal to the Director General of Water Services.



**UNCONTROLLED
WHEN PRINTED**

NOTES:
1. ALL DRAWS SHOULD BE POSITIVELY LOCATED PRIOR TO ANY CONSTRUCTION WORKS.
2. OTHER UNDERGROUND UTILITIES ARE NOT SHOWN.
3. QUALITY CONNECTIONS ARE NOT PROVEN.
4. NOT ALL POT. WATER FEE CONNECTIONS ARE SHOWN.
5. SEE ASSOCIATED MISCOT SHEETS FOR MANDREL DETAILS.
6. SOME INFORMATION DERIVED FROM ARCHIVE DATA.

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BS32 4RZ

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