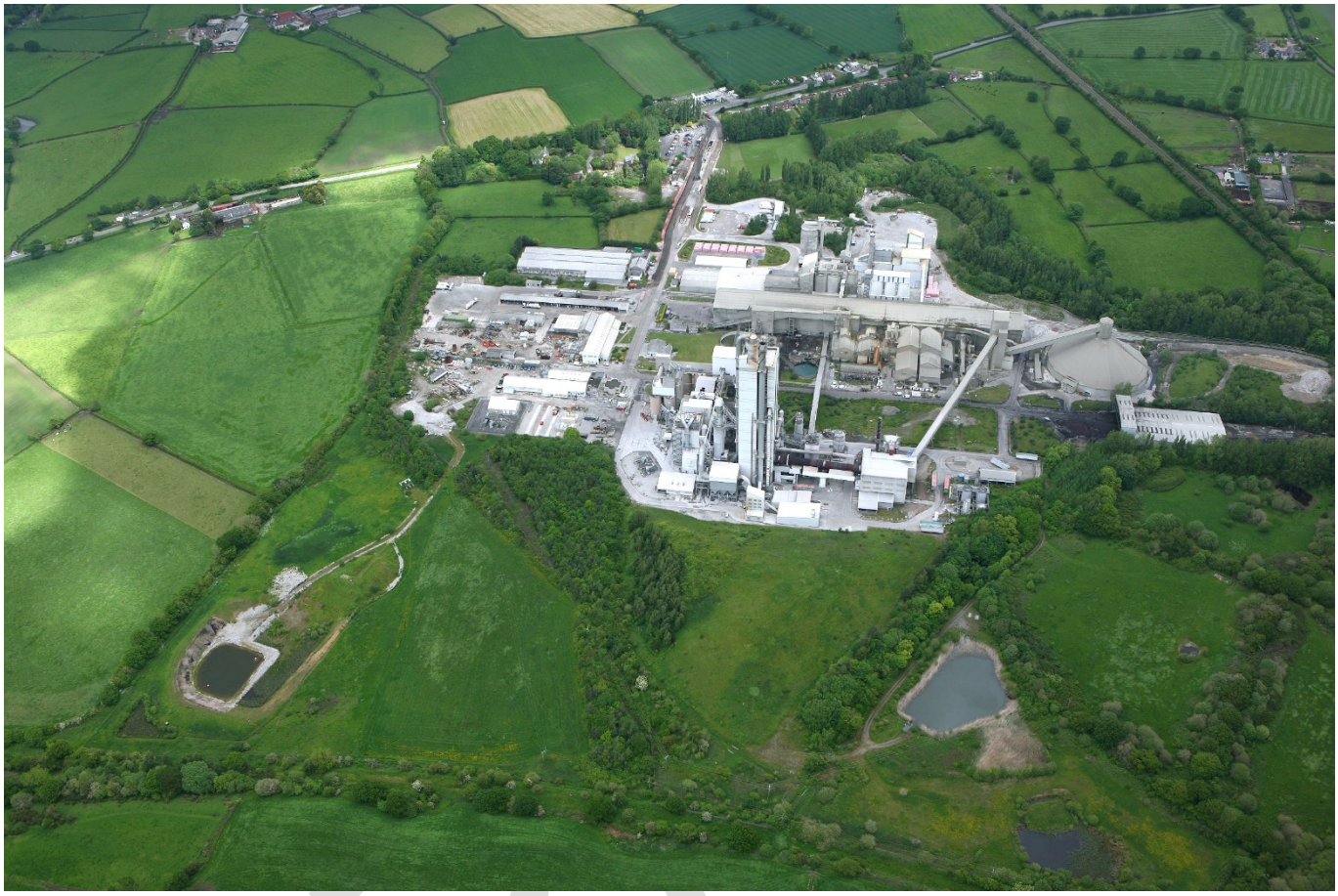

Castle Cement Limited

Carbon Capture and Storage Project – Padeswood, North Wales

Flood Consequences Assessment

663575

June 2024

DNV ISO 9001 · ISO 14001 ISO 45001
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1 INTRODUCTION

1.1.1 RSK Environment Ltd was commissioned by Castle Cement Limited (the 'Applicant') to provide a Flood Consequences Assessment (FCA) to support the planning application at Padeswood Cement Works (the 'Site'). The Site includes the full extent of Castle Cement Limited's land ownership including operational and non-operational land and the Proposed Development. Development proposals include the expansion of the existing operational cement works to include a Carbon Capture Plant, which will compromise of a Combined Heat and Power (CHP) plant and a Post Combustion Carbon Capture and Compression (PCCCC) plant.

1.1.2 The purpose of the FCA is to establish the flood risk associated with the Proposed Development and to propose suitable mitigation, if required, to reduce the flood risk to a more acceptable level. The FCA must demonstrate that the Proposed Development will be safe for its lifetime (for the purposes of the FCA, this is assumed to be 60 years) taking account of the vulnerability of its users, without increasing flood risk elsewhere.

1.1.3 This assessment has been prepared in accordance with the Planning Policy Wales 12[1] and its accompanying Technical Advice Note 15[2], the Interim Code of Practice for Sustainable Drainage[3], BS 8533-2011 Assessing and Managing Flood Risk in Development Code of Practice[4] and the Recommended Non-Statutory Standards for Sustainable Drainage (SuDS) in Wales[5], with site-specific advice from Natural Resources Wales, the Lead Local Flood Authority, the Local Planning Authority, the architect and the Applicant.

1.1.4 It includes a summary of the proposed surface water drainage strategy, showing how Sustainable Drainage Systems (SuDS) have been used to demonstrate surface water is appropriately managed on-site, with the aim that there is no increased risk of flooding on-site or elsewhere as a result of the Proposed Development.

1.1.5 This assessment has been undertaken in consultation with the relevant authorities, and with reference to data, documents and guidance published by Natural Resources Wales, the Lead Local Flood Authority/Local Planning Authority (Flintshire County Council) and the Water Authority (Welsh Water).

1.1.6 The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

[1] https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf

[2] https://www.gov.wales/technical-advice-note-tan-15-development-flooding-and-coastal-erosion

[3] https://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf

[4] https://www.en-standard.eu/bs-8533-2017-assessing-and-managing-flood-risk-in-development-code-of-practice/#:~:text=This%20British%20Standard%20gives%20recommendations,associated%20with%20a%20proposed%20development

[5] https://www.gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf

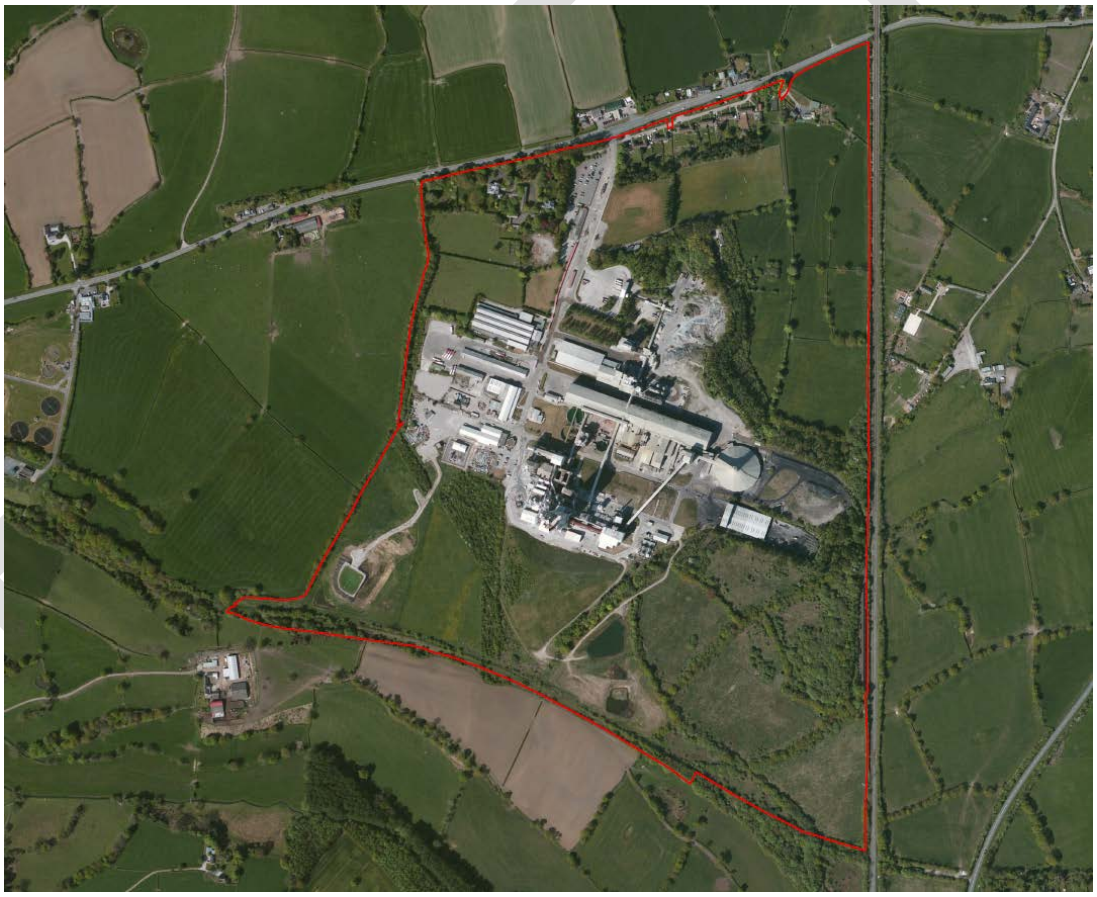
2 SITE DESCRIPTION & PROPOSALS

2.1 Existing Site

Site Description

The Padeswood Cement Works (**Figure 2.1**) is located to the south of Buckley, near Mold, Flintshire, North Wales, CH7 4HB at National Grid Reference SJ 29127 62227, within the administrative boundary of Flintshire County Council. Currently, the Site is an operational cement works and contains infrastructure, plant and machinery to enable operations that include but are not limited to cement kilns, grinding mills and silos as well as several office buildings, workshops and vehicle parking. The Site as defined also includes an area of non-operational land comprising a mixture of uses, including agriculture and residential**.**

Figure 2.1 Site Boundary



2.1.1 The Site is approximately 70.9ha in size and is broadly rectangular in shape with the existing operations in a central belt stretching from the western edge to the eastern edge.

2.1.2 Padeswood Hall Farm, a property owned and leased to private tenants by the Applicant, is located within the Site towards the northern boundary. A second property, Padeswood Hall, is also located within the Site, approximately 100m

west of Padeswood Hall Farm. Padeswood Hall was previously occupied as office accommodation but is currently vacant.

2.1.3 Padeswood Drive, a minor residential road exiting from the A5118, is located within the northern perimeter of the Site and provides access to 12 semi-detached residential dwellings, which are owned by the Applicant and privately rented to residential tenants. Approximately 400m west of the northern corner of the Site and approximately 200m south west of the south western corner of the Site are small farm holdings with several agricultural buildings and sheds.

2.1.4 A small automotive industrial estate is located immediately opposite the main Site access off the A5118. Otherwise, the land surrounding the Site comprises agricultural fields with hedgerow field boundaries and there are several small areas of woodland. Planting has been undertaken in areas of the Site to provide screening to nearby receptors, such as the A5118.

2.1.5 The A5118 runs parallel to the northern boundary of the Site, where the junction for the main Site access is located. The eastern boundary of the Site is aligned with Borderlands railway, running north to south, terminating at Wrexham General to the south and Bidston to the north, for onward connection to Liverpool.

Topography

2.1.6 Levels across the Site range from approximately 105.7m Above Ordnance Datum (AOD) in the west to approximately 107.1m in the east. There are some areas with a greater change in elevation to the east and south; however, they are not used in relation to the operation of the cement works. The topographic survey is included in **Appendix B**.

Existing Drainage

Private

2.1.7 Based on the provided surface water drainage connectivity plans (**Appendix C**) surface water runoff discharges to the private on-site sewer network and is then directed towards the balancing ponds in the southern areas of the Site then discharged to on-site watercourses.

2.2 Development Proposals

2.2.1 The Proposed Development comprises of the following main elements as detailed in **Table 2.2**.

Table 2.1 Full Description of Main Proposed Development's Components

Proposed Development Component	Component Description
Temporary Enabling Development	
Carbon Capture Plant materials laydown and contractors' storage area	This area will be used by the appointed principal contractor for storage of materials, equipment and plant required for the construction phase of the Proposed Development. This area will also be used for the fabrication of large plant, such as the regenerator and absorber columns. This area will be reinstated post-construction.
Carbon Capture Plant contractor village and welfare	This area will be used by the appointed principal contractor for temporary welfare facilities for construction workers. The facilities will include toilet and washing provision, sheltered areas to change and rest and places for workers to prepare food.
Plant shutdown village	This is a temporary working area for use during shutdowns of the existing operational kiln.
Carbon Capture Plant laydown and construction offices	This area will be used by workers for vehicle parking during the construction phase of the Proposed Development. Temporary construction offices will be erected for the duration of the construction period. This area is part of the biodiversity mitigation proposals and will be reinstated and improved post-construction.
Carbon Capture Plant laydown area	This area will be used by the appointed principal contractor for temporary storage and assembly of construction equipment, similar to the Carbon Capture Plant materials laydown and contractors' storage area.
Permanent Enabling Development	
Earth bunding	Earth bunding will be implemented on the northern section of the Site to screen the Proposed Development from residential properties on Padeswood Drive. Bunding will be created using the stripped soil during the construction phase and will be stabilised and landscaped by native planting.
Padeswood Hall	The derelict Padeswood Hall will be demolished as part of the Proposed Development.
Padeswood Hall Farm and all outbuildings	These buildings are set to be demolished as part of the Proposed Development. The Applicant will engage with current tenants at Padeswood Hall Farm to provide ample notice of the works to enable them to make plans

Proposed Development Component	Component Description
	for future housing arrangements. The Applicant will notify the tenants when a local property within the Applicant's company portfolio becomes available.
Carbon Capture Plant site access road	A permanent site access road will be constructed to allow for vehicle access to the Carbon Capture Plant from the A5118. The site access road will use the existing site access from the A5118 then follow the existing track immediately west past Padeswood Hall and Padeswood Hall Farm before following the western perimeter of the Site boundary, heading southwards for approximately 350m to the Carbon Capture Plant.
Site access improvements	Minor modifications will be carried out to the existing site access from the A5118 to facilitate access for construction equipment and vehicles.
Offices and joint control centre	A new building will be constructed and used during the operational phase of the Proposed Development as a base for workers to control the Carbon Capture Plant.
Storm water holding pond	A new storm water attenuation pond will be constructed to serve the Carbon Capture Plant.
General car park	An new car park area for staff, general contractors and visitors to the new Carbon Capture Plant and existing cement works will be constructed.
Pipeline connection point compound ground preparation	A 50m by 28m area located within the north western corner of the Carbon Capture Plant footprint and is designated for the construction of Liverpool Bay CCS Limited's Above Ground Installation (connection point) where the CO_2 transport pipeline will connect the Proposed Development to the HyNet connection point in Northop Hall. Ground will be prepared (vegetation clearance, cut and fill and levelling) to accommodate the installation of the Above Ground Installation.
Carbon Capture Plant	
Instrument air system	Comprising air compressor and air dryer, to provide a clean supply of compressed air for use by various plant control instrumentation such as pneumatic equipment and electrical control valves.

Proposed Development Component	Component Description
Waste heat recovery system	Two heat exchangers will be installed within the existing cement works. One will be installed adjacent to the preheater tower and the second installed at the clinker cooler. They will be used to harvest waste heat for use in the Carbon Capture Plant.
Combined Heat Power plant and associated infrastructure	A Combined Heat Power plant comprising a gas burner and boiler to produce steam, for a steam turbine generator with 15MWe (minimum) and low pressure steam for heating in the PCCCC 83MW (minimum) thermal of installed capacity.
Integrated quencher	An integrated quencher tower will be constructed which cools the gas stream using water and removes particles and aerosols to optimise CO_2 absorption.
Gas-Gas heater	A type of heat exchanger which exchanges the heat from the untreated flue gas upstream of the Integrated quencher to treated flue gas from the Wash tower.
Absorber tower	The CO_2 in the gas stream reacts with the amine solution to capture the CO_2.
Wash tower	The wash tower collects liquid droplets that are transported in the gas stream from the Absorber tower to improve CO_2 capture efficiency and reduce emissions.
CO_2 regenerator column	A cylindrical pressure vessel where the rich amine (amine containing CO_2) is heated to release the CO_2 captured in the Absorber tower.
Compressor house	A building containing a multistage CO_2 compressor to increase pressure for CO_2 pipeline operation.
Pipeline connection point compound	This 50m by 28m area is located within the north western corner of the Carbon Capture Plant footprint and is designated for the construction of Liverpool Bay CCS Limited's Above Ground Installation (connection point) where the CO_2 transport pipeline will connect the Proposed Development to the HyNet connection point in Northop Hall. This Above Ground Installation will tie into the Proposed Development utilities mentioned above i.e. drainage and power. The Above Ground Installation does not form part of this DNS application as permission will be sought by Liverpool Bay CCS Limited at a later date. The land required for the Above Ground Installation is reserved

Proposed Development Component	Component Description
	on the planning drawings submitted with this DNS application.
Flue gas stack	The residual emissions will be released from the new Flue gas stack after the removal of up to 95% of the CO_2.
Hybrid cooling towers	Used to control water temperature to indirectly cool the amine solution sent to the Absorber tower and thus optimise CO_2 capture efficiency.
Piperack and air coolers	Process pipes and cable trays to transfer liquids and power around the Carbon Capture Plant are mounted on the piperack at lower levels. Air coolers are mounted on top of the piperack to reduce cooling water temperature.
Substation	The substation will distribute power to the Carbon Capture Plant from the Combined Heat and Power plant and grid electricity during start up and Combined Heat and Power plant outages.

2.2.2 A Project Layout Plan is presented in **Appendix D** that shows the location and footprint of each of the above components within the Site.

2.2.3 The drainage layout plans are included in **Appendix E**.

3 ENVIRONMENTAL SETTING

3.1 Hydrology

3.1.1 There is an unnamed ditch network spanning the perimeter of the Site boundary. A north–south aligned watercourse runs the length of the western Site boundary. A north-south aligned unnamed watercourse runs through the north east and eastern section of the Site boundary.

3.1.2 A section of watercourse runs from the eastern extent of the existing plant in a south westerly/southern direction. The watercourse turns to the west and runs along the southern boundary, continuing beyond the Site eventually discharging into Black Brook to the west.

3.1.3 There are four artificial ponds/natural ponds and wet areas, which lie in the southern section of the Site boundary. Black Brook lies 325m to the south of the Site boundary. Black Brook is designated a Moderate Overall waterbody under the Water Framework Directive/River Basin Management Plan (Cycle 3 – 2021).

3.1.4 Designated sites Buckley Claypits and Commons Site of Special Scientific Interest and Deeside and Buckley Newt Sites Special Area of Conservation (SAC) lie slightly in excess of 1km to the north of the Site boundary.

3.2 Geology

3.2.1 Based on published geological records for the area (British Geological Survey online mapping), the Site exhibits the following geology:

- Superficial Geology (as illustrated in **Figure 3.1**) :
    - Majority of Site (grey) - Till, Devensian - Diamicton. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.
    - South Western corner (brown) - Head - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

Figure 3.1 Local Superficial Geology

- Bedrock Geology (illustrated in **Figure 3.2**):
    - Northern section (black) – Pennine Middle Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 318 and 309.5 million years ago during the Carboniferous period.
    - Central section (grey) - Pennine Lower Coal Measures Formation - Mudstone, siltstone and sandstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period.
    - South Western/South Eastern sections (red) - Gwespyr Sandstone - Sandstone and argillaceous rocks, interbedded. Sedimentary bedrock formed between 320 and 318 million years ago during the Carboniferous period.

Figure 3.2 Local Bedrock Geology

3.2.2 A number of boreholes are noted on the British Geological Survey GeoIndex, however, these refer to colliery shafts/adits and contain limited geological data.

3.2.3 At the time of writing, no site-specific intrusive ground investigations have been made available for the Site to confirm the underlying geology, potential contamination, permeability or groundwater levels on-site.

3.3 Hydrogeology

3.3.1 Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the Site is underlain by a Secondary (undifferentiated) superficial aquifer. The maps also indicate that the Site is underlain by a Secondary A bedrock aquifer.

4 LEGISLATION AND POLICY CONTEXT

4.1 National Policy

4.1.1 **Table 4.1** provides a summary of the national legalisation and policy context in relation to flood consequences assessments.

Table 4.1 National Legislation and Policy Context

Legislation	Key provisions
Planning Policy Wales (PPW) Edition 12 (Feb 2024)[6]	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. In the exception case where new development is necessary in such areas, the policy framework aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.
Technical Advice Note 15 (2021) [7]	Planning Policy Wales is supported by the Technical Advice Note (TAN) 15, which provide additional guidance on flood risk.
Flood and Water Management Act 2010[8]	This legislation was formally ratified in May 2010 with the aim of implementing the findings of the 2007 Pitt Review (a comprehensive appraisal of all aspects of flood risk management in England with a series of recommendations to Government for future flood risk management) and co-ordinating control of drainage and flood issues. There are a number of increased responsibilities within the Act that affect the adoption of Sustainable Drainage Systems (SuDS) features and the role of Natural Resources Wales to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.
Water Resources Act 1991[9]	Section 24 – Natural Resources Wales is empowered under this Act to maintain and improve the quality of 'controlled' waters (defined as rivers, streams, lakes, canals, coastal waters, estuaries and groundwater). Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters.

[6] https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf

[7] https://www.gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf

[8] https://www.legislation.gov.uk/ukpga/2010/29/contents

[9] https://www.legislation.gov.uk/ukpga/1991/57/contents

Legislation	Key provisions
	Section 88 – Discharge consents are required for discharges to controlled waters.
Water Framework Directive (2000)[10]	The Water Framework Directive requires all inland and coastal waters to reach 'good' chemical and biological status. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by floodwaters. The main impact of the Water Framework Directive on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The Water Framework Directive aims to protect conservation-sites identified by the European Commission Habitats Directive and Birds Directive that have water-related features, by designating them as 'protected sites'.
Planning (Hazardous Substances) (Wales) Regulations 2015[11]	These Regulations consolidate, with amendments, the Planning (Hazardous Substances) Regulations 1992 (S.I. 1992/656) and subsequent amending instruments insofar as they apply to Wales. They also include provision relating to the period for determination of procedure under sections 20 and 21 of the Planning (Hazardous Substances) Act 1990 ("the PHSA"). The regulations outline the quantity of hazardous substances that can be stored on-site prior to the requirement for hazardous substances consent.

4.2 Local Policy

4.2.1 Local policies ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and making development safe without increasing flood risk elsewhere and where possible, reducing flood risk. The Local Development Plan sets out a long term spatial vision, objectives and the planning and development strategy for the county. Relevant policies on flood risk, drainage and hydrology are outlined in **Table 4.2.**

[10] https://www.legislation.gov.uk/ukpga/1991/57/contents

[11] https://www.legislation.gov.uk/wsi/2015/1597/contents/made

Table 4.2 Local Policy Context

LDP document	Key provisions and policies
	EN14: Flood Risk In order to avoid the risk of flooding, development will not be permitted: a) in areas at risk of fluvial, pluvial, coastal and reservoir flooding, unless it can be demonstrated that the development can be justified in line with national guidance and is supported by a technical assessment that verifies that the new development is designed to alleviate the threat and consequences of flooding; b) where it would lead to an increase in the risk of flooding on the Site or elsewhere from fluvial, pluvial, coastal or increased surface water run-off from the Site; c) where it would have a detrimental effect on the integrity of existing flood risk management assets: or d) where it would impede access to existing and proposed flood risk management assets for maintenance and emergency purposes.
a) Flintshire Local Development Plan (2023)[12]	**EN15: Water Resources** Development affecting water resources will only be permitted if: b) it would not have a significant adverse impact on the capacity and flow of groundwater, surface water, or coastal water systems; c) it would not pose an unacceptable risk to the quality of groundwater, surface water, or coastal water; and d) it would have access to adequate water supply, sewerage and sewage treatment facilities which either already exist, or will be provided in time to serve the development, without detriment to existing abstractions, water quality, fisheries, amenity or nature conservation; and e) there is no adverse effect on the integrity of the River Dee and Bala Lake SAC in particular through the treatment of waste water. To ensure no adverse effect on the integrity of the River SAC, development creating waste water discharges will be required to demonstrate there is no increase in phosphorus levels in the SAC. This can be achieved through implementation of mitigation measures and

[12] https://www.flintshire.gov.uk/en/PDFFiles/Planning/Examination-Library-Documents/LDP-Version-8.pdf

LDP document	Key provisions and policies
	associated supplementary planning guidance. Mitigation will involve, either: 1. Delivery of measures specified in the Dee Catchment Phosphorus Reduction Strategy (DCPRS), which will require: i. Developer contributions/community infrastructure levy funds to deliver measures identified within the DCPRS to reduce phosphorus levels within the catchment. ii. Phasing of development to meet the delivery milestones within the DCPRS, and delaying development if milestones have not been met; OR 2. Using alternative mitigation approaches to those mentioned in 1. above. Where further evidence demonstrates that adverse effects on the integrity of the River Dee and Bala Lake SAC can be avoided using alternative mitigation, these must be agreed with the Council, in consultation with Natural Resources Wales.

5 SOURCES OF FLOOD RISK

5.1 Criteria

5.1.1 In accordance with the PPW and advice from Natural Resources Wales, an assessment of the risk associated with various flooding sources is required along with consideration of the effects of climate change over the design life of the Proposed Development (for the purposes of this FCA, this is assumed to be 60 years).

5.1.2 Natural Resources Wales's most recent climate change guidance, published in September 2021[13], should be referenced in order to identify the appropriate peak river flow and rainfall intensity allowances for the scheme. The appropriate allowance for peak river flow is based on the Site's location in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

5.1.3 The flood risk elements that need to be considered for any site are defined in BS 8533[14] as the "Forms of Flooding" and are listed as:

- Flooding from rivers (fluvial flood risk);
- Flooding from the sea (tidal flood risk);
- Flooding from the land;
- Flooding from groundwater;
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from reservoirs, canals and other artificial structures.

5.1.4 The following sub-sections review each of these in respect of the Site.

5.2 Definitions of Risk

5.2.1 The categories of flood risk are outlined in the Tables below, taken from the Natural Resources Wales definitions for sources of flood risk. The Development Advice Map zones in **Table 5.1** have been included to reflect current guidance, however the Development Advice Map is set to be replaced by the Flood Map for Planning ,as outlined in **Table 5.2**. The Flood Risk Assessment Wales maps have been included and outlined in **Table 5.3**, although these maps have no official status for planning purposes. The flood risk category matrix for reservoirs, groundwater, sewers and other artificial sources is presented in **Table 5.4.**

[13] https://www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

[14] https://www.en-standard.eu/bs-8533-2017-assessing-and-managing-flood-risk-in-development-code-of-practice/#:~:text=This%20British%20Standard%20gives%20recommendations,associated%20with%20a%20proposed%20development

Table 5.1 Development Advice Map Zones

Flood Zone	Description
Zone A	Considered to be at little or no risk of fluvial or coastal/tidal flooding
Zone B	Areas known to have flooded in the past
Zone C1	Areas of floodplain served by significant infrastructure, including flood defences
Zone C2	Areas of floodplain without significant flood defence infrastructure

Table 5.2 Flood Map for Planning Flood Risk from Rivers, Flood Risk from the Sea and Flood Risk from Surface Water & Small Watercourses

Flood Zone	Description
Rivers	
Flood Zone 1	Areas with less than 0.1% chance of flooding from rivers in a given year.
Flood Zone 2	Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
Flood Zone 3	Areas with more than 1% (1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
Rivers & Sea	
Flood Zone 1	Areas with less than 0.1% chance of flooding from rivers and sea combined in a given year.
Flood Zone 2	The combined 0.1% risk of flooding from rivers and the sea including climate change.
Flood Zone 3	The combined 1% risk of flooding from rivers and the sea including climate change.
Sea	
Flood Zone 1	Areas with less than 0.1% chance of flooding from the sea in a given year.
Flood Zone 2	Areas with 0.1% to 0.5% (1 in 1000 to 1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.

Flood Zone	Description
Flood Zone 3	Areas with more than 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
Surface Water and Small Watercourses	
Flood Zone 1	Areas with less than 0.1% chance of flooding from surface water in a given year.
Flood Zone 2	Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
Flood Zone 3	Areas with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change

Table 5.3 Flood Risk Assessment Wales Map for Rivers, and Surface Water & Small Watercourses, and the Sea.

Flood Zone	Description
Rivers and Surface Water and Small Watercourses	
High	'High' risk means that each year, this area has a chance of flooding of greater than 1 in 30 (3.3%)
Medium	'Medium' risk means that each year, an area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
Low	'Low' risk means that each year, an area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).
Sea	
High	'High' risk means that each year, this area has a chance of flooding of greater than 1 in 30 (3.3%)
Medium	'Medium' risk means that each year, an area has a chance of flooding of between 1 in 200 (0.5%) and 1 in 30 (3.3%).
Low	'Low' risk means that each year, an area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 200 (0.5%).

Table 5.4 Flood Risk Category Matrix from Reservoirs, Groundwater, Sewers and Other Artificial Sources

Threat Probability	Low Impact	Medium Impact	High Impact
High	Medium	Medium	High
Medium	Low	Medium	Medium
Low	Low	Low	Low
Very Low	Very Low		

5.3 TAN 15 Justification Test

5.3.1 TAN15[15] provides technical guidance on flood risk and development which supplements the policy set out in PPW 12[16].

5.3.2 In line with Figure 2 of TAN15, the development category for the Proposed Development is 'Less Vulnerable Development', which includes all general industrial development.

Justification Test

5.3.3 New development[17] proposed for Flood Zone C is required to show compliance with the justification test set out in TAN15 and PPW. The Proposed Development is not required to apply this test as the Site is located entirely within Flood Zone A, as outlined in **Section 5.4**.

5.4 Flooding From Rivers (Fluvial Flood Risk)

5.4.1 The Welsh Government Development Advice Maps (**Figure 5.1**) shows that the Site is designated as Zone A. As noted in **Table 5.1**, Zone A refers to a site which is considered to be at little or no risk of fluvial or coastal/tidal flooding. It is noted there is minor encroachment of Zone B at the south-western corner of the Site within the red line boundary, the development extents shown in **Appendix D**, confirm there is no development proposed within this area of Zone B.

5.4.2 The Natural Resources Wales 'Flood Risk from Rivers' map shows the extents of flooding from rivers designated as 'Main Rivers' by Natural Resources Wales.

[15] https://www.gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf

[16] https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf

[17] Excluding "highly vulnerable development" and Emergency Services which cannot be permitted in Zone C2. The Proposed Development does not include these kinds of development.

The flood map for planning (**Figure 5.2**) indicates that the Site is located within Flood Zone 1 once the mapping comes into operation.

5.4.3 According to the Flood Risk Assessment Wales mapping in **Figure 5.3**, the Site (and therefore the Proposed Development) is outside of the high-low flood risk categories and is therefore classified as very low risk.

Figure 5.1 Development Advice Map (accessed Feb 2023)

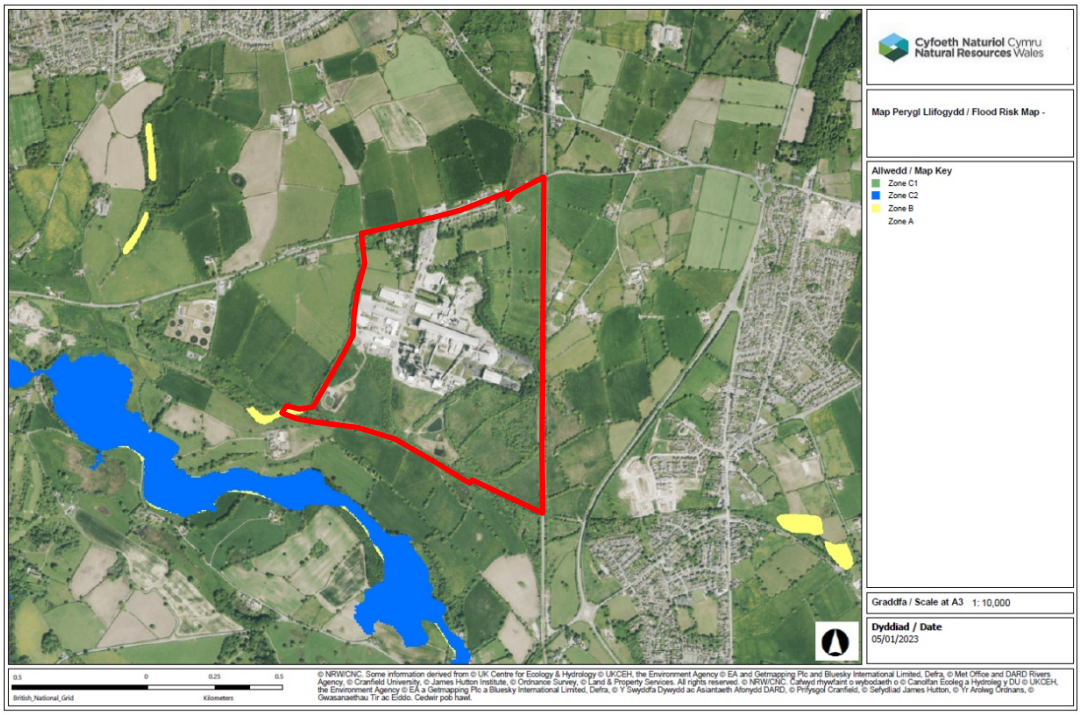


Figure 5.2 Natural Resources Wales Fluvial Flood Map for Planning (accessed April 2024)

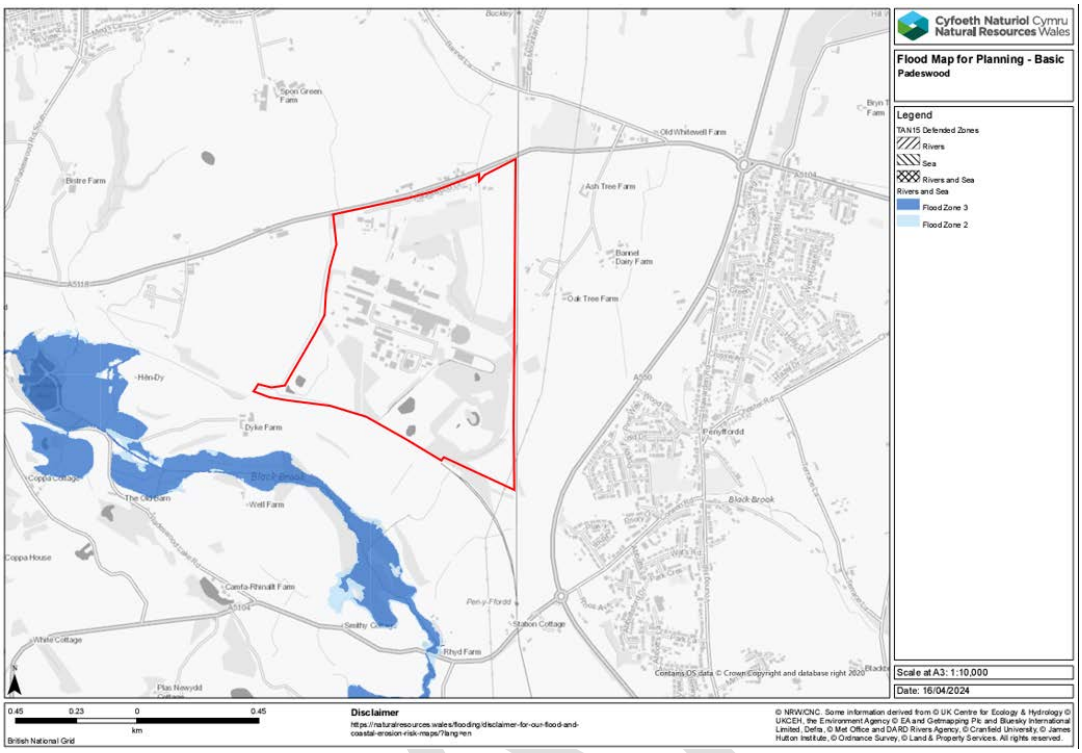
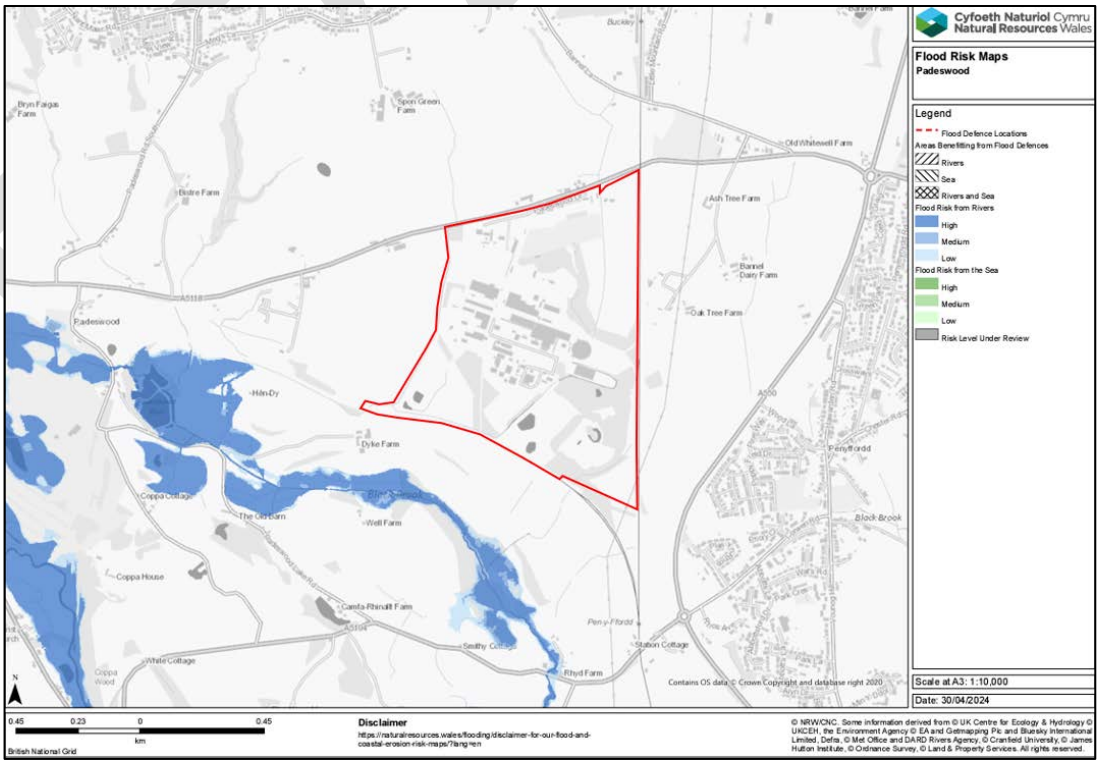


Figure 5.3 Flood Risk Assessment Wales Map (accessed April 2024)



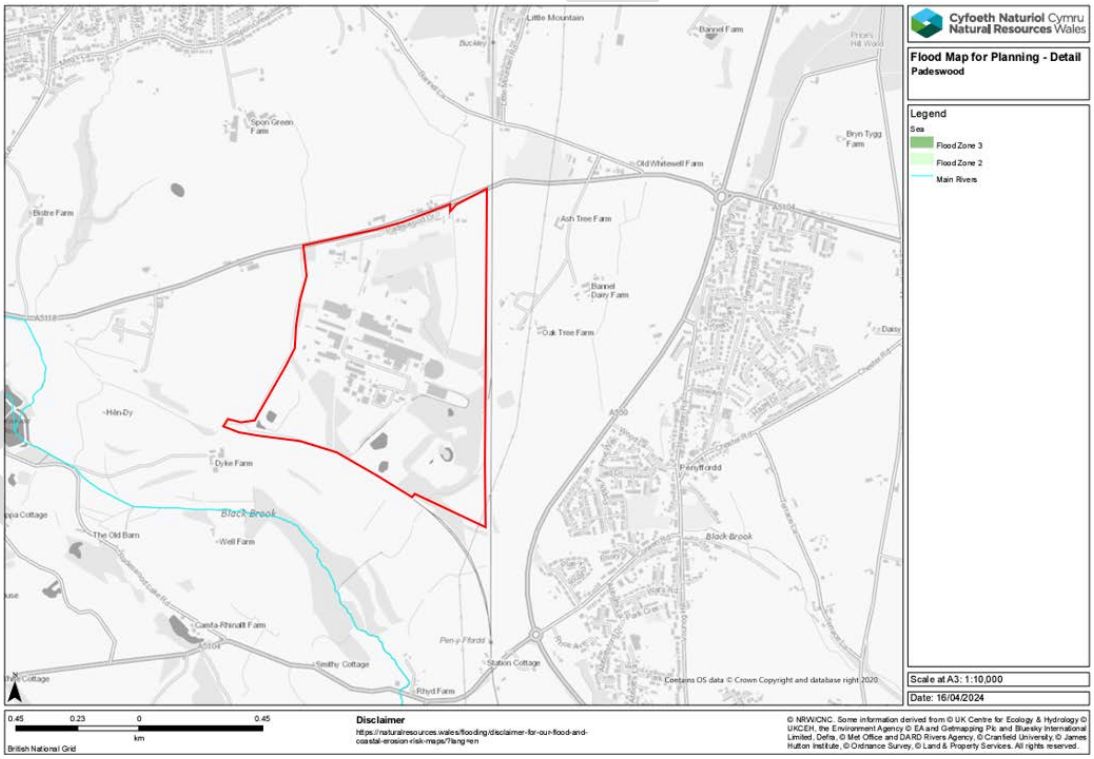
Climate Change

5.4.4 Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks. However, the impact of climate change on fluvial flooding at the Site is considered to be low as the Site is not adjacent to the Fluvial Flood Zones 2 or 3 and is not in an area shown to have flooded previously. The Site is located at a higher elevation than the main watercourses to the south, so even if these areas of flood extents expand in future due to climate change, then the Site is still unlikely to be vulnerable to fluvial flooding.

5.5 Flooding From Sea (Tidal Flood Risk)

5.5.1 The Natural Resources Wales tidal flood risk map (**Figure 5.4**) shows the Site to be located outside the area at risk of tidal flooding. This is further confirmed by the mapping shown in **Figure 5.3** for the Flood Risk Assessment Wales map. Therefore, tidal flood risk is very low.

Figure 5.4 Natural Resources Wales Tidal Flood Map (Accessed April 2024)



Climate Change

Due to its inland and elevated location, climate change impacts upon the tidal flood risk to the Site will be negligible.

5.6 Flooding From Surface Water and Small Watercourses

5.6.1 If, for a variety of reasons, intense rain is unable to soak into the ground or be carried through man-made drainage systems, it can run off over the surface causing localised floods before reaching a river or other watercourse.

5.6.2 Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur. Excess surface water flows from the Site drain naturally to the local water features, either via the on-site drainage network, via overland flow or through infiltration.

5.6.3 Natural Resources Wales's surface water and small watercourses flood map (**Figure 5.5**) shows that the Site contains areas at a low – high risk of surface water flooding, with the Site located within surface water Flood Zones 1, 2 and 3. The flood maps are based on nationalised modelling of overland pathways and assessed using digital elevation models derived from LiDAR data sets for the topographical inputs into the modelling. The modelling is not site-specific and does not account for drainage infrastructure.

5.6.4 The area of risk has been compared with the development plan from **Appendix D** and presented in **Figure 5.6** as a simple overlay for a visual comparison. The mapping shows the greatest extents of risk are located centrally within the Site where there is no further development proposed. The surface water flooding shown on the flood mapping will be, to an extent, intercepted and drained by the existing private surface water drainage system as shown in **Appendix C**. Therefore, flooding shown on the mapping may appear greater than would be expected to occur on-site.

5.6.5 A linear band of surface water flood risk extends southwards from the central area of risk, suggesting an overland flow path through the Proposed Development. It is assumed that the proposed road network around the periphery of the Proposed Development will interrupt this flow path and cause surface water flows to route south eastwards around the Site and onwards into the southern Site boundary watercourse.

5.6.6 There is some surface water flooding at the southern Site boundary associated with the small watercourse located there. The surface water flooding shown on the plan appears to encroach into the southern extents of the Proposed Development, however the drainage engineering layout in **Appendix E** would suggest that there is at least a 2.4m elevation difference between the watercourse and Proposed Development as indicated by the 97.5mAOD and 99.9mAOD design elevation levels.

5.6.7 The surface water flood risk at the north of the Site shows that the proposed sports ground to the north east is within surface water Flood Zone 2 and 3, whilst

the proposed carpark and temporary construction offices to the north west are within surface water Flood Zone 2.

5.6.8 The Flood Risk Assessment Wales map (illustrated in **Figure 5.7**) largely aligns with the mapping identified in the Natural Resources Wales surface water and small watercourse flood map. However, unlike the Natural Resources Wales map, the Flood Risk Assessment Wales map does not include expected increases in flood risk from climate change so the risk shown on Site is marginally lower in that map.

5.6.9 Overall, given the non-residential classification of the Proposed Development, and the mitigation features in place such as positive drainage for the centrally located risk, and the proposed embankment at the southern Site boundary, the overall surface water flood risk is considered to be low risk.

Figure 5.5 Natural Resources Wales Surface Water Flood Map (Accessed April 2024)

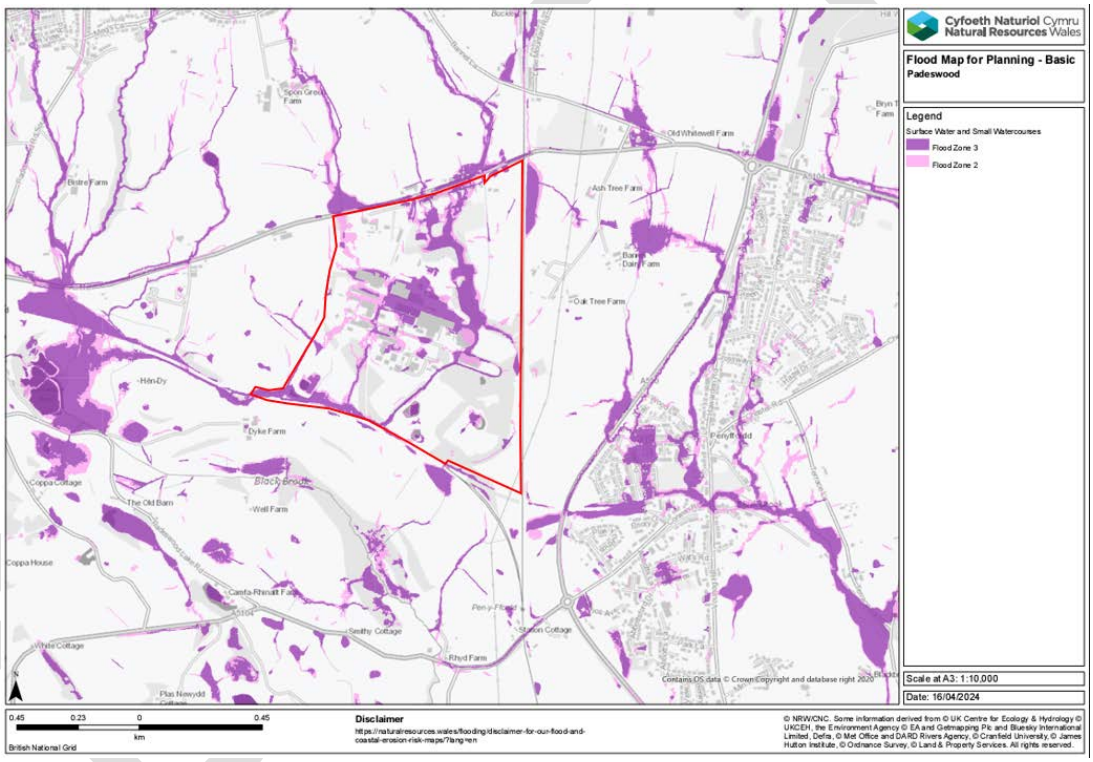


Figure 5.6 Surface Water Flood Map with the Proposed Development layout (Accessed April 2024)

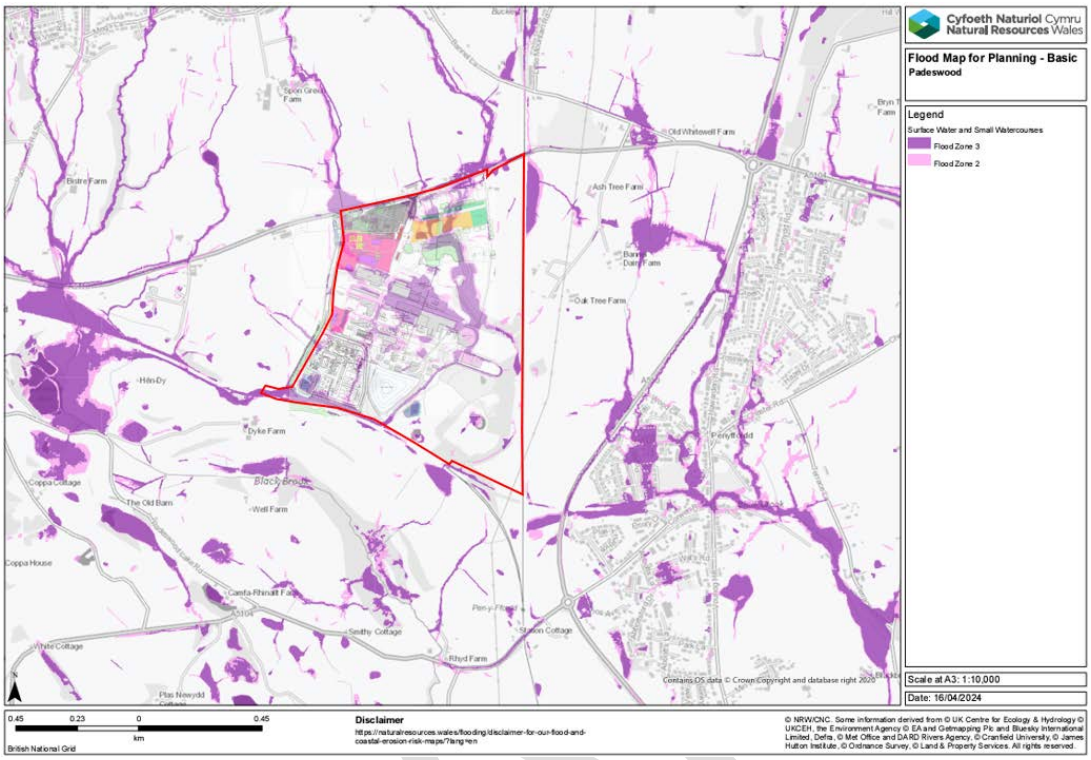
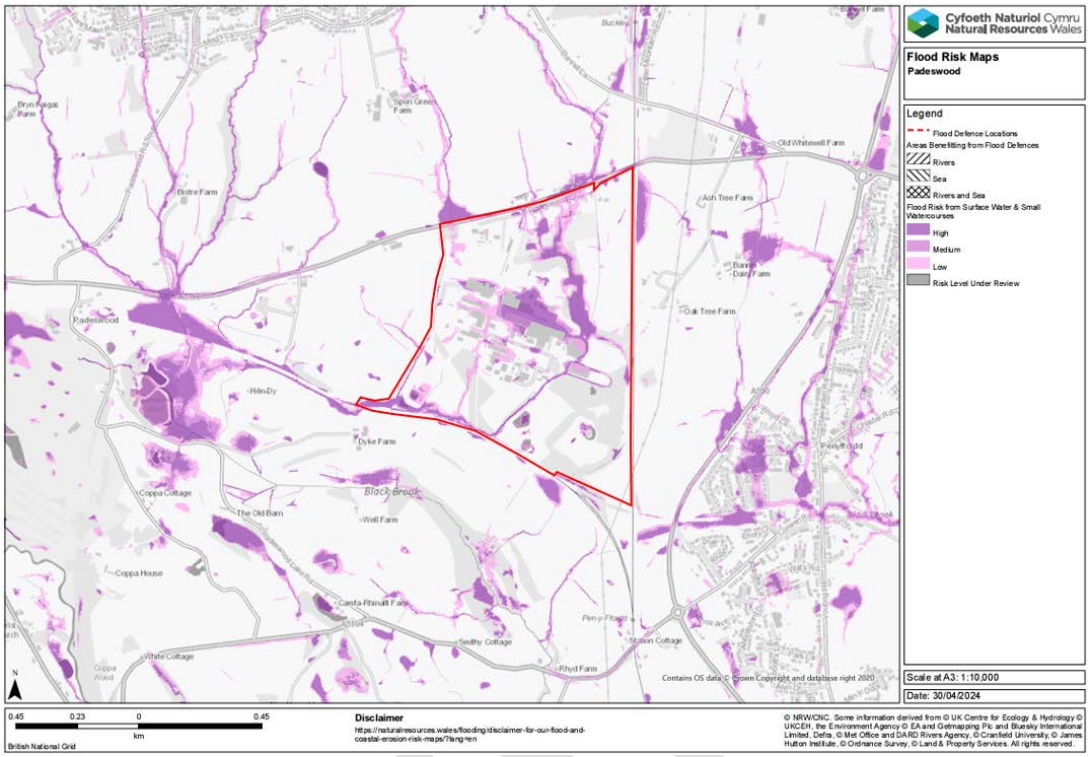


Figure 5.7 Flood Risk Assessment Wales – Surface Water and Small Watercourses Map (Accessed April 2024)



Climate Change

5.6.10 Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. Climate change is taken into account in the Flood Zone mapping in **Figure 5.5** which shows marginal changes to present day flood extents in Flood Risk Assessment Wales mapping in **Figure 5.7**.

5.6.11 The impact of climate change on pluvial flooding at the Site is considered to be low as the drainage strategy will account for a climate change factor.

5.7 Flooding From Groundwater

5.7.1 Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths anyway, but during

very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

5.7.2 The Strategic Flood Consequence Assessment[18] (SFCA) mapping shows that the Site does not lie within an area of potential groundwater flood risk. Therefore, the risk of groundwater flooding affecting the Site is considered low.

Climate Change

5.7.3 Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk is likely to be low.

5.8 Flooding From Sewers

5.8.1 Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

5.8.2 Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption[19]. One of the design parameters is that sewer systems be designed such that no flooding of any part of the Site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage.

5.8.3 The Site contains a complex and long-established existing private surface water drainage network which exists throughout the entirety of the Site. The SFCA does not map any sewer flooding reports in the vicinity of the Site, with the closest records shown to be within the area of Penyffordd to the east.

5.8.4 To ensure that sewer and surface water flooding is not exacerbated; surface water must be considered within the design of the Proposed Development. This ensures that any additional surface water and overland flows are managed correctly, to minimise flood risk to the Site and the surrounding area. Any new surface water network on the Site should be designed to ensure exceedance of

[18] https://www.flintshire.gov.uk/en/PDFFiles/Planning/Evidence-Base-Documents/Natural-Built-Environment/LDP-EBD-EN1-Strategic-Flood-Consequences-Assessment-Final-Report-2018.pdf

[19] https://www.water.org.uk/wp-content/uploads/2018/10/SfA-8-Master-2.pdf

the network has been considered, with any surface water exceedance being restricted to the on-site areas.

5.8.5 The residual sewer flood risk posed to the Site will remain low.

Climate Change

5.8.6 The impact of climate change is likely to be generally negative regarding flooding from sewers. Increased rainfall and more frequent flooding associated with climate change will put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and potential flooding. This would increase the frequency of local sewer flooding but would not be significant in terms of the Proposed Development given the current low flood

risk of sewer flooding at the Site, and the controls on developments to avoid exceeding the network capacity.

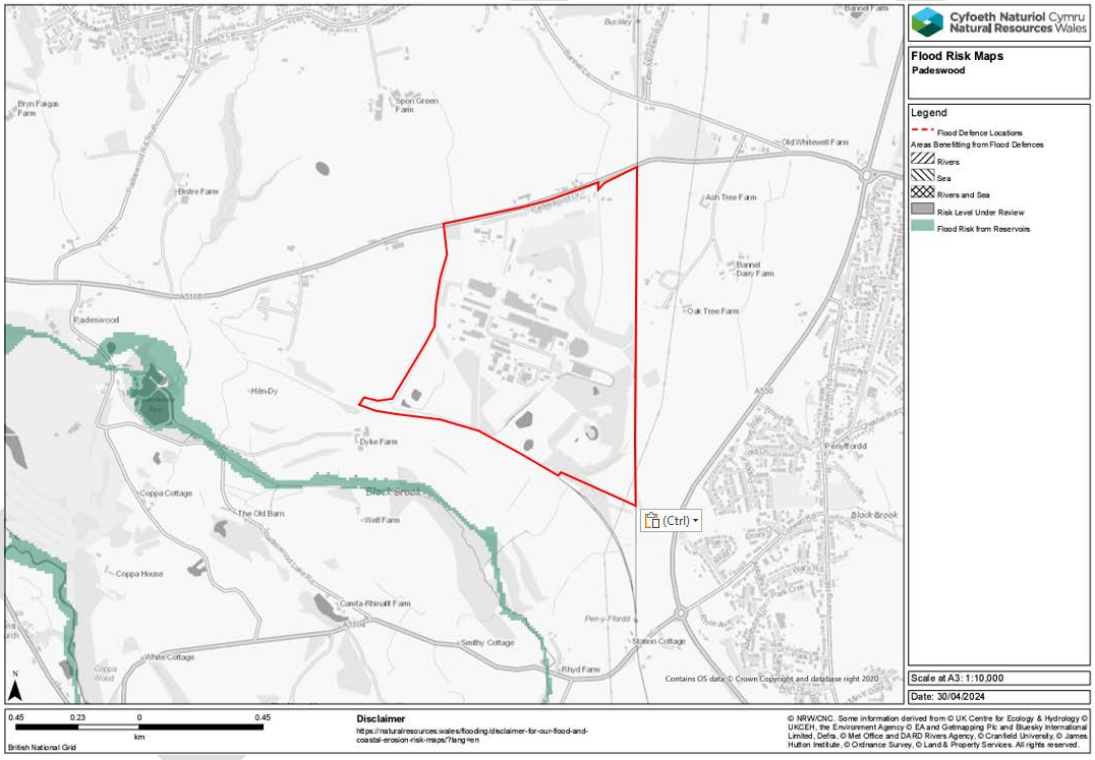
5.9 Reservoirs

5.9.1 Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

5.9.2 Reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then, reservoir safety legislation has been introduced to ensure reservoirs are maintained.

5.9.3 The reservoir flood map for planning (**Figure 5.8**) shows that the Site is not in an area at risk of flooding from reservoir flooding and as such is considered at a very low risk from this source.

Figure 5.8 Reservoir Flood Risk Map (accessed April 2024)



Climate Change

5.9.4 Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased

rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for the Site.

5.10 Canals

5.10.1 There are no Canal & River Trust owned canals within the vicinity of the Site, therefore no flood risk is attributed to this source.

5.11 Flood Risk Resulting From the Proposed Development

5.11.1 The Proposed Development will use the latest best practice guidance to ensure that flood risk is not increased as a result of the Proposed Development. Sections of the Proposed Development are located on an area of existing hardstanding, as such will not contribute additional runoff into the drainage systems, whilst other sections (CHP and PCCCC plant) are located on areas of soft landscaping. Whilst it is acknowledged that there is a pluvial risk/risk of flooding from small watercourses to sections of the Site, this will not be increased to the Site or the surrounding area as a result of the development through the incorporation of relevant mitigation as outlined in **Section 6** and **8** and in the accompanying surface water drainage strategy which forms part of the planning application.

6 MITIGATION MEASURES AND RESIDUAL RISK

6.1 Finished Development Levels

6.1.1 As this Site is unlikely to be affected by fluvial flooding, there is no need to incorporate any freeboard levels into the finished floor levels of the design. Low lying areas that could lead to ponding of surface flows will be avoided by careful design of finished levels.

Construction Mitigation

6.1.2 Construction mitigation is secured through the production of an Outline Construction Environmental Management Plan (OCEMP), which identifies good working practices in line with appropriate standards. Mitigation is outlined within the OCEMP provided with this planning application (as provided in **Volume 4, Technical Appendix 2.1**).

6.2 Easements and Consents

6.2.1 Under the Water Resources Act 1991[20] and associated bylaws works in, over, under or adjacent to ordinary watercourses will require Lead Local Flood Authority or Local Planning Authority consent. This is to ensure that they neither interfere with the required Lead Local Flood Authority or Local Planning Authority's work nor adversely affect the environment, fisheries, wildlife and flood defence in the locality.

6.2.2 Due to the presence of Ordinary Watercourses within the vicinity of the Site, the Lead Local Flood Authority will require consent for any works within the proximity of any watercourse and may also require specific easements adjacent to these watercourses.

6.2.3 Any consent works usually take place post planning, prior to construction, however, the principles of any development within the appropriate easements should be agreed at the planning stage.

6.3 Safe Access/Egress

6.3.1 As the Site lies outside of the 1 in 1000 year fluvial/tidal flood extent, safe access and egress will be available even during the most extreme flooding scenarios.

[20] https://www.legislation.gov.uk/ukpga/1991/57/contents

7 PROPOSED DEVELOPMENT ACCEPTABILITY

7.1 Proposed Development Justification

7.1.1 The Site is located within an area designated as Zone A/Flood Zone 1 (Rivers and The Sea) according to the Development Advice Map and pending Flood Map for Planning. Using the criteria set out in TAN15[21], as detailed in **Section 5.1**, the Proposed Development would be deemed to be acceptable.

[21] https://www.gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf

8 SURFACE AND FOUL WATER DRAINAGE ASSESSMENT

8.1 Scope

8.1.1 The Site is located in Development Advice Map Zone A/Flood Zone 1 and is greater than 1ha in size, therefore Natural Resources Wales and Flintshire County Council policies only require such development to focus on the management of surface water run-off. This section discusses the potential quantitative effects of the Proposed Development on both the risk of surface water flooding on-site and elsewhere within the catchment, as well as the type of potential SuDS features that could be incorporated as part of the masterplan.

8.1.2 In accordance with the Sustainable Drainage (SuDS) Statutory Guidance[22], the surface water drainage strategy should seek to implement a SuDS hierarchy that aspires to achieve reductions in surface water runoff rates to greenfield rates. Where a reduction to greenfield rates is not practicable, the proposed surface water drainage strategy should not exceed the existing runoff rate.

8.1.3 In addition, Welsh Government SuDS Statutory Guidance[23] requires that the first choice of surface water disposal should be to discharge to an adequate soakaway or infiltration system, where practicable. If this is not reasonably practicable then discharge should be to a watercourse, the least favourable option being to a sewer (surface water sewer is prioritised over combined sewer). Infiltration techniques should therefore be applied wherever they are appropriate.

8.1.4 This section has been written in conjunction with the drainage engineering drawings provided in **Appendix E** and the Site Drainage Technical Note (report number Rev A: 215000-00190-000-CI-TEN-00001, 20 February 2024) which has been provided in **Appendix F**. The drainage proposals are indicative and subject to change as additional detail is provided as part of the Full Application Approval of SuDS.

8.2 Off-site Discharge Options and Limits

Infiltration

8.2.1 In accordance with the SuDS Statutory Guidance, infiltration should be considered as the primary option to discharge surface water from the developed site. The effectiveness of infiltration is completely dependent on the physical conditions at the Site.

8.2.2 It is concluded in Section 5 paragraph 6 of the Site Drainage Technical Note (February 2024) that, based on the results of a desktop study, there is potential

[22] https://www.gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf

[23] https://www.gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf

to utilise infiltration drainage to the ground at the north of the Site at a rate of 10mm/h.

Discharge to Watercourse

8.2.3 In addition to the potential for infiltration drainage to the north of the Site, discharging surface water directly to a local watercourse is considered feasible for the Site, as there are ordinary watercourses surrounding the Site, ultimately conveying flow south towards Black Brook.

8.2.4 The off-site ordinary watercourses may capture any surface water runoff generated from the Site and provide feasible discharge points.

Discharge to Surface Water Sewer

8.2.5 There are a number of private surface water sewers located on-site (**Appendix C**) which serve the existing cement works. Due to their location, the enabling development could connect into the existing drainage sewer features to reach the outfalls from the Site although will still ultimately discharge to the watercourse after a short distance.

8.3 Post-development Situation

Discharge Rate

8.3.1 The existing site area is 70.9ha and is a combination of the existing operational cement works and the peripheral green/undeveloped areas.

8.3.2 The pro-rata Institute of Hydrology (IoH) 124 method[24] has been used to estimate the greenfield surface water runoff for 1ha of the Site (refer to **Table 8.1**). Calculations are contained in **Appendix G**.

Table 8.1 IOH 124 Surface Water Runoff (Greenfield) for 1ha

Return period	Peak flow (l/s)
QBar*	5.47
1 in 1 year	4.81
1 in 30 year	9.74
1 in 100 year	11.93

*mean annual maximum flow rate

8.3.3 The discharge from the Proposed Development areas will not exceed the equivalent greenfield QBAR rate. The design calculations in Appendix A of the

[24] https://nora.nerc.ac.uk/id/eprint/7367/1/IH_124.pdf

Site Drainage Technical Note (February 2024) show that a developable area of 4.1ha which approximately equates to the proposed discharge rate of 22.9litres per second (l/s) as outlined in Section 10 paragraph 1 of the technical note.

Proposed Drainage Strategy

8.3.4 The surface water drainage strategy has been shown on the drainage engineering drawings in **Appendix E** and principles outlined in the Site Drainage Technical Note (February 2024) in **Appendix F**.

8.3.5 Drawings 215000-00190-000-CI-DDR-00001 (Rev B) and 215000-00190-000-CI-DDR-00002 (Rev B) show that the main compound area will drain towards the stormwater holding pond towards the southern boundary of the Site. The stormwater holding pond is in part created from the existing holding pond in the same location, however additional volume is required to achieve sufficient attenuation and has been planned for as part of the Proposed Development.

8.3.6 Runoff into the stormwater holding pond will pass through a Class 1 interceptor on the northern side of the pond before the pond inlet. Measures to prevent oily water contaminating the surface water runoff are outlined in Section 7 of the technical note and runoff from these areas will be treated separately at the oil water separator. A penstock valve at the holding pond outlet has been included to shut off discharge to the environment in the event of a fire and fire water contamination as outlined in Section 5.1 of the technical note.

8.3.7 Once water quality is ensured, the holding pond will discharge to the watercourse at the controlled rate to the southern boundary of the Site as per the existing scenario.

8.3.8 The surface water drainage attenuation has been designed to include a 40% climate change allowance (upper estimate) in line with government guidance for climate change allowances[25]. The attenuation caters for the 1 in 100 year event plus climate change allowance without flooding. Surface water calculations for the storage estimation are included in Appendix A of the technical note.

8.3.9 Drawing 215000-00190-000-CI-DDR-00004 (Rev A) outlines the drainage for the car parks to the north of the Site. As outlined in the technical note, Section 5 paragraph 6, the car park will drain towards soakaways with a design infiltration rate of 10mm/h. There will be two soakaways to accommodate the runoff, the design dimensions of which are detailed on the drawing.

8.3.10 Drawing 215000-00190-000-CI-DDR-00005 (Rev A) shows the drainage from the new access road which connects the north side of the Site to the Proposed Development at the south side. The drainage strategy for this road is outlined in Section 5 paragraph 5 of the technical note which explains the road will drain via

[25] https://www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

gullies to outer kerbs and discharge direct to the ditch running along the western edge of the road.

8.4 SuDS Application

8.4.1 The Proposed Development must demonstrate compliance with the Statutory SuDS Standards[26] for the design, construction, operation and maintenance and operation of surface water systems serving new developments. There are 6 Standards outlined in the guidance, these are guided by a list of Principles which underpin the design of surface water management schemes to meet the Standards.

8.4.2 The surface water drainage design for the Proposed Development will be led by what can be practically achieved within the development boundaries. The 6 Standards and notes on compliance based on the current proposals are outlined below.

Standard 1 – Surface Water Runoff Destination

8.4.3 This Standard addresses the use of surface water by the Proposed Development and where it should be discharged. This Standard is assessed as a hierarchy. The hierarchy has been applied in **Section 8.2** which outlines that infiltration is feasible at the north side of the Site based on a desk study. The drainage for the proposed carparking (General Car Park) within the Proposed Development at the north side of the Site is proposed to discharge into soakaways for infiltration at an infiltration rate deemed appropriate for this area of the Site.

8.4.4 Infiltration was not assessed as feasible for the south side of the Site. The runoff from the Proposed Development along the access road and south compound will therefore drain to the local watercourses (via a stormwater holding pond in the case of the Carbon Capture Plant).

Standard 2 – Surface Water Runoff Hydraulic Control

8.4.5 This Standard applies to discharges to surface water bodies, surface water sewers or combined sewerage systems. This Standard has been applied in **Section 8.3** which has outlined that the Proposed Development should discharge at QBAR greenfield runoff rates for the equivalent developable area. The requirement for attenuation to meet this Standard has been considered and attenuation estimates provided within the Site Drainage Technical Note (February 2024) in **Appendix F**. The attenuation estimates include for the 1 in 100 year storm event with an inclusion for 40% climate change increase to rainfall.

Standard 3 – Water Quality

8.4.6 This Standard encourages the treatment of surface water runoff to prevent negative impacts on the receiving water quality and protection of the downstream

[26] https://www.gov.wales/sites/default/files/publications/2019-06/statutory-guidance.pdf

drainage systems including sewers. The use of SuDS should aim to effectively manage sediments and other pollutants so discharge will be an acceptable water quality and will not cause a pollution risk. In the Site Drainage Technical Note (February 2024), Section 5 outlines the elements of the Proposed Development with non-potentially contaminated storm water. These are defined as the access roads, internal roads within the Carbon Capture Plant, and the new General Car Park.

8.4.7 Potentially contaminated storm water is outlined in Section 6 of the technical note which explains that tank dykes for areas of potentially significant contamination will be utilised. The valves for the outlets to main stormwater drainage will normally be closed, and following rainfall the water will be tested and non-contaminated water allowed to discharge on towards the stormwater holding pond.

8.4.8 Areas of potentially oily water will be treated separately as explained in Section 7 of the technical note. These are outlined as the pumps, compressors and transformers. The oily water will be collected and segregated by kerbs and drained to an oil water separator.

8.4.9 For an additional safety measure, a penstock valve will be fitted at the outlet of the holding pond set to automatically close in the event of a fire as outlined in Section 5.1 of the technical note. This will enable any fire contaminated water to be contained and treated in the pond prior to discharge to surrounding watercourse.

8.4.10 Overall, with the mitigation features outlined in the technical note, it is assessed that the Proposed Development's drainage meets Standard 3.

Standard 4 – Amenity

8.4.11 This Standard encourages providing amenity through the use of sustainable drainage that integrates the surface water drainage function with open space and recreation opportunities where possible. SuDS should aim to make the most of surface water runoff as a resource by either harvesting it for non-potable consumption or infiltration into the ground, or by using it as a recreational, educational and/or amenity resource.

8.4.12 Within the areas of car parking to the north of the Site, infiltration is proposed, therefore providing an amenity benefit through contributions to groundwater recharge.

8.4.13 The Proposed Development does not include for the amenity value of SuDS given the spatial constraints within the Site boundary and the industrial nature of the Site. The Proposed Development would not benefit from the amenity value of SuDS given the Site is within private land and public access is restricted.

Standard 5 – Biodiversity

8.4.14 This Standard provides that biodiversity benefits will usually be best achieved by drainage systems which are on the surface and visible with vegetated

components, forming part of the local green infrastructure and local ecosystem structure.

8.4.15 The Proposed Development does not include for vegetated components at the surface due to spatial constraints within the Site and due to the industrial nature of the Proposed Development. The provision of biodiversity enhancing SuDS within the Site would be limited by the nature of the industrial uses within the Site. This means that the basin will remain unvegetated given the requirement to retain fire water runoff in the event of a fire.

Standard 6 – Design of Drainage for Construction, Operation and Maintenance and Structural Integrity

8.4.16 This Standard provides that the design should take full account of the method of construction, including any specific programming requirements, to minimise the potential for poor construction of any drainage component. For phased developments, the design should indicate how SuDS features will be managed, protected and commissioned, especially where their use may change through the construction programme.

8.4.17 As the Proposed Development progresses to detailed design, the guidance outlined in Standard 6 will be adhered to and will ensure the SuDS used meet the relevant design criteria. It is envisaged that SuDS maintenance will be the responsibility of the Site owners.

9 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

9.1.1 This FCA complies with the Planning Policy Wales[27] and TAN15[28] Guidance and demonstrates that flood risk from all sources has been considered in the Proposed Development. It is also consistent with the Flintshire County Council requirements with regard to flood risk.

9.1.2 The Site lies in an area designated as Flood Zone A (Development Advice Maps) and Flood Zone 1 (Flood Map for Planning – fluvial and tidal), and is outlined to have a chance of flooding of less than 1 in 1,000 (<0.1%) in any year.

9.1.3 TAN15[29] sets out an Acceptability Test, which states that preference should be given to development located outside Flood Zones C1 and at the lowest risk of flooding from all sources. This FCA demonstrates that the requirements of the Acceptability Test have been met. The Proposed Development is classified as 'less vulnerable' and therefore considered appropriate within Flood Zone A/1 without application of the Justification Test.

9.1.4 This FCA has considered multiple sources of flooding and a summary is provided in **Table 9.1**.

Table 9.1 Flood risk summary

Source	Level of risk	Summary/mitigation requirements
Fluvial	Very Low	The Site is shown to lie in Flood Zone 1.
Tidal	Very Low	The Site is inland and not shown to be within any tidal flood extents.
Surface water	Very Low - High	The areas outlined for development are typically at a very low – low risk of flooding from this source. However, the development areas are bounded by zones of higher risk and a low-high linear flow path runs north to south within the southernmost development parcel. The Proposed Development layout and proximity drained areas will mitigate flood risk.
Groundwater	Low	The SFCA doesn't place the Site in an area of groundwater risk, although no

[27] https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf

[28] https://www.gov.wales/sites/default/files/publications/2022-03/technical-advice-note-15-development-flooding-and-coastal-erosion.pdf

[29] https://www.gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf

Source	Level of risk	Summary/mitigation requirements
		site-specific data on groundwater is available.
Sewers	Low	Mitigation as above/where applicable e.g. ongoing maintenance of the on-site systems.
Reservoir	Very Low	The Site is not shown to be in an area of reservoir flood risk.
Other sources	Very Low	No further artificial sources of flood risk have been identified.

9.1.5 Overall, taking into account the above points, the development of the Proposed Development should not be precluded on flood risk grounds.

10 REFERENCES

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APPENDIX A RSK GROUP SERVICE CONSTRAINTS

1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Castle Cement Limited (the "client") in accordance with the terms of a contract between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the Site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the Site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the Site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the Site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the Site at pre-determined borehole and soil vapour locations based on the

operational configuration of the Site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on-site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the Site. Features (boreholes, trial pits etc) annotated on-site plans are not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B TOPOGRAPHIC SURVEY

LEGEND

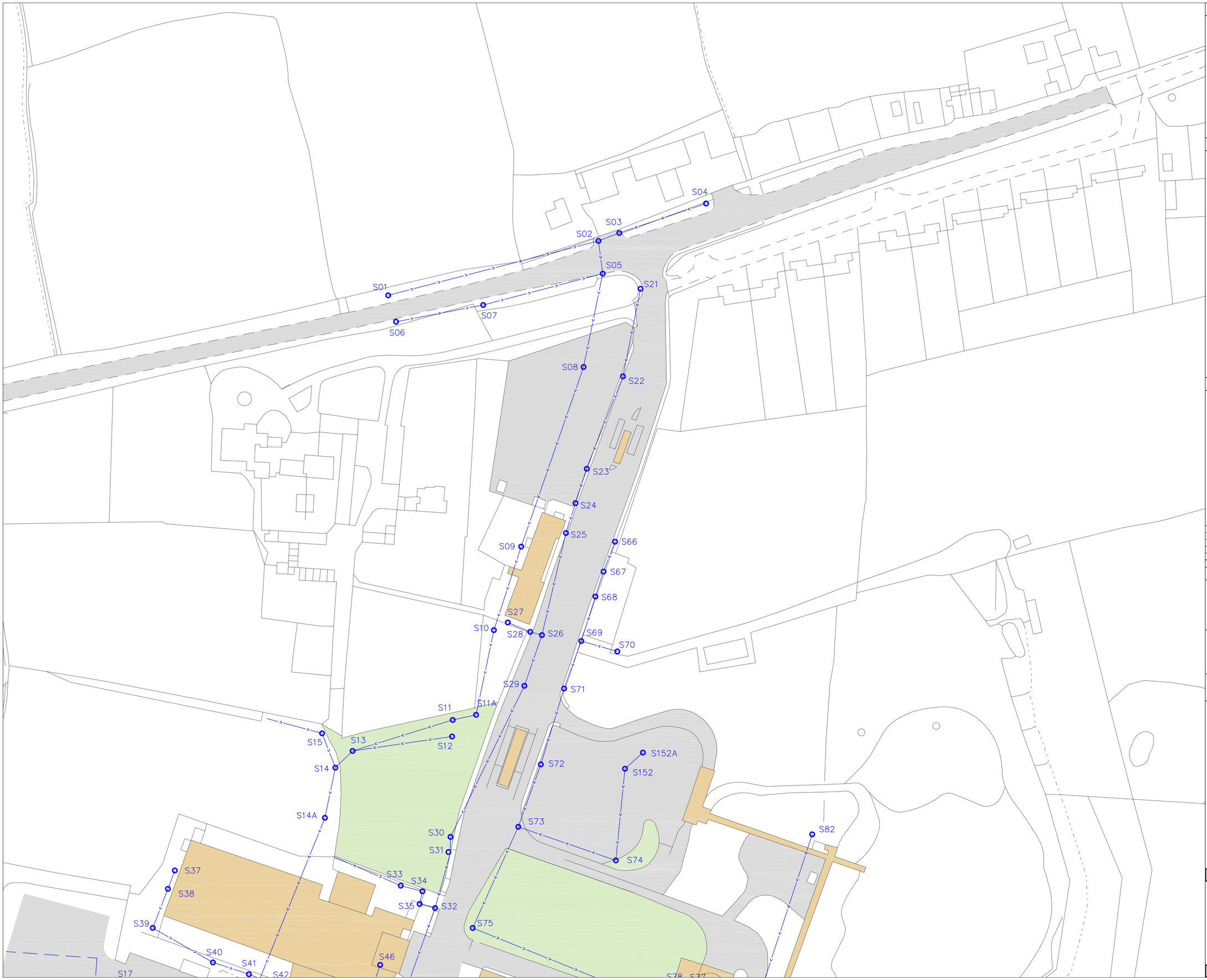
Building	Stock	Conveyor	OS General Feature	Waters Edge	Tree (Con)	Electricity Pylon
Kerb	Road	Edge of Veg	Water Pipe	Royalty Boundary	Ditch Invert	Piezometer
Fence	Rail	Manhole	Top of Rock Face	Top of Batter	Lamp Post	Stock
Gate	Track	Bottom of Batter	Overhead Cable (El)	Borehole	Pipe Invert	Building
Hedge	Wall	Edge of Concrete	Overhead Cabe (Tel)	Tree (Dec)	Telegraph Post	Water

Site. Padeswood

Title. Topographical Survey

Scale. 1:1250	Date. Jan 2018	Drawing No.	
Drawn by PD	Revised Apr 2021	P103/1	

APPENDIX C SITE DRAINAGE SURVEY



LEGEND

	SWD Surface Water Drainage
	FWD Foul Water Drainage
S01	SWD Manhole
F01	FWD Manhole
CP	Catch Pit
G	Gully

CCTV ABBREVIATIONS

Sewer Broken	B
Circumferential crack	CC
Circumferential crack at joint	CCJ
Longitudinal crack at joint	CLJ
Multiple crack at joint	CMJ
Connection	CN
Sewer Deformed	D
Debris 70%	DE
Debris/Silt 10%	DES
Longitudinal fracture at joint	FLJ
Infiltration seeping at joint	ISJ
Joint displaced large	JDL
Joint displaced medium	JDM
Junction	JN
Sewer material change	MC
Open joint large	OJL
Fine roots at joint	RFJ
Mass roots at joint	RMJ
Survey abandoned	SA

KEY PLAN

1

2

Revision	Description	Date
A	drawing updated	18-07-16

SHEET 2 OF 2

PROJECT

DRAINAGE CONNECTIVITY
HANSON CEMENT WORKS
CHESTER ROAD, PADESWOOD CH7 4HB

TITLE

SURVEY SHOWING CONNECTIVITY &
LOCATION OF SURFACE WATER DRAINAGE

CLIENT

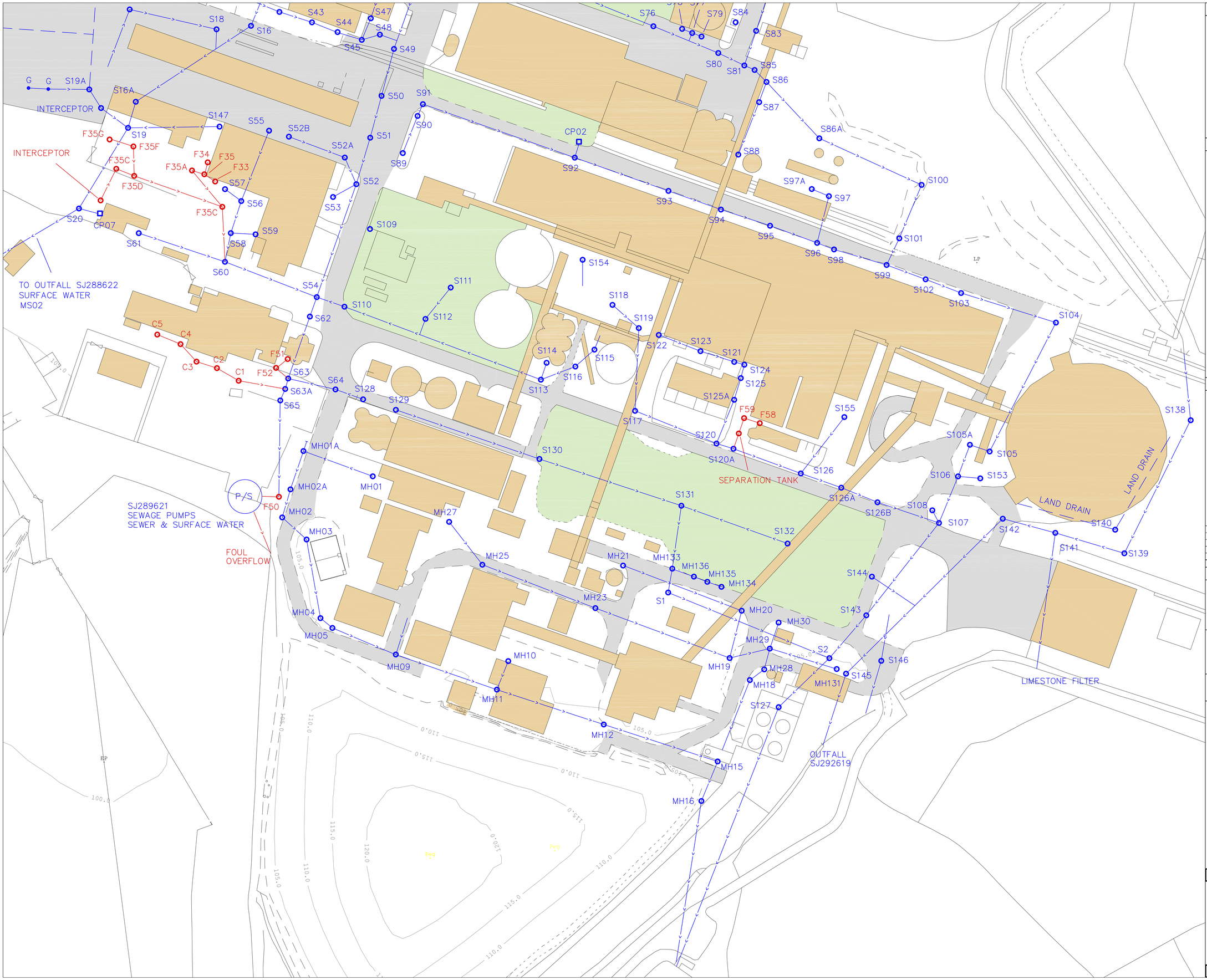
METRO ROD

Metro Rod Deeside and North Wales
Wirral, Chester Office T:01244 288809
North Wales Office
T:1492 817388 or 01286 864020
W:www.metrorod.co.uk
E: deeside@metrorod.co.uk
E: northwales@metrorod.co.uk

DATE	09-06-2016	DRAWN	g-map	SCALE	1:750	A1

Freedom g|map
Underground Utility Mapping | GPR Surveys | Void Detection | Topographic Surveys
Drainage CCTV | Manhole Surveys | Measured Building Surveys | Ground Modelling
GIS Data Collection | Utility Record Collection | Composite Drawings | CAD Services
Unit 53, Gravelly Industrial Park, Erdington, Birmingham, B24 8TG
T: 0870 755 0775 F: 0845 168 7500 E: info@g-map.com W: www.g-map.com

DRAWING NUMBER	g-map/394477/S/02	REV



LEGEND

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	FWD Foul Water Drainage
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CCTV ABBREVIATIONS

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Circumferential crack at joint	CCJ
Longitudinal crack at joint	CLJ
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Connection	CN
Sewer Deformed	D
Debris 70%	DE
Debris/Silt 10%	DES
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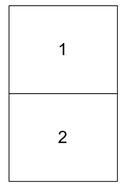
Infiltration seeping at joint	ISJ
Joint displaced large	JDL
Joint displaced medium	JDM
Junction	JN
Sewer material change	MC
Open joint large	OJL
Fine roots at joint	RFJ
Mass roots at joint	RMJ
Survey abandoned	SA

KEY PLAN



Revision	Description	Date
A	drawing updated	18-07-16

SHEET 2 OF 2

PROJECT

DRAINAGE CONNECTIVITY
HANSON CEMENT WORKS
CHESTER ROAD, PADESWOOD CH7 4HB

TITLE

SURVEY SHOWING CONNECTIVITY &
LOCATION OF SURFACE WATER DRAINAGE

CLIENT

METRO ROD

Metro Rod Deeside and North Wales
Wirral, Chester Office T:01244 288809
North Wales Office
T:1492 817388 or 01286 864020
W:www.metrorod.co.uk
E: deeside@metrorod.co.uk
E: northwales@metrorod.co.uk

DATE	09-06-2016	DRAWN	g-map	SCALE	1:750	A1

DRAWING NUMBER	g-map/394477/F/02	REV

APPENDIX D PROPOSED DEVELOPMENT LAYOUT

scale 1:1250 @ A0

0 10 20 30 50 75M

SEE DRAWING No SMP-AL 101

TO PENYMYNYDD

TO MOLD

dwellings

dwellings

dwellings

main access and egress

earth bunding

earth bunding

earth bunding

earth bunding

earth bunding

GENERAL CAR PARK

SECURITY

HEAD OFFICE

Carbon Capture Plant laydown and construction offices

Carbon Capture Plant laydown and construction offices

PAVILION

SCHOOL ECOLOGY CENTRE

ponds

Carbon Capture Plant materials laydown and contractor storage area

STORES

Aggregates off-load

WORKSHOPS

Carbon Capture Plant site access road

Carbon Capture Plant contractor village and welfare

EXISTING OPERATIONAL CEMENT WORKS

PROPOSED OFFICES, LABS, JOINT CONTROL CENTRE

EXISTING CLINKER STOREAGE DOME

Third Party Pipeline connection point compound

EXISTING TOWER & STACK

Waste Heat recovery system

CARBON CAPTURE PLANT (CCS)

Waste Heat Recovery System connection to existing stack

BOILER HOUSE

EXISTING SPOIL

pond

disused railway

SEE DRAWING No SMP-AL 101

SEE DRAWING No SMP-AL 101

SEE DRAWING No SMP-AL 101

For details of mitigation area refer to RSK drawing no 0242-SH-XX-XX-DR-1-1000

KEY

CAR PARKING

CARBON CAPTURE PLANT
Contractor Laydown, Storage, Village and Wellfare areas

CARBON CAPTURE PLANT
Contractor Laydown and Construction Offices

revisions

ref:	Notes:	by:	date:
A	Updated		24.03.18
B	Updated to instructions		24.03.21
C	Updated to instructions		24.04.07
D	Updated to RSK Comments		24.04.22
E	RSK drwg ref added		24.04.30
F	RSK drwg ref added		24.06.02

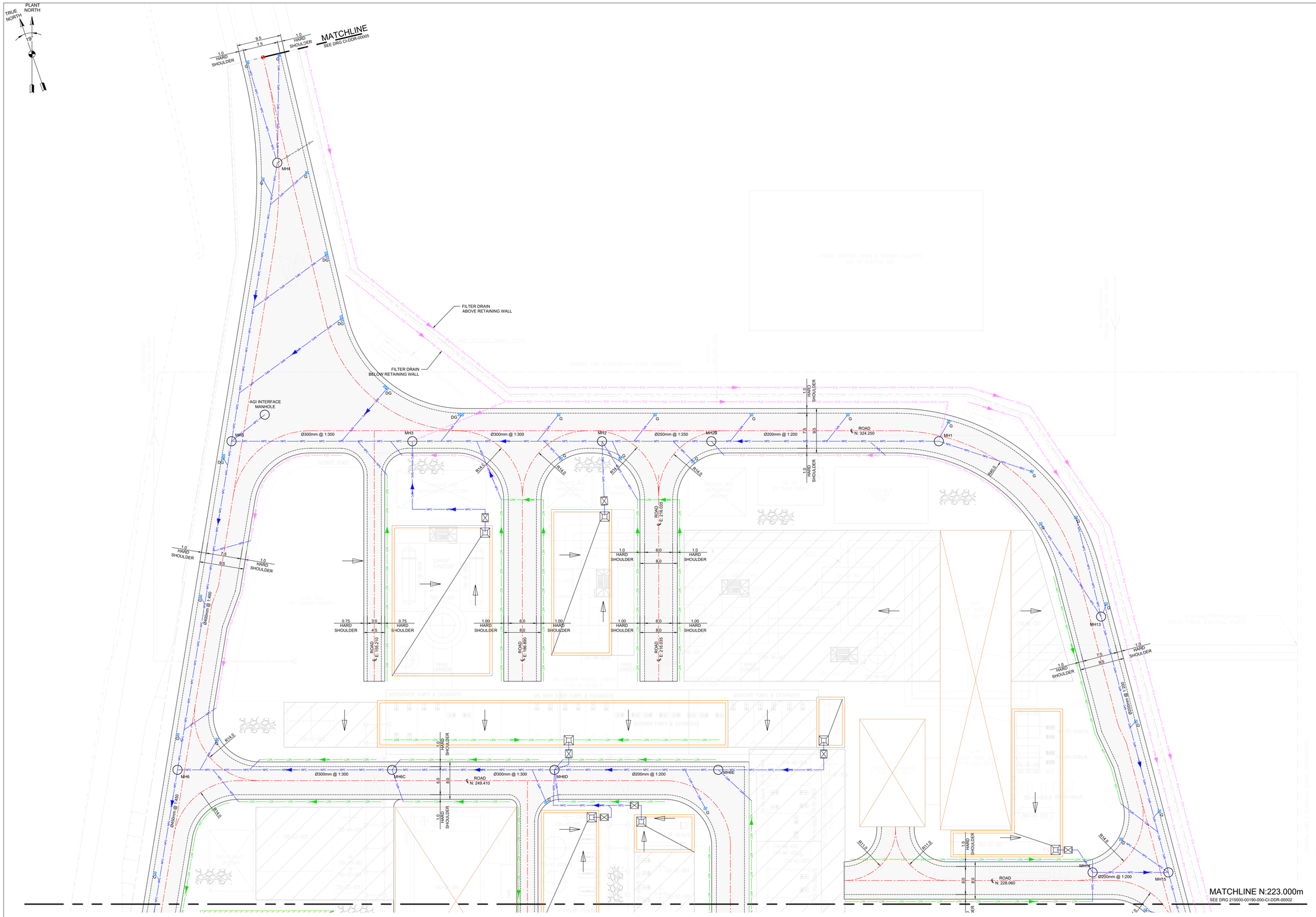
subject to site survey and Local Authority approval

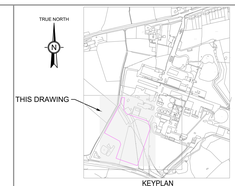
Heidelberg Materials

Project:	HM PADESWOOD CCS PLANT
Client:	
Drawing Title:	CCS Site Layout
Drawing Number:	2022-34- SMP AL 100
Job No.: 2022-34	Scale: 1:1250 @ A0
Date: 2024.03.07	Revision: F
Drawn By: DPT	Checked By:

VISION MILL ARCHITECTS LIMITED
LEARNING - LIVING - PLAYING - WORKING
15 Gloucester Street, Stroud, Gloucestershire, GL5 1QG
01453 760074 info@visionmillarchitects.co.uk
also at
67, Langdale Rise, Maidstone, Kent ME16 0EX
01622 676493

APPENDIX E DRAINAGE ENGINEERING DRAWINGS





KEYPLAN

LEGEND:

- NON-POTENTIALLY CONTAMINATED LINE
- LINEAR DRAIN LINE
- FILTER DRAIN
- IMPACT PROTECTION BARRIER
- KERB WALL
- BUND WALL
- BUILDING ENCLOSURE
- DIRECTION OF FLOW
- DIRECTION OF PAVING SLOPE
- MANHOLE
- VALVE BOX
- VALVE
- GULLY
- DOUBLE GULLY
- PAVED AREA
- GRAVEL

GENERAL NOTES:

1. ALL DIMENSIONS, COORDINATES AND ELEVATIONS ARE IN METRES.
2. FOR EARTHWORK DRAWINGS REFER TO 215000-00190-000-CI-DSW-00002.
3. THIS DRAWING IS BASED ON THE PIPING PLOT PLAN DRAWING: 215000-00190-000-PI-PLN-00002, Rev-C.
4. GRADE ELEVATIONS:
   MAIN PLANT 99.900 m AND HPP IS 100.050 m.
   STORM WATER POND AREA 97.000 m.
5. REASONABLE VARIATIONS TO THE HPP ARE ALLOWED.
6. LIGHTING COLUMNS AND FIRE HYDRANTS MAY BE LOCATED ON EITHER OR THE SAME SIDE OF THE ROAD, SUITABLY SPACED.
7. ELECTRICAL CABLE TRENCHES, POTABLE WATER LINES, FIRE WATER LINES NOT CONFIRMED AT THIS STAGE.
8. ROAD TYPES:

TYPE	NO. OF LANES	LANE WIDTH (m)	HARD SHOULDER WIDTH (m)	TOTAL ROAD WIDTH (m)	MIN RADII OF ROAD CENTERLINE (m)
PRIMARY	2	3.75	1	9.5	16.75
SECONDARY	2	3	1	8	16
TERTIARY	1	3	0.75	4.5	7

MANHOLE SCHEDULE

MH NUMBER	MH DEPTH (m)	MH DIA (mm)
MH1	1.400	1200
MH2	1.900	1200
MH2B	1.650	1200
MH3	2	1200
MH4	1.300	1200
MH5	2.250	1350
MH5B	2	1200
MH6	2.400	1350
MH6C	2.150	1200
MH6D	2.050	1200
MH6E	1.800	1200
MH7	2.500	1350
MH8	2.550	1350
MH9	2.600	1350
MH10	2.850	1500
MH11	3.500	1800
MH11A	3.400	1500
MH11B	3.300	1200
MH11C	3.200	1200
MH11D	3.300	1200

MANHOLE SCHEDULE

MH NUMBER	MH DEPTH (m)	MH DIA (mm)
MH13	1.400	1200
MH14	1.400	1200
MH15	1.800	1350
MH16	2	1350
MH17	2.050	1350
MH18	2.100	1350
MH19	2	1350
MH20	2.250	1500
MH21	2.300	1500
MH22	2.350	1500
MH23	2.400	1500
MH24	NOT USED	
MH25	NOT USED	
MH26	4.150	2100
MH27	2.350	2100
MH28	NOT USED	
MH29	NOT USED	
MH30	1.300	2100

ALL VALUES SHOWN ABOVE ARE PRELIMINARY.

HOLDS

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	REF DRAWING No	REFERENCE DRAWING TITLE
								215000-00190-000-PI-PLN-00002	BLOCK PLAN
								215000-00190-000-CI-DSW-00007	SITE PREP SHEET PILE RETAINING WALL
								215000-00190-000-CI-DDR-00003	ROAD AND DRAINAGE LAYOUT - SHEET 3 OF 3
B	02/04/24	ISSUED FOR REVIEW	AA	-	-	GK	SS	215000-00190-000-CI-DDR-00002	ROAD AND DRAINAGE LAYOUT - SHEET 2 OF 3
A	16/02/24	ISSUED FOR IDC	AA	-	-	AD	GK	215000-00190-000-CI-DDR-00001	ROAD AND DRAINAGE LAYOUT - SHEET 1 OF 3 (THIS DRG)

A1 SHEET SCALE 1:250

WORLEY PROJECT No. 215000-00190

ENGINEERING AND PERMIT STAMPS (As Required)

worley DELIVERING SUSTAINABLE CHANGE

MITSUBISHI HEAVY INDUSTRIES

CUSTOMER

Heidelberg Materials

"This drawing is prepared solely for the use of the contractual customer of Worley and Worley assumes no liability to any other party for any representations contained in this drawing."

DRG TITLE

UNDERGROUND SERVICES
ROAD AND DRAINAGE LAYOUT
SHEET 1 OF 3

DRG No 215000-00190-000-CI-DDR-00001

REV B

Worley_A0

PID File Path:

USER NAME:

DATE & TIME:

TRUE NORTH
PLANT NORTH
19°

MATCHLINE N:223.000m
SEE DRG 215000-00190-000-CI-DDR-00001

N: 228.060

CONNECTION T.B.C.
Ø250mm @ 1:200

INTERCEPTOR
Ø825mm @ 1:825

SLOPED ACCESS
(TRANSITION FROM 99.900 TO 97.000

STORM WATER
RETURN LINE

MH-30
MANHOLE INLET TO BE EQUIPPED WITH PENSTOCK SHUT-OFF VALVE.
MANHOLE OUTLET TO BE EQUIPPED WITH VORTEX FLOW CONTROL
DEVICE (i.e Hydro-Brake by Hydro International, or equal approved).

FLOW MEASUREMENT STATION
TO BE EQUIPPED WITH PROPRIETARY (i.e by Flowtech Plastics, or equal
approved) WEIR OR FLUME CHANNEL AND FLOW MEASURING DEVICE.

HEAD WALL

DRAINAGE DITCH WITH SELECTED STONE
PITCHING IN MORTAR LINING

PRELIMINARY SIZING
DEPTH = 1.0m
BASE WIDTH = 1.0m
SIDE SLOPES = 1 VERTICAL : 2 HORIZONTAL

OUTFALL INTO EXISTING
WATER COURSE

450mm RIP RAP LAYER
PROTECTON WITH
MEAN ROCK SIZE D_{50} = 150mm

EXISTING WATER COURSE

TRUE NORTH
THIS DRAWING
KEYPLAN

LEGEND:

- NPC — NON-POTENTIALLY CONTAMINATED LINE
- LDN — LINEAR DRAIN LINE
- FLD — FILTER DRAIN
- IMPACT PROTECTION BARRIER
- KERB WALL
- BUND WALL
- BUILDING ENCLOSURE
- DIRECTION OF FLOW
- DIRECTION OF PAVING SLOPE
- MANHOLE
- VALVE BOX
- VALVE
- GULLY
- DOUBLE GULLY
- PAVED AREA
- GRAVEL

GENERAL NOTES:

1. SEE DRAWING 215000-00190-000-CI-DDR-00001 (SHEET 1) FOR NOTES.

HOLDS

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	REF DRAWING No	REFERENCE DRAWING TITLE
								215000-00190-000-PI-PLN-00002	BLOCK PLAN
								215000-00190-000-CI-DSW-00007	SITE PREP SHEET PILE RETAINING WALL
								215000-00190-000-CI-DDR-00003	ROAD AND DRAINAGE LAYOUT - SHEET 3 OF 3
B	02/04/24	ISSUED FOR REVIEW	AA	-	-	GK	SS	215000-00190-000-CI-DDR-00002	ROAD AND DRAINAGE LAYOUT - SHEET 2 OF 3 (THIS DRG)
A	16/02/24	ISSUED FOR IDC	AA	-	-	AD	GK	215000-00190-000-CI-DDR-00001	ROAD AND DRAINAGE LAYOUT - SHEET 1 OF 3

A1 SHEET SCALE 1:250

WORLEY PROJECT No.
215000-00190

ENGINEERING AND PERMIT STAMPS (As Required)

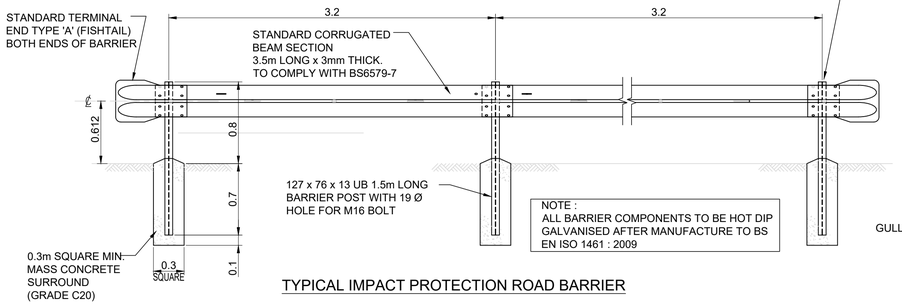
worley DELIVERING SUSTAINABLE CHANGE
MITSUBISHI HEAVY INDUSTRIES

CUSTOMER
Heidelberg Materials

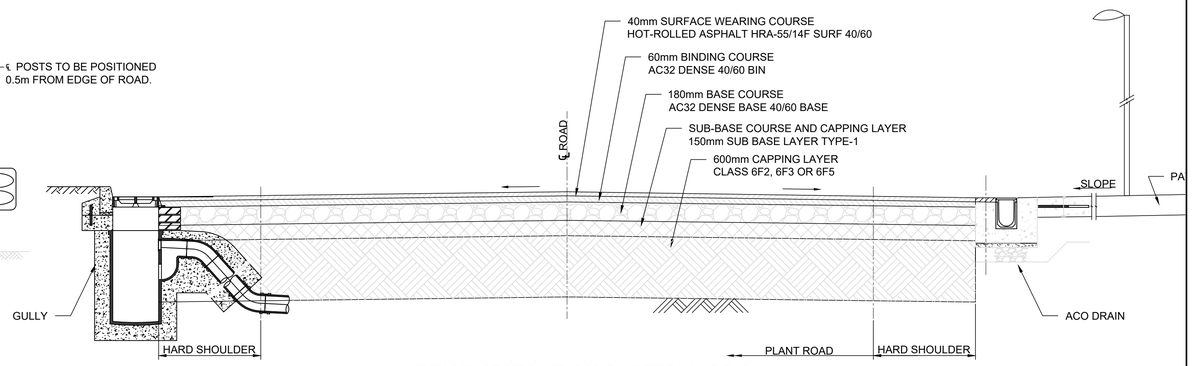
DRG TITLE
UNDERGROUND SERVICES
ROAD AND DRAINAGE LAYOUT
SHEET 2 OF 3

DRG No 215000-00190-000-CI-DDR-00002
REV B

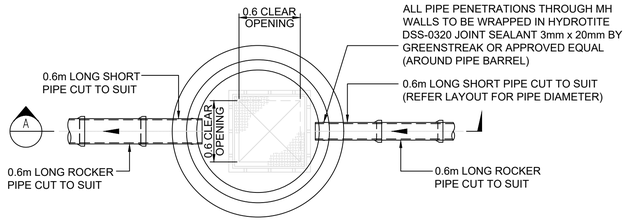
PID File Path:
USER NAME:
DATE & TIME:
Worley, A3



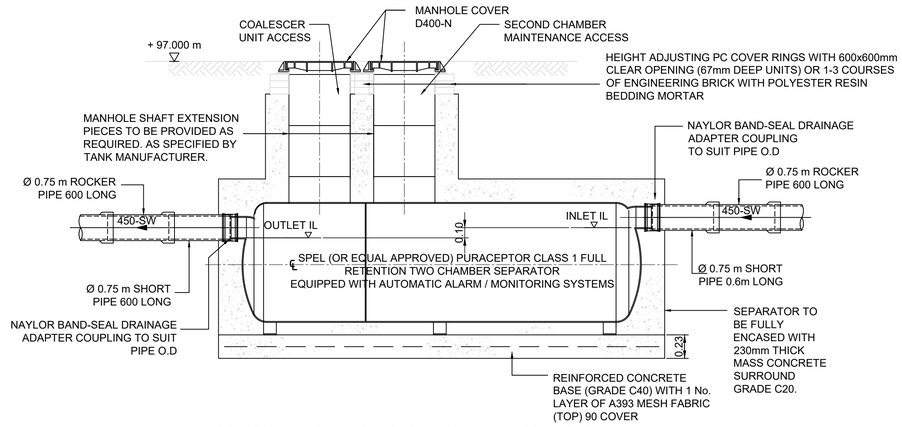
TYPICAL IMPACT PROTECTION ROAD BARRIER



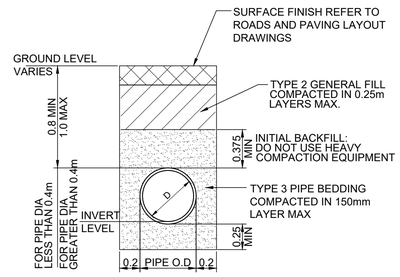
TYPICAL SECTION THROUGH INTERNAL ROAD



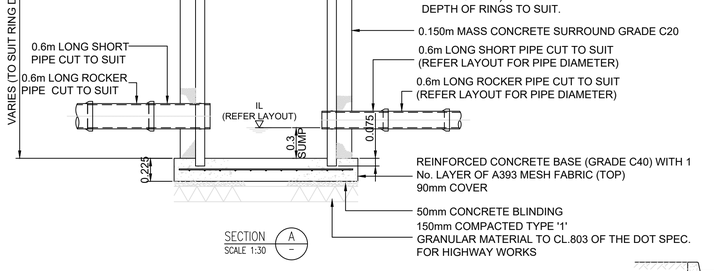
TYPICAL MANHOLE DETAIL

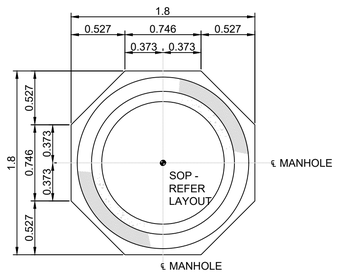


CLASS-1 FULL RETENTION TWO CHAMBER SEPERATOR
CONCRETE SURROUND DETAILS



TYPICAL UG PIPE BEDDING DETAIL





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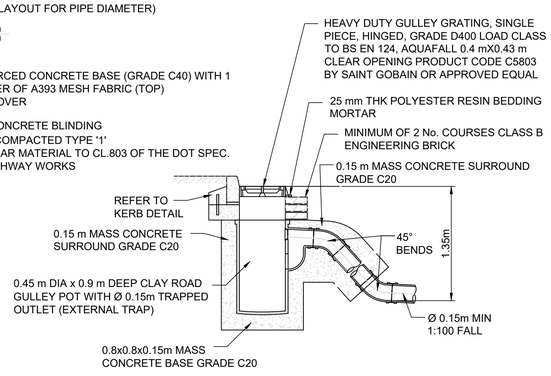
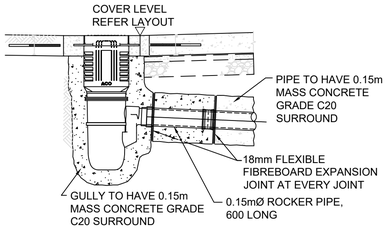
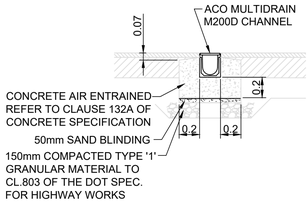
RING MANHOLE BASE



TYPICAL ROAD GULLY DETAILS



ACO UNIVERSAL GULLY UNIT



TYPICAL CHANNEL DETAIL
IN ASPHALT PAVED AREAS

GENERAL NOTES:

1. SEE DRAWING 215000-00190-000-CI-DDR-00001 (SHEET 1) FOR NOTES.
2. ALL DIMENSIONS ARE IN m U.N.O.

HOLDS

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A	16/02/24	ISSUED FOR IDC	AA	-	-	AD	GK	215000-00190-000-CI-DDR-00001	ROAD AND DRAINAGE LAYOUT - SHEET 1 OF 3

A1 SHEET | SCALE 1:30

WORLEY PROJECT No. 215000-00190

ENGINEERING AND PERMIT STAMPS (As Required)

worley DELIVERING SUSTAINABLE CHANGE

MITSUBISHI HEAVY INDUSTRIES

CUSTOMER

Heidelberg Materials

DRG TITLE

UNDERGROUND SERVICES
ROAD AND DRAINAGE SECTION AND DETAILS
SHEET 3 OF 3

DRG No 215000-00190-000-CI-DDR-00003 | REV B

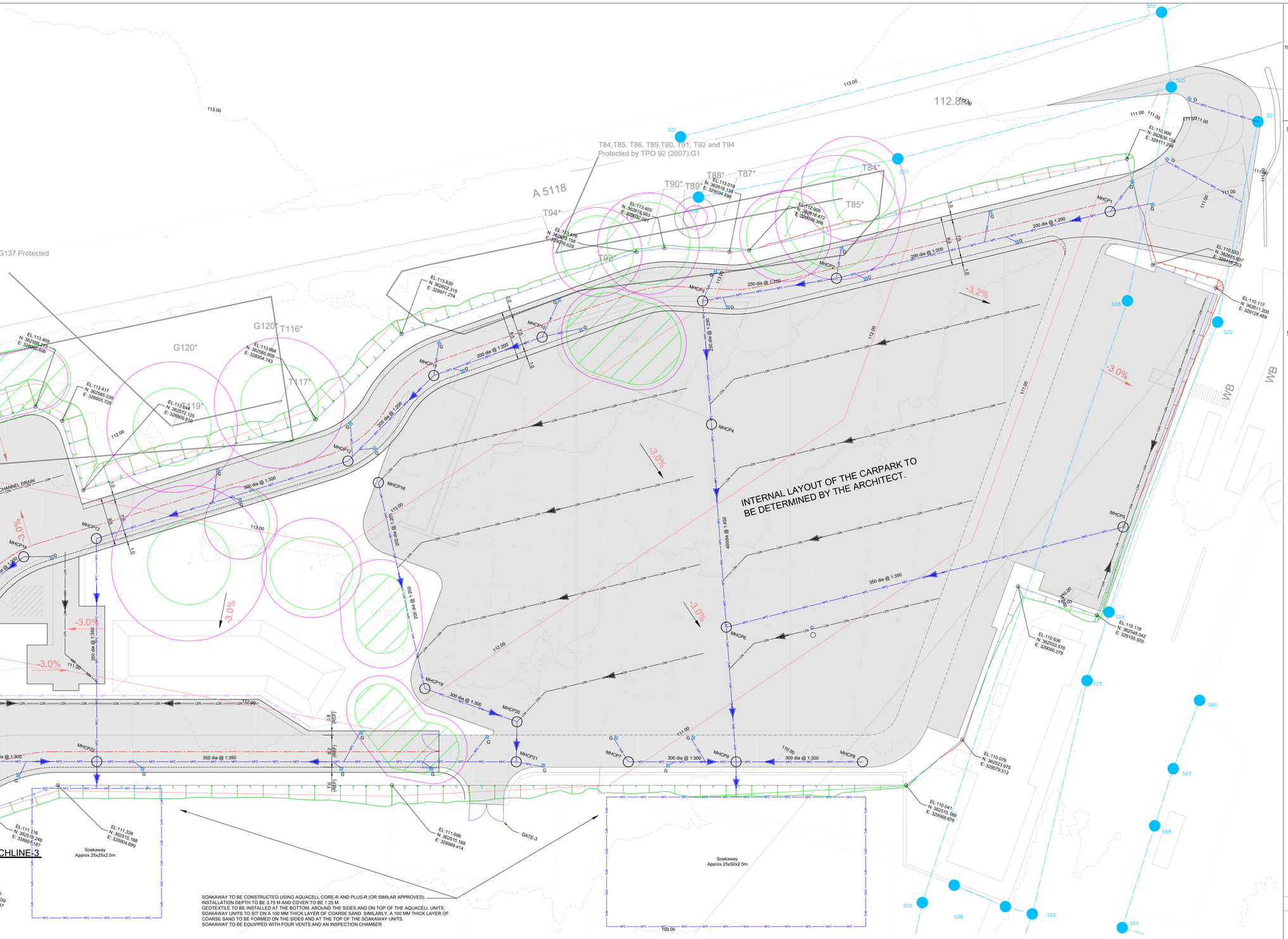
PID File Path:

USER NAME:

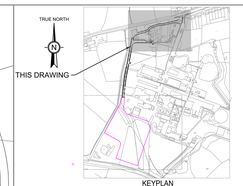
DATE & TIME:

Worley_A1

TRUE NORTH
PLANT NORTH
19°



SOAKAWAY TO BE CONSTRUCTED USING AQUACELL CORE-R AND PLUS-R (OR SIMILAR APPROVED).
INSTALLATION DEPTH TO BE 3.75 M AND COVER TO BE 1.25 M.
GEOTEXTILE TO BE INSTALLED AT THE BOTTOM, AROUND THE SIDES AND ON TOP OF THE AQUACELL UNITS.
SOAKAWAY UNITS TO SIT ON A 100 MM THICK LAYER OF COARSE SAND. SIMILARLY, A 100 MM THICK LAYER OF COARSE SAND TO BE FORMED ON THE SIDES AND AT THE TOP OF THE SOAKAWAY UNITS.
SOAKAWAY TO BE EQUIPPED WITH FOUR VENTS AND AN INSPECTION CHAMBER



KEYPLAN

LEGEND:

- NPC LINE (NON-POTENTIALLY CONTAMINATED LINE)
- LINEAR DRAIN LINE
- IMPACT PROTECTION BARRIER
- EXISTING GROUND CONTOURS
- PROPOSED GROUND CONTOURS
- DIRECTION OF FLOW
- MANHOLE
- GULLY (G)
- NEW ROADS AND CARPARK
- TREE CANOPY
- TREE RPA
- EXISTING MANHOLES (LOCATIONS APPROXIMATE)
- EXISTING UNDERGROUND LINES (LOCATIONS APPROXIMATE)

GENERAL NOTES:

1. ALL DIMENSIONS, COORDINATES AND ELEVATIONS ARE IN METRES.
2. FOR EARTHWORK DRAWINGS REFER TO 215000-00190-000-CI-DSW-00002
3. THIS DRAWING IS BASED ON THE CLIENT DRAWING: 2022-34-AL SK01, Construction Management Masterplan Rev M.
4. REASONABLE VARIATIONS TO THE ROAD LAYOUT ARE ALLOWED.
5. LIGHTING COLUMNS AND FIRE HYDRANTS MAY BE LOCATED ON EITHER OR THE SAME SIDE OF THE ROAD, SUITABLY SPACED.
6. ELECTRICAL CABLE TRENCHES, POTABLE WATER LINES, FIRE WATER LINES ETC NOT CONFIRMED AT THIS STAGE.

MANHOLE SCHEDULE

MH NO.	MH DIA	MH DEPTH (m)
MHCP1	1200	1.100
MHCP2	1200	1.372
MHCP3	1200	1.500
MHCP4	1200	1.606
MHCP5	1200	1.050
MHCP6	1350	1.741
MHCP7	1200	1.050
MHCP8	1200	1.100
MHCP9	1350	1.867
MHCP10	1200	1.100
MHCP11	1200	1.233
MHCP12	1200	1.296
MHCP13	1200	1.318
MHCP14	1200	1.100
MHCP15	1200	1.215
MHCP16	1200	1.329
MHCP17	1200	1.498
MHCP18	1200	1.100
MHCP19	1200	1.144
MHCP20	1200	1.201
MHCP21	1200	1.298
MHCP22	1200	1.867

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								215000-00190-000-CI-DDR-00006	ACCESS ROAD AND DRAINAGE DET - SHEET 3 OF 3
								215000-00190-000-CI-DDR-00005	ACCESS ROAD AND DRAINAGE DET - SHEET 2 OF 3
A	21/03/24	ISSUED FOR IFR	AA	-	-	GK	GK	215000-00190-000-CI-DDR-00004	ACCESS ROAD AND DRAINAGE DET - SHEET 1 OF 3 (THIS DRG)

A1 SHEET SCALE 1:250

WORLEY PROJECT No. 215000-00190

ENGINEERING AND PERMIT STAMPS (As Required)

worley DELIVERING SUSTAINABLE CHANGE
MITSUBISHI HEAVY INDUSTRIES

CUSTOMER

Heidelberg Materials

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DRG TITLE

UNDERGROUND SERVICES
ACCESS ROAD AND CARPARK
ROAD AND DRAINAGE - SHEET 1 OF 3

DRG No 215000-00190-000-CI-DDR-00004 REV A

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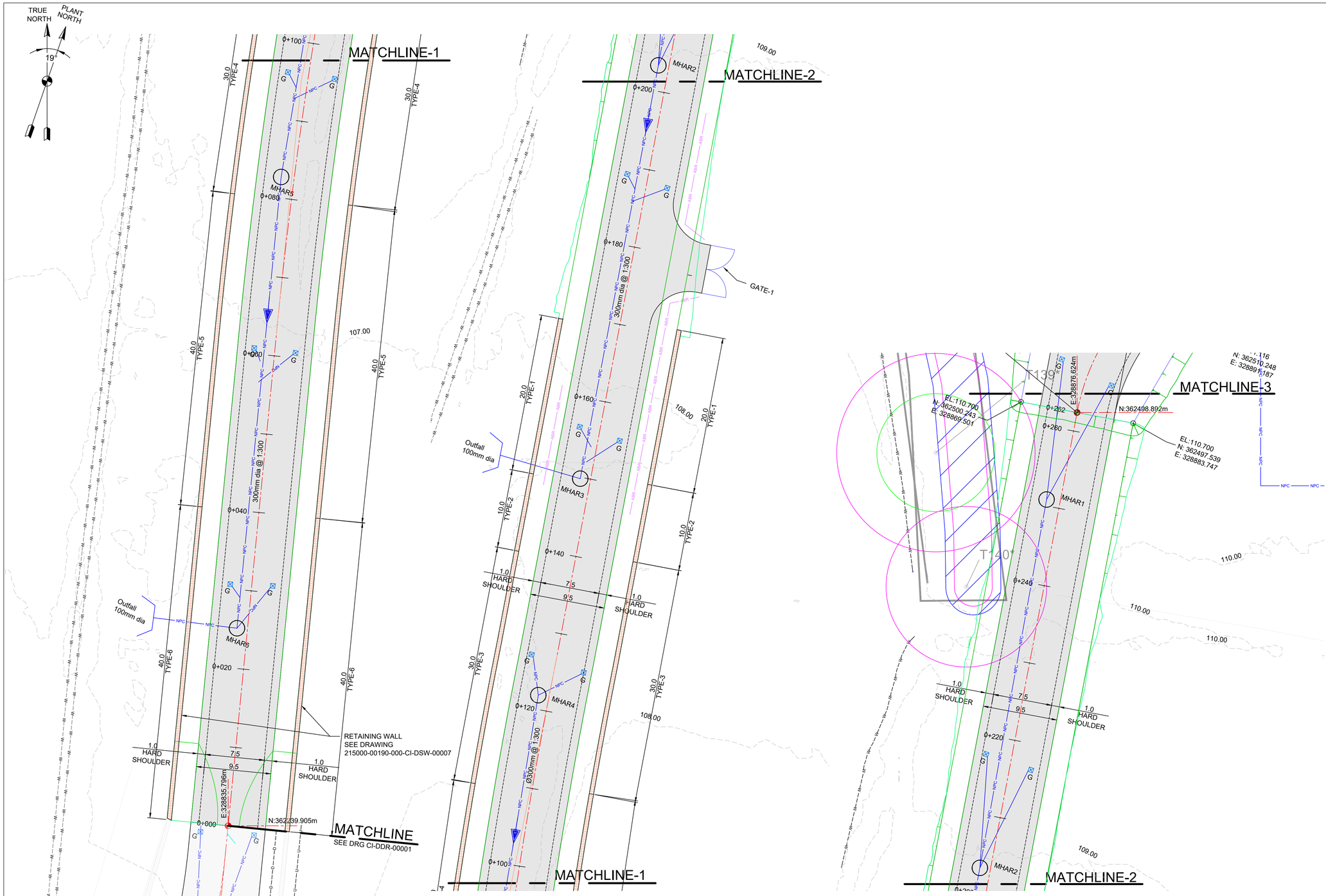
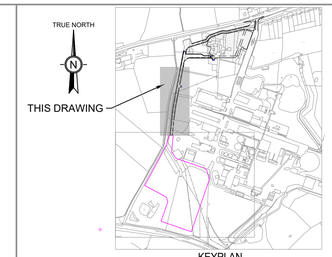
DATE & TIME:
Worley, AC





KEYPLAN

LEGEND:

- NPC LINE (NON-POTENTIALLY CONTAMINATED LINE)
- FRENCH DRAIN ABOVE RETAINING WALL
- IMPACT PROTECTION BARRIER
- EXISTING WATER COURSE
- EXISTING GROUND CONTOURS
- RETAINING WALL
- DIRECTION OF FLOW
- MANHOLE
- GULLY (G)
- NEW ROADS AND CARPARK
- TREE CANOPY
- TREE RPA

GENERAL NOTES:

1. ALL DIMENSIONS, COORDINATES AND ELEVATIONS ARE IN METRES.
2. FOR GENERAL NOTES REFER DRAWING 215000-00190-000-CI-DDR-00004 (SHEET 1)

MANHOLE SCHEDULE

MH NO.	MH DIA	MH DEPTH (m)
MHAR1	1200	1.300
MHAR2	1200	1.300
MHAR3	1200	1.450
MHAR4	1200	1.300
MHAR5	1200	1.300
MHAR6	1200	1.382

HOLDS

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								215000-00190-000-CI-DDR-00006	ACCESS ROAD AND DRAINAGE DET - SHEET 3 OF 3
								215000-00190-000-CI-DDR-00005	ACCESS ROAD AND DRAINAGE DET - SHEET 2 OF 3 (THIS DRG)
A	21/03/24	ISSUED FOR IFR	AA	-	-	GK	GK	215000-00190-000-CI-DDR-00004	ACCESS ROAD AND DRAINAGE DET - SHEET 1 OF 3

A1 SHEET | SCALE 1:250

WORLEY PROJECT No. 215000-00190

ENGINEERING AND PERMIT STAMPS (As Required)

worley DELIVERING SUSTAINABLE CHANGE

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DRG TITLE

UNDERGROUND SERVICES
ACCESS ROAD AND CARPARK
ROAD AND DRAINAGE - SHEET 2 OF 3

DRG No 215000-00190-000-CI-DDR-00005 | REV A

P:\D File Path:

USER NAME:

DATE & TIME:

Worley_A1

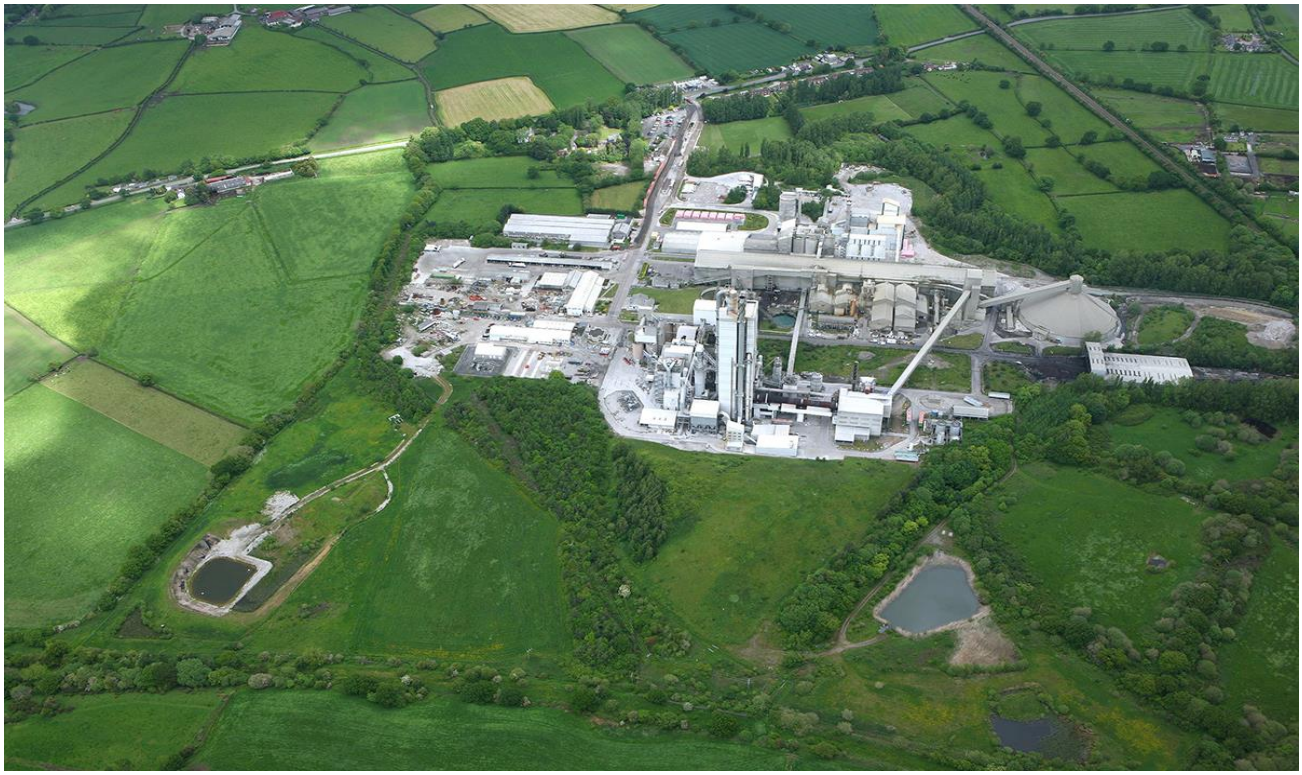
APPENDIX F SITE DRAINAGE TECHNICAL NOTE

HEIDELBERG MATERIALS

Padeswood Carbon Capture Plant – FEED Phase

Site Drainage Technical Note

Document no. Rev A: 215000-00190-000-CI-TEN-00001



20/02/2024

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Incorporated in England number: 4334425
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Rev	[redacted]	[redacted]	[redacted]	[redacted]	Revision Date
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Revision History

Rev	Status	Section	Description of Change
A	IDC	All	Issued for Inter Discipline Check

Holds

No	Section	Description	Input From	Planned Date
1	5.2	Reference to the "Flood Risk Assessment" by RSK Environment Ltd.	RSK	27/02/2024

Table of contents

Appendices

1. Project Introduction

Heidelberg Materials (HM) has become a partner in the HyNet Northwest consortium, which aims to create the world's first low-carbon industrial cluster in the region of Northwest England. The proposed hydrogen and carbon capture and storage (CCS) industrial cluster will play a critical role in the UK's transition to net zero greenhouse gas emissions and the fight against climate change. As part of 'Making Net Zero Possible', Asset Improvement programme options to decarbonise COMPANY cement plant are being considered. Carbon Capture (CC) is one of the key technologies being developed as a route to decarbonisation. COMPANY cement plant located at Padeswood which currently produces about 110 ton per hour (tph) of clinker, has been selected by DESNZ as a track 1 phase 2 carbon capture project. The PROJECT will enable carbon capture from the existing cement kiln 4 and from a new Combined Heat and Power (CHP) plant designed to provide the heat and electricity required to operate the Carbon Capture and Compression (CCC) plant. Captured CO_2 will be transported by pipeline to the HyNet CO_2 main pipeline at Northop Hall AGI for onward transportation to storage offshore in depleted gas fields operated by Eni UK. The PROJECT will enable the production of net zero cement for use in the UK construction industry.

Ahead of this CONTRACTOR has been engaged by COMPANY to undertake a pre-FEED study for the carbon capture development. The pre-FEED study was completed in March 2023. Based on the pre-FEED study, an amine-based post combustion CO_2 capture technology has been selected as a suitable technology for capturing 95% of the CO_2 emissions from cement plant.

A consortium between Mitsubishi Heavy Industries (MHI) and Worley as the selected FEED contractor for the Heidelberg Material (HM) Padeswood CCS Project shall deliver an overall FEED package utilizing MHI's Carbon capture technology.

The capture plant can be considered a green field development, but some elements of the integration with the cement plant will be considered brown field. Green field elements will be developed by MHI and Worley, while brownfield elements will be developed by both HM and MHI/Worley.

2. Document Purpose

The purpose of this document is to define the Heidelberg Materials Padeswood Carbon Capture Plant site drainage concept to be used in the development of the FEED project deliverables.

The scope of this document covers typically gravity flow open drainage systems including the necessary collection, storage and disposal of effluent streams from the new carbon capture units and associated OSBL systems.

Pumped discharge and associated force mains are described where necessary within the open drain systems.

The contents of this document overlap with 215000-00190-000-PR-PHL-0004 "Drainage Philosophy". This document is focused on the civil engineering aspects of those systems designed by the CSA team, and these are principally storm water systems and sanitary systems. These are described in "Drainage Philosophy" as Open Drain System – Potentially Contaminated Surface Water (PCSW) and Foul Sewer (Sanitary Wastewater).

3. Abbreviations, Definitions & References

3.1 Abbreviations

Acronym	Definition
aMSL	Above Mean Sea Level
BS	British Standard
BSI	British Standards Institution
CSA	Civil, Structural & Architectural
CBR	California Bearing Ratio
DMRB	Design Manual for Roads and Bridges
EN	Euro Norm (i.e. European Standard)
FFL	Finished Floor Level
GL	Grade Level
HDPE	High Density Polyethylene
HPP	High Point Finish Paving
ISO	International Organization for Standards
LPP	Low Point Finish Paving
MCHW	Manual of Contract Documents for Highway Works
PD	Published Documents (BSI)
SuDS	Sustainable Drainage Systems
TOC	Top of Concrete level
UK	United Kingdom

Table 1 - List of Abbreviations

3.2 Definitions

Term	Definition
COMPANY	Heidelberg Materials
CONTRACTOR	Consortium of Worley Europe Limited and Mitsubishi Heavy Industries Limited (MHI)
LICENSOR	MHI entering a Licensing Agreement with the CLIENT
PROJECT	Padeswood Carbon Capture Plant
SUPPLIER/VENDOR	Company / organisation suppling equipment, materials or services.
SUB-SUPPLIER	The organisation selected by the SUPPLIER/VENDOR to supply the part of equipment and services.
WORK	Shall mean all and any of the WORKs and / or services and / or materials required to be provided under the Contract with CLIENT.
shall and must	Indicates mandatory requirements
Should	Indicates that a provision is not mandatory but recommended as good practice.
May	Used to indicate that optional action is available

Table 2 - List of Definitions

3.3 Order of Precedence

The requirements of the standards and publications referenced in this document shall be applied in the following order of precedence:

1. Government Acts, Regulations, and Statutory Requirements
2. Project Drawings
3. This Document
4. Referenced Specifications and Publications
5. Referenced Codes & Standards

Any conflict between the minimum requirements of the above documents shall be brought to the CONTRACTOR's attention for resolution.

An alternate specification or design may only be used when it satisfies the government and statutory requirements and offers a benefit to the project. All such alternatives shall require approval from CONTRACTOR.

3.4 References

For a list of Codes and Standards and the other reference document, refer to the Clause 3.4 of the "CSA Design Criteria" document (215000-00190-000-CI-CRT-00001).

4. Drainage Effluent Systems

Effluent water originating from the plant shall be collected, segregated, and drained to an appropriate drainage system, according to the level of contamination. For the purposes of this document, the following systems are described for conveying effluents:

4.1 Non-Potentially Contaminated Storm Water

- Rainwater from non-contaminated and rarely contaminated areas, building roofs, parking areas and hard standings.
- Treated effluent meeting the requirements for environmental discharge.
- Firefighting water from firefighting in non-segregated areas

4.2 Potentially Contaminated Storm Water

- Rainwater from paved, kerbed or dyked areas subject to potential contamination with controlled outlets.

4.3 Oily Water Sewer

- Rainwater from paved, kerbed or dyked areas subject to contamination.
- Water from floors, paved areas resulting from washdown and firefighting activities.
- Minor equipment drains.
- Instrumentation drainage.

4.4 Amine Drain

- Rainwater from areas potentially contaminated by amines.

5. Non-Potentially Contaminated Storm Water

Non-contaminated and rarely contaminated surface water run-off from roofs, roads and grade areas shall be collected by a network of channels, gullies, pipes, and manholes.

Perimeter roads on the new CCS Plant – gullies along the outer kerb and linear drain along the inner edge.

Internal roads on the new CCS Plant– linear drains along both edges.

Paved areas on the new CCS Plant– paving laid with falls to the outside edges. Linear drains installed along these edges.

New access road from the main site entrance to the CCS Plant – gullies along both outer kerbs with direct discharge into the ditch running along the western edge of the road.

New carpark in the northern part of the main site – surface laid with falls into the grid of gullies and linear drains connected to soakaways with the underground pipework. From a desktop study on soil types in the area in reference, it was concluded that an infiltration rate of 10mm/h is achievable.

The surface water system will be designed for flow rates based on the 1 in 10-year return period. Network simulation is undertaken for 1 in 50 year and 1 in 100-year events. Beyond design basis storms may result in standing water or sheet flow across surfaces. As the outfall will be at the low point of the site these flows are considered to enter the storm drainage system after peak flow.

The storm water system shall be collected in the Holding Pond, where it undergoes a final inspection for contaminates.

Before being discharged to the environment at the 1:1 year pre-development run off rate, the storm water shall be collected in the Holding Pond, where it undergoes a final inspection for contaminates.

5.1 Firewater Run-Off Collection

Firewater run-off is collected by the surface water system. Firefighting run-off within tank dykes will be contained within the dyke and firefighting water may be partially or wholly contained within kerbed areas depending on volume of firefighting water used.

In the event of a fire, the Holding Pond should be closed to prevent discharge of firefighting products to the environment. The method of closure shall be by use of an electrically operated penstock gate and shall be linked into the fire alarm system to enable automatic closure.

5.2 Rainfall

In respect of Civil engineering requirements, an appropriate storm hydrograph shall be used within the design software package.

Urban creep allowance factor shall be set at 1.0 as this is considered appropriate for industrial development.

Climate change allowance factor is set at 1.25. This value is consistent with "Flood Risk Assessment" document produced by RSK Environment Ltd. [Hold 1].

To estimate stormwater runoff volumes, it has been assumed that 65% of the developed site will be considered impermeable.

6. Potentially Contaminated Storm Water

Tank dykes and areas of potentially significant contamination (kerbed areas) shall be connected to the surface water system through a valved outlet. The valve shall be normally closed. Following periods of rainfall, the collected water shall be tested to verify if it is contaminated. Non-contaminated effluent shall be discharged to the surface water system while contaminated effluent shall be discharged to the oily water system.

7. Oily Water Sewer

Water that is likely to be polluted by hydrocarbon products shall be collected in this system. Paved areas where contamination is assessed as a regular occurrence shall be segregated by kerbs and shall fall to internal catch basins at low points of paving. These areas shall be connected by gravity sewer to the oily water sewer network to a local lift station where it will be pumped for treatment at the Oil Water Separator.

7.1 Pumps

These shall be mounted on above grade plinths with the pump base frame designed to hold initial oil leakage. The base frame shall be piped to discharge to common header pipes from where it will be routed to the oily water sewer.

7.2 Compressors

These are located within weatherproof buildings and connected to normally dry sump pits. Oil collection in the sump pit shall be discharged to the non-potentially contaminated system if clean and to the oily water system if contaminated.

7.3 Transformers

These are located above a stone filled sump pit with automatic discharge to storm water system. If oil is detected in the sump the flow shall be closed. Available sump storage volume shall be sufficient for 110% of the transformer oil contents.

8. Amine Drains

Amine shall not enter the storm water system. In areas where amine contamination is possible the area to be kerbed with internal catch basins.

These areas shall be connected by gravity sewer to the amine drain network through a normally closed valved outlet to the Amine collection Tank. If the kerbed areas are considered to be free of contamination, then it can be discharged to the non-potentially contaminated storm water system.

Concrete surfacing shall be provided below areas where amine contamination is expected. The slabs will be kerbed to at least 150mm above HPP.

9. Loading Bays

Tanker loading bays shall be connected to the stormwater drain system through a valved outlet. The valve shall be normally open, but during tanker loading and unloading operations, the valve shall be closed, and potential fluids shall be directed to a holding tank. Any accidentally discharged fluid is then contained in the tank and in the surrounding area and may be removed by vacuum truck. The area would require cleaning prior to opening the valve.

10. Holding Pond

All rainwater collected on the site shall be collected in the Holding Pond before being discharged to the environment. Outflow to the outfall shall be limited to the greenfield runoff rate calculated in accordance with the procedures described at www.uksuds.com, and using the greenfield runoff tool. The outflow is limited to Q_{BAR} and this is 22.9 l/s for the proposed site.

The required retention volume has been calculated as approximately 2475 m^3 for a 100-year event. The Holding Pond has a capacity of 2700 m^3 to allow for slight increases in impermeable areas during the design process.

Before entering the Holding Pond, the rainwater from the underground drains shall pass through an Class 1 oil separator installed before the inlet. After the final visual inspection, the water can be discharged into the local watercourse located approximately 70 m to the South.

Summary calculations are attached in Appendix A.

Appendix A
Surface Water Storage Calculations

hrwallingford

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Alexander Dunn
Site name:	Padeswood CCS
Site location:	

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	53.15071° N
Longitude:	3.06587° W
Reference:	722145672
Date:	Feb 20 2024 11:21

Site characteristics

Total site area (ha):	4.1
Significant public open space (ha):	0
Area positively drained (ha):	4.1
Impermeable area (ha):	2.8
Percentage of drained area that is impermeable (%):	68
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	4.1
Net impermable area for storage volume design (ha):	2.98
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	61
Rainfall 100 yrs 12 hrs:	--	73.73
FEH / FSR conversion factor:	1.01	1.01
SAAR (mm):	793	793
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.3	0.3
Hydological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 10 year:	1.42	1.42
Growth curve factor 30 year:	1.78	1.78

Design criteria

Climate change allowance factor:	1.4		Growth curve factor 100 years:	2.18	2.18
Urban creep allowance factor:	1.1		Q_{BAR} for total site area (l/s):	22.9	22.9
Volume control approach	Flow control to max of 2 l/s/ha or Qbar		Q_{BAR} for net site area (l/s):	22.9	22.9
Interception rainfall depth (mm):	5				
Minimum flow rate (l/s):	2				

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	20.2	20.2
1 in 30 years (l/s):	22.9	22.9
1 in 100 year (l/s):	22.9	22.9

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	2475	2475
Long term storage 1/100 years (m^3):	0	0
Total storage 1/100 years (m^3):	2475	2475

APPENDIX G GREENFIELD RUNOFF CALCULATIONS

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Kristian Jackson
Site name:	Padeswood
Site location:	Padeswood

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.15203° N
Longitude:	3.06155° W
Reference:	3005516161
Date:	Mar 15 2023 13:07

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	779	779
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	5.47	5.47
1 in 1 year (l/s):	4.81	4.81
1 in 30 years (l/s):	9.74	9.74
1 in 100 year (l/s):	11.93	11.93
1 in 200 years (l/s):	13.46	13.46