

Appendix 11B

Drainage Strategy

Welsh Government
Global Centre of Rail Excellence
Drainage Strategy Report

Rev 2 | 18 February 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Contents

	Page
1 Project Overview	1
2 The Site	2
2.1 Site Location and Description	2
2.2 Site Topography	3
2.3 Published Flood Risk Maps	4
3 Existing Hydrology	7
3.1 The Nant Helen site	7
3.2 Washery Site	9
4 Proposed Stormwater Drainage	11
4.1 Introduction	11
4.2 Schedule 3 of the Flood and Water Management Act	11
4.3 S1 - Runoff Destination	12
4.4 S2 - Hydraulic Control	13
4.5 S3 - Water Quality	19
4.6 S4 - Amenity	19
4.7 S5 - Biodiversity	20
4.8 S6 - Construction, Operation and Maintenance	20
5 Foul Drainage	21
5.1 Existing Foul Drainage	21
5.2 Proposed Foul Drainage	21
5.3 Proposed Trade Effluent	21
6 Conclusion	22

Appendices

Appendix A

Restoration and Existing Topography Drawing

Appendix B

Nant Helen Original and Proposed Catchment Boundaries Drawing

Appendix C

Celtic Energy Restoration Drainage Proposals

Appendix D

Hydrological Calculations Technical Note

Appendix E

GCRE Nant Helen

Proposed Drainage Drawings

Appendix F

Washery Site Drawings

Appendix G

DCWW Pre planning Response

1 Project Overview

The Nant Helen site to the north of Onllwyn is an open cast mine owned and operated by Celtic Energy. The mining operations currently being undertaken will cease in 2021, at which point Celtic Energy will be required to restore the land in accordance with regulatory requirements and the agreements with Powys County Council (PCC). The Nant Helen Complementary Earthworks restoration scheme for the site has been approved through the Planning process.

Following discussions with both PCC and Neath Port Talbot County Borough Council (NPTCBC), the local authorities have expressed a desire to develop restoration proposals for the Nant Helen site which will create long term, sustainable jobs.

The approved Nant Helen Complementary Earthworks Scheme provides a flexible landform that can be used or adapted for a diverse set of future uses. One use for the site is for industrial purposes, in particular the Welsh Government's (WG) proposal to develop a rail testing and storage facility, known as the Global Centre of Rail Excellence (GCRE). This also includes developing the adjacent Onllwyn Washery into a rail maintenance and research facility.

The GCRE development will comprise of two tracks on sleepers set into a ballast track foundation, associated Overhead Line Equipment (OLE) to support electric trains and all required supporting infrastructure. This will be located on the 17.5m wide flat plateaus provided by the Complementary Earthworks. An access track will also be located adjacent to the track.

A new private access road is proposed to replace the existing which connects Onllwyn Road and the A4221. This will be diverted from its original route where necessary to suit the development, bridging over the cuttings.

The existing coal washery site is proposed to be redeveloped to a rail maintenance facility and research centre. The proposals currently comprise of numerous track sidings and buildings required to support the facility. The storm and foul discharge will need to be managed as the maintenance facility works will produce trade effluent which will need to be disposed of in a suitable agreed manner.

This drainage strategy is written to cover the requirements of the GCRE infrastructure, the diverted private road and the redevelopment of the Washery. New storm drainage infrastructure will be required to serve the GCRE development, however the general principle for the Nant Helen site is to retain all storm drainage features associated with the Nant Helen Complementary Earthworks drainage strategy where possible, and either amend or relocate to suit the GCRE requirements. The proposed road and rail maintenance facility, which have not been covered in the Nant Helen Complementary Earthworks drainage strategy, will require a new storm drainage provision with green infrastructure solutions, examples include swales, ditches and attenuation ponds.

2 The Site

2.1 Site Location and Description

The Nant Helen site is currently an open cast coal mine, owned and operated by Celtic Energy. The quarrying works being undertaken are nearing completion for the site. Following completion, the land is to be restored in accordance with the proposed restoration scheme which has been prepared separately by Celtic Energy. This will also include the construction of earthworks cuttings and embankments, with associated drainage features, as per the Complementary Earthworks scheme.

The site is located at approximate National Grid reference 283000, 210000. The area encompassed within the Nant Helen site planning application boundary is approximately 416ha. The existing Washery site is approximately 49ha. The Nant Helen and Washery Site locations can be seen in Figure 1.

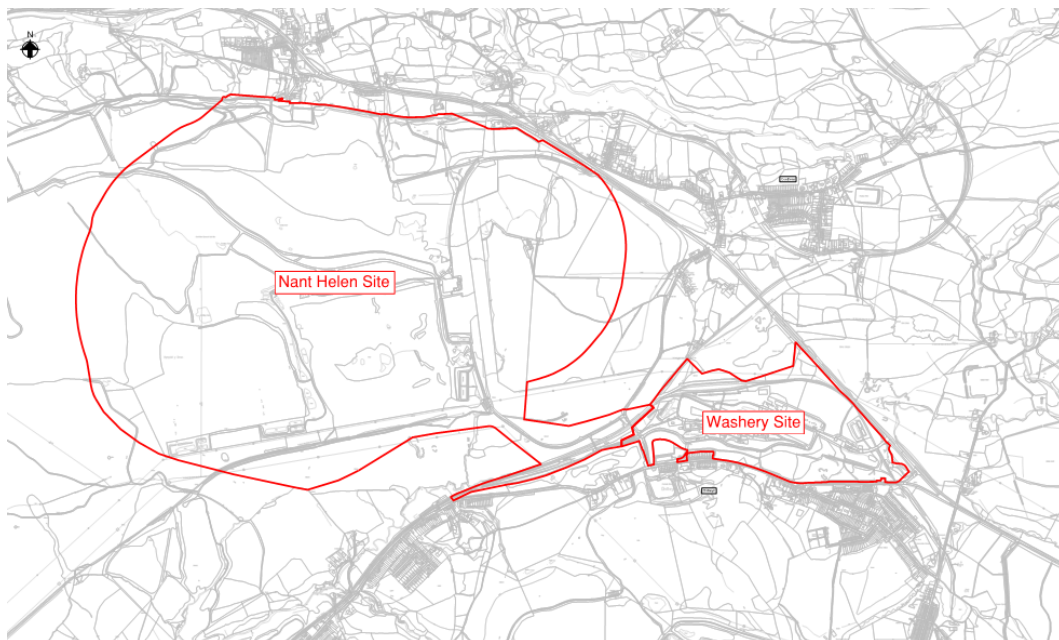


Figure 1: Site Location on OS Mapping (red – planning application boundary)

The site is proposed to be developed into a rail testing and storage facility, named the Global Centre of Rail Excellence (GCRE). Utilising the earthworks platforms provided by the Complementary Earthworks scheme, the testing track on the Nant Helen site development will comprise of two tracks on sleepers set into a ballast track foundation, associated Overhead Line Equipment (OLE) to support electric trains and an access track. The plateaus provided in the Contemporary Earthworks are anticipated to be sufficiently wide to contain the proposed works. Local earthworks reprofiling may be required to tie the works into the Complementary Earthworks scheme.

The existing private track that runs through the site connecting Onllwyn Road and the A4221 will be diverted from its original route to suit the Complementary Earthworks development, bridging over the cuttings where necessary.

The Nant Helen site is located on the border between Neath Port Talbot and Powys, south of Caehopkin and north of Onllwyn. The site is bounded at the east by the A4221 highway and Onllwyn Road. The northern boundary of the site is formed by the Sustrans Cycle Route 43 and the southern boundary by an existing rail corridor. There are numerous engineered and natural ditches located within and around the site.

Adjacent to the Nant Helen site is the existing Coal Washery. This is currently a working coal washing facility and the proposal is to develop this into a rail maintenance facility comprising of numerous rail sidings and associated buildings to operate the maintenance facility. This will require both storm and foul drainage, including trade effluent provision.

On the rail approach to the Washery from the south west, prior to the proposed GCRE track connecting point, additional sidings are proposed. The existing rail track running from the south west through Seven Sisters terminates within the Washery site, and generally follows the line of the A4109 with the road to the south.

The Washery site is bounded by Wembley Avenue to the south and the A4221 to the east. There is a positive storm and foul network associated with the Washery as well as a local natural ditch network surrounding the site.

The River Dulais runs in a south westerly direction down the valley, predominantly to the north of the existing rail track. Tributaries to the river connect underneath the track in numerous locations. As the track approaches the Washery, the tributaries closely follow and run parallel to the track.

2.2 Site Topography

2.2.1 Nant Helen Site

The Nant Helen site is located around a ridgeline which runs from east to west on the site. To the north of this ridge, the land slopes down at a moderate gradient to the Sustrans cycle route. Similarly, the land south of the ridge falls at a moderate gradient to the rail line. The ridgeline finishes within the site extent to the east and small portion at the eastern extent of the site slopes down towards the A4221.

Owing to the opencast mining operations which take place on the western area of the site, the topography within the site changes due to the large scale earthworks taking place and the movement of earthworks material.

Celtic Energy have provided their proposed restoration contours which cover a portion of the site. The proposals broadly represent the existing topography described above, although the ridge line contained within the restoration proposals has been shifted to the north and a flat plateau is proposed at the ridgeline.

Where the proposed development is within the extent of the restoration scheme, the restoration levels have been applied as the baseline for the proposed drainage and earthworks. Outside of the restoration extent, 2m resolution LIDAR data has been applied for the baseline model.

A drawing has been produced which shows the topography of the site on this basis and can be seen in Appendix A.

2.2.2 Washery Site

The Washery site is located at the base of the hill with the brow being just south of the site boundary. The site high point (255m AOD) is located just east of centre on the southern site boundary and is on the downslope of the hills northern face. As the hill continues to fall, there is a slight plateau set at approximately 240m AOD located north east of the site high point where the land gently slopes away towards the site boundary in all directions.

North of the site the elevation starts to rise which has produced a local flat valley at approximately 230m AOD north of the site boundary.

The Washery development itself has also altered the natural topography, reprofiling areas to suit the development needs, namely larger gentle graded plateaus for the rail sidings and operations. In general, the overall direction of the natural contours has been retained with the western portion of the site sloping to the River Dulais to the west and the eastern portion of the site sloping east towards the A4221. The existing topography can be seen on CG2502 and CG2503 in Appendix F.

2.3 Published Flood Risk Maps

The Flood Risk maps hosted on the Natural Resources Wales (NRW) web portal have been checked for the site. These are detailed in the following subsections.

2.3.1 Development Advice Maps

The Development Advice Map (DAM) has been consulted to determine whether the site is located within a surface water flood zone. The map shows that the proposed development within the Nant Helen site is located entirely within Zone A, which is considered to be at little or no risk of fluvial or tidal/coastal flooding. An extract from the DAM can be seen in Figure 2.

The DAM shows the Washery site to be predominantly in Flood Zone A, an extract can be found in Figure 3. A small section on the eastern boundary is located in Zone C2 however this position correlates to an existing watercourse and no development is planned in this area.

As such, a Flood Consequence Assessment will not be required.



Figure 2: Long term flood risk Development Advice Map for the Nant Helen site. Yellow – Zone B, Blue – Zone C2

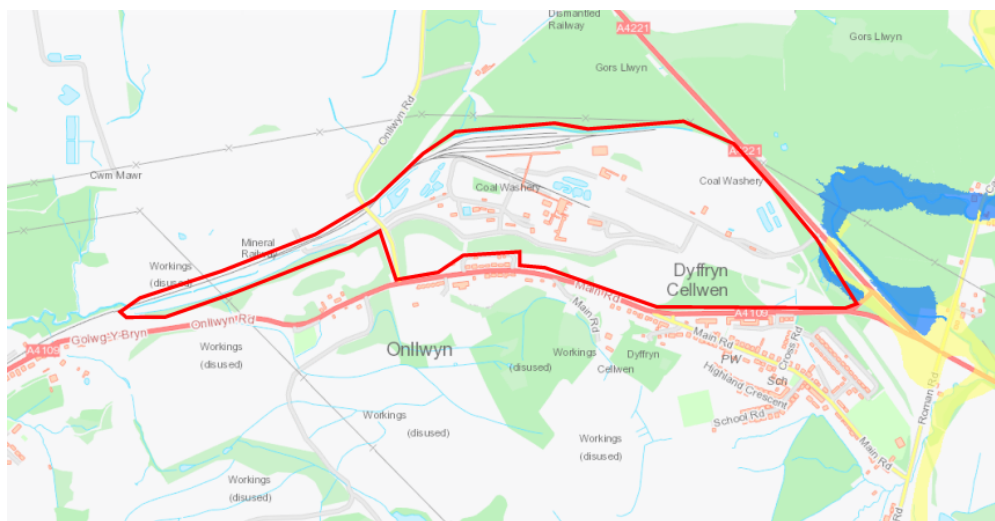


Figure 3 - Long term flood risk Development Advice Map for the Washery site. Yellow – Zone B, Blue – Zone C2

2.3.2 Fluvial, Reservoir, Coastal and Surface Water Flooding

Owing to the location and elevation of the site, there is no risk from Fluvial, Reservoir or Coastal Flooding.

The surface water flood maps show a number of areas within the Nant Helen GCRE site at low, medium and high risk of surface water flooding. These are generally centred around the numerous water features and ponds, see Figure 4.

The surface water flood map for the Washery site can be seen in Figure 5. The land directly to the north of the Washery site is subject to low, medium and high

surface water flood risk however, development is not currently planned for this area. There are some areas of surface water flooding risk on the Washery site which are to be expected as these largely correlate to existing surface water channels and ponds.

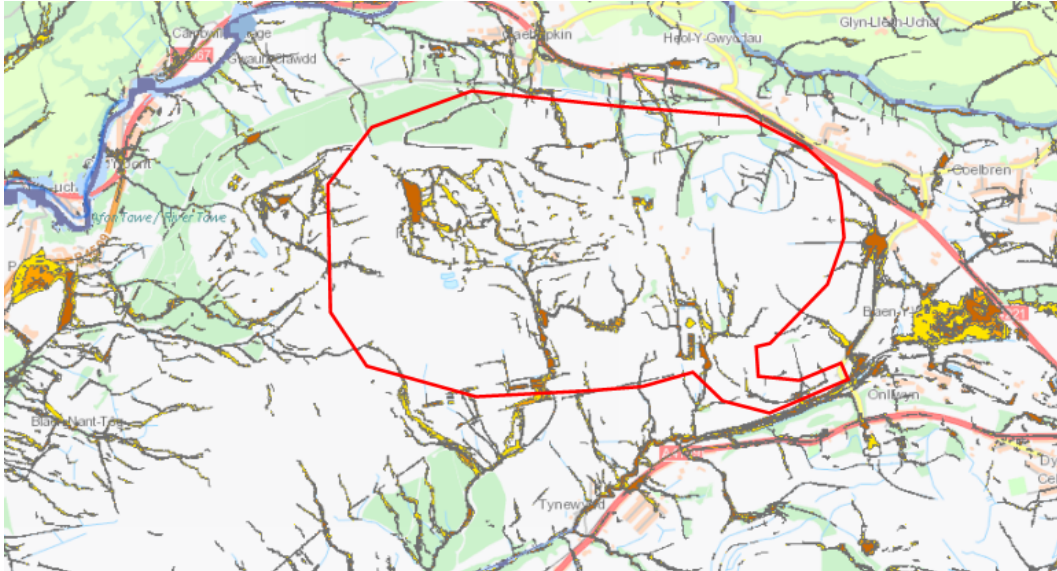


Figure 4 - Fluvial, coastal, reservoir and surface water flood risk map based on the NRW Long Term Flood Risk Maps for the Nant Helen Site (yellow and orange – surface water flooding, blue – fluvial flooding).



Figure 5 - Fluvial, coastal, reservoir and surface water flood risk map based on the NRW Long Term Flood Risk Maps for the Washeries Site (yellow and orange – surface water flooding, blue – fluvial flooding).

3 Existing Hydrology

For the analysis of the existing hydrology, the site has been split into two sections. The Nant Helen section which corresponds to Complementary Earthworks site boundary and the Washery site area.

3.1 The Nant Helen site

The proposed works to develop the Nant Helen site for the proposed GCRE use has been considered in the catchment analysis undertaken for the Complementary Earthworks Scheme.

The drainage catchments for the proposed GCRE works will remain the same as those proposed for the Complementary Earthworks. These have been summarised in the sections below.

3.1.1 Rainfall Runoff Catchments

As described in Section 2.2, the Nant Helen site encompasses a central ridgeline. This ridgeline forms the boundary between three overarching catchments. Stormwater runoff from these catchments is ultimately conveyed to three major watercourses:

- The River Tawe, to the north of the site
- The River Dulais, to the south-west of the site
- The Afon Pyrddin, to the east of the site

Within the site, these larger catchments are separated into a number of smaller sub-catchments which are served by ditches and small watercourses. These serve as tributaries, conveying the runoff from the site to the major watercourses.

Unusually, for this site there are two different catchment scenarios to consider. The first are the natural catchment areas that were present prior to the mining operations on the site (referred to as the “Original Catchments”). The second is the catchments modified as part of the Complementary Earthworks scheme, (referred to as the “Restoration Catchments”).

3.1.2 Original Catchment Boundaries

The original catchment information for the site has been provided by Celtic Energy. This information was extracted and digitized from the Flood Estimation Handbook (FEH) 1999.

To validate these catchment boundaries, a visual comparison was undertaken with the catchment data available on the FEH Online portal. The boundaries for the sub-catchments were shown to be visually similar. The shapefile for the overarching River Tawe, River Dulais and Afon Pyrddin catchments was also downloaded and compared. The ridgeline for the site demarcating the catchment boundaries matched the information provided by Celtic Energy.

A drawing showing the original catchments has been provided in Appendix B. Table 1 below provides a summary of the existing catchments. For ease of reference, the catchment names used by Celtic Energy have been applied for the proposals.

3.1.3 Restoration Catchments

The catchments and associated discharge rates based on the restoration earthwork proposals have been provided by Celtic Energy. These are contained within Appendix C. This information highlights that the majority of the proposed catchments will have reduced discharge rates compared to the original discharge rates.

During discussions with Celtic Energy, it was highlighted that the reduction to discharge rates for the River Tawe catchments has been provided to alleviate historical flooding issues in downstream tributaries. This was mainly achieved by shifting the ridgeline north and consequently reducing the contributing catchment areas. Attenuation ponds have also been proposed in some catchments to further restrict stormwater runoff.

A reduction in discharge rate has also been provided in the restoration scheme for the River Dulais catchments. However, this is not provided to alleviate downstream flooding but due to the presence of existing settlement ponds which have been incorporated into the restoration proposals as proposed attenuation features.

3.1.4 Summary of Rainfall Runoff Catchments

Based on the above, the original catchment areas should be compared to the proposed catchment areas to ensure the natural runoff regime for the site is replicated.

However, for the River Tawe catchments only, the reduction in peak discharge rates proposed by the restoration scheme will be applied to the proposals to avoid reducing the betterment provided.

3.1.5 Greenfield Runoff Rate

A hydrological analysis has been undertaken for the three major catchments to determine the Greenfield Runoff Rate (GRR). The IH124, ReFH2.2 and FEH Statistical methods have been applied and compared to calculate the GRR for the 1:1, 1:30 and 1:100-year rainfall events.

Of these methods, ReFH2.2 was selected as the most appropriate as it is a widely accepted method for plot-scale sites and uses the updated FEH13 DDF curves. It also demonstrated a better correlation with the observed QMED at river monitoring station 58008, located downstream in the River Dulais at Cilfrew.

The GRR for each catchment was therefore calculated to be the values as shown in Table 1 below. For further details of the assumptions, calculations and conclusions, refer to the Hydrology Calculations technical note in Appendix D.

Table 1 – Greenfield Runoff Rate for the site calculated using the ReFH2.2 summer profile

Catchment	Greenfield Runoff Rate (l/sec)		
	1:1 year	1:30 year	1:100 year
River Tawe	17.8	42.2	53.0
River Dulais	19.8	46.3	57.9
Afon Pyrddin	16.9	40.5	51.0

3.2 Washery Site

3.2.1 Rainfall runoff catchments and Existing Drainage

The existing coal washery development has introduced surface water channels and site reprofiling which have impacted the natural catchments. A ridgeline is present to the east of the existing coal stores which divides the site into two catchments as shown on CG2502 and CG2503 in Appendix F. The area to the west of the ridgeline falls towards the River Dulais to the west of the site. The area to the east of the ridgeline falls towards the A4221 and lies within the Afon Pyrddin catchment.

The topography indicates that overland flow enters the Washery site from the higher ground from the south. Surface water management information provided by Celtic Energy, show that perimeter surface water ditches intercept the flow and convey it to the River Dulais to the west and a tributary to the Afon Pyrddin to the east.

Within the eastern Afon Pyrddin Catchment, the watercourses and surface water channels converge and cross the A4221 adjacent to the Washery site access entrance from the A4221. It is thought that a culvert is present in this location to convey the flow underneath the highway, but this has not been confirmed.

Directly north of the site is a flat area shown to be at risk to surface water flooding on the NRW flood maps. The natural contours imply that this northern area drains towards the River Dulais tributaries via perimeter surface water channels around the existing Washery.

An existing surface water management strategy has been provided by Celtic Energy who currently operate the coal washery. The information, reproduced on CG2502 and CG2503 in Appendix F, shows there to be multiple surface water ditches, piped networks, ponds and settlement lagoons for the management of surface water runoff on the existing site. These all primarily outfall to the River Dulais to the west, with a small portion of access track and storage areas outfalling to the Afon Pyrddin tributary to the east. The existing ponds are also currently being used for the treatment of washery process water which is discharged to the River Dulais under an existing discharge consent. The discharge consent limits the runoff to a maximum 100l/sec and no more than 5000m³ per day.

Two settlement lagoons are shown on the eastern boundary however, these lagoons are not shown as in use on the surface water management information provided by Celtic Energy.

The proposed section of track connecting the Washery site to the test track on Nant Helen site also lies within the River Dulais catchment.

3.2.2 Greenfield runoff rate

The Greenfield runoff rates for the River Dulais and Afon Pyrddin catchments have been used as calculated for the Nant Helen catchment in Section 3.1.5.

For further details of the assumptions, calculations and conclusions, refer to the Hydrology Calculations technical note in Appendix D.

Table 2 - Greenfield Runoff Rates for the Washery site catchments

Catchment	Greenfield Runoff Rate (l/sec)		
	1:1 year	1:30 year	1:100 year
River Dulais	19.8	46.3	57.9
Afon Pyrddin	16.9	40.5	51.0

4 Proposed Stormwater Drainage

4.1 Introduction

The Nant Helen Complementary Earthwork Scheme provides a 17.5m wide plateau to facilitate the infrastructure for the GCRE scheme. As such, the Complementary Earthworks Scheme considered the impact of the cuttings and embankments on the existing drainage catchments and flow paths whilst making an allowance for the drainage requirements of the proposed GCRE scheme.

The GCRE rail and access track will require a dedicated storm water drainage system. This infrastructure will be located on the 17.5m flat plateaus created by the Complementary Earthworks. The track drainage will replace the ditches proposed on the plateaus however, the outfall locations and overarching strategy will remain the same as that detailed in the Complementary Earthworks Drainage Strategy report.

The private access road realignment through the GCRE site will also require a dedicated storm drainage system.

The development of the Washery site will require a surface water network to serve the maintenance facility including buildings, track sidings, storage areas and general infrastructure. Any new track infrastructure including the connecting track to the Nant Helen site and the proposed sidings on the approach to the Washery, will also require drainage provision.

This section outlines the drainage strategy for each catchment area on both the Nant Helen and Washery sites and the proposed attenuation and conveyance features.

The proposed drainage drawings for the Nant Helen site can be found in Appendix E and the Washery site in Appendix F.

4.2 Schedule 3 of the Flood and Water Management Act

Schedule 3 of the Flood and Water Management Act 2010 establishes SABs (SuDS Approving Body) in local authorities. Since the 7th January 2019, developments greater than 100m² or developments containing more than one building will be required to submit a SAB application. This application requires developers to utilise Sustainable Drainage Systems (SuDS) in their surface water management for a development.

SuDS aim to manage rainfall on site using methods that mimic natural processes, by making use of the landscape and vegetation to control the flow, volume and quality of the surface water runoff. In addition, SuDS also provide amenity benefits by providing aesthetically pleasing and natural landscapes, and biodiversity benefits by creating habitats for wildlife and vegetated areas.

The Welsh Government's Statutory Standards for Sustainable Drainage Systems contains six standards, which details the requirements for the surface water drainage. The standards are as follows:

- S1. Runoff destination
- S2. Hydraulic control
- S3. Water quality
- S4. Amenity
- S5. Biodiversity
- S6. Construction, operation and maintenance

These form a set of principles which must be considered in the design of the SuDS features in order to obtain approval by the SAB.

4.3 S1 - Runoff Destination

The Welsh Government's SuDS Standard S1 provides a discharge hierarchy for surface water from developments, as well as exemption criteria for each level that must be met before the next level can be considered. The discharge hierarchy is shown below:

- Level 1: Surface water runoff is collected for use;
- Level 2: Surface water runoff is infiltrated to ground;
- Level 3: Surface water runoff is discharged to a surface water body;
- Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;
- Level 5: Surface water runoff is discharged to a combined sewer.

The aim of this is to encourage developments to use runoff as a resource and ensure that runoff is sustainably managed to avoid any negative impacts from the development, such as increased flood risk.

4.3.1 Level 1 - Collected for Use

The GCRE track infrastructure does not require non-potable water to be used therefore this does not provide a viable discharge point for the site.

There is an opportunity in the proposed rail maintenance facility to utilise harvested rainwater, particularly for lavatories, and this should be adopted where possible. The frequency of use of these facilities compared to the site area however will mean that only a small proportion of the total volume of rainfall and runoff can be reused. Additionally, rainwater harvesting tanks may be already full after successive storms and not be sufficient to cater for larger return period events. Therefore, rainwater harvesting is not considered a suitable primary outfall for the surface water strategy.

4.3.2 Level 2 - Infiltrate to Ground

For the Nant Helen site much of the current area has been previously open casted, whilst other areas have remained unaffected. Both the natural and restored ground are within material of low permeability. Therefore, infiltration is not a viable outfall source for the site.

Soakaway tests have not yet been undertaken for the Washery site at this stage, however it is anticipated that the ground material will be similar to the Nant Helen site, and soakaways are likely to not be viable. Open source British Geological Survey (BGS) superficial records indicate peat to be present in the area. This further indicates that the use of a soakaway solution as the primary outfall would not be feasible.

Additionally, the large presence of water bodies and surface water channels indicate that the ground is of low permeability, this should be confirmed through soakaway testing in future design stages.

However, some infiltration is likely to occur and may be suitable to provide infiltration of the first 5mm of rainfall and prevent discharge in small return period events. This is discussed further under Standard S2 - Hydraulic Control.

4.3.3 Level 3 - Discharge to a Surface Water Body

There are a number of existing ditches and watercourses within the Nant Helen site extents as well as drainage features associated with the Complementary Earthworks scheme to convey and attenuate the flow. These form the pathways for surface water runoff to communicate to the downstream watercourses. As such, it is proposed to outfall runoff from the site to the receiving watercourses using these existing features, albeit with some ditches/swales relocated to suit the proposed works.

The existing Washery works discharge into lagoon features on the western boundary which capture runoff and attenuate/treat it before outfalling to the River Dulais to the west. It is also assumed that the lagoons on the eastern side boundary perform a similar function and attenuate/treat flow before outfalling into an Afon Pyrddin tributary to the east, however this has not been confirmed. For the maintenance facility, it is proposed that storm runoff is directed to the eastern and western boundary and discharged into the same receiving watercourses as the existing works, mimicking the current hydraulic regime.

Discharging to a waterbody will provide the runoff destination for all the sites, as such, Level 4 and 5 have not been considered.

4.4 S2 - Hydraulic Control

Standard S2 details the requirements for hydraulic runoff from the site. The existing GRR for the Nant Helen site including the original and restoration catchment areas and the Washery site have been assessed and compared in Section 3 of this report.

4.4.1 Nant Helen Site

The proposed test track and rail infrastructure are contained on the 17.5m plateaus created by the Complementary Earthworks. The attenuation features proposed for the Complementary Earthworks, described in the Complementary Earthworks Drainage Strategy Report, have been designed to accommodate the GCRE proposals and as such will be retained and utilised for the proposed scheme. The hydraulic control measures and attenuation ponds have been designed to control additional impermeable area, above that of the natural catchments, for storm events up to and including the 1 in 100 year return period event including a 40% allowance for climate change. The attenuation requirements for the GCRE Nant Helen site are shown on drawings CG3050 to CG3053 in Appendix E.

The proposed catchment and discharge rates for the GCRE Nant Helen site in comparison to the original catchment areas is summarised in Table 3.

Table 3 - Summary of the original and proposed catchment areas and discharge rates for the GCRE Nant Helen for the 1:100-year event.

Catchment	Original Catchment Area (ha)	Proposed Catchment Area (including track area) (ha)	Original 1:100 year Discharge Rate (m ³ /s)	Proposed 1:100 year Discharge Rate (m ³ /s)
1B	9.5	0.0	0.5	0.0
1C	7.5	3.0	0.4	0.2
1D	55.2	25.4	2.9	1.3
1E	39.6	41.0	2.1	1.9
1F	42.3	44.3	2.2	2.1
1G	36.2	16.4	1.9	0.3
1H	24.6	8.3	1.3	0.4
1I	0.0	26.3	0.0	1.4
River Tawe	214.9	164.7	10.9	7.7
2A	33.0	28.8	1.9	1.7
2B	55.7	115.3	3.2	3.2
2C	77.6	72.7	4.5	4.2
River Dulais	166.2	216.8	9.6	9.1
3A	34.8	34.4	1.8	1.7
Afon Pyrddin	34.8	34.4	1.8	1.7
Total	415.9	415.9	22.3	18.5

For the River Tawe catchment, the reduction in contributing area coupled with the reduction in discharge rates proposed as part of the restoration scheme results in a

total 30% reduction in peak flow to the River Tawe, which includes a 40% allowance for climate change for future impermeable areas.

Conversely, the River Dulais Catchment has an overall increase in impermeable area, particularly attributed to Catchment 2B. To mitigate the associated increase in site runoff, a series of ponds have been proposed within the catchment to attenuate stormwater to the original peak discharge rate.

The Afon Pyrddin also has a small increase in catchment area, resulting in the flows being attenuated to match the original discharge rate.

A portion of the impermeable area of GCRE track connecting the testing loops to the mainline has not been accounted for in the Complementary Earthworks Scheme drainage. Attenuation and hydraulic control for the additional 4.1ha of impermeable area will be provided adjacent to the existing railway to the south and detailed further in Section 4.4.2.

The GCRE track, ballast and access track along the 17.5m plateau will require its own dedicated drainage features which will outfall into the Complementary Earthworks drainage features or for the connecting track to the Washery, a dedicated attenuation feature before the receiving watercourse.

The realigned access road could be drained through swales running adjacent to the highway which then connect to the Complementary Earthworks drainage and outfall into the relevant catchment. As the road is being aligned and similar cross section installed, there is no change in the impermeable area.

4.4.2 Washery Site

It is anticipated that the earthworks and levels for the proposed maintenance facility will not differ significantly from those of the existing Washery due to the need to tie into the existing rail infrastructure. Additionally, much of the area previously supported additional rail sidings and infrastructure in its former historic use. Earthworks modelling will be undertaken in further design stages however, it is not expected for the proposed gross drainage catchment areas to differ markedly from the existing.

Increases in impermeable area are expected due to the positive drainage of additional rail track, hardstanding areas, buildings and access tracks. It is proposed to attenuate the flows to the greenfield rates outlined in Section 3 prior to outfalling into the existing watercourses. Similarly, to the Nant Helen Site, attenuation and hydraulic control will be provided for storm events up to and including the 1 in 100 year return period event plus a 40% allowance for climate change.

The proposed sidings on the approach to the Washery site will require surface water network and attenuation due to an increase in impermeable area.

As discussed in Section 3.2, areas to the south and north of the existing Washery's area are thought to produce overland surface water runoff towards the Washery site. As per the current hydraulic regime, the cut off ditches that currently intercept the overland flow will be maintained to convey the flow to the existing

watercourses. This minimises the risk of surface water flooding for the development from the upper natural catchments. Attenuation of such flows are not proposed as the runoff is from green areas only.

The attenuation requirements for the Washery site are shown on drawings CG2504 to CG2505 in Appendix F and summarised in Table 4.

Table 4 - Washery's Site Attenuation Volume Estimates

Area	Catchment Ref	Imp. Area (ha)	100 yr GRR (l/s)	Estimated Attenuation Vol. m³
Maintenance facility	2D	15.72	910.2	7830
West Approach Sidings	2E	3.70	214.2	2130
Eastern Sidings	3B	1.05	60.8	600
Main loop Connection	2C	4.10	237.4	2340
Access Track	2C	1.70	98.4	970

4.4.3 Drainage Features

To facilitate conveyance of flow around the Nant Helen and Washery site, a number of drainage features are proposed. These are detailed briefly in the following subsections.

For the location of these drainage features, refer to drawings CG3050 to CG3053 in Appendix E and CG2504 to CG2505 in Appendix F.

4.4.3.1 Rail track drainage

Rail track drainage will be provided in the rail ballast in the form of perforated pipe filter drains. The surface water runoff within the 17.5m plateaus will be directed into the filter drains which will run parallel to the rail track. An indicative arrangement of the plateaus can be found on CG3024 in Appendix E. Drainage of the cuttings will also be provided by the filter drains.

For the Nant Helen site, the longitudinal gradient of the track is such that the low points are aligned with the embankment sections of the Complementary Earthworks. This allows the track drainage to connect to either cut off ditches or cascades located at the base of the embankments.

Track drainage will also be provided for the rail network in the Washery site. Similarly, to the test track, filter drainage will be used to drain the track ballast running parallel to the track. The filter drains will then discharge into ditches and ponds at appropriate locations downstream.

4.4.3.2 Swales/ Cut-off Ditches

In the Nant Helen site, to collect and convey runoff from the base of embankments and top of cuttings, cut-off ditches have been proposed. These will capture sheet runoff from upland areas and convey them to the low points within the catchments.

Swales and cut off ditches will be used to capture runoff from the realigned private access road with runoff directed to the ditch network associated with the Complementary Earthworks.

Within the Washery site, swales and cut off ditches will be used to convey flow from the track filter drainage and proposed buildings to the attenuation features. The gentle site gradients and linear nature of the rail maintenance facility lends itself for the use of swales as an effective and sustainable drainage solution.

Three types of ditch profile are currently proposed:

- In areas of low flow, low velocity and shallow longitudinal gradients (less than 1 in 35), grass lined channels will be used. These will generally be towards the start of the ditches where runoff will be less concentrated.
- Where higher flows are anticipated or for longitudinal gradients steeper than 1 in 35, stone bedded channels will be proposed. This will provide channels with long-term stabilisation and erosion protection. The stone size will be determined based on the anticipated flows in the ditch.
- Finally, at longitudinal gradients steeper than 1:12 or where flow would become supercritical (Froude number > 1), the ditches will be rock reinforced bedded on a concrete bed. Longitudinally, these would be stepped with slight ponding on each step to dissipate energy from the water.

4.4.3.3 Culverts

Water collected by cut-off ditches at the base of the embankments on the Nant Helen site will need to be conveyed under the plateau at discreet low points. To do this, a number of culverts will be installed as part of the scheme.

Culverts should be designed in accordance with CIRIA C689 - "*Culvert Design and Operation Guide*". Culverts should be sized to accommodate flows from the 1:100-year event including a 40% allowance for climate change.

At the inlet and outlet for the culverts, a headwall will be required. These are likely to be precast or in-situ concrete headwalls. However, for smaller diameter culverts alternative soft engineered options may be considered.

The outfall from the Washery site is anticipated to connect to the River Dulais tributary upstream of the culvert under Onllwyn Road.

Culverts may also be required in and around the development to maintain the natural flow paths and existing surface water channels which may be severed by proposed rail and access road infrastructure.

4.4.3.4 Cascades

At a number of locations on the Nant Helen site, the cut-off ditches are required to flow down the side of the proposed engineered slopes. To do this, cascade features will be required.

These will be designed to have sufficient capacity for the 1:100-year event (+40% climate change) and dissipate energy from the flow as required.

4.4.3.5 Attenuation Ponds

The attenuation ponds specified in the Complementary Earthworks will be retained for the proposed GCRE development. The existing lagoons on the Washery site will be removed, where required, to allow for the new track infrastructure however, new attenuation ponds are proposed. Ponds will also be required for the new track sidings and the track connecting the Nant Helen site to the Washery.

All ponds have been sized for the various catchments as described in Section 4.4. A 300mm freeboard will be provided above the highest water level for each pond.

The attenuation ponds will be lined to provide a permanent wet base and increase the amenity and biodiversity value to the scheme. An access track has also been provided around the Nant Helen ponds to provide an area for inspection and maintenance.

Access to all ponds will be required to facilitate inspection and maintenance.

Hydraulic control will be provided on the pond outfalls to attenuate the discharge rate to the GRR.

4.4.4 Further Considerations

For the Nant Helen site, the GCRE infrastructure is predominantly permeable. An impermeable access track is being introduced however runoff from this track is being slowed as it percolates through the ballast. Generally, stormwater falling on the catchment will infiltrate and evapotranspire at the same rate it does in the existing case. Therefore, it is not proposed to review the Complementary Earthworks proposals to reduce discharge from the site for rainfall events less than 5mm.

This will also be the case for the relocated private road which will be served by vegetated cut off ditches and swales offering interception.

The proposed maintenance facility on the Washery site will have a number of impermeable surfaces, including the access roads and associated buildings. Interception of the first 5mm of rainfall will be required for these areas. It is anticipated that this will be provided by the swales, ditches and green infrastructure for the scheme. Further consideration of this element will be required during subsequent design stages.

For each sub-catchment, the runoff rate will be controlled to the GRR to mitigate any increase in flood risk and prevent morphological and ecological damage downstream. For the River Tawe catchments, the betterment provided as part of the restoration scheme has been incorporated into the proposals, resulting in an overall reduction from the GRR.

Volumetric control will also need to be considered for each catchment based on the potential future impermeable area. This will be achieved through long-term storage areas discharging at a reduced discharge rate within the attenuation ponds.

4.5 S3 - Water Quality

The Welsh Standard S3 covers the necessary water quality requirements for a scheme.

During construction, it is likely that silts will be mobilised by rainfall which if uncontrolled will be conveyed to the downstream watercourses. Celtic Energy have noted this and propose to use a combination of settlement ponds and Siltbusters to capture silt during the earthworks. This will be detailed in the Contractor's method statements.

Following completion of the earthworks, the engineered slopes will be grass seeded. Once the roots have taken, the site will be effectively green and therefore no dedicated treatment train is required at this stage. However, it is noted that the grass lined channels and attenuation ponds will provide water quality benefits for the scheme.

The predominant mechanism for potential surface water pollution is anticipated to be derived from the mobilisation of contaminants from the rail network during storm events, particularly in the siding areas where carriages may be stationary for some time. Appropriate stages of treatment, often referred to as 'treatment trains' will be required to ensure adequate pollution mitigation is provided.

The current proposed treatment train, in order, consists of; trackside filter drains, ditches/swales and attenuation/bio retention ponds prior to discharge into the natural watercourses. For the maintenance facility area, sediment/oil forebays may be required upstream of the ponds to capture and contain any potential contaminants which have not been treated by the upstream networks.

Additionally, specific maintenance areas such as carriage washing and fuel handling areas etc, may require their own dedicated pollution control systems prior to connecting into the wider surface water network.

4.6 S4 - Amenity

The Welsh Standard S4 states that the surface water management systems should maximise amenity benefits.

The proposed use of grass lined ditches will provide a more natural looking drainage on the site which will be visually appealing. Similarly, the ponds can be shaped to look visually appealing and provide provision for additional flora, fauna and wildlife habitats.

4.7 S5 - Biodiversity

Standard S5 requires that surface water management systems also maximise biodiversity benefits.

The use of grass lined ditches and attenuation ponds will provide a diverse range of habitats for flora and fauna.

4.8 S6 - Construction, Operation and Maintenance

Standard S6 requires that the proposed surface water drainage systems are designed such that they can be constructed, operated and maintained easily, safely and cost effectively for the whole design life of the systems. They should also aim to minimise the use of natural resources and embedded carbon.

The Complementary Earthworks scheme will be completed before the GCRE scheme is installed which will provide suitable access to all areas. Utilising the drainage installed as part of those works will minimise the amount of work required and therefore natural resources.

The use of green features will also assist in offsetting carbon and the nature of the ballast will offer a filtering effect and to a degree keep contaminants within the ballast rather than discharging them into the watercourse.

The drainage proposals minimise the requirement for hard engineering solutions by utilising ditches for conveyance and attenuation ponds for storage. Stone for the ditches will likely be from site won material rather than being imported.

An access track has been provided around each of the attenuation ponds to facilitate an area for inspection and maintenance. To provide access to each pond, a proposed maintenance access track route has been determined around the GCRE, this is shown in drawing CG3075 in Appendix E.

5 Foul Drainage

No existing or proposed foul drainage is currently required for the Nant Helen Site. The existing Washery site is served by foul drainage and the proposed maintenance and research facilities will require foul drainage provision as detailed in the following sections.

5.1 Existing Foul Drainage

Asset record information obtained from Dŵr Cymru Welsh Water (DCWW) show a public 150mm foul sewer enters the western portion of the Washery site from the north. The records show the sewer converts to a 230mm diameter combined drain within the site before exiting the site. After the public combined network that serves Onllwyn connects to this combined network it continues in a south westerly direction down the valley.

Information provided by Celtic Energy shows an existing private foul drainage network present in the Washery site. The network collects flows from various buildings before heading in a westerly direction and outfalling to the existing 230mm diameter combined sewer.

Celtic Energy have advised that trade effluent is not currently discharged from the site into the DCWW foul or combined network.

5.2 Proposed Foul Drainage

Foul drainage will be generated from the site from staff facilities such as canteens, toilets and welfare facilities. Based on a staff population of 118, the estimate submitted in the economic business case, the proposed peak flow is estimated to be 1.87 l/s.

A pre planning application was made to DCWW to ascertain if sufficient capacity exists within the local network to facilitate the proposed development based on the above peak flow. DCWW have subsequently advised that sufficient capacity exists within the combined sewer to cater for the development. Therefore, it is proposed to convey the foul drainage from the development to the existing connection to the DCWW combined sewer. The pre planning response letter can be found in Appendix G.

5.3 Proposed Trade Effluent

It is anticipated that the maintenance facility works will also produce trade effluent from train carriage washing facilities. The quantity and flow rates for such facilities are currently unknown at this stage of the scheme. As part of the pre planning application to DCWW, it was highlighted that discharge of pre-treated carriage wash may require a connection to the DCWW network. DCWW have advised in the pre planning response that a discharge consent would be required.

Should an agreement on the discharge of trade effluent to the DCWW sewer not be reached with DCWW, storage and removal of trade effluent may be required.

6 Conclusion

The surface water drainage strategy has been considered in accordance with the Welsh Government's Statutory Standards for Sustainable Drainage Systems. Consideration has been given to the proposed runoff destination, hydraulic control, water quality, amenity and biodiversity for the scheme.

The proposed Nant Helen rail testing tracks will be located on the 17.5m earthworks plateaus provided by the previously submitted Nant Helen Complementary Earthworks Scheme.

The drainage strategy for the Complementary Earthworks considered and made allowance for the proposed GCRE development. Minor changes have been proposed which include; the replacement of the drainage on the earthworks plateaus for dedicated track drainage, additional drainage for the rail link between the testing loops and the existing mainline and the drainage for the GCRE access road.

The Complementary Earthworks Scheme will result in modifications to the original catchment and restoration catchment areas. For each sub-catchment, to ensure the runoff rate from the site is not increased, the catchment areas for the original and proposed catchments were compared. Where the proposed catchment is larger, flows have been attenuated to the GRR for the smaller catchment area. In addition to this, for the River Tawe catchments, the betterments to the GRR proposed in the Celtic Energy Restoration Plan have been adopted. Further details are contained with the previously submitted Complementary Earthworks Drainage Strategy Report. Attenuation and flow control will be provided to GRR for storm events up to and including the 1 in 100 year return period event including a 40% allowance for climate change.

Rail maintenance and research facilities are proposed on the site of the existing Onllwyn Coal Washery. The existing surface water catchments and drainage strategy have been evaluated and used to inform the proposed strategy. It is proposed to control, treat and convey the surface water from the proposed impermeable areas to the GRR prior to discharging to existing watercourses. The majority of the site is proposed to outfall west into the River Dulais mimicking the existing hydraulic regime. The eastern portion of the site is proposed to outfall to a tributary for the Afon Pyrddin to the east. Attenuation and flow control will be provided for storm events up to and including the 1 in 100 year return period event including a 40% allowance for climate change.

The principles of the stormwater conveyance have been discussed. The rail track will be primarily drained by filter drains within the ballast. Elsewhere, the stormwater runoff will be captured and conveyed within the catchments utilising engineered cut-off ditches, swales, culverts, cascades and attenuation ponds. The sequential drainage elements will provide treatment of the storm water prior to discharging to existing watercourses. The ditches and attenuation ponds will also

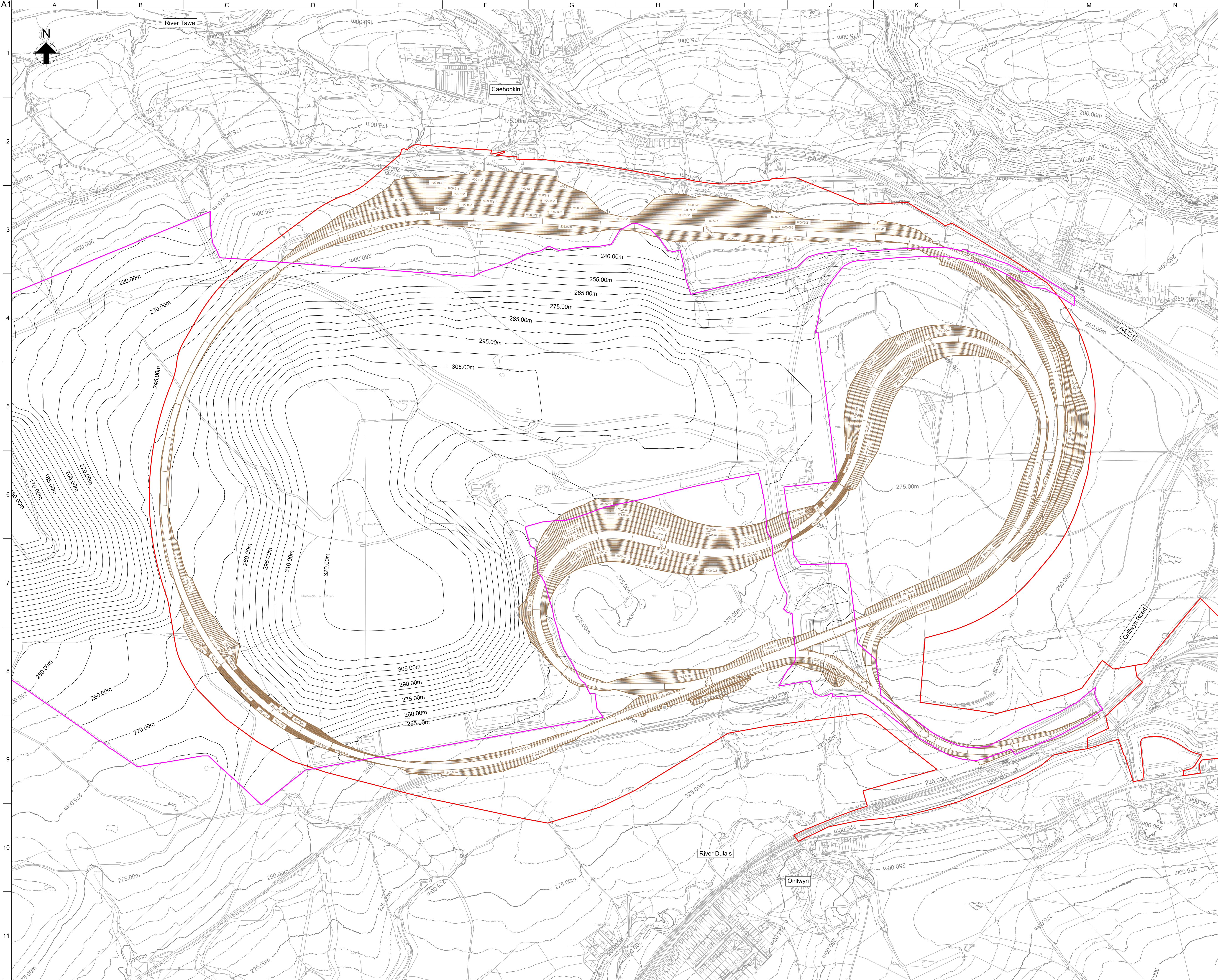
provide both amenity and biodiversity value by blending into the natural landscape and providing a contrast between dry and wet areas.

The proposed rail maintenance facility at the Washery site will require a foul drainage connection for the site buildings. Based on an occupancy of 118 staff and estimated peak flow of 1.87 l/s, DCWW have confirmed that sufficient capacity exists within the existing connection to the combined sewer to facilitate the proposed development.

Carriage washing facilities will generate trade effluent which will need to be disposed of accordingly. The discharge of trade effluent to the combined DCWW sewer would require a trade discharge agreement with DCWW. Should an agreement on the discharge of trade effluent to the DCWW sewer not be reached with DCWW, storage and removal of trade effluent may be required.

Appendix A

Restoration and Existing Topography Drawing



Legend

Planning Application Boundary

Restoration Works Boundary

285.000m Restoration Topography

285.000m Existing Topography

285.000m Complimentary Earthworks Plateaus

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

2. Levels shown within the Restoration Works Boundary are based on the restoration scheme proposed by Celtic Energy and provided to Arup on 17/10/2019. No responsibility is taken for the accuracy of this information.

3. Levels outside the Restoration Contour Boundary are based on 2m resolution LIDAR data. No responsibility is taken for the accuracy of this information.

4.Slight discrepancies between LIDAR data and restoration proposals to be reviewed once topographical survey is undertaken on site.

P02	12/02/21	DS	JS	JS
Drawing Updated				
P01	17/07/20	DO	IA	JS
Issued for Planning				
Issue	Date	By	Chkd	Appd

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Client

Welsh Government

Job Title

Global Centre for Rail Excellence

Drawing Title

Existing Site Plan,
Restoration Topography and
Planning Boundary

Scale at A1

1:5000

Discipline

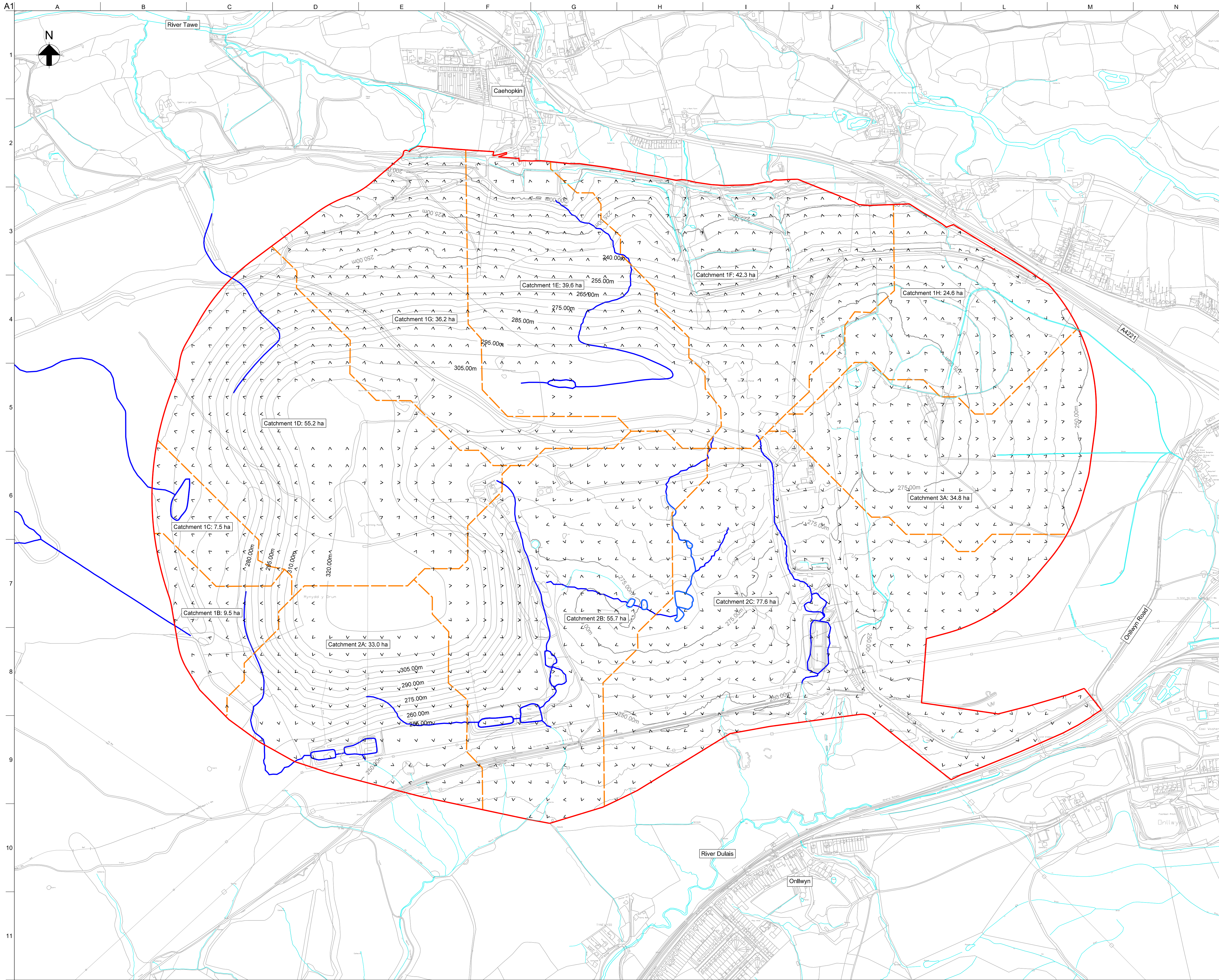
Infrastructure

Drawing Status

Job No	Drawing No	Issue
264904	CG3000	P02

Appendix B

Nant Helen Original and Proposed Catchment Boundaries Drawing



Legend

Planning Application Boundary

285.000m Existing and Restoration Topography

Existing Watercourse

Engineered Site Restoration Watercourse (Proposed)

Surface Runoff Direction

Catchment Boundary

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

2. Levels within the Restoration Works Extent are based on the restoration scheme proposed by Celtic Energy and provided to Arup on 17/10/2019. No responsibility is taken for the accuracy of this information.

3. Levels outside the Restoration Scheme Extents are based on 2m resolution LIDAR data. No responsibility is taken for the accuracy of this information.

4. Slight discrepancies between LIDAR data and restoration proposals to be reviewed once topographical survey is undertaken on site.

P01	17/07/20	DO	IA	JS
Issued for Planning				
Issue	Date	By	Chkd	Appd

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Welsh Government

Job Title

Global Centre for Rail Excellence

Drawing Title

Existing and Restoration Topography
Flow Paths

Scale at A1

1:5000

Discipline

Infrastructure

Drawing Status

For Information

Job No	Drawing No	Issue
264904	CG3005	P01

Appendix C

Celtic Energy Restoration Drainage Proposals

CELTIC ENERGY LTD

NANT HELEN REMAINDER SURFACE COAL MINE SITE

Condition 45: Restoration of Watercourses – Design Statement Revision C

1.0 Introduction

The overall site restoration strategy was established through the original planning consent, to which reference has been made in developing these proposals to restore the watercourses affected by the site workings. The site covers the head of the local catchment areas, with the larger part of the site draining towards the north to the Afon Tawe and the southern part of the site draining towards the south to the Dulais. A very small triangle of land to the east drains towards the Afon Pyrrddin.

A restoration scheme has been submitted under condition 45 of the current Planning Permission and the restoration of the watercourses is specifically referenced in part g) to enhance biodiversity and in part i) to create attenuation ponds, water features, wetlands and reed beds to achieve maximum ecological diversification.

2.0 Design Principles

The restoration of the watercourses has been designed to incorporate attenuation ponds, wetlands and rush-lined channel beds in accordance with the submitted scheme. These water features will slow down and reduce surface water flows away from the site and re-connect the restored on-site watercourses to the existing downstream watercourses that were severed by the site operations.

Wherever gentler gradients permit, the watercourses will be clay-lined and planted with rushes; wetlands are located into the proposed landscape where possible. The gradients along some of the watercourses are steep and for slopes in excess of 1 in 12 the channel beds will need to be reinforced with rock. These sections will be stepped and formed with back-fall areas to provide small pools and to help slow the flows.

In between the more gentle and steep gradients the watercourse beds will be lined with loose stone/gravel. The size of the gravel beds that will be required for stability have been determined by calculation and typical details of each of the three types of construction are included on the watercourse restoration drawings.

Of the total length of new watercourses, an estimated 17% will be rush-lined, 53% formed with stone/gravel beds and 30% will need to be reinforced with rock. Natural materials will be sourced from the site as much as possible for use in the construction of the new watercourses.

Reference has been made to the original planning application documents to compare the original surface water run-off from the site and the long-term surface run-off resulting from the restoration proposals. Preliminary designs have been undertaken for the proposed

on-site water features to act as attenuation ponds and reduce the surface water run-off from the site to lower flow rates than were experienced before the site was brought into operation. The principle of reducing the flows away from the site also serves to reduce possible flood risk in the downstream receiving watercourses including the main rivers, the Afon Tawe and the Dulais.

A summary comparison table of the pre- and post-operational surface water run-off rates to each of the original catchment areas follows, together with a second table showing the results of the preliminary attenuation assessments. Calculations for each watercourse and the associated attenuation assessments are included as separate attachments.

3.0 Q₁₀₀ Off-Site Flow Comparisons

Original Site Catchment	Original Q ₁₀₀ Site Run-off (cumec)	Proposed Watercourse	Proposed Q ₁₀₀ Site Run-off (cumec)	Difference in Flows Off-site (Percentage)
1a	0.310	Site run-off	0.268	-14%
1b	3.000	Site run-off	0.251	-92%
1c	3.600	A	1.080	-70%
1d	4.200	C	1.522	-64%
1e	1.480	E	1.066	-28%
1f	1.010	Site run-off	0.967	-4%
1g	1.090	D	0.441	-60%
2a	1.330	H	0.397	-70%
2b	1.620	G1 and G2	0.819	-49%
2c	0.830	F	0.216	-74%

4.0 Preliminary Q₁₀₀ Attenuation Assessments

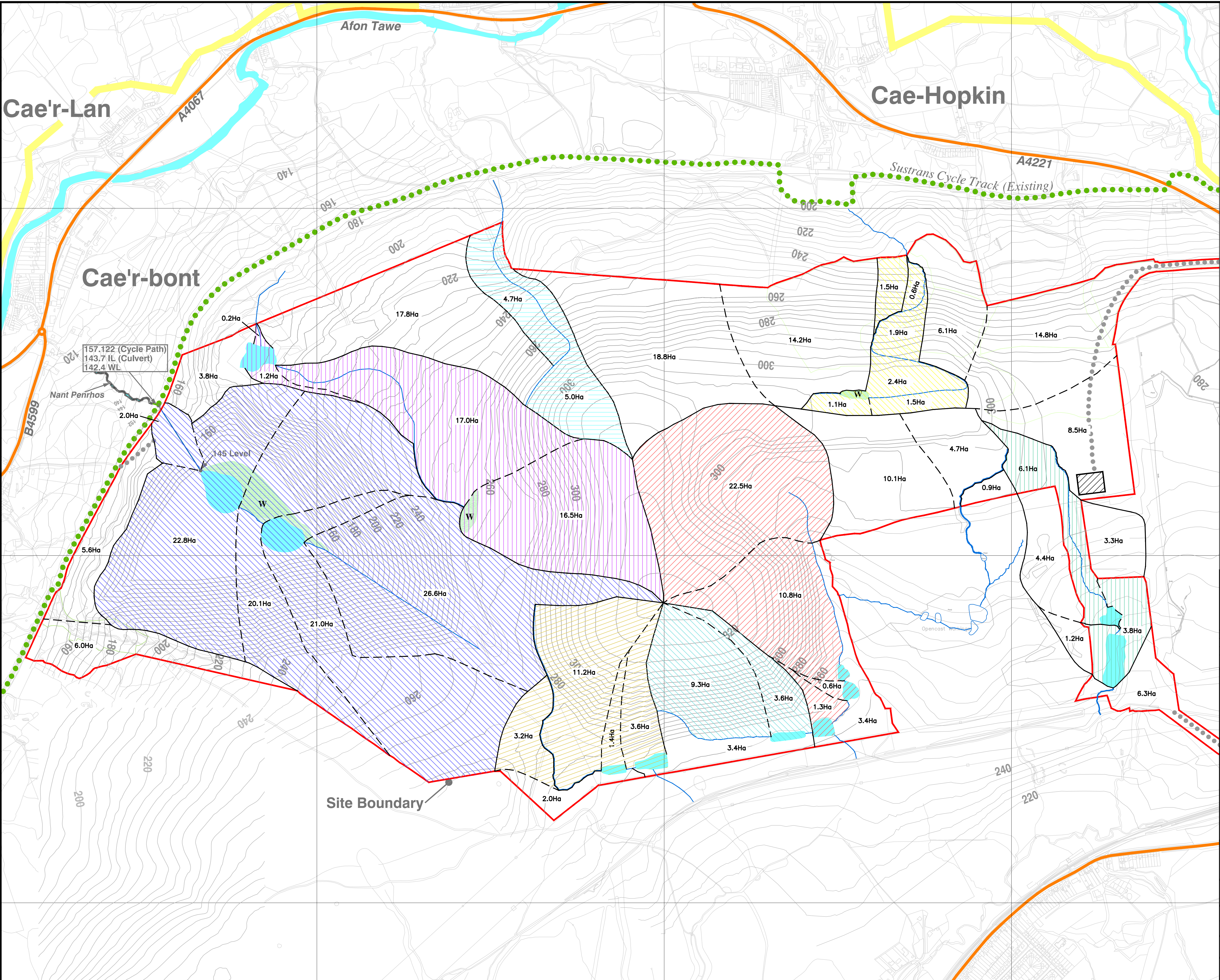
Attenuation Pond	Flow Control Structure (m)	Maximum Q ₁₀₀ Attenuation Volume (cum)	Maximum Q ₁₀₀ Water Level Variations (m)	Maximum Q ₁₀₀ Outflow (cumec)
A1 UPPER	1.000	4528	0.495	0.594
A2 LOWER	1.000	6477	0.615	0.820
C	1.400	2534	0.443	0.704
F UPPER	1.000	716	0.313	0.299
F LOWER	1.000	1974	0.252	0.216
G1 UPPER	1.100	1037	0.910	1.627
G1 LOWER	0.700	1758	0.896	1.011
G2 UPPER	0.300	1229	0.570	0.220
G2 LOWER	0.550	2597	0.914	0.819
H UPPER	1.000	801	0.481	0.568
H LOWER	1.000	1213	0.379	0.397

5.0 Condition 45 Drawings

2363-D01-C	Proposed Restoration Water Features
2363-D02-C	Restoration Watercourses Catchment Plan
2363-D04-C	Watercourse A Longitudinal Section
2363-D05-C	Watercourse C Longitudinal Section
2363-D06-C	Watercourse D Longitudinal Section
2363-D07-B	Watercourse E Longitudinal Section
2363-D08-B	Watercourse F Longitudinal Section
2363-D09-B	Watercourse G1 Longitudinal Section
2363-D10-B	Watercourse G2 Longitudinal Section
2363-D11-B	Watercourse H Longitudinal Section
2363-D12-B	Restoration Watercourse Details
2363-D13-C	Water Features and Landscape

6.0 Condition 45 Calculations

2363-C01-C	Restoration Watercourse A
2363-C02-C	Restoration Watercourse C
2363-C03-C	Restoration Watercourse D
2363-C04-B	Restoration Watercourse E
2363-C05-B	Restoration Watercourse F
2363-C06-B	Restoration Watercourse G1
2363-C07-B	Restoration Watercourse G2
2363-C08-B	Restoration Watercourse H
2363-C09-C	Site Run-off to Areas 1a, 1b, 1c, 1d, 1e and 1f



KEY

- SITE BOUNDARY
- WATERCOURSE A CATCHMENT AREA
- WATERCOURSE C CATCHMENT AREA
- WATERCOURSE D CATCHMENT AREA
- WATERCOURSE E CATCHMENT AREA
- WATERCOURSE F CATCHMENT AREA
- WATERCOURSE G1 CATCHMENT AREA
- WATERCOURSE G2 CATCHMENT AREA
- WATERCOURSE H CATCHMENT AREA

C WESTERN PONDS AMENDED		30.09.19
B RESTORATION CONTOURS AMENDED		23.11.18
A FIRST ISSUE FOR PLANNING AUTHORITY		19.08.16
Revision Details		By Date

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Project

**NANT HELEN
RESTORATION**

Title

**RESTORATION
WATERCOURSES
CATCHMENT PLAN**

Scale at A1

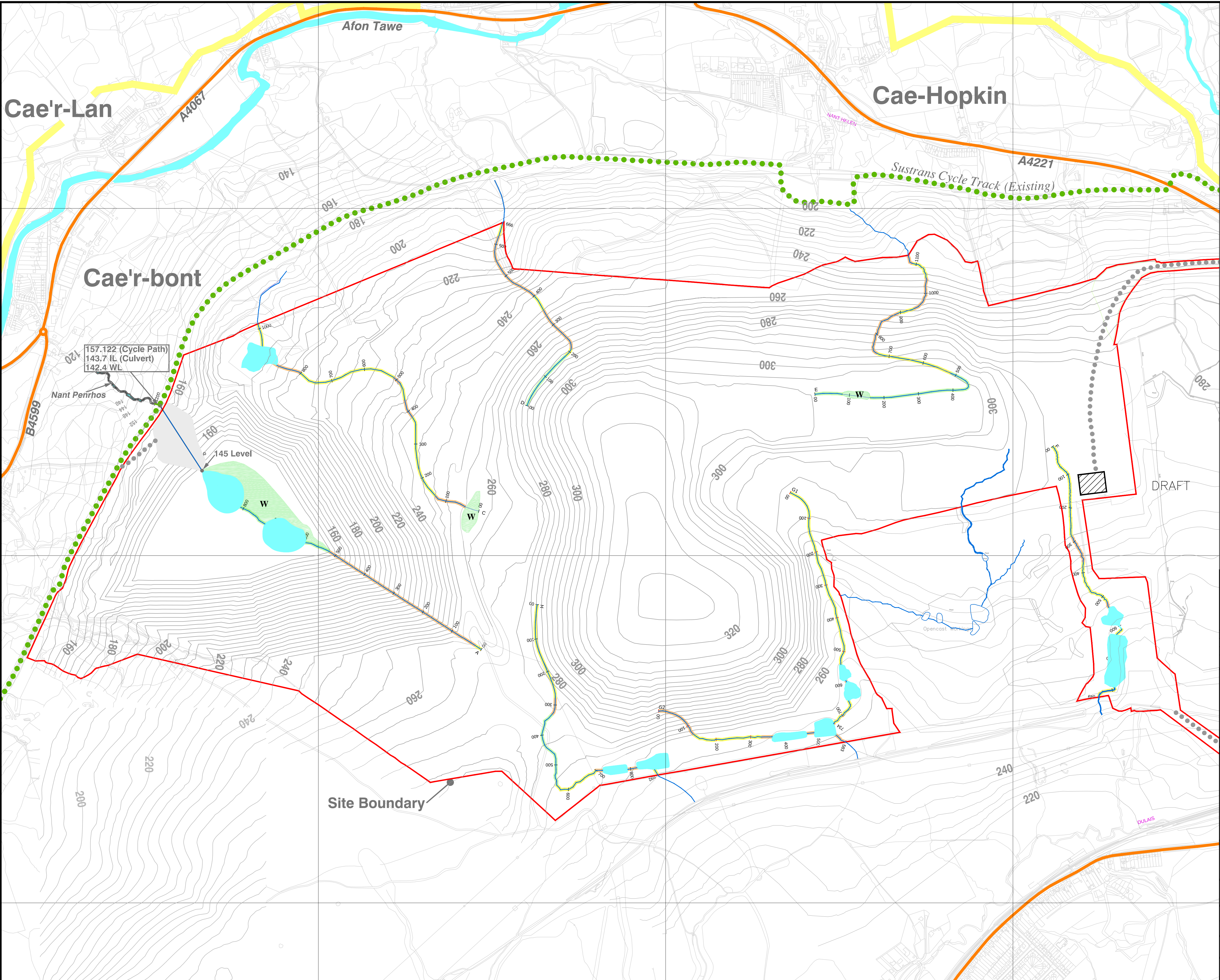
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Drawn	Date
Checked	Date

Project No: **2363**

Drawing No: **D02-C**

Date: **29 Jun 2016**



- KEY
- SITE BOUNDARY
 - WATERCOURSE
 - RUSH-LINED WATERCOURSE
 - STONE BED WATERCOURSE
 - ROCK REINFORCED WATERCOURSE
 - POND
 - WETLAND
 - HARDSTANDING
 - CYCLE ROUTE
 - RETAINED ACCESS

C WESTERN PONDS AMENDED	30.09.19
B RESTORATION CONTOURS AMENDED	23.11.18
A FIRST ISSUE FOR PLANNING AUTHORITY	19.8.16
Revision Details	By Date

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RESTORATION

Title
PROPOSED RESTORATION
WATER FEATURES

Scale at A1
1:5000

Drawn	Date 6 Jul 2016
Checked	Date

Project No: 2363

Drawing No: D01-C

Appendix D

Hydrological Calculations Technical Note

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Project title	Nant Helen Complementary Restoration Earthworks	Job number	264904
cc		File reference	
Prepared by	Rob Varley	Date	04 December 2019
Subject	Nant Helen Complementary Restoration Earthworks - Hydrological Assessment		

1 Introduction

The Nant Helen site to the north of Onllwyn is an open cast mine owned and operated by Celtic Energy. The mining operations currently being undertaken will cease in 2021, at which point Celtic Energy will be required to restore the land in accordance with regulatory requirements and the agreements with Powys County Council (PCC). A restoration scheme for the site has been submitted for approval through the Planning process.

Following discussions with both PCC and Neath Port Talbot County Borough Council (NPTCBC), the local authorities have expressed a desire to develop restoration proposals for the Nant Helen site which will create long term, sustainable jobs.

As such, the Nant Helen Complementary Earthworks Scheme looks to provide a flexible landform that can be used or adapted for a diverse set of future uses. This could range from the traditional agriculture, woodland and nature conservation purposes, to amenity, leisure and tourism uses.

Other potential uses for the site could also include industrial purposes such as the Welsh Government's (WG) proposal to develop a rail testing and storage facility, known as the Global Centre of Rail Excellence (GCRE) at this site together with the adjacent Onllwyn Washery.

For the proposed scheme, an earthworks plateau is proposed that can be adapted for all the above purposes. Consideration has been given to providing suitable longitudinal gradients and track radii should the GRCE project proceed. It is proposed that the construction of this earthworks plateau will be undertaken in tandem with the restoration scheme for the site.

A planning application has been prepared for the Nant Helen Complementary Earthworks. A separate planning application will be submitted at a future date to cover any additional infrastructure required to bring the site to its selected future use.

This technical note details the hydrological calculations undertaken to determine the Greenfield Runoff Rate (GRR) for the scheme.

Technical Note

264904

04 December 2019

2 Overview of site

2.1 Site Description

The Nant Helen Complementary Earthworks Scheme consists of an inner and an outer track loop. The outer track loop encompasses a ridgeline running from east to west across the centre of the site. This ridgeline forms the catchment boundary for three adjacent watercourses:

- The River Tawe, located to the north of the site (River Tawe Catchment)
- The River Dulais, located to the south of the site (River Dulais Catchment)
- The Afon Pyrddin, located to the east of the site (Afon Pyrddin Catchment)

The extent of each of these catchments relative to the planning boundary has been shown in Appendix A. The total area within the Planning boundary is approximately 416ha.

Stormwater runoff from the site is conveyed via a number of smaller streams and ditches, which discharge into the major watercourses as tributaries. A number of these tributaries have been severed during the open cast mining operations that have taken place on the site.

As part of the Celtic Energy restoration scheme, these tributaries and associated catchment areas are proposed to be reinstated. However, the proposed restoration scheme highlights that the discharge rate from these catchments will be attenuated to discharge rates significantly less than the calculated Greenfield Runoff Rate (GRR). This was queried during a meeting with Celtic Energy, where it was established that a number of tributaries within the River Tawe Catchment have experienced fluvial flooding issues in the past. Therefore, the proposed discharge from the reinstated catchments had been reduced from the GRR to help alleviate these downstream flooding issues.

This note has been prepared to establish the GRR for the site, and as such the restoration scheme is not considered. However, these reductions to the GRR for the River Tawe catchment have been adopted as discussed in the overarching drainage strategy report for the scheme.

2.2 Site Catchment Descriptors

The descriptors for the three catchments were obtained from the FEH Online Service. The catchments selected were the smallest catchments that included the largest possible portion of the study site, so the catchment descriptors were site-specific as possible. This meant that to represent the River Tawe and River Dulais Catchments, a smaller tributary was selected to minimise the inclusion of adjacent areas and therefore obtain catchment descriptors representative of the site.

The purchased descriptors were subsequently compared (Table 1), and the below findings noted:

- The FARL index demonstrates that the watercourses are not controlled upstream of the site by lakes or reservoirs.

Technical Note

264904

04 December 2019

- The FPEXT descriptor shows that a larger proportion of the Afon Pyrddin catchment would be inundated during a 1:100-year flooding event, although the value is still relatively small.
- The Base Flow Index (BFIHOST) is relatively similar for all catchments, but slightly higher for the Afon Pyrddin catchment.
- The Standard Average Annual Rainfall 1961-1990 (SAAR6190) is similar between the three sites.
- The urban extent is higher for the Afon Pyrddin catchment as the catchment area encompasses a portion of the village of Coelbren.
- The descriptor SPRHOST indicates that the soil within all catchments has a relatively low permeability.

Table 1 - Comparison of the River Tawe, River Dulais and Afon Pyrddin Catchment Descriptors			
Catchment Descriptor	River Tawe Catchment	River Dulais Catchment	Afon Pyrddin Catchment
AREA (km ²)	0.54	1.04	0.61
FARL	1	1	1
FPEXT	0.0092	0.0241	0.0776
BFIHOST	0.306	0.286	0.319
SAAR6190 (mm)	1775	1826	1789
SPRHOST (%)	50.86	52.90	44.77
URBEXT2000	0.000	0.000	0.0245

Technical Note

264904

04 December 2019

3 Hydrological Assessment

To design the cut off ditches, culverts, cascades and attenuation volumes required for the scheme, the GRR for the 1, 30 and 100-year return period events is required.

To calculate these, a hydrological analysis has been undertaken on the River Dulais, Afon Pyrddin and River Tawe Catchments. Although each of these catchments have been separated into a number of sub-catchments serving individual tributaries, these would be too small to analyse individually. Therefore, an analysis has been undertaken on each overarching catchment and the results will be applied to each sub-catchment area.

Three calculation methods have been used to derive this rate, the FEH Statistical, ReFH rainfall-runoff (Version 2.2) and IH124 methods. The parameters used and results from each analysis are detailed in the sections below.

Refer to Section 4 for a summary of the results.

3.1 River Dulais Catchment

3.1.1 IH124 Method

To undertake the IH124 Method, the source control module within Microdrainage was applied.

The point SAAR value of 1800mm was applied using the interactive map within the microdrainage software. This value of 1800mm is between the values obtained for the three catchments, which demonstrates this will be a good representative of the average SAAR value for the site.

The area of the River Dulais catchment contained within the planning application boundary was measured to be 167Ha. This area was applied within the software to determine the peak GRR for the total site. The peak GRR has been calculated for the 1 year, 30 year and 100-year return period events and was subsequently scaled by the area to give the GRR per hectare:

- 1:1 year rainfall event – 12.8l/s/ha
- 1:30 year rainfall event – 25.7l/s/ha
- 1:100 year rainfall event – 31.8l/s/ha

Refer to *Figure 1: IH124 Calculation undertaken within Microdrainage for the River Dulais Catchment* Figure 1 for the Microdrainage summary of results.

Technical Note

264904

04 December 2019

The screenshot shows the 'Rural Runoff Calculator' software window. The 'IH 124' tab is active, displaying input parameters and a table of results. The input parameters are: Return Period (Years) 100, Area (ha) 167.000, SAAR (mm) 1800, Soil 0.500, Growth Curve (None), and Partly Urbanised Catchment (QBAR) Urban 0.000, Region Region 9. The 'Results' panel shows QBAR rural (l/s) 2438.2 and QBAR urban (l/s) 2438.2. The 'Return Period Flood' table lists various regions and their corresponding peak flow rates (Q) for different return periods.

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (2 yrs) (l/s)	Q (5 yrs) (l/s)	Q (10 yrs) (l/s)	Q (20 yrs) (l/s)	Q (25 yrs) (l/s)	Q (30 yrs) (l/s)	Q (50 yrs) (l/s)	Q (100 yrs) (l/s)
Region 4	2438.2	6266.3	2023.7	2185.1	2999.0	3633.0	4333.7	4579.0	4777.3	5369.0	6266.3
Region 5	2438.2	8680.1	2121.3	2178.8	3145.3	4035.3	5097.9	5515.3	5857.8	6929.5	8680.1
Region 6/Region 7	2438.2	7778.0	2072.5	2148.1	3120.9	3949.9	4884.3	5237.3	5525.8	6388.2	7778.0
Region 8	2438.2	5900.5	1901.8	2154.4	2999.0	3633.0	4265.0	4476.6	4647.9	5164.2	5900.5
Region 9	2438.2	5315.3	2145.6	2264.6	2950.3	3462.3	3976.8	4154.7	4299.0	4720.4	5315.3
Region 10	2438.2	5071.5	2121.3	2271.0	2901.5	3364.8	3833.4	3998.7	4133.9	4510.7	5071.5
Ireland National	2438.2	4486.3	2072.5	2340.7	2925.9	3291.6	3661.2	3779.3	3875.8	4145.0	4486.3
Ireland East	2438.2	4632.6	2072.5	2340.7	2950.3	3364.8	3752.8	3876.8	3973.4	4242.5	4632.6

Figure 1: IH124 Calculation undertaken within Microdrainage for the River Dulais Catchment

3.1.2 ReFH Version 2.2

The catchment descriptors purchased from the FEH Online service were imported into the ReFH2 software (version 2.2). Within the software, the FEH13 DDF rainfall model was applied as this updated method removes the need to derive an alpha correctional factor. This factor was used to modify the initial soil moisture content (C_{ini}) of the model and was often derived using results from the FEH Statistical Method.

By removing the alpha factor, the peak flows estimated by the ReFH2 method are independent of those generated using the FEH Statistical Method, resulting in improved decision making and higher flexibility when selecting the appropriate GRR (ReFH2 Technical Report).

The default storm duration recommended by ReFH2 was used to calculate the GRR. This corresponded to the 2 hour 54 minute storm event. A timestep of 6 minutes was applied.

The 1, 30 and 100-year peak flow outputs were scaled by the subject catchment area to obtain GRR per hectare and are shown in Table 2 below. Both the winter and summer seasonal values have been provided:

Technical Note

264904

04 December 2019

Table 2 – Derived GRR from the ReFH2 Analysis for the River Dulais		
Return Period	Winter (l/s/ha)	Summer (l/s/ha)
1:1 Year	18.4	19.8
QMED	20.7	22.4
1:30 Year	42.2	46.3
1:100 Year	52.7	57.9

The proposed scheme predominantly involves sizing cut-off ditches, culverts, cascades and attenuation features which are suitable for conveying and attenuating predominantly undeveloped land. It is important that the critical storm event is used to size these features to ensure they have sufficient capacity. Since the GRR was calculated to be higher for the summer seasonality, these values will be applied in the design, to ensure adequate sizing of proposed drainage features.

3.1.3 FEH Statistical Method

To undertake the FEH Statistical analysis, the WINFAP4 software was used. Within the software, the latest version of the HiFlows UK data set was applied (version 8), to ensure the latest available station data was utilised.

DEFRA/EA Science Report SC090031 provides guidance and best practice on estimating peak flows and hydrographs for small catchments. The report recommends that for ungauged catchments, the QMED obtained from catchment descriptors should be modified using data transfer from a local donor station with annual maxima data.

The use of a geographically close catchment prevents introducing uncertainties from local flooding factors that may not be contained within catchment descriptors. The QMED adjustment factor in the data transfer equation is moderated based on distance between catchment centroids, so only geographically close stations will have a larger influence.

Using the WINFAP Donor Adjustment method provided a list of the ten closest catchments, and selected the nearest 6 of these by default:

- Station 58008: Dulais at Cilfrew
- Station 59001: Tawe @ Ynystanglws
- Station 58002: Neath @ Resolven
- Station 58006: Mellte @ Pontneddfechan
- Station 60009: Sawdde @ Felin-Y-Cwm
- Station 58012: Afan @ Marcroft Weir

A review of the catchment descriptors for these donor sites was undertaken. Stations 59001, 60009 and 58012 were all removed due to the difference of the SPRHOST, BFIHOST and AREA with the subject catchment. Station 58002 was also removed due to the large AREA difference and the noted combined effect on observed flows from reservoirs, water abstraction and effluent returns.

The donor catchments used for the QMED adjustment were therefore:

Technical Note

264904

04 December 2019

- Station 58008: Dulais at Cilfrew
- Station 58006: Mellte @ Pontneddfechan

Station 58006 provided the closest correlation with the target sites catchment descriptors. Station 58008 also provided a good correlation and is downstream of the site in the River Dulais. Given this station includes the area within the site catchment, it is likely to give a reasonable representation of the QMED adjustment required. It was noted that the observed flows for both stations are affected by effluent, but since they are suitable for QMED this was deemed to be acceptable.

A comparison of QMED was undertaken between the calculated value using catchment descriptors and the measured value observed from annual maxima data. This comparison is shown in Table 3 below.

Table 3 – Comparison of calculated and observed QMED values for donor sites			
Station	Observed QMED (m3/s)	Calculated QMED (m3/s)	Difference (QMED _{calc} /QMED _{obs})
River Dulais (From FEH Online)	N/A	2.4	N/A
58008 (Dulais @ Cilfrew)	56.4	46.9	1.20
58006 (Mellte @ Pentneddfechan)	87.4	75.3	1.16

The use of data transfer from these donor sites results in an uplift of the GRR from 23.0 l/s/ha (using the QMED catchment descriptor equation) to 25.7 l/s/ha.

The default pooling group contained 16 stations with a total of 515 years of data. This pooling group had a standardised test value (H2) of 1.36, indicating that the pooling group was possibly heterogeneous and a review of the group was optional.

A review of the pooling group was undertaken and the following stations removed:

- Station 49005 – Bollingey Stream at Bollingey Cocks Bridge. Rationale: Short records, only 8 years. Different seasonality of flooding. Negative L-kurtosis. High BFIHOST (0.627) compared to target site. High discordancy value of 2.803.
- Station 69047 – Roch @ Littleborough. Rationale: Low FARL value (0.890)

It was also noted that Station 45816 (Haddeo at Upton) had a steeper growth curve than other stations and a high BFIHOST (0.590). However, a review of the site showed that it has had two relatively large annual maxima events during its recording period. These signify extreme events which have occurred and offer an important contribution to the pooled growth curve. Therefore, it was decided that this station should be included within the group.

The resulting pooling group consisted of 14 stations with a total of 466 years of data. One station was added to achieve the required 500 years:

- Station 21017 – Ettrick Water @ Brockhoperig

Technical Note

264904

04 December 2019

This brings the total years of data within the group to 507 years. The modifications to the pooling group resulted in a reduced H2 value of 1.10. The group therefore remained possibly heterogeneous, but there were no obvious justifications to make further amendments.

The goodness of fit test was used which recommended the Generalised Logistic fit. This was applied to produce peak flow estimates for the QMED, 30 and 100-year return period events. These were then scaled by the catchment area to determine the GRR.

The modified pooling group was used to produce peak flow estimate for the QMED, 30 and 100 year return period events. These were then scaled by the catchment area to determine the GRR.

The derived Greenfield Runoff Rate is shown below:

- QMED (1:2 year) rainfall event – 25.7 l/s/ha
- 1:30 year rainfall event – 52.2 l/s/ha
- 1:100 year rainfall event – 67.9 l/s/ha

3.2 Afon Pyrddin Catchment

3.2.1 IH124 Method

The IH124 Method was applied within Microdrainage as described for the River Dulais catchment (see Section 3.1.1). The area of the Afon Pyrddin catchment within the planning application boundary was measured to be 33Ha. The point SAAR value of 1800mm was applied.

As the IH124 method was derived for sites over 50ha, it is common practice to undertake the calculation based on an area of 50ha and then linearly interpolate this down for the catchment area. This has been shown in Table 4 below. The results from Microdrainage are shown in Figure 2:

Table 4 – Derived GRR from the IH124 Analysis for the Afon Pyrddin			
Return Period	Total GRR for 50ha (l/s)	Scaled Catchment (33ha) GRR (l/s)	GRR per ha (l/s/ha)
1:1 Year	733.5	484.1	14.7
1:30 Year	1469.7	970.0	29.4
1:100 Year	1817.2	1199.4	36.3

Technical Note

264904

04 December 2019

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (2 yrs) (l/s)	Q (5 yrs) (l/s)	Q (10 yrs) (l/s)	Q (20 yrs) (l/s)	Q (25 yrs) (l/s)	Q (30 yrs) (l/s)	Q (50 yrs) (l/s)	Q (100 yrs) (l/s)
Region 4	833.6	2142.3	691.9	747.0	1025.3	1242.0	1481.6	1565.4	1633.2	1835.5	2142.3
ICP SUDS	833.6	2967.5	725.2	744.9	1075.3	1379.6	1742.8	1885.5	2002.6	2369.0	2967.5
ADAS 345	833.6	2659.1	708.5	734.4	1067.0	1350.4	1669.8	1790.5	1889.1	2183.9	2659.1
FEH	833.6	2017.2	650.2	736.5	1025.3	1242.0	1458.1	1530.4	1589.0	1765.5	2017.2
ReFH2	833.6	1817.2	733.5	774.2	1008.6	1183.7	1359.5	1420.4	1469.7	1613.8	1817.2
Region 10	833.6	1733.8	725.2	776.4	991.9	1150.3	1310.5	1367.1	1413.3	1542.1	1733.8
Ireland National	833.6	1533.8	708.5	800.2	1000.3	1125.3	1251.7	1292.0	1325.0	1417.1	1533.8
Ireland East	833.6	1583.8	708.5	800.2	1008.6	1150.3	1283.0	1325.4	1358.4	1450.4	1583.8

Figure 2: IH124 Calculation undertaken within Microdrainage for the Afon Pyrddin Catchment

3.2.2 ReFH Version 2.2

The ReFH2 method was applied as described for the River Dulais catchment (see section 3.1.2). Catchment descriptors were exported from FEH Online and analysed for both winter and summer seasonality. The default recommended storm duration of 2 hours, 42 minutes with 6-minute intervals was used.

The 1, 30 and 100-year peak flows from the analysis were scaled by the subject catchment area to obtain GRR per hectare estimates. These are shown in Table 5 below.

Table 5 - Derived GRR using the ReFH2 Analysis for the Afon Pyrddin		
Return Period	Winter Seasonality (l/s/ha)	Summer Seasonality (l/s/ha)
1:1 Year	15.6	16.9
QMED	17.5	19.2
1:30 Year	36.6	40.5
1:100 Year	45.9	51.0

As with the River Dulais catchment, the summer seasonality has been applied due to the proposed use of the GRR to size culverts and ditches from predominantly undeveloped areas.

3.2.3 FEH Statistical Method

As per the River Dulais analysis, the latest HiFlows UK data set was used (version 8).

Technical Note

264904

04 December 2019

The data transfer method from donor catchments was used to estimate QMED. Applying the donor adjustment method within the WINFAP software provided a list of the ten geographically closest catchments, selecting the closest six of these by default. These are listed below in order of proximity, as well as whether they were included for data transfer:

- Station 58008: Dulais at Cilfrew - Included
- Station 58002: Neath @ Resolven – Discounted
- Station 59001: Tawe @ Ynystanglws – Discounted
- Station 58006: Mellte @ Pontneddfechan - Included
- Station 57017: Rhondda Fawr @ Tynewydd – Discounted
- Station 58012: Afan @ Marcroft Weir - Discounted

The catchment descriptors for these are shown in Table 4 below. Stations 58002 and 59001 were discounted owing to the significantly larger catchment area (more than 200 times larger than the target catchment). Station 58012 was discounted as it has a significantly higher BFIHOST value than the target site. Station 57017 was discounted owing to its much higher SAAR value than the target site.

The two remaining donor catchments are larger than the subject site but are similar from a hydrological perspective. For the selected donor site, a comparison was undertaken between QMED calculated using catchment descriptors and the measured values observed from annual maxima data. This comparison is shown in Table 6 below.

Table 6 – Comparison of calculated and observed QMED values for Afon Pyrddin donor sites			
Station	Observed QMED (m ³ /s)	Calculated QMED (m ³ /s)	Difference (QMED _{calc} /QMED _{obs})
River Dulais (From FEH Online)	N/A	2.388	N/A
58008 (Dulais @ Cilfrew)	56.3	46.9	1.20
58006 (Mellte @ Pentneddfechan)	87.4	75.3	1.16

The data transfer from the selected donor sites resulted in an uplift to the QMED value from 1.399m³/s to 1.551m³/s.

The default pooling group consisted of 14 stations with a total of 516 years of data. This pooling group had a standardised test value (H2) of 1.48, indicating that it was possibly heterogeneous and a review of the group was optional.

A review of the pooling group was subsequently undertaken and the following stations removed:

- Station 69047 – Roch at Littleborough: Low FARL value (0.890) relative to target catchment (1.000).

Technical Note

264904

04 December 2019

- Station 47022 – Tory Brook at Newnham Park: Low FARL value (0.942) relative to target catchment (1.000).
- Station 27073 – Brompton Beck at Snainton Ings: High FPEXT (0.2373) and BFIHOST (0.887) compared to the target site (0.0776 and 0.319 respectively).

The resulting pooling group consisted of 11 stations with a total of 416 years of data. Two stations were added to achieve the required 500 years:

- Station 46005 – East Dart @ Bellever
- Station 21017 – Ettrick Water @ Brockhoperig

This brings the total data within the group to 511 years. The modifications to the pooling group resulted in a reduced H2 value of 1.29. This means it remains possibly heterogeneous, however there are no obvious justifications to make further changes.

The goodness of fit test was used which recommended the Generalised Logistic fit. This was applied to produce peak flow estimates for the QMED, 30 and 100-year return period events. These were then scaled by the catchment area to determine the GRR.

The derived Greenfield Runoff Rate is shown below:

- QMED (1:2 year)– 25.3 l/s/ha
- 1:30 year– 52.0 l/s/ha
- 1:100 year– 68.6 l/s/ha

3.3 River Tawe Catchment

3.3.1 IH 124 Method

The IH124 Method was applied within Microdrainage as described for the River Dulais catchment.

The area of the River Tawe catchment contained within the planning application boundary was measured to be 217Ha. This area was applied within the software to determine the peak GRR for the total site. The peak GRR was been calculated for the 1 year, 30 year and 100-year return period events and was subsequently scaled by the area to give the GRR per hectare:

- 1:1 year rainfall event – 12.4l/s/ha
- 1:30 year rainfall event – 25.0l/s/ha
- 1:100 year rainfall event – 30.9l/s/ha

The results from the Microdrainage analysis are shown in Figure 3.

Technical Note

264904

04 December 2019

Figure 3: IH124 Calculation undertaken within Microdrainage for the River Tawe Catchment

3.3.2 ReFH2

Similarly, the ReFH2 method was applied as described for the River Dulais catchment (see section 3.1.2). The default recommended storm duration of 2 hours, 42 minutes with a 6-minute time step was used to calculate the GRR.

The 1, 30 and 100-year peak flows from the analysis were scaled by the subject catchment area to obtain GRR per hectare estimates. These are shown in Table 7 below.

Table 7 - Derived GRR using the ReFH2 Analysis for the River Tawe		
Return Period	Winter Seasonality (l/s/ha)	Summer Seasonality (l/s/ha)
1:1 Year	16.3	17.8
QMED	18.5	20.2
1:30 Year	38.0	42.2
1:100 Year	47.6	53.0

As with the other catchments, the larger summer seasonality values will be adopted.

3.3.3 FEH Statistical Assessment – Pooled Analysis

Reviewing the FEH Statistical Method for the Afon Pyrddin and River Dulais catchments highlighted that the pooling groups and donor stations were very similar for the two catchments, resulting in very similar discharge rates.

Technical Note

264904

04 December 2019

The catchment descriptors between the River Tawe and River Dulais/Afon Pyrrdin are very similar. As such, it is presumed that an FEH pooled analysis would result in very similar results for the River Tawe Catchment. As such, the values derived from the River Dulais catchment have been adopted for the scheme.

4 Conclusion

4.1 Results and Comparison

A hydrological study of the River Tawe, River Dulais and Afon Pyrrdin catchments have been undertaken using the IH124, ReFH2 and FEH Statistical methods. The statistical method was not undertaken for the River Tawe catchment due to the similarities between the catchment descriptors, and as such the outputs from the River Dulais catchment have been adopted for the River Tawe. A summary of the results has been included in Table 8:

Table 8 – Summary of Hydrological Analysis for the GCRE Project				
Catchment	Return Period (yr)	IH124 Peak Flows (l/s/ha)	ReFH2 Peak Flows (l/s/ha)	WINFAP Peak Flows (l/s/ha)
River Tawe	1	12.4	17.8	N/A
River Dulais		12.8	19.8	N/A
Afon Pyrrdin		14.7	16.9	N/A
River Tawe	QMED (2 year)	N/A	20.2	25.7
River Dulais		N/A	22.4	25.7
Afon Pyrrdin		N/A	19.2	25.3
River Tawe	30	25.0	42.2	52.2
River Dulais		25.7	46.3	52.2
Afon Pyrrdin		29.4	40.5	52.0
River Tawe	100	30.9	53.0	67.9
River Dulais		31.8	57.9	67.9
Afon Pyrrdin		36.3	51.0	68.6

The results of the IH124 method are shown to correlate well between the three catchments. However, this is due to the only variable within the equation within the three catchments being the catchment area. The IH124 QBAR equation contains a factor of $(0.01 \times \text{AREA})^{0.89}$. Therefore, a larger area such as the River Tawe catchment will have a reduced discharge rate when compared to a smaller area such as the Afon Pyrrdin catchment.

The GRR estimate provided using the FEH Statistical and ReFH2 methods are significantly higher than the estimate provided by the IH 124 method. IH124 is a relatively coarse method based on regional growth curves, which utilises no site-specific information. In addition to this, NRW Guidance Note GN008 provides a preference for the FEH Statistical and ReFH2 methods. Given this, the results of the IH124 method has been discounted.

Technical Note

264904

04 December 2019

The ReFH2 discharge rates show a reasonable correlation between the three catchments. The results from the WINFAP4 method show a better correlation, with less than 1 l/s/ha difference between the two catchments. This is due to the similarity between the pooling groups, initial QMED estimate from catchment descriptors and the suitable donor catchments based on Geographical distance. Therefore, the closer correlation of the FEH method does not in this instance indicate that it is more accurate. There is a large difference between the results generated by the two methods, particularly when comparing the QMED values.

As mentioned previously, there is a station downstream in the River Dulais. The QMED value measured from this station is 56.4m³/s, which equates to 13.1 l/s/ha. As this is downstream and serves a larger area, a larger GRR would be expected when analysing a smaller area owing to the longer time of concentration and catchment losses through infiltration and evapotranspiration. However, the values estimated using the WINFAP method are almost double the observed QMED, which is significantly higher than would be expected.

The WINFAP method uses a catchment descriptor equation to estimate QMED which was derived from regression analysis and based on observed information from gauging stations. However, most of the gauged catchments used to compare the equations are between 50km² and 500km², whilst the target catchments are 1km² or less. A smaller area used within the derived FEH QMED equation results in higher peak flow rates, which explains why using this method would result in a significantly higher QMED value. Owing to the small catchment sizes, it is likely that this equation is overestimating QMED.

ReFH2.2 is widely accepted for use on plot-scale sites, as it uses site specific catchment descriptors with updated FEH13 DDF curves. ReFH2.2 is also used on the plot scale, which is more appropriate for the catchment sizes being reviewed. Given the smaller catchment areas, since the ReFH2 provides a reasonably consistent GRR for the catchments that is slightly higher than the observed downstream QMED in the River Dulais, this method has been chosen as the preferred method.

Therefore, it is recommended that the GRR applied to the Nant Helen Complementary Earthworks scheme should be as shown in Table 9:

Table 9 – GRR to be Applied for the Nant Helen Complementary Earthworks Scheme		
Catchment	Return Period (yr)	ReFH2 Peak Flows (l/s/ha)
River Tawe	1	17.8
River Dulais		19.8
Afon Pyrrdin		16.9
River Tawe	30	42.2
River Dulais		46.3
Afon Pyrrdin		40.5
River Tawe	100	53.0
River Dulais		57.9
Afon Pyrrdin		51.0

Technical Note

264904

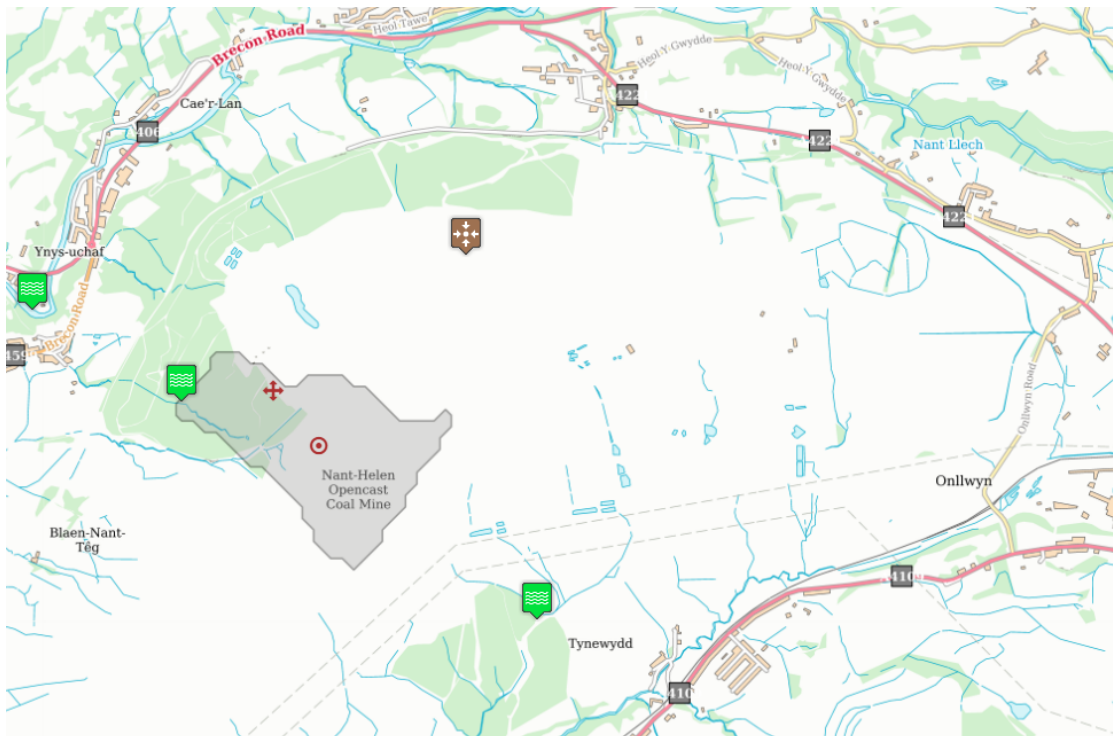
04 December 2019

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Rob Varley	Miguel Piedra	John Smith
Signature			

Appendix A – FEH Catchment Downloads

River Tawe Catchment from FEH Online

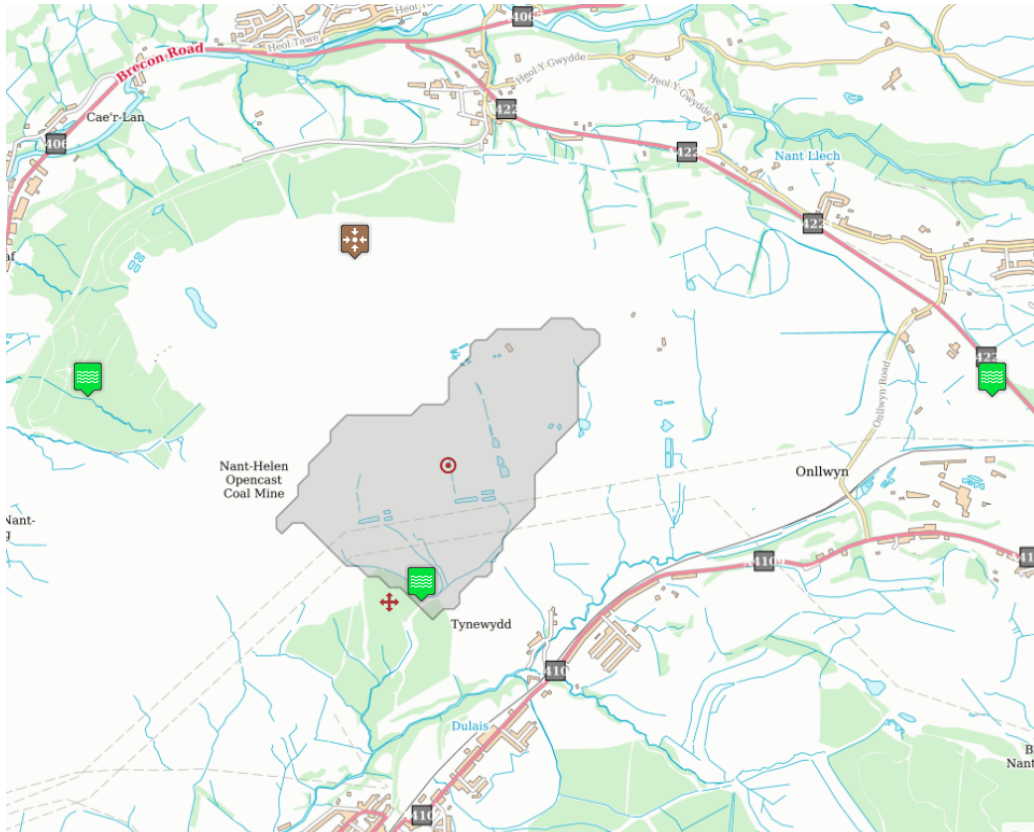


Technical Note

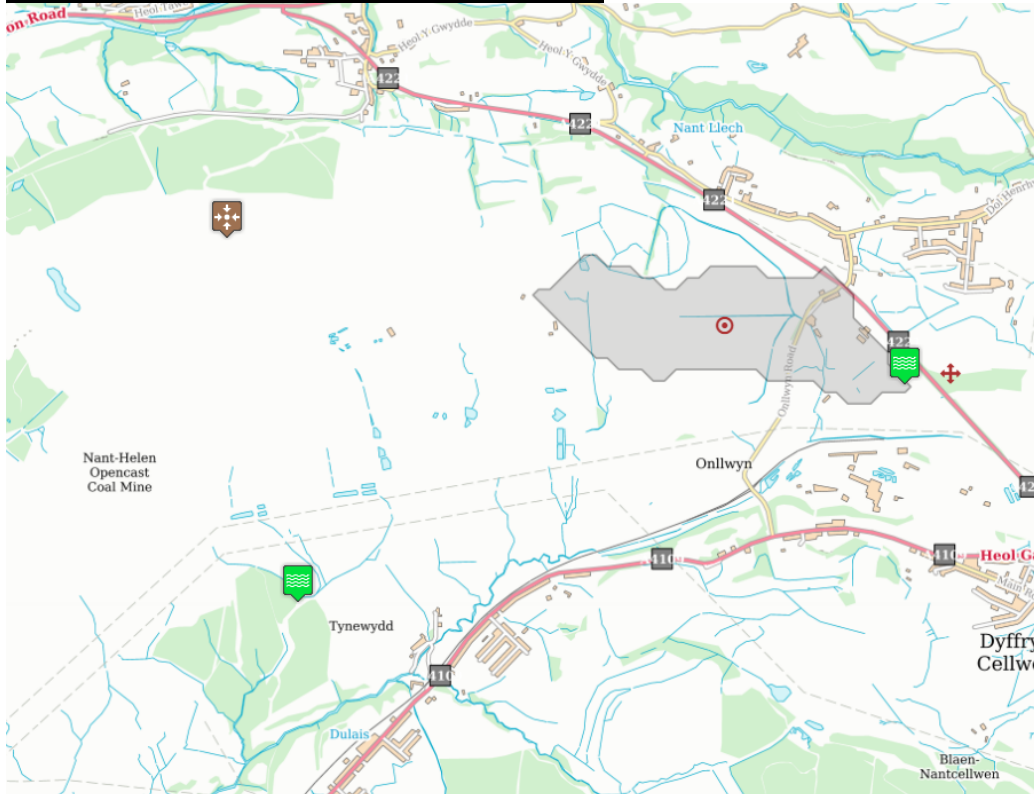
264904

04 December 2019

River Dulais Catchment from FEH Online



Afon Pyrddin Catchment from FEH Online

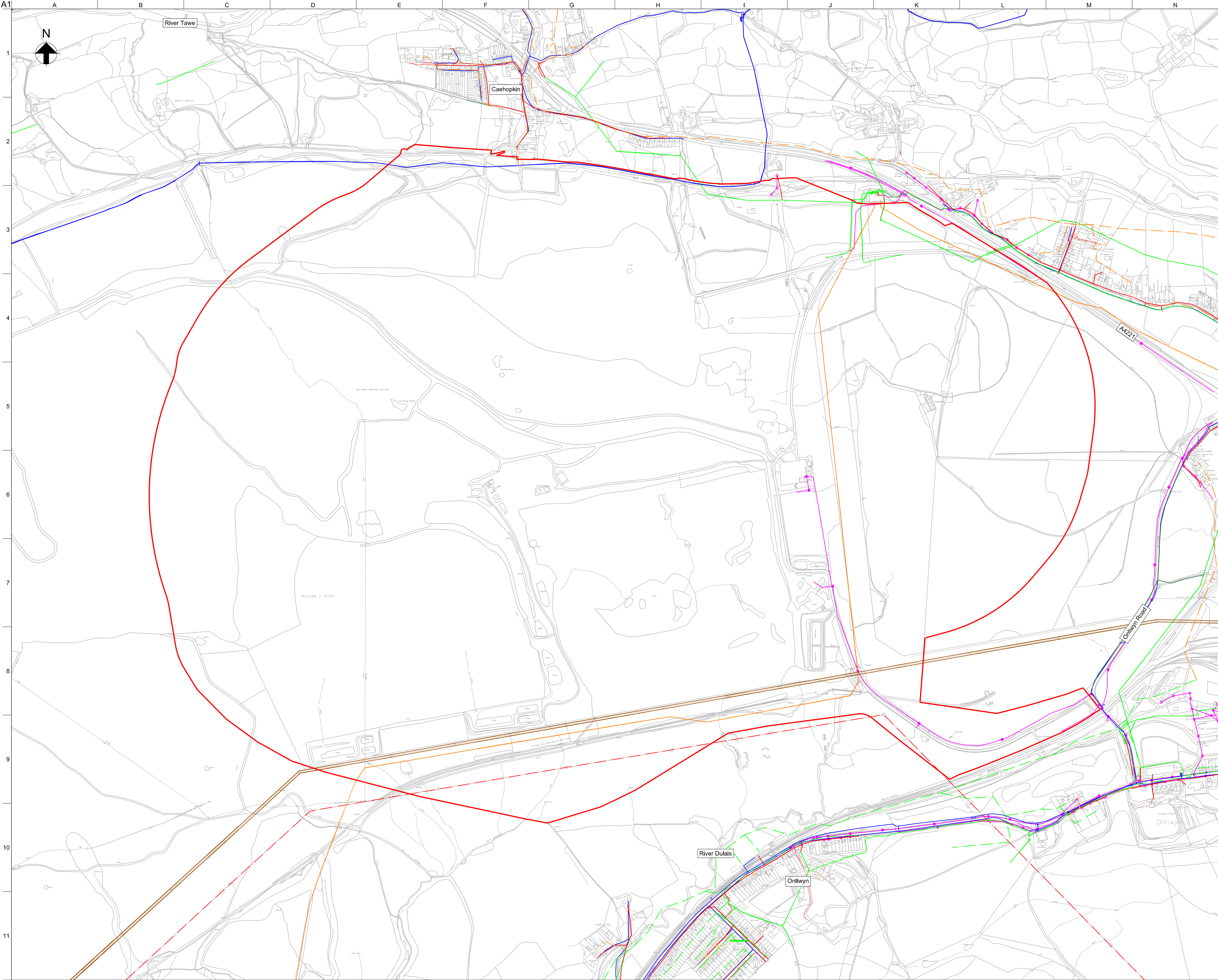


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Appendix E

GCRE Nant Helen

Proposed Drainage Drawings



- Legend**
- Planning Application Boundary
 - Existing National Grid Overhead Line
 - Existing DCWW Storm Sewer
 - Existing DCWW Foul Sewer
 - Existing DCWW Combined Sewer
 - Existing Water Main
 - Existing BT
 - Existing WPD Service Line
 - Existing WPD PL
 - Existing WPD LV
 - Existing WPD 132kv HV
 - Existing WPD 33kv HV
 - Existing WPD 11kv HV

- Notes**
- All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.
 - The utility information shown has been taken from Statutory Record plans. No responsibility is taken for the accuracy of this information.
 - The location and alignment of utilities may vary from that shown. Statutory plans received may not be complete and as such uncharted services could be present. An overhead and a buried services survey should be undertaken during future design stages to confirm utility alignment.

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Welsh Government

Job Title
Global Centre for Rail Excellence

Drawing Title
Existing Utilities

Scale at A1
1:5000

Discipline
Infrastructure

Drawing Status
For Information

Job No 264904	Drawing No CG3010	Issue P01
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Legend

Planning Application Boundary

285.00m

Proposed Finished Level Contours

Proposed Cutting Zone

Proposed Embankment Zone

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

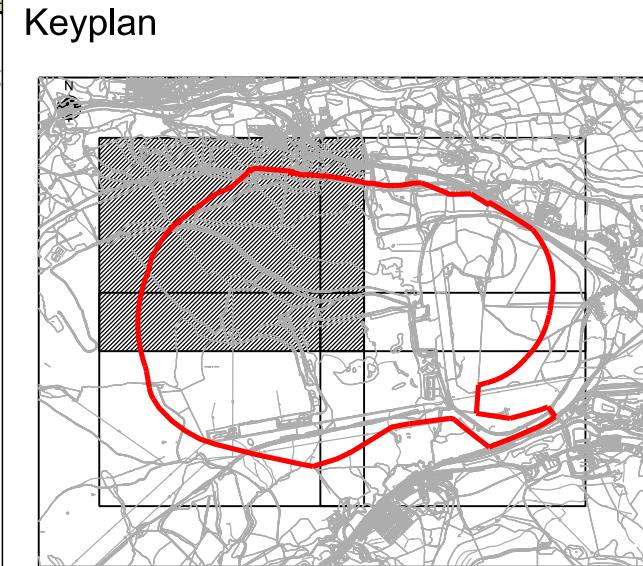
2. For typical sections across the proposed track, refer to drawing CG3024.

3. For proposed drainage, refer to drawings CG3050 to CG3053.

4. Where proposed earthworks are within the proposed restoration boundary, the restoration contours have been used as the existing ground level. Elsewhere, the 2m LIDAR data has been used as the baseline ground level. For existing topography, refer to drawing CG3000.

5. Proposed embankments to have permitted side slopes of 1 in 3. Proposed cuttings within superficial deposits and restored ground to have permitted side slopes of 1 in 2.5. Where cuttings are located within rock areas, a steeper side slope of 1 in 1 has been provided.

6. All slopes to be seeded.



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Job Title

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Drawing Title

Proposed Finished Levels
Sheet 1 of 4

Scale at A1

1:2500

Discipline

Infrastructure

Drawing Status

For Information

Job No

264904

Drawing No

CG3020

Issue

P01



Legend

Planning Application Boundary

285.00m Proposed Finished Level Contours

Proposed Cutting Zone

Proposed Embankment Zone

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

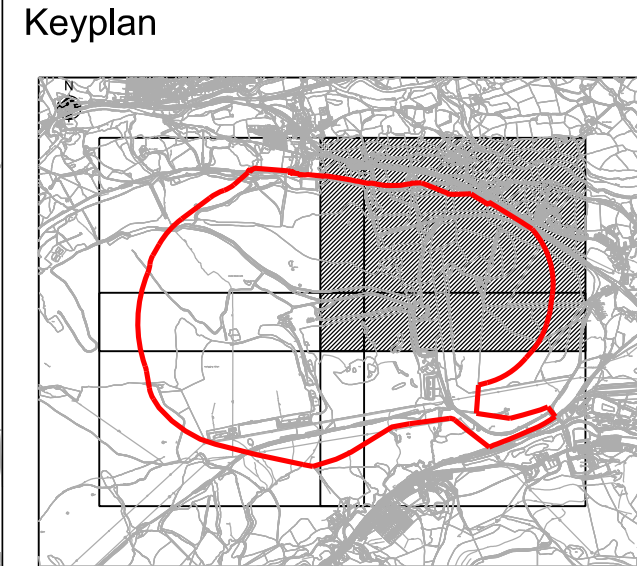
2. For typical sections across the proposed track, refer to drawing CG3024.

3. For proposed drainage, refer to drawings CG3050 to CG3053.

4. Where proposed earthworks are within the proposed restoration boundary, the restoration contours have been used as the existing ground level. Elsewhere, the 2m LIDAR data has been used as the baseline ground level. For existing topography, refer to drawing CG3000.

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Proposed Finished Levels
Sheet 2 of 4

Scale at A1

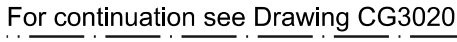
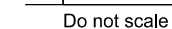
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Infrastructure

Drawing Status

Job No	Drawing No	Issue
264904	CG3021	P01



For continuation see Drawing CG3020

For continuation see Drawing CG3023

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Legend

Planning Application Boundary

285.00m

Proposed Finished Level Contours

Proposed Cutting Zone

Proposed Embankment Zone

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

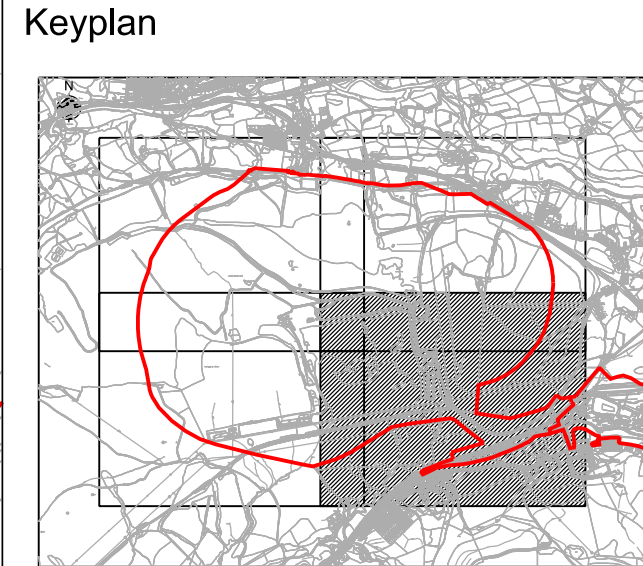
2. For typical sections across the proposed track, refer to drawing CG3024.

3. For proposed drainage, refer to drawings CG3050 to CG3053.

4. Where proposed earthworks are within the proposed restoration boundary, the restoration contours have been used as the existing ground level. Elsewhere, the 2m LIDAR data has been used as the baseline ground level. For existing topography, refer to drawing CG3000.

5. Proposed embankments to have permitted side slopes of 1 in 3. Proposed cuttings within superficial deposits and restored ground to have permitted side slopes of 1 in 2.5. Where cuttings are located within rock areas, a steeper side slope of 1 in 1 has been provided.

6. All slopes to be seeded.



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Drawing Updated				
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Drawing Title

Proposed Finished Levels
Sheet 4 of 4

Scale at A1

1:2500

Discipline

Infrastructure

Drawing Status

Job No

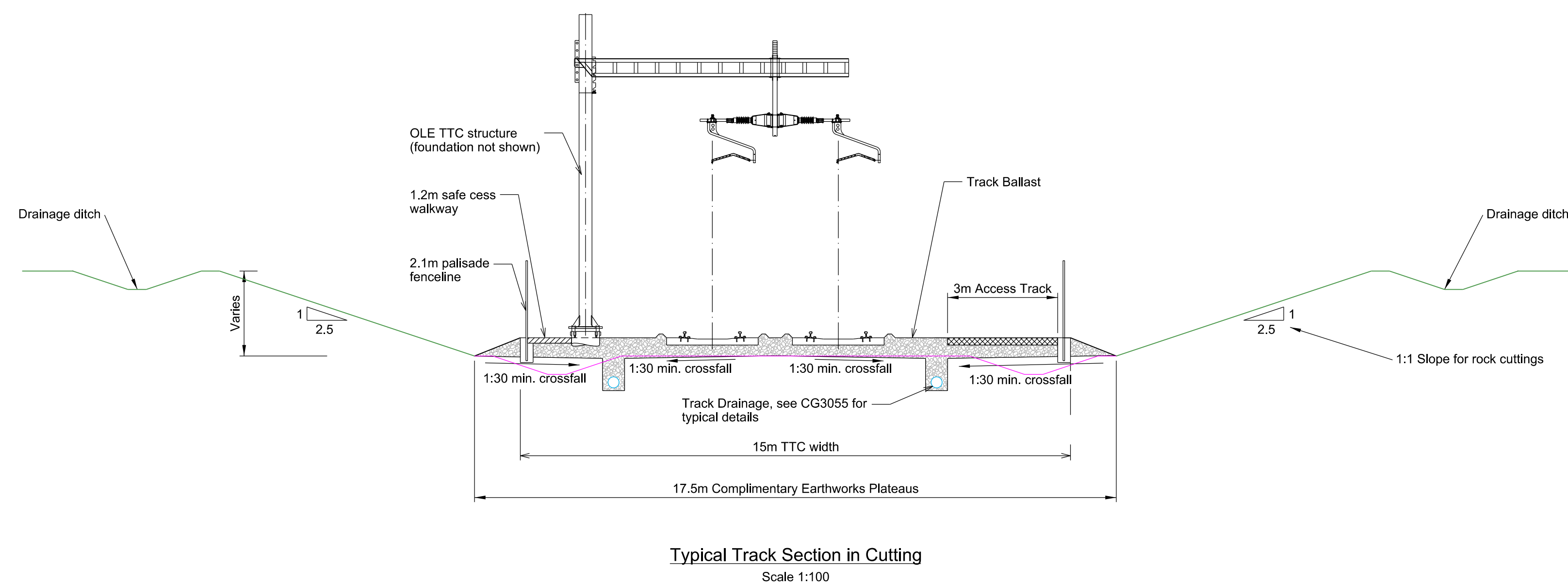
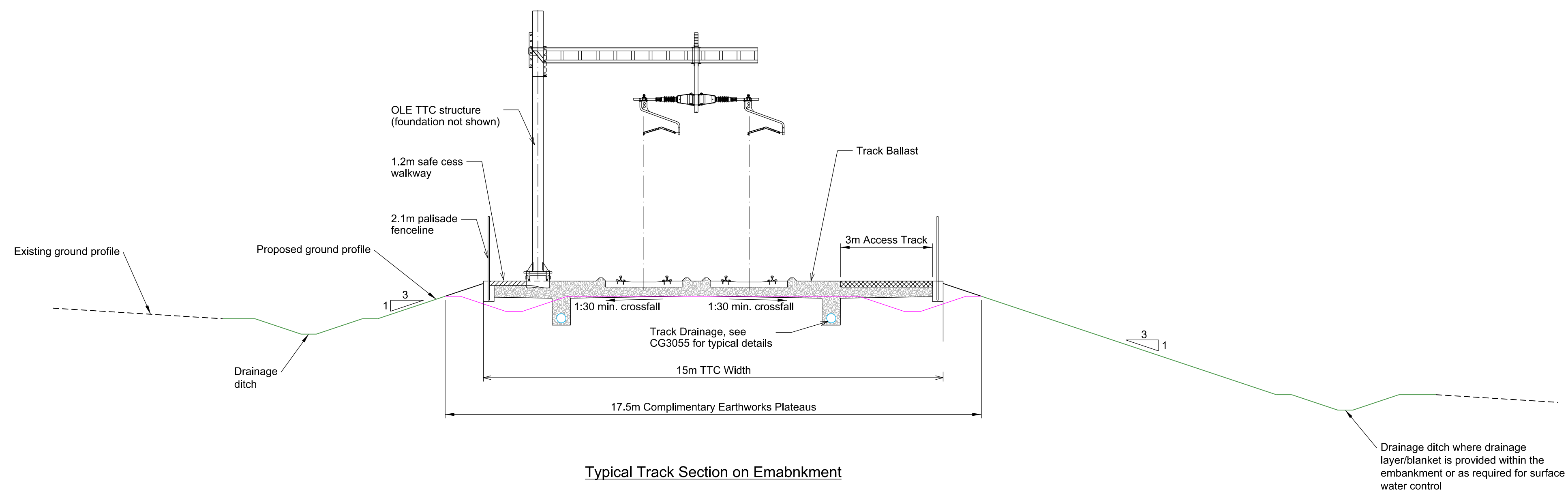
264904

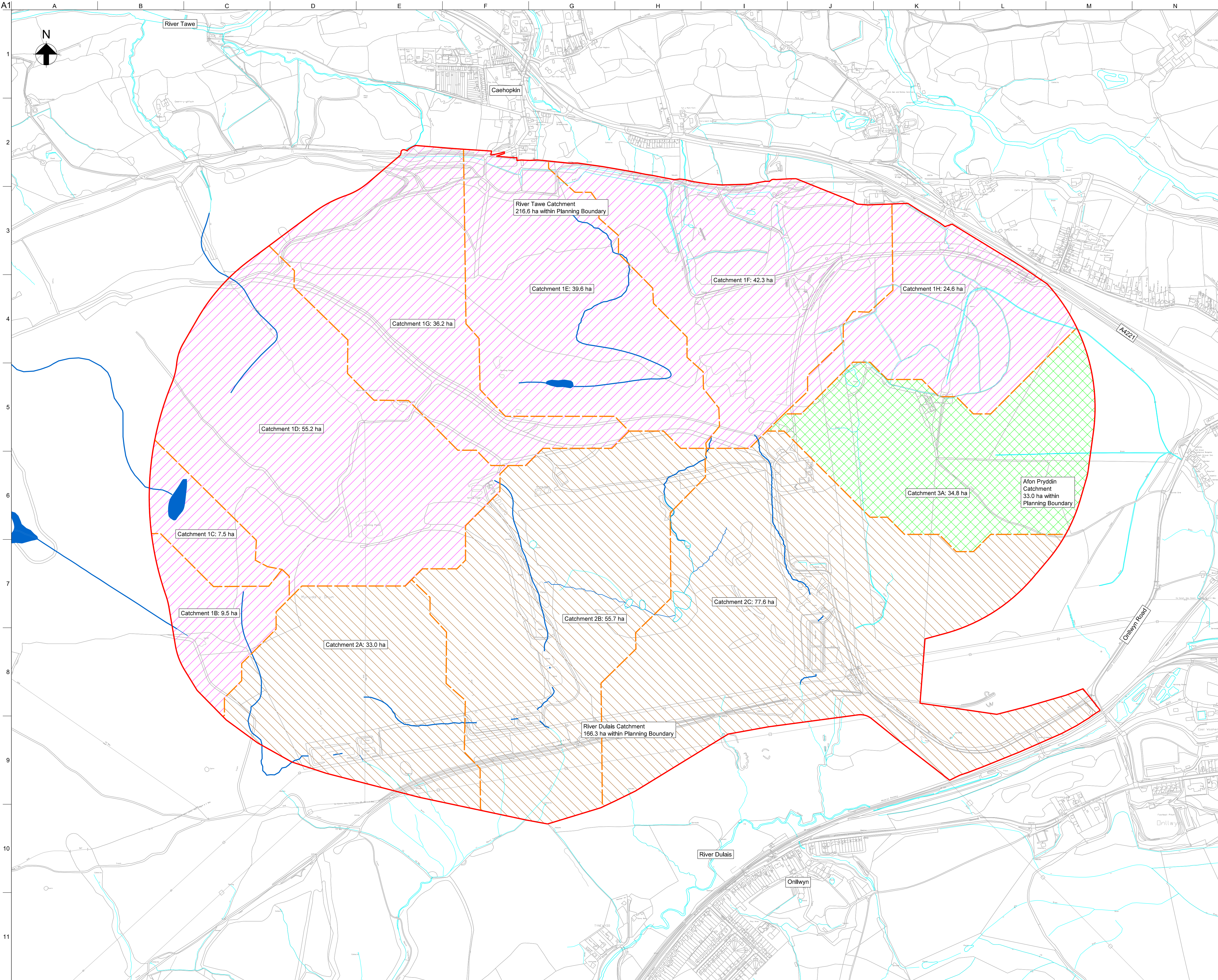
Drawing No

CG3023

Issue

P02





Do not scale

Legend

- Planning Application Boundary
- River Tawe Catchment
- River Dulais Catchment
- Afon Pryddin Catchment
- Existing Watercourses
- Restoration Watercourses
- Tributary Catchments
- Proposed Carrier Drain
- Proposed Filter Drain

Notes

- All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.
- The overarching catchment boundaries shown have been downloaded from the FEH Online Service. These were preferred over catchments derived from the Lidar model due to the open cast mining works undertaken on the site.
- Tributary catchments are based on the existing catchments prepared by the restoration works and compared to the online catchments using the FEH Online Tool.

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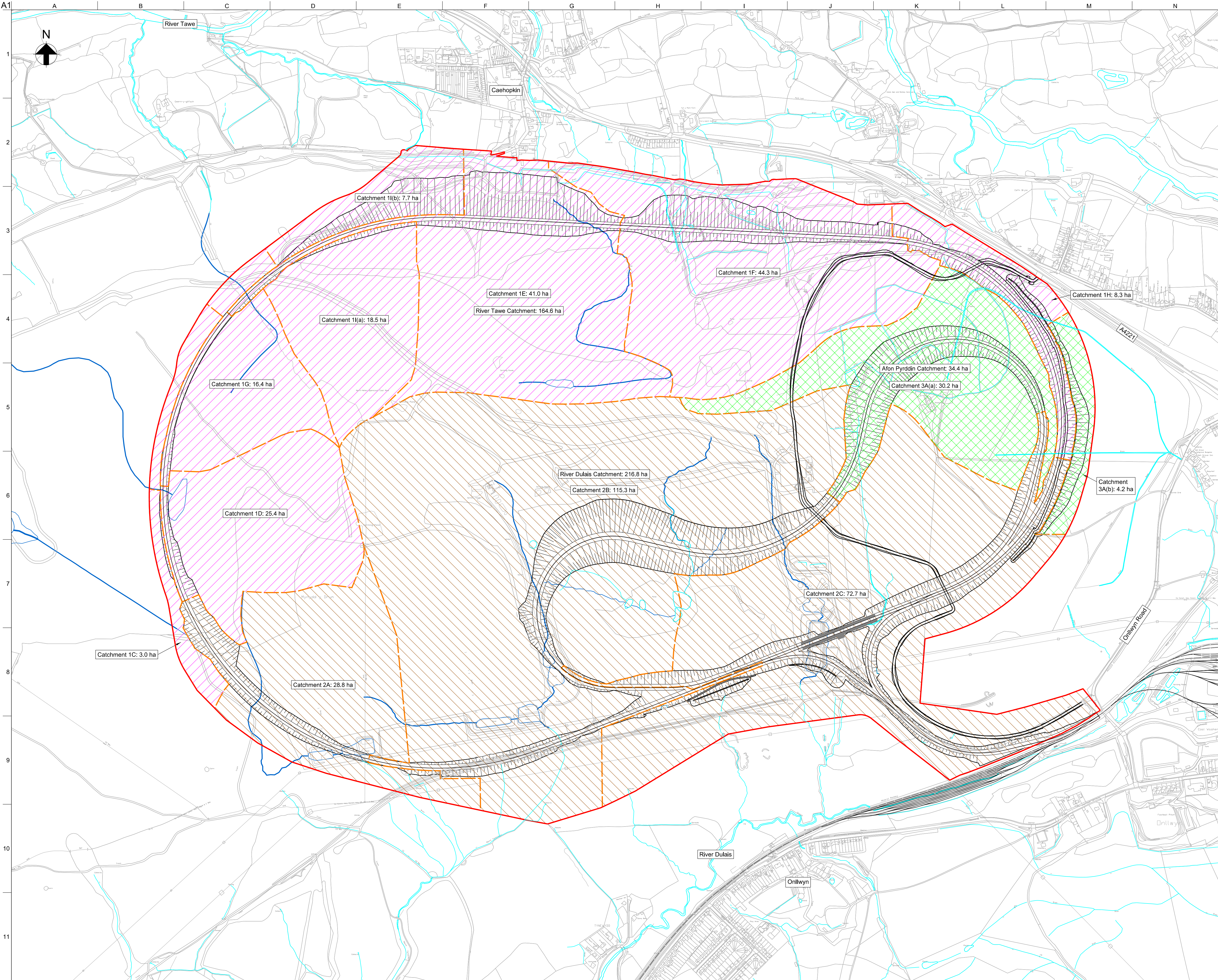
Job Title
Global Centre for Rail Excellence

Drawing Title
Existing Drainage Catchments

Scale at A1 1:5000
Discipline Infrastructure

Drawing Status		
For Information		
Job No	Drawing No	Issue
264904	CG3040	P01

U:\264904\CG3040-004 Internal Project Data\A3-D Drawings\A3-31 Issue drawings\Drainage Submission\CG3040.dgn



Legend

Planning Application Boundary

River Tawe Catchment

River Dulais Catchment

Afon Pryddin Catchment

Proposed Catchment Boundary

Existing Watercourse

Restoration Watercourses

Notes

1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

2. The catchment boundaries shown have been downloaded from the FEH Online Service.

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Proposed Drainage Catchment Overview

Scale at A1

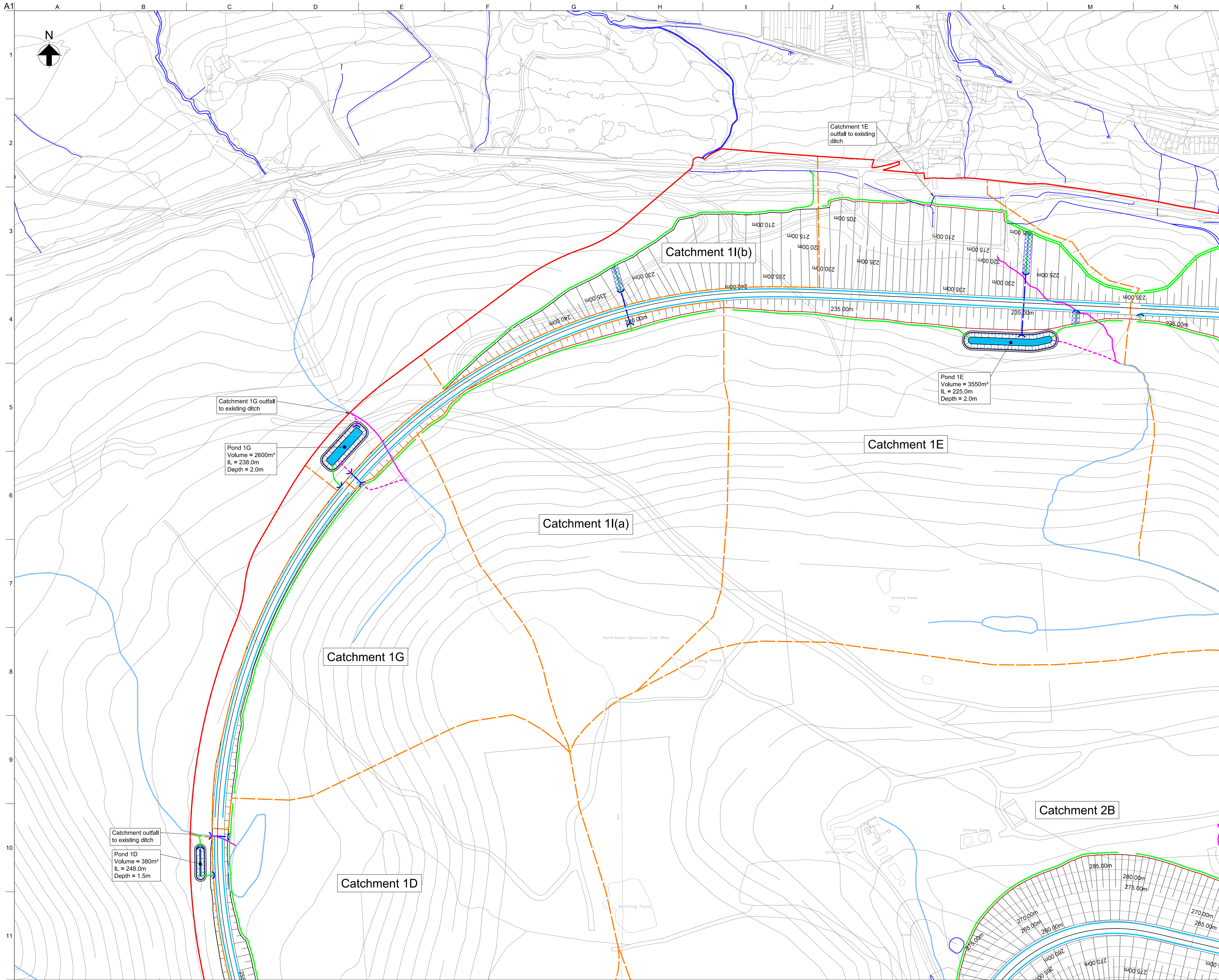
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Discipline

Infrastructure

For Information

Job No	Drawing No	Issue
264904	CG3041	P02



Legend

Planning Application Boundary

Existing Watercourse

Restoration Watercourse

Restoration Watercourse to be Removed / Discontinued

Restoration Watercourse to be Diverted

Proposed Catchment

Proposed Cut Off Ditch

Proposed Pond

Proposed Carrier Drain

Proposed Filter Drain

Proposed Culvert

Proposed Carrier Drain

Proposed Filter Drain

Notes

1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

2. This drawing is for planning purposes only and is to be read in conjunction with the Drainage Strategy report.

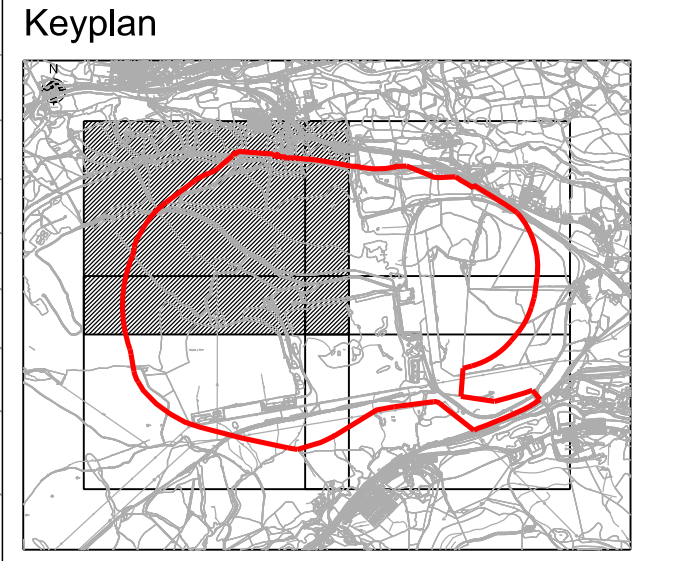
3. For cut-off ditch typical details, refer to drawing CG3055.

4. The diameter of culverts and sizing of headwall structures is to be determined during subsequent design stages.

5. Existing watercourses that will be removed as part of the site restoration works have not been shown for clarity.

7. The restoration watercourses have been shown based on the current restoration proposals for the site. Should the track earthworks be undertaken at the same time as the restoration earthworks, the restoration watercourses shown as to be removed will not be installed.

8. The attenuation ponds shown are indicative based on the sizing determined from hydraulic calculations as discussed in the Drainage Strategy report. The depth and profile may change in subsequent design stages to accommodate topography and improve aesthetics.



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Proposed Drainage
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Scale at A1

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Discipline

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For Information

Job No

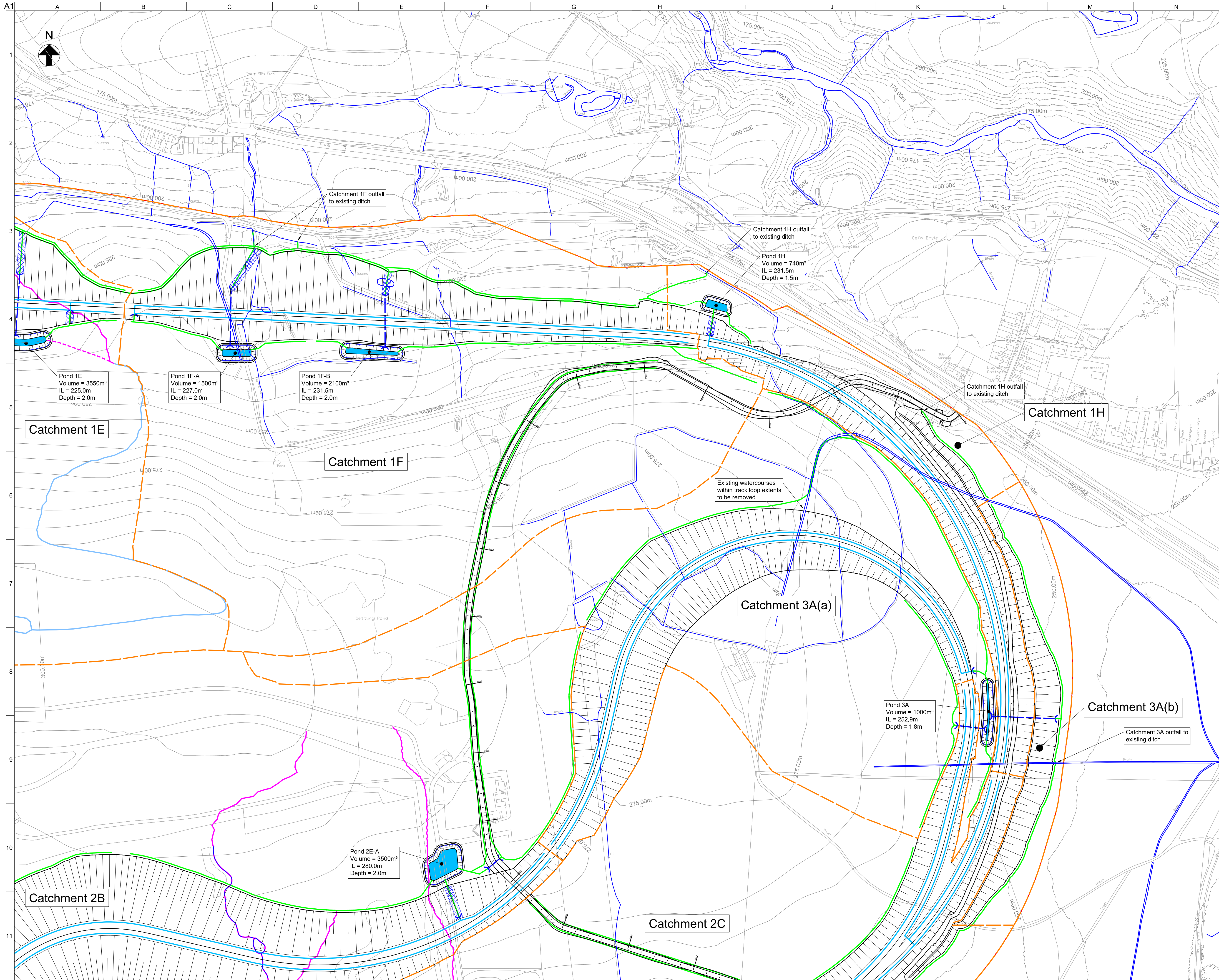
264904

Drawing No

CG3050

Issue

P01



Legend

Planning Application Boundary

Existing Watercourse

Restoration Watercourse

Restoration Watercourse to be Removed / Discontinued

Restoration Watercourse to be Diverted

Proposed Catchment

Proposed Cut Off Ditch

Proposed Pond

Proposed Carrier Drain

Proposed Filter Drain

Proposed Culvert

Proposed Carrier Drain

Proposed Filter Drain

Notes

1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

2. This drawing is for planning purposes only and is to be read in conjunction with the Drainage Strategy report.

3. For cut-off ditch typical details, refer to drawing CG3055.

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Drawing Title

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Scale at A1

1:2500

Discipline

Infrastructure

Drawing Status

For Information

Job No

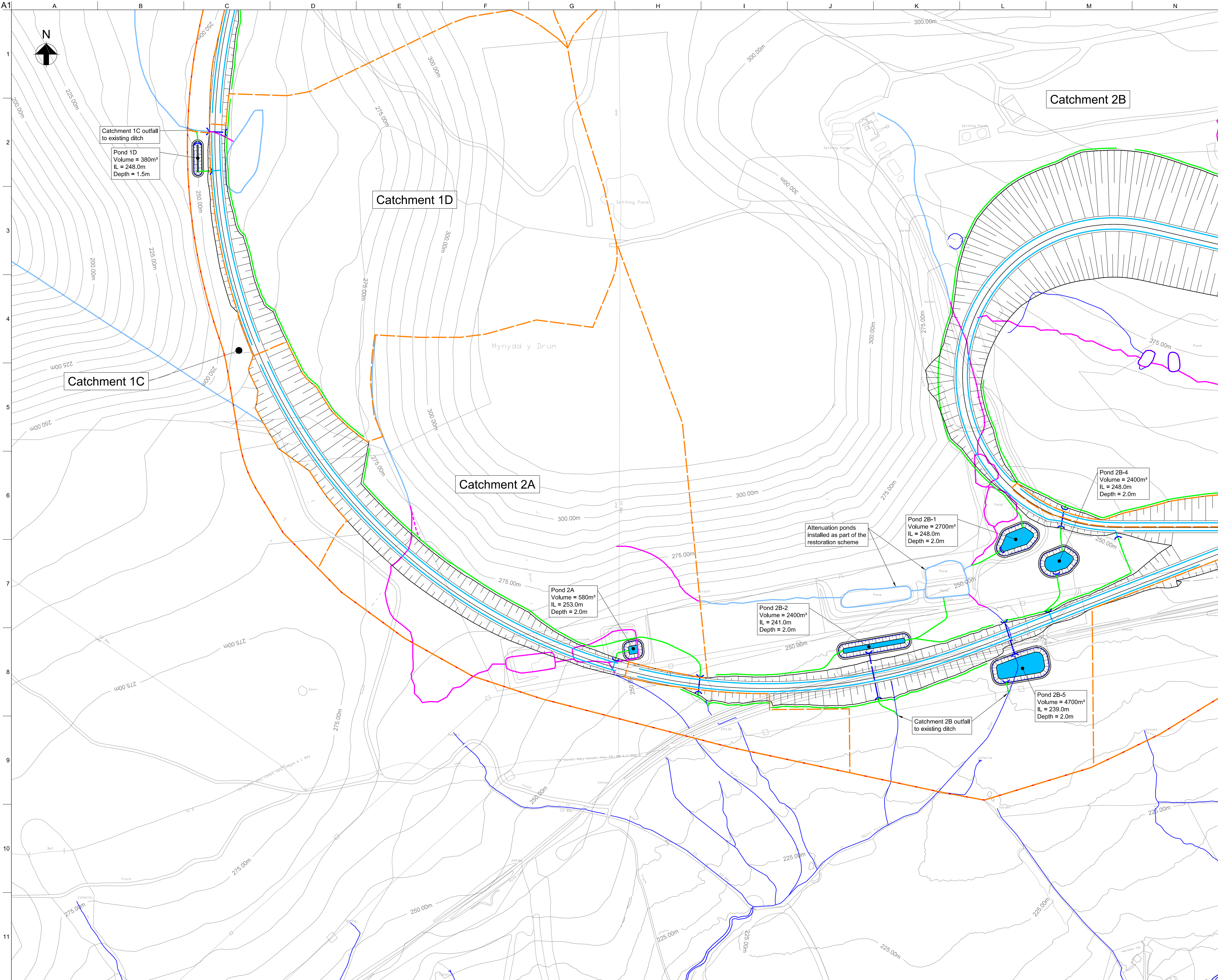
264904

Drawing No

CG3051

Issue

P01



Legend

Planning Application Boundary

Existing Watercourse

Restoration Watercourse

Restoration Watercourse to be Removed / Discontinued

Restoration Watercourse to be Diverted

Proposed Catchment

Proposed Cut Off Ditch

Proposed Pond

Proposed Carrier Drain

Proposed Filter Drain

Proposed Culvert

Proposed Carrier Drain

Proposed Filter Drain

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

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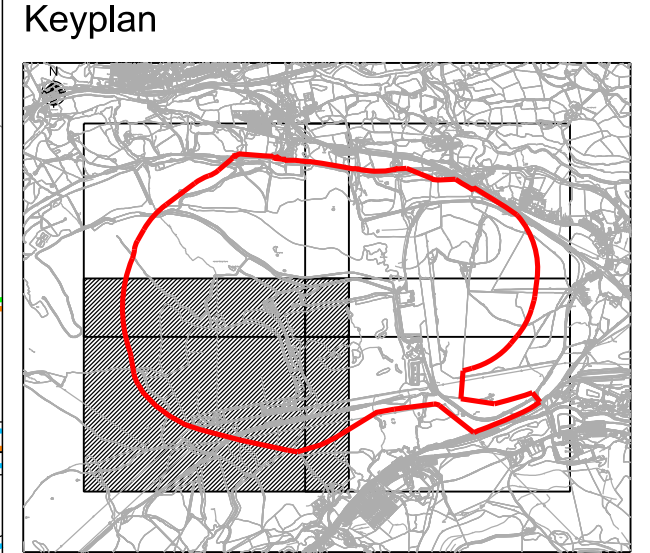
3. For cut-off ditch typical details, refer to drawing CG3055.

4. The diameter of culverts and sizing of headwall structures is to be determined during subsequent design stages.

5. Existing watercourses that will be removed as part of the site restoration works have not been shown for clarity.

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8. The attenuation ponds shown are indicative based on the sizing determined from hydraulic calculations as discussed in the Drainage Strategy report. The depth and profile may change in subsequent design stages to accommodate topography and improve aesthetics.



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Drawing Title

Proposed Drainage
Sheet 3 of 4

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1:2500

Discipline

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Drawing Status

For Information

Job No

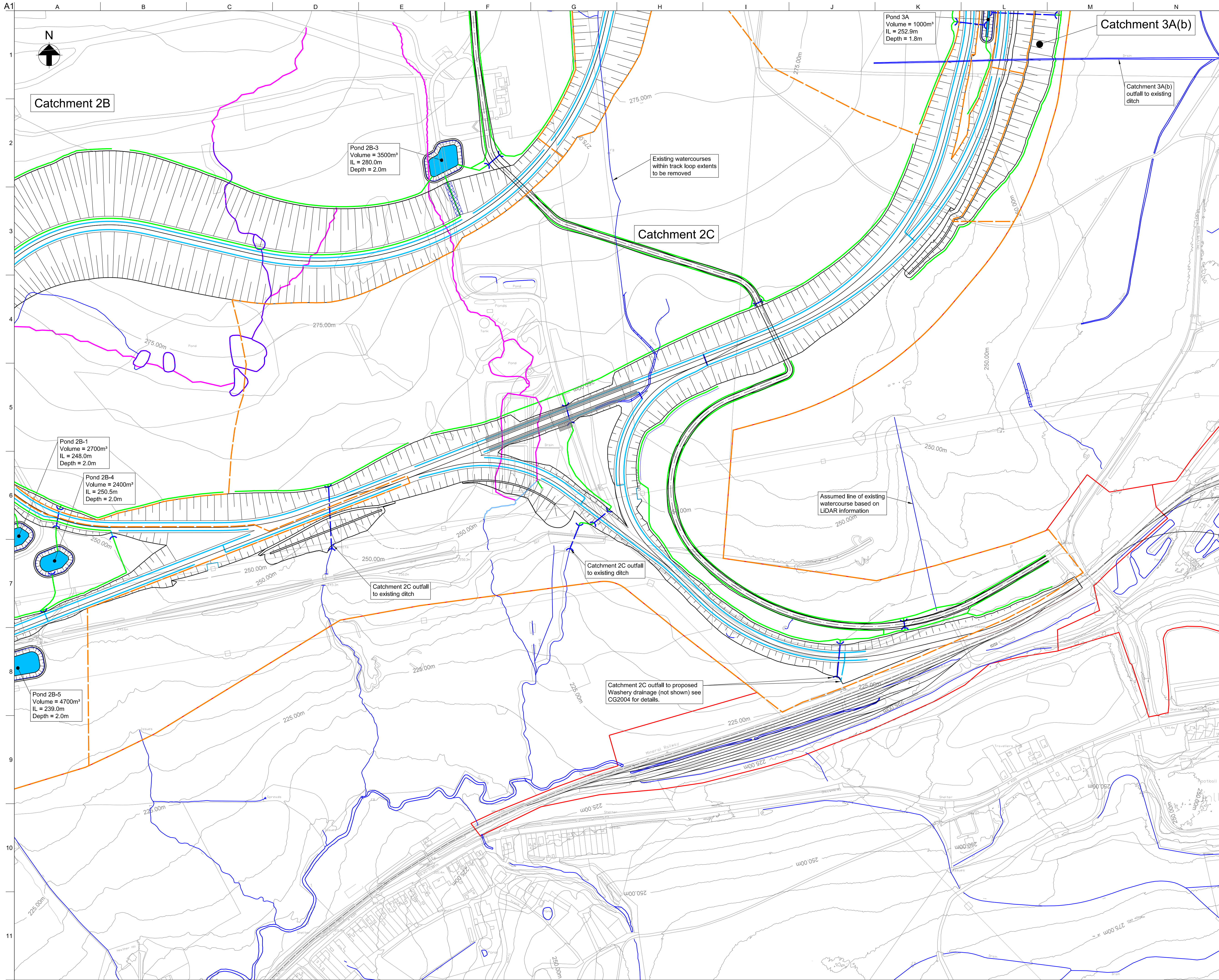
264904

Drawing No

CG3052

Issue

P01



Legend

- Planning Application Boundary
- Existing Watercourse
- Restoration Watercourse
- Restoration Watercourse to be Removed / Discontinued
- Restoration Watercourse to be Diverted
- Proposed Catchment
- Proposed Cut Off Ditch
- Proposed Pond
- Proposed Carrier Drain
- Proposed Filter Drain
- Proposed Culvert
- Proposed Carrier Drain
- Proposed Filter Drain

Notes

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- For cut-off ditch typical details, refer to drawing CG3055.
- The diameter of culverts and sizing of headwall structures is to be determined during subsequent design stages.
- Existing watercourses that will be removed as part of the site restoration works have not been shown for clarity.
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P02	02/03/21	DS	JS	JS
Drawing Updated				
P01	17/07/20	DO	IA	JS
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Drawing Title
**Proposed Drainage
Sheet 4 of 4**

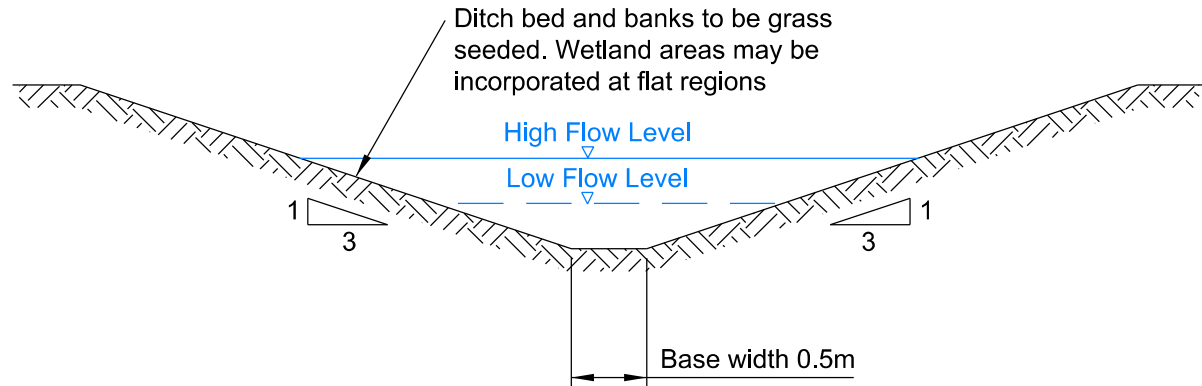
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Discipline Infrastructure

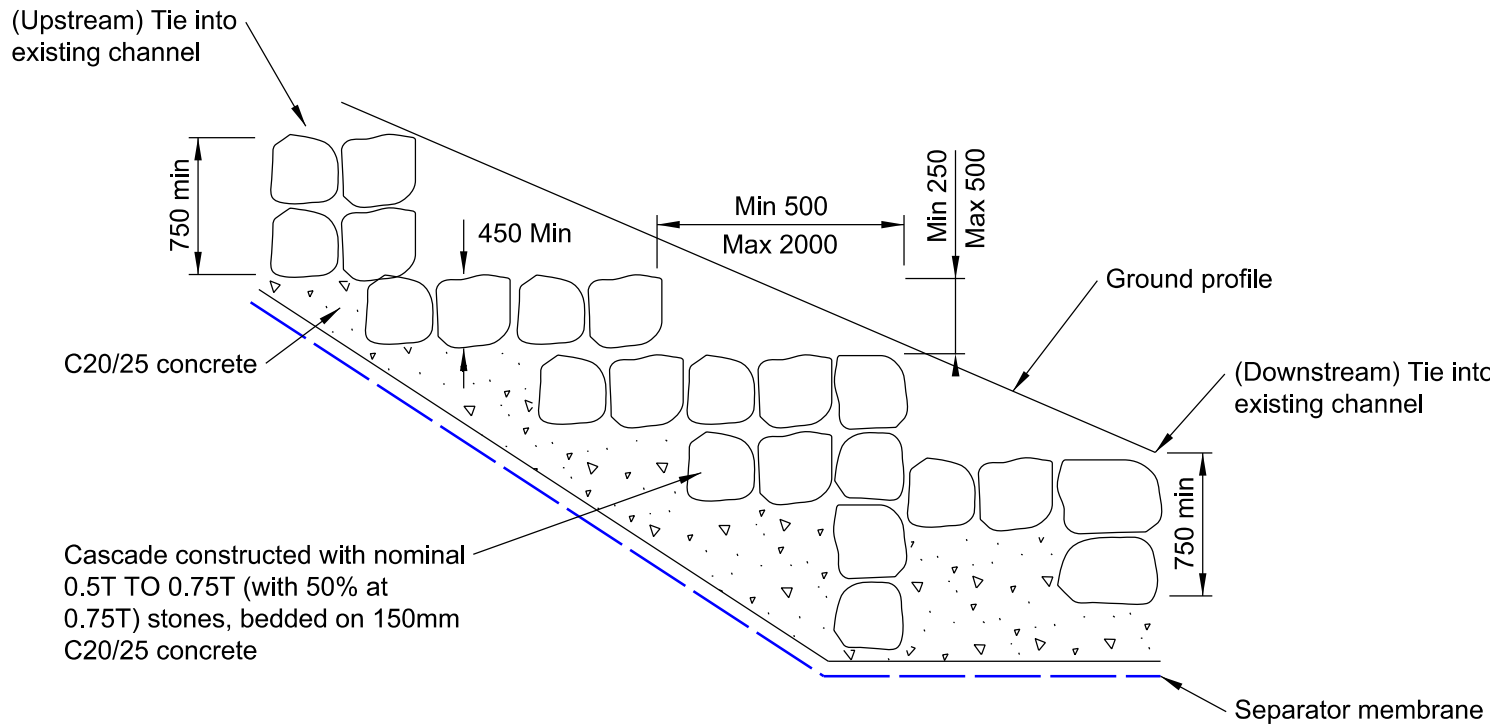
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For Information

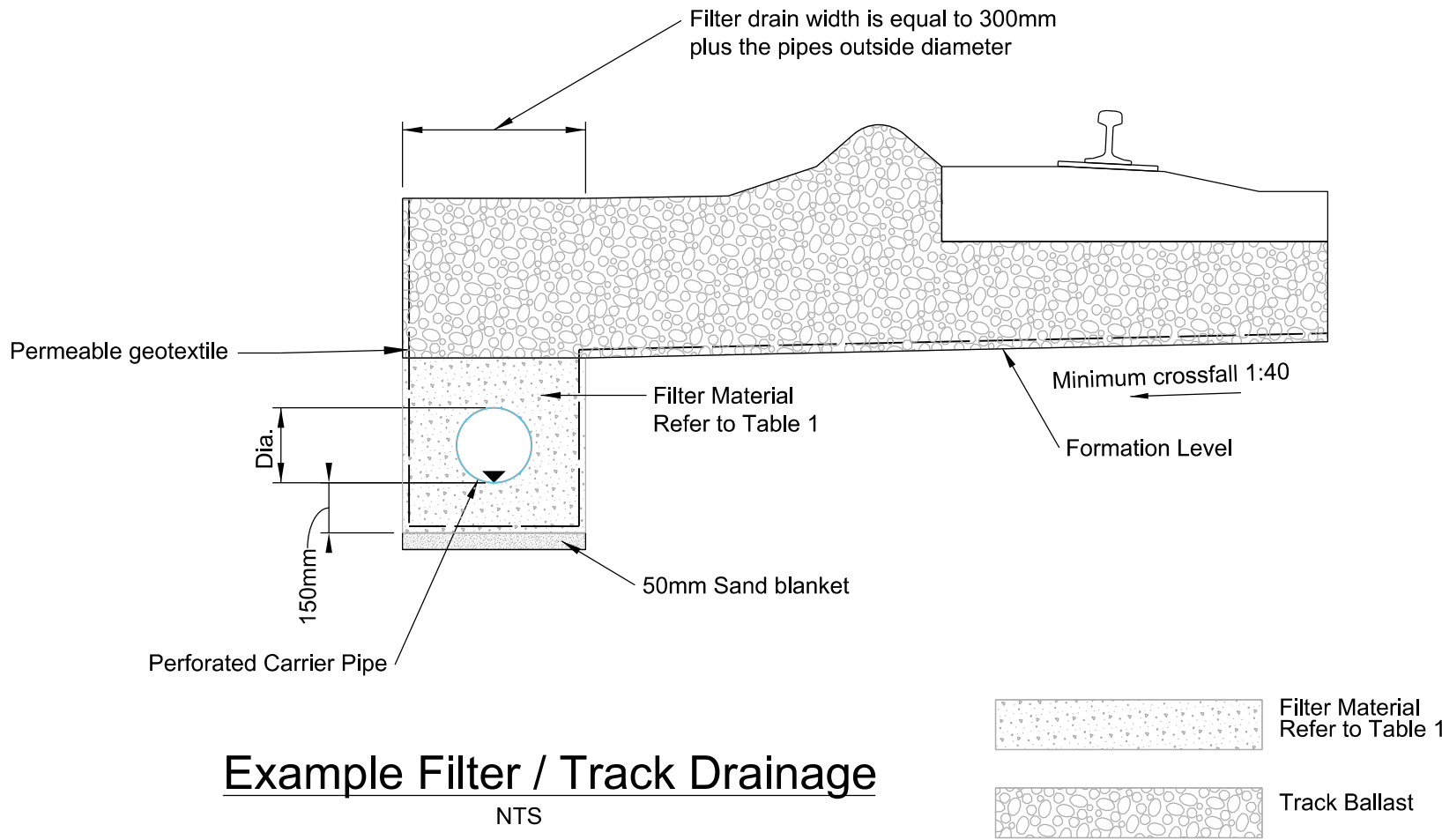
Job No 264904	Drawing No CG3053	Issue P02
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Typical Section - Grass Lined Channel (See Note 4)
N.T.S



Typical Cascade Detail
N.T.S

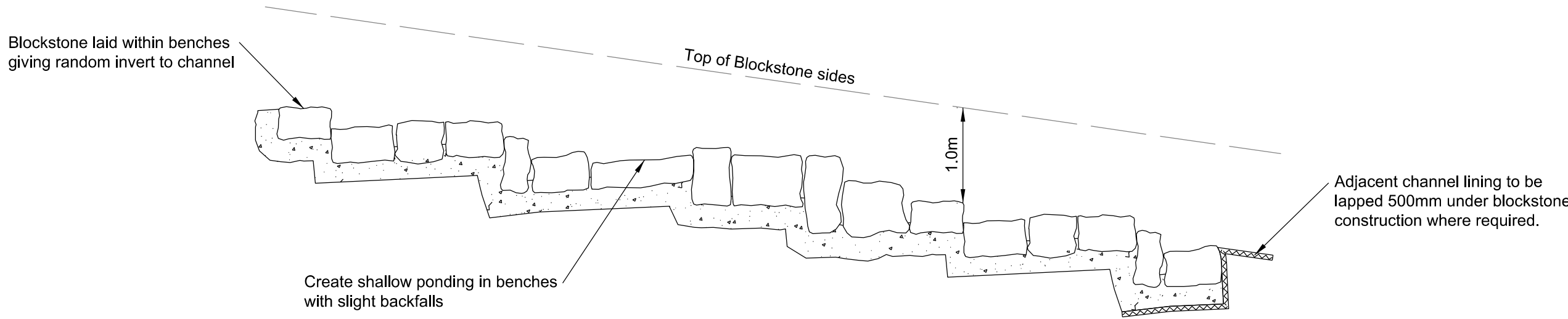


Example Filter / Track Drainage

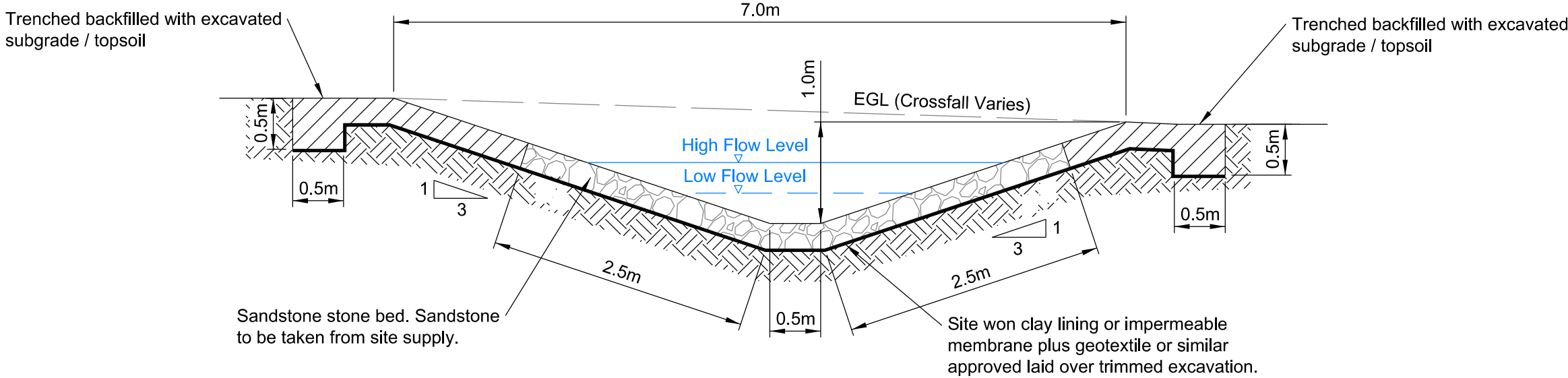
Pipe Nominal Size (DN)	Aggregate to BS 12620
140 to 400	10, 14 or 20mm Nominal Single Size Or 14 to 5mm Graded Or 20 to 5mm Graded
> 400	10, 14 or 20mm Nominal Single Size Or 14 to 5mm Graded Or 20 to 5mm Graded Or 40 to 5mm Graded

OR IN ACCORDANCE WITH
PIPE MANUFACTURERS
BEDDING SPECIFICATION

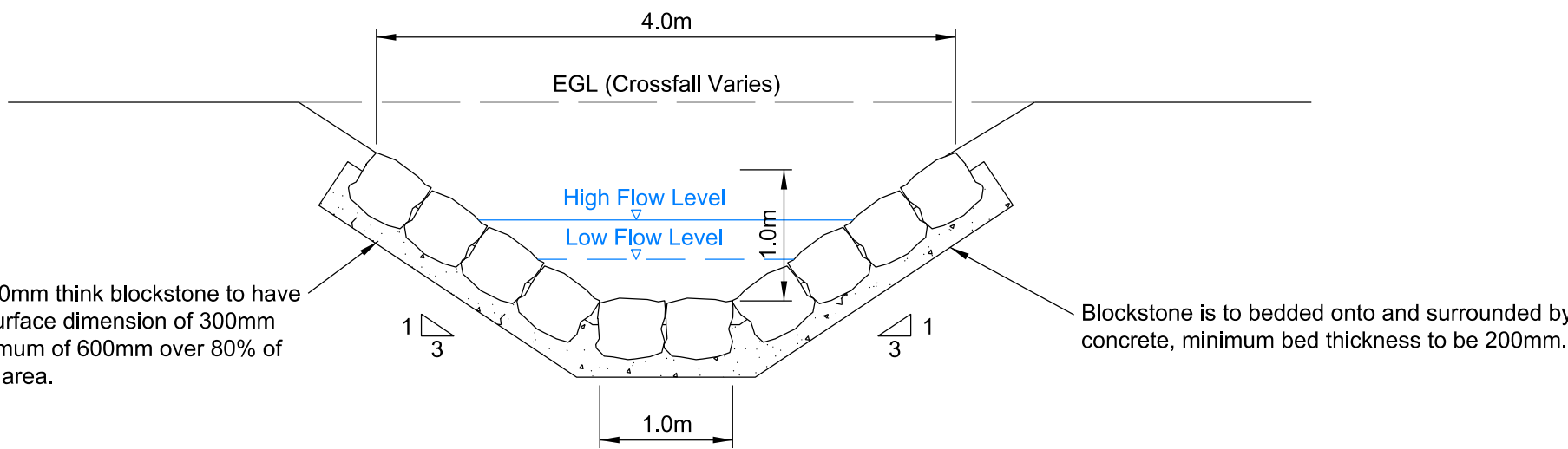
Table 1 - Example Requirements For Pipe Bedding And Filter Details



Typical Longitudinal Section - Rock Reinforced Ditch
N.T.S



Typical Section - Stone Bedded Ditch (See Note 4)
N.T.S



Detail C - Rock Reinforced Ditch (See Note 4)
N.T.S

Notes

1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.
2. This drawing is for planning purposes only and is to be read in conjunction with the Drainage Strategy report.
3. For drainage plans, refer to CG3050 to CG3053.
4. Grass lined channels to be used in areas of shallow longitudinal gradient, low flow and low velocity. Stone lined channels to be used in locations of medium longitudinal gradient and medium flow and velocity. Rock reinforced channels to be used in high velocity areas steeper than 1:12.
5. Details shown for information only, subject to detailed design.

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Job Title
Global Centre for Rail Excellence

Drawing Title
Typical Channel and Pond Details

Scale at A1
As Shown

Discipline
Civils

Drawing Status
For Information

Job No 264904	Drawing No CG3055	Issue P01
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Legend

Planning Application Boundary

Proposed Attenuation Pond

Existing Access Track to be retained
Asphalt Surface

Proposed Access Track
Asphalt Surface

Existing Access Track to be retained
Gravel/unbound surface

Proposed Access Track
Gravel/unbound surface

- Notes
1. Access tracks shown are to facilitate attenuation pond access and maintenance.

2. Access routes to be typically 3m wide.

3. Access track locations shown indicatively and subject to further design.

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Drawing Updated				
P01	01/09/20	DO	JS	JS
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Drawing Title

Maintenance Access Routes

Scale at A1

1:5000

Discipline

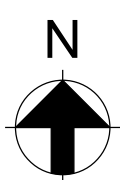
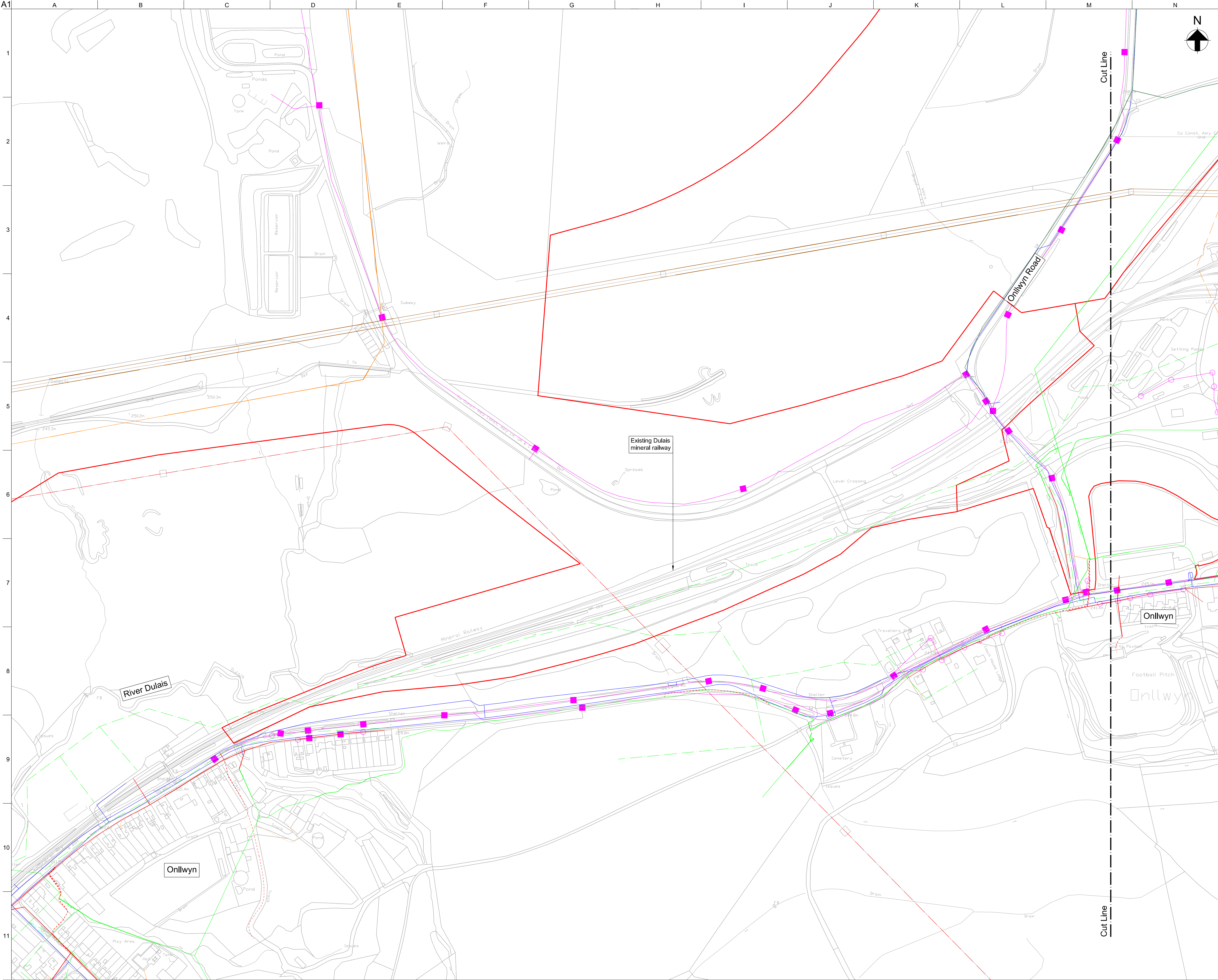
Infrastructure

For Information

Job No	Drawing No	Issue
264904	CG3075	P02

Appendix F

Washery Site Drawings

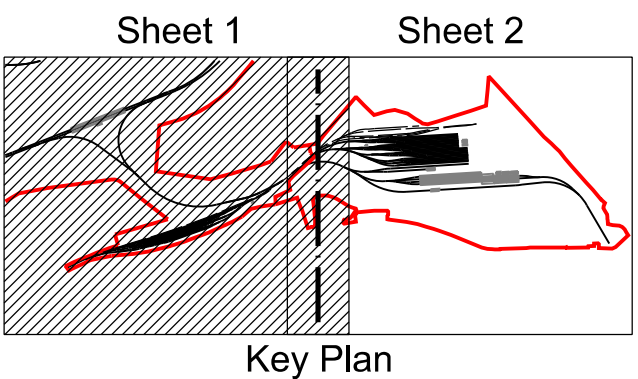


Legend

- Planning Application Boundary
- Existing National Grid Overhead Line
- Existing DCWW Storm Sewer
- Existing DCWW Foul Sewer
- Existing DCWW Combined Sewer
- Existing Water Main
- Existing BT
- Existing WPD Service Line
- Existing WPD PL
- Existing WPD LV
- Existing WPD 132kv HV
- Existing WPD 33kv HV
- Existing WPD 11kv HV

Notes

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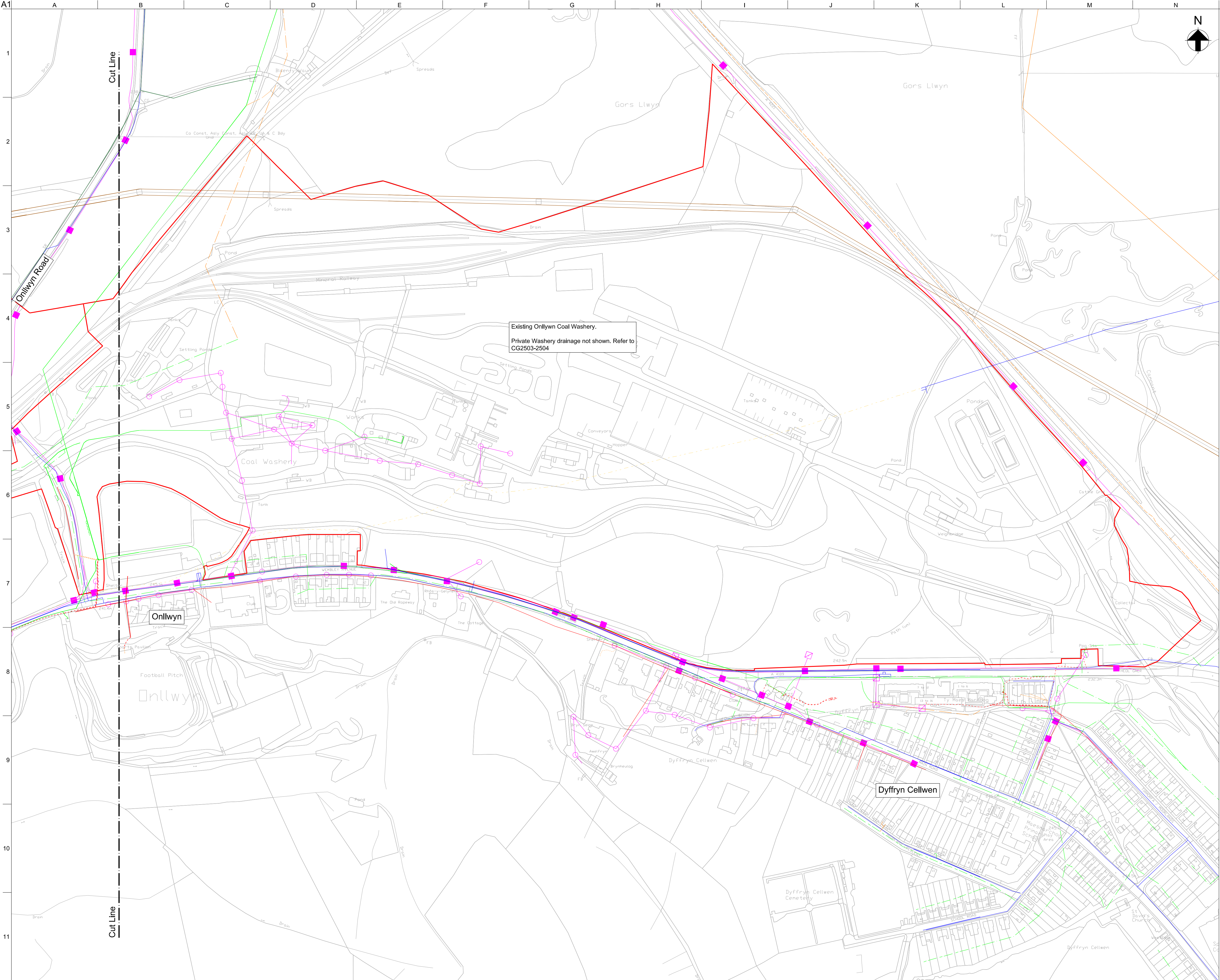
Client
Welsh Government

Job Title
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Drawing Title
Washery Site
Existing Site and Utilities
Sheet 1 of 2

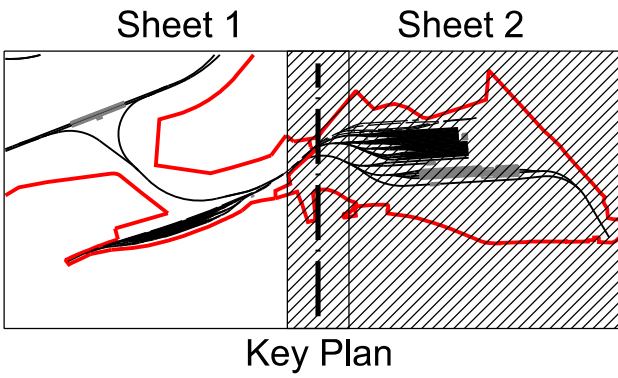
Scale at A1
1:2000
Discipline
Civil

Drawing Status		
For Information		
Job No 264904	Drawing No CG2500	Issue P01



- Legend**
- Planning Application Boundary
 - Existing National Grid Overhead Line
 - Existing DCWW Storm Sewer
 - Existing DCWW Foul Sewer
 - Existing DCWW Combined Sewer
 - Existing Water Main
 - Existing BT
 - Existing WPD Service Line
 - Existing WPD PL
 - Existing WPD LV
 - Existing WPD 132kV HV
 - Existing WPD 33kV HV
 - Existing WPD 11kV HV

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Drawing Title
**Washery Site
Existing Site and Utilities
Sheet 2 of 2**

Scale at A1

1:2000

Discipline

Civil

Drawing Status

For Information

Job No

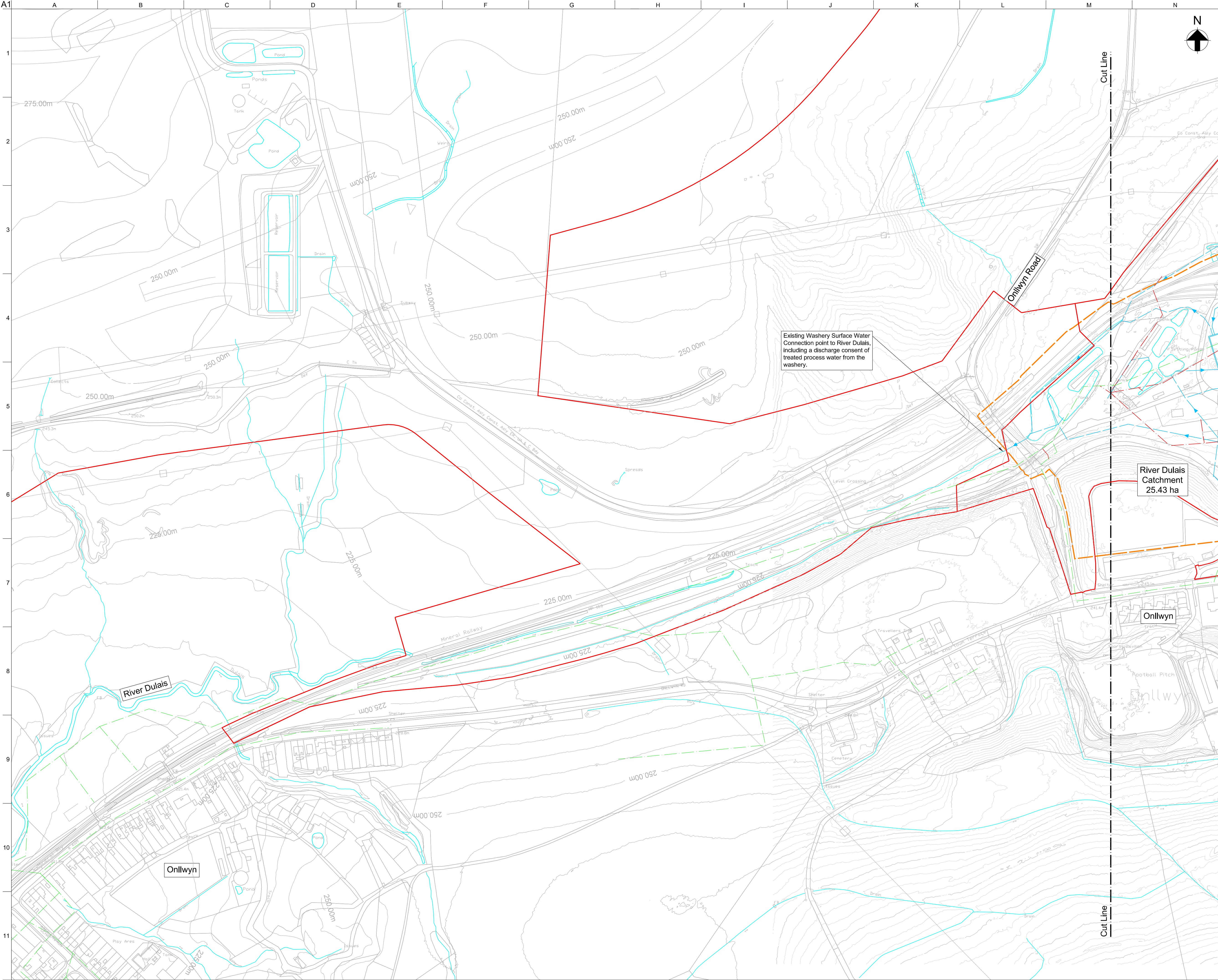
264904

Drawing No

CG2501

Issue

P01



Legend

Planning Application Boundary

Existing Watercourse

Existing Ridgeline

Existing Catchment

Existing Storm Drainage

Existing Private Foul Drainage

Existing DCWW Combined Sewer

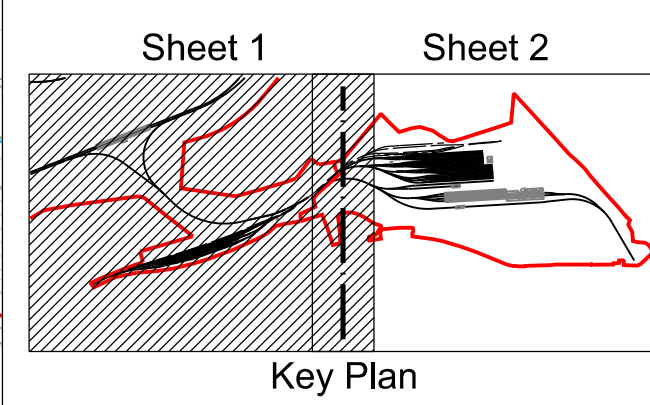
- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

2. Existing catchments shown have been derived from the topography information from from LiDAR survey. Existing catchments are shown for the washerys site only and do not present whole river catchments.

3. Existing Wahsery drainage shown traced from information provided by Celtic Energy.

4. Existing watercourses as defined by the Ordnance Survey information shown.

5. Existing DCWW combined sewer traced from asset information provided by DCWW.



P01	17/07/20	DO	IA	JS
Issued for Planning				
Issue	Date	By	Chkd	Appd

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Client

Welsh Government

Job Title

Global Centre for Rail Excellence

Drawing Title

Washery Site
Existing Catchments and Drainage
Sheet 1 of 2

Scale at A1

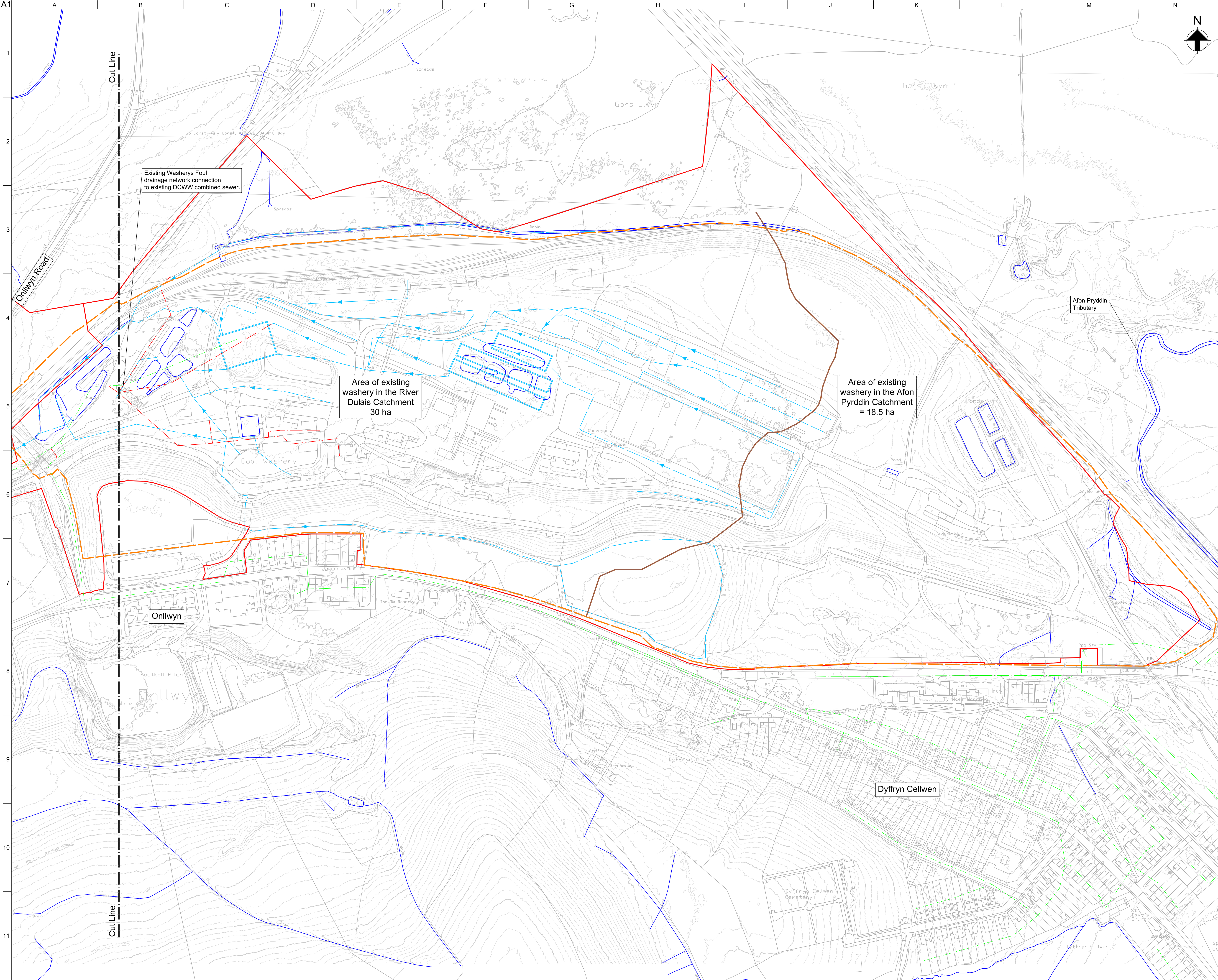
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Discipline

Civil

For Information

Job No	Drawing No	Issue
264904	CG2502	P01

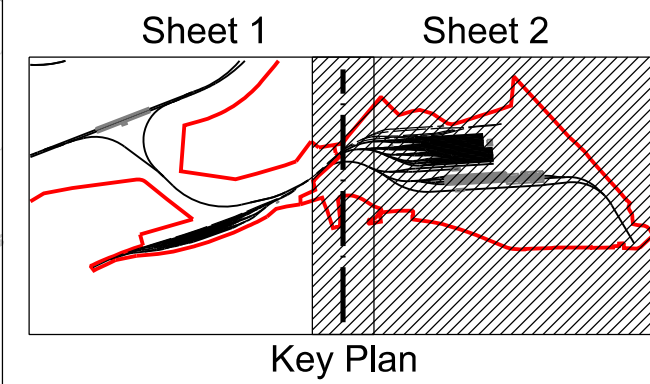


Legend

- Planning Application Boundary
- Existing Watercourse
- Existing Ridgeline
- Existing Catchment
- Existing Storm Drainage
- Existing Private Foul Drainage
- Existing DCWW Combined Sewer

Notes

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Client
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Job Title
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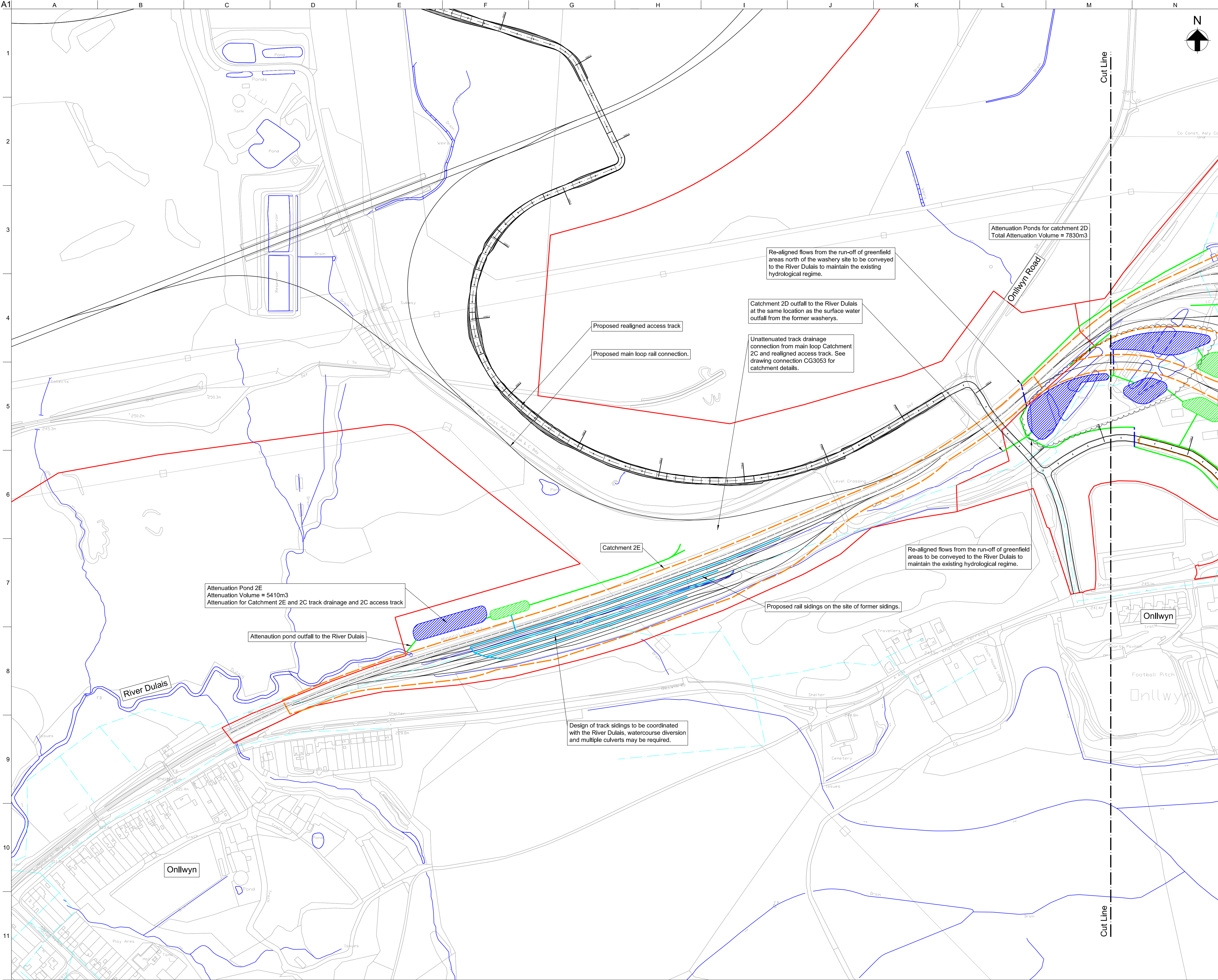
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**Washery Site
Existing Catchments and Drainage
Sheet 2 of 2**

Scale at A1
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Discipline
Civil

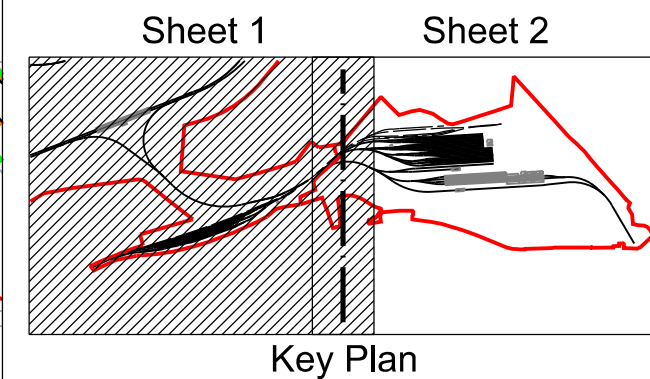
Drawing Status
For Information

Job No 264904	Drawing No CG2503	Issue P01
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- Legend**
- Planning Application Boundary
 - Existing Watercourse
 - Proposed Catchment
 - Proposed Cut Off Ditch/Swale
 - Proposed Filter Drain
 - Proposed Culvert
 - Proposed Carrier Drain
 - Proposed Foul Drain
 - Proposed Attenuation Pond Forebay
 - Proposed Attenuation Pond
 - Existing DCWW Drainage Network

- Notes**
- All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.
 - This drawing is for planning purposes only and is to be read in conjunction with the Drainage Strategy report.
 - For cut-off ditch typical details, refer to drawing CG2506.
 - The diameter of culverts and sizing of headwall structures are to be determined during subsequent design stages.
 - The attenuation ponds shown are indicative based upon the principles discussed in the drainage strategy report.
 - Foul drainage shown indicatively and strategy subject to agreement with DCWW. Foul strategy shown does not allow for trade effluent which, if required, is subject subject to discussion with DCWW and subsequently not shown.



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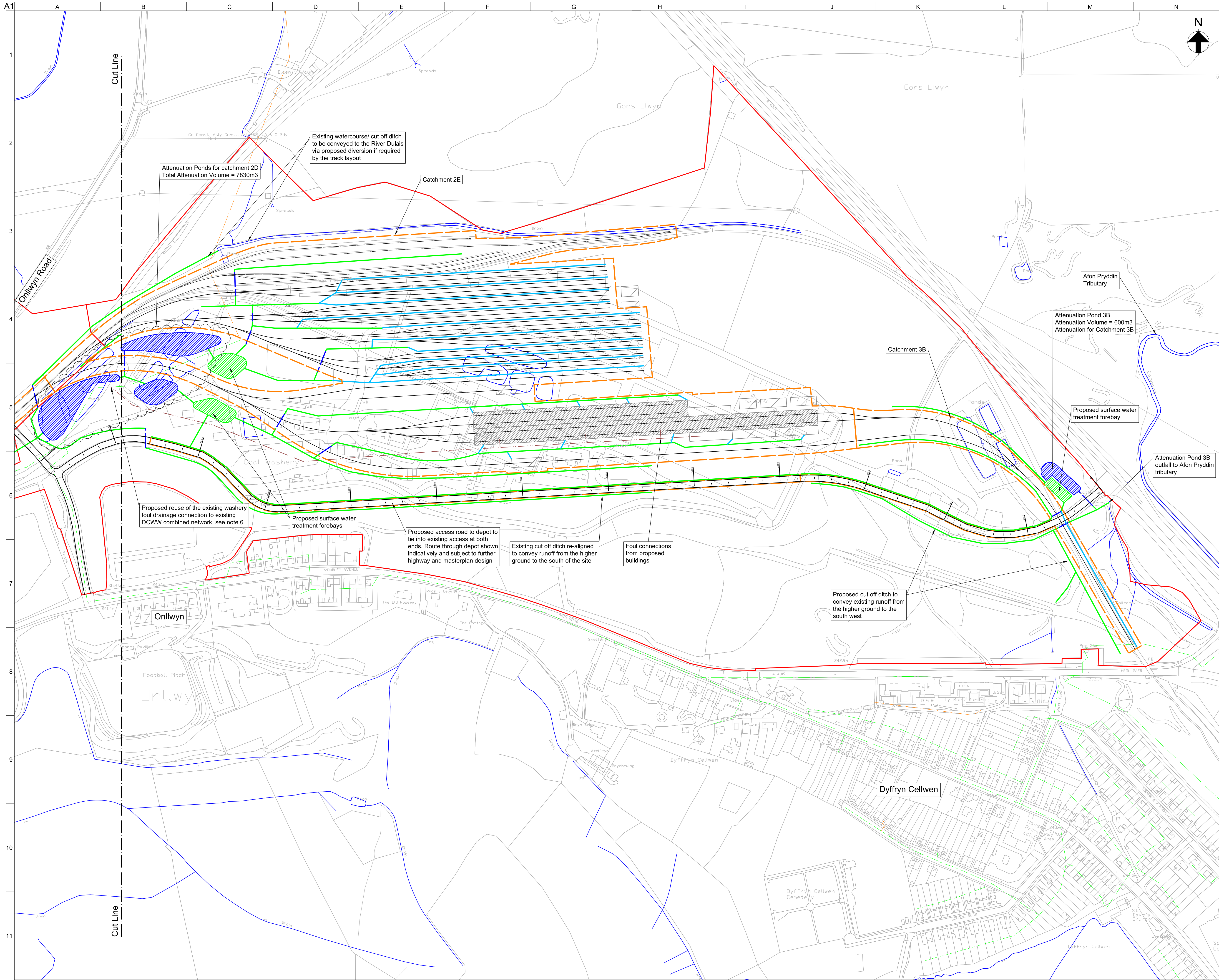
Client
Welsh Government

Project Title
Global Centre for Rail Excellence

Drawing Title
**Washery Site
Proposed Drainage
Sheet 1 of 2**

Scale at A1 1:2000 Role
Suitability Civil

Job No
For Information
Drawing No
264904 CG2504 P01



Legend

Planning Application Boundary

Existing Watercourse

Proposed Catchment

Proposed Cut Off Ditch/Swale

Proposed Filter Drain

Proposed Culvert

Proposed Carrier Drain

Proposed Foul Drain

Proposed Attenuation Pond Forebay

Proposed Attenuation Pond

Existing DCWW Drainage Network

- Notes
1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.

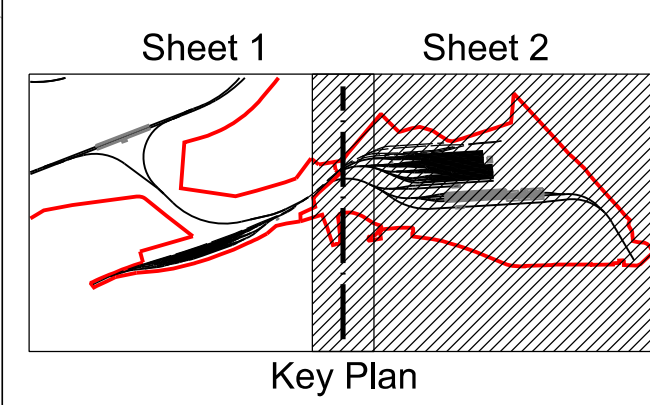
2. This drawing is for planning purposes only and is to be read in conjunction with the Drainage Strategy report.

3. For cut-off ditch typical details, refer to drawing CG2506.

4. The diameter of culverts and sizing of headwall structures are to be determined during subsequent design stages.

5. The attenuation ponds shown are indicative based upon the principles discussed in the drainage strategy report.

6. Foul drainage shown indicatively and strategy subject to agreement with DCWW. Foul strategy shown does not allow for trade effluent which, if required, is subject subject to discussion with DCWW and subsequently not shown.



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Job Title

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Drawing Title

Washery Site
Proposed Drainage
Sheet 2 of 2

Scale at A1

1:2000

Discipline

Civil

Drawing Status

For Information

Job No

264904

Drawing No

CG2505

Issue

P01

A1

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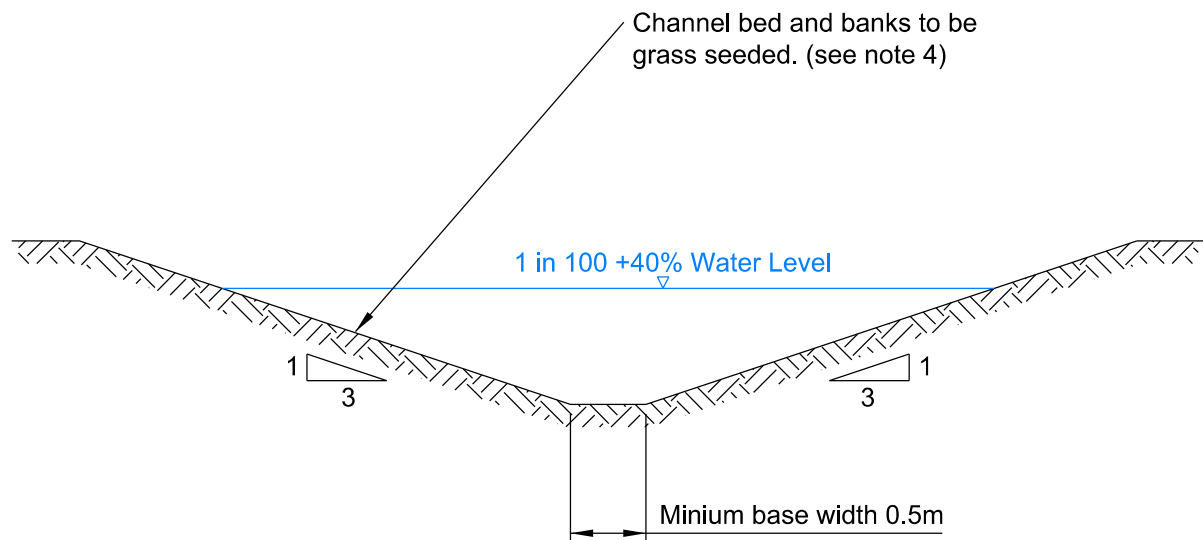
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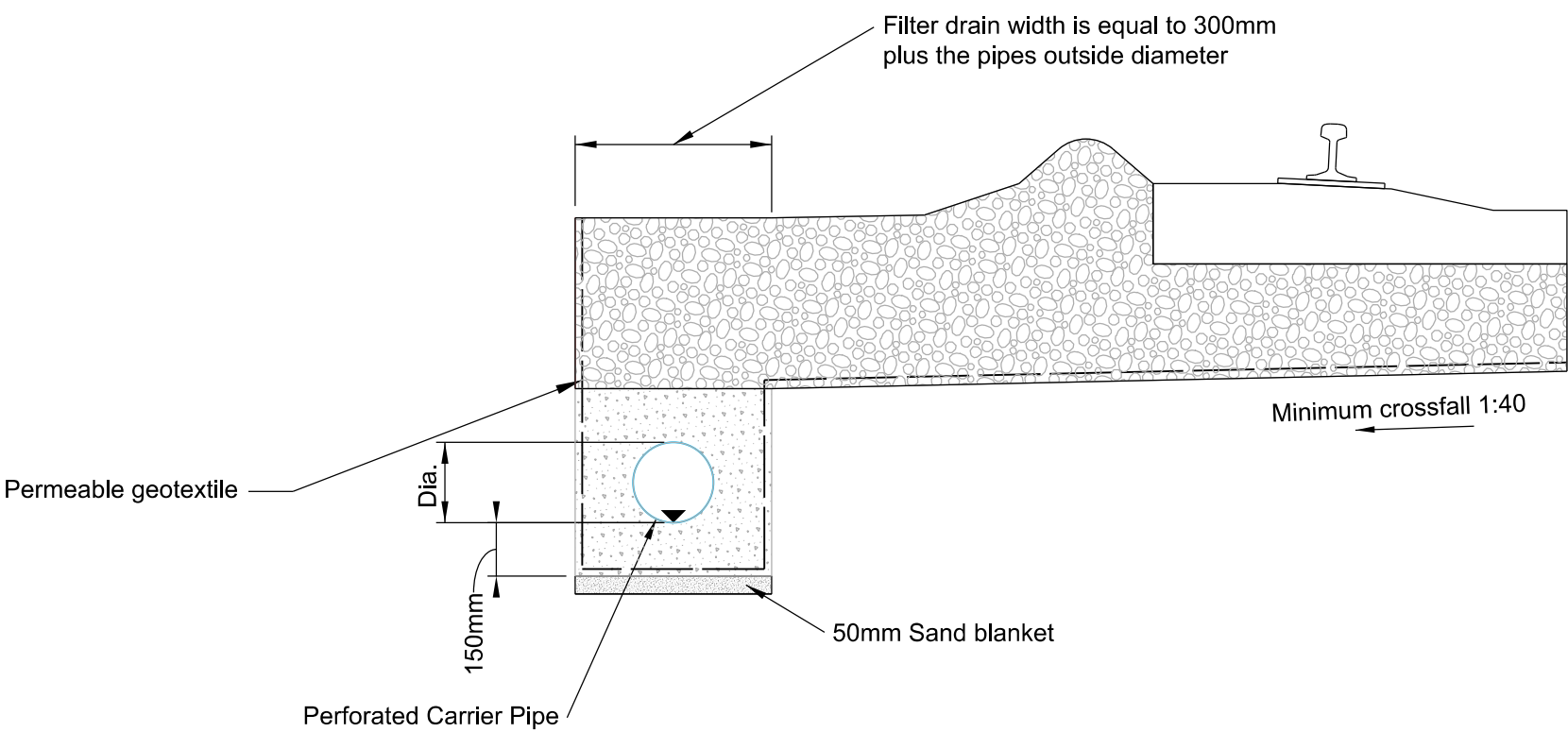
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11



Typical Section - Cut off Ditch and Swale Channel
N.T.S



Example Filter / Track Drainage
NTS

	Filter Material Refer to Table 1
	Track Ballast

Pipe Nominal Size (DN)	Aggregate to BS 12620
140 to 400	10, 14 or 20mm Nominal Single Size Or 14 to 5mm Graded Or 20 to 5mm Graded
> 400	10, 14 or 20mm Nominal Single Size Or 14 to 5mm Graded Or 20 to 5mm Graded Or 40 to 5mm Graded

OR IN ACCORDANCE WITH
PIPE MANUFACTURERS
BEDDING SPECIFICATION

Table 1 - Example Requirements For Pipe Bedding And Filter Details

Notes

1. All dimensions are in metres unless noted otherwise. All elevations are in metres Above Ordnance Datum (AOD). Do not scale.
2. This drawing is for planning purposes only and is to be read in conjunction with the Drainage Strategy report.
3. For drainage plans, refer to CG2504 and CG2505.
4. Channel subject to detailed design, additional erosion control may be required for higher velocity flows.
5. Details shown for information only, subject to detailed design.

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Client
Welsh Government

Job Title
Global Centre for Rail Excellence

Drawing Title
Washery Site
Typical Drainage Details

Scale at A1
As Shown

Discipline
Civils

Drawing Status

For Information

Job No 264904	Drawing No CG2506	Issue P01
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Appendix G

DCWW Pre planning Response

Mr David Owen
Arup
Cardiff
CF10 4QP

Date: 19/06/2020
Our Ref: PPA0004933

Dear Mr Owen

Grid Ref: 284848 210504
Site Address: Onllwyn, Neath Port Talbot
Development: Global Centre for Rail Excellence

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

APPRAISAL

Firstly, we note that the proposal relates to the 'Global Centre for Rail Excellence' at Onllwyn, Neath Port Talbot and acknowledge that the site comprises of a potential windfall development with no allocated status in the Local Development Plan (LDP). Accordingly, whilst it does not appear an assessment has been previously undertaken of the public sewerage system, we offer the following comments as part of our appraisal of this development.

Please note, notwithstanding the following assessment, we would advise there is also a mandatory requirement to undertake pre-application consultation with all 'Specialist Consultees', including Dwr Cymru Welsh Water as the statutory water and sewerage undertaker, in accordance with Schedule 4 of Town & Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2016. As a major development, you will be statutorily required to consult Welsh Water and a substantive response will be issued within 28 days from the date of the notice as per the requirements of Article 2E.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a predominantly combined public sewerage system which drains to Crynant Wastewater Treatment Works (WWTW). The site also lies in proximity to a foul water public sewer, located approximately 0.6km to the north, that drains to Ystradgynlais WWTW.

This site is crossed by public sewers with their approximate position being marked on the attached Statutory Public Sewer Record. In accordance with the Water Industry Act 1991, Dwr Cymru Welsh Water requires access to its apparatus at all times in order to carry out maintenance and repairs. No part of any building will be permitted within the protection zone of the public sewers measured 3 metres either side of the centreline. Our strong recommendation is that your site layout takes into account the location of the assets crossing the site and should be referred to in any master-planning exercises or site layout plans submitted as part of any subsequent planning application. Further information regarding Asset Protection is provided in the attached Advice & Guidance note.

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

Surface Water Drainage

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

It is therefore recommended that the developer consult with Neath Port Talbot County Borough Council, as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note. In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

Foul Water Drainage – Sewerage Network

We have considered the impact of foul flows generated by the proposed development, as confirmed on the accompanying 'Proposed Site Location Plan' (Drawing No. SK001), and concluded that flows can be accommodated within the public sewerage system. We advise that the flows can connect to the existing combined sewer crossing the development site.



Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dwr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in
Welsh and English

Dŵr Cymru Cyf, a limited company registered in
Wales no 2366777. Registered office: Pentwyn Road,
Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account. However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water Industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com.

Notwithstanding the above, if the development will give rise to a new discharge (or alter an existing discharge) of trade effluent, directly or indirectly to the public sewerage system, then a Discharge Consent under Section 118 of the Water Industry Act 1991 is required from Dwr Cymru / Welsh Water. Please note that the issuing of a Discharge Consent is independent of the planning process and a consent may be refused although planning permission is granted.

SEWAGE TREATMENT

No problems are envisaged with the Wastewater Treatment Works for the treatment of domestic discharges from this site

WATER SUPPLY

A water supply can be made available to service this proposed development and facilitated via an existing connection at NGR-284571, 210338. Alternatively, the developer may be required to contribute, under Sections 40 – 41 of the Water Industry Act 1991, towards the provision of new off-site and/or on-site watermains and associated infrastructure. The cost of providing new on-site watermains can be calculated upon the receipt of detailed site layout plans which should be sent to the above address.

The proposed development is crossed by a trunk watermain and an abandoned distribution watermain the approximate positions being shown on the attached plan. Dwr Cymru Welsh Water as Statutory Undertaker has statutory powers to access our apparatus at all times. It may be possible for this watermain to be diverted under Section 185 of the Water Industry Act 1991, the cost of which will be re-charged to the developer. The developer must consult Dwr Cymru Welsh Water before any development commences on site.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application.



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Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at developer.services@dwrcymru.com

Please quote our reference number in all communications and correspondence.

Yours faithfully,



Owain George
Planning Liaison Manager
Developer Services

ENC. Sewer plan
Water plan
Pre Planning notes

Please Note that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.