Snowdonia VIP

Garth & Cilfor Construction Compounds – Abstraction Licenses

Hydrogeological Assessment

March 2023

Waterco

Assessment | Modelling | Design

Project Information	
Project:	Snowdonia VIP – Garth & Cilfor Abstractions
Report Title:	Hydrogeological Assessment
Client:	Hochtief UK Construction Ltd
File Ref:	15055 - Hydrological Assessment-01

Approval Record	
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Document History		
Revision	**Date**	**Comment**
01	24/03/2023	First issue

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This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

Contents

Appendices

Introduction

Waterco has undertaken a Hydrogeological Assessment in support of groundwater abstraction license applications at the Garth and Cilfor Construction compounds near Porthmadog, Gwynedd.

The abstraction license applications are required in support of the Snowdonia Visual Impact Provision (SVIP) project. The project aims to reduce the visual impact of National Grid's overhead line across the Dwyryd Estuary from Penrhyndeudraeth to Llandecwyn near Porthmadog. The scheme will entail removing a section of overhead line and replacing it with electricity cables buried in a tunnel underground (beneath the Dwyryd Estuary). The scheme benefits from full planning permission.

Scope

The scope of this Hydrogeological Assessment has been set out by Natural Resources Wales (NRW) following submission of an abstraction license pre-application request. NRW have requested that the Hydrogeological Assessment addresses the anticipated impacts to local water features, including information on the following:

- The interaction of pumped groundwater with watercourses.
- The instantaneous rate of abstraction, and the rates of abstraction from each end of the tunnel.
- The quality of water to be dewatered – whether it is expected to be brackish or freshwater.
- The timing of the abstraction.
- The location of discharge and volumes to be discharged.

The NRW pre-application response is included in Appendix A.

Development Proposals

As part of the scheme, a launch shaft (up to 15.4m deep) will be advanced at the Garth Construction Compound, located at Quarry Lane, Minffordd, Penrhyndeudraeth, Gwynedd, LL48 6HP. A receiving shaft (up to 65.8m deep) will be advanced at the Cilfor Construction Compound, located at land east of A496, Talsarnau, Llandecwyn, Gwynedd, LL47 6YL. The tunnel beneath the Dwyryd estuary will be advanced with a tunnel boring machine (TBM) and laid at a fall from Garth to Cilfor. A scheme overview plan is included in Appendix B.

Two abstraction licenses are being submitted, one for the abstraction at the Garth Construction Compound and one for the abstraction at the Cilfor Construction Compound. The Garth abstraction license is for: dewatering during the construction of the launch shaft; dewatering of the shaft post-construction associated with the groundwater pressure relief pumping from the base slab of the shaft; and the nominal abstraction

of the slurry (water and rock mix) from the TBM (TBM slurry circuit). The Cilfor abstraction license is for dewatering during the construction of the shaft. The shaft at Cilfor will be watertight once shaft construction is complete.

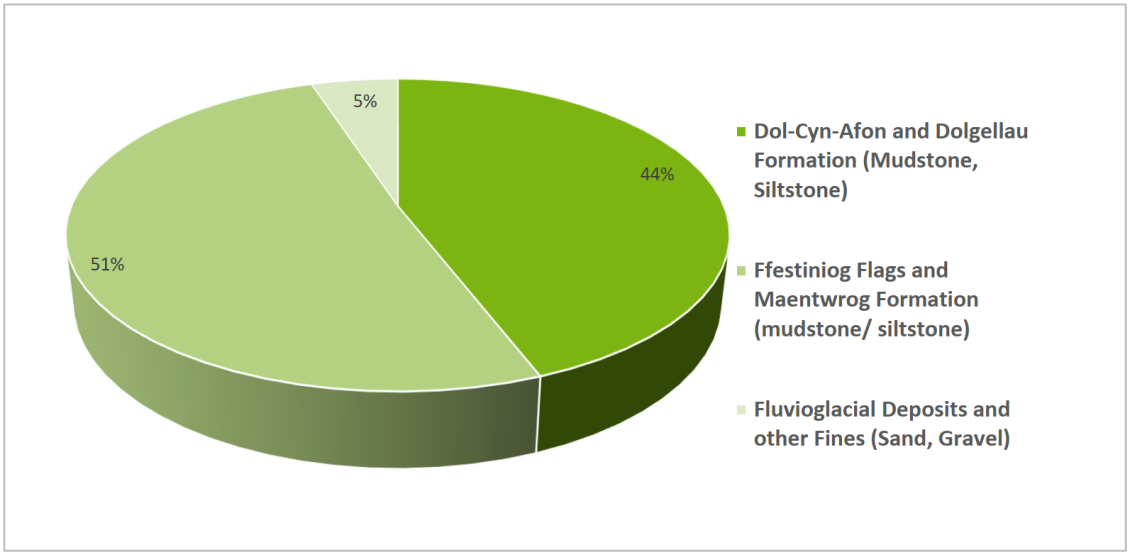
The water used to operate the TBM will be sourced from the Afon Glaslyn and inputted into the tunnel in a pipe (slurry circuit). The abstracted water will be treated on site and recycled to limit abstraction quantities from the Afon Glaslyn. The water discharged from the tunnel during the tunnel drive is expected to be equivalent to the water inputted into the tunnel to operate the TBM. The tunnel will be sealed however minor groundwater leakages through seals may still occur. Groundwater volumes from leakages in the tunnel are considered negligible in context to the quantity of water used in the TBM slurry circuit.

Ground Conditions

Ground investigations and associated reporting has been undertaken by WSP. The Factual Ground Investigation Reports (documents references SVIP - GI Phase 1 Factual Report PDD-33494-REP-012 & SVIP - GI Phase 2 Factual Report PDD-33494-REP-019) support the abstraction licence applications.

A summary of the geology to be expected during the tunnel drive is shown in Figure 1.

Figure 1: Proportion of Geological Formation to be Excavated.



The Factual Ground Investigation Reports include groundwater monitoring data. Shallow depth groundwater is identified at the Garth Construction Compound with a groundwater strike recorded at 0.6m below ground level (m.bgl) at BH100. Groundwater was encountered between 1m.bgl and 1.2m.bgl at trial pits 100 and 100A in the Garth Construction Compound.

Artesian water pressure was observed during borehole drilling at the Cilfor Construction Compound with groundwater encountered at ground level when advancing trial pits.

Interaction of Pumped Groundwater on Watercourses

Garth Compound

The proposed tunnel shaft at Garth is located within 30m of an ordinary (unnamed) watercourse. The watercourse provides a land drainage function to the site and has a limited upstream catchment (limited to the field east of the site and extending approximately 100m from the site). The watercourse is ephemeral and is known to be dry during summer months when the water table is low. The watercourse flows south-west and joins the Afon Glaslyn.

The construction of the shaft will be such that groundwater ingress during construction will be minimal. A method statement detailing the construction method which will minimise groundwater ingress is included in Appendix C. Minimising groundwater ingress during construction will ensure that there is negligible hydraulic impact on the existing watercourse.

Discharge of the abstracted groundwater (following suitable treatment) will be made direct to the Afon Glaslyn, ensuring the watercourse on site is not impacted by additional flows or that the flow regime is not changed. A discharge location plan is provided as Appendix D.

Cilfor Compound

Nant Yr Efail (watercourse) borders the site to the north-east, north and west and is within 35m of the proposed receiving shaft. Nant yr Efail flows west and joins the Afon Dwyryd approximately 465m west of the site. As detailed in the method statement (Appendix C), the construction of the shaft will be such that groundwater ingress during and post-construction will be minimal, with the shaft made watertight. This will ensure that there is negligible hydraulic impact on the existing watercourse.

Discharge of abstracted water (following suitable treatment) will be made to Nant Yr Efail immediately upstream of its confluence with the Afon Dwyryd where saline conditions are expected. The discharge location is chosen as to avoid discharge of potentially brackish water to the fresh water reach of Nant Yr Efail. A discharge location plan is provided as Appendix D.

Rate & Volume of Abstraction

Garth Compound

During construction of the tunnel shaft, dewatering will be required. Up to 500m^3 per day (worst case) will be abstracted from the tunnel shaft during construction. The construction of the shaft is estimated to take three months. Water will be abstracted at a maximum pump rate of 40 l/s.

Once the tunnel shaft is constructed, a groundwater pressure relief system will be installed in the base. Abstraction from the groundwater pressure relief pumping is estimated up to 110m^3 per day. Water will be abstracted at a maximum pump rate of 40 l/s.

The tunnel boring machine requires a maximum of 500m^3 of water per day to operate (assuming clay geology). The water discharged from the TBM in the slurry circuit will not include groundwater and is purely

the water inputted into the TBM (sourced from the Afon Glaslyn). The Slurry water will be discharged at a maximum pump rate of 40 l/s.

The maximum daily discharge from the Garth shaft during the tunnel drive will be 610m^3. Of this, up to 110m^3 will be groundwater (shaft pressure relief pumping) with the remaining 500m^3 comprising the TBM slurry (no groundwater).

Cilfor Compound

During construction of the tunnel shaft dewatering will be required. Up to 120m^3 per day (worst case) will be abstracted from the tunnel shaft during construction. The construction of the shaft is estimated to take 3-5 months. Once construction is complete, the shaft will be watertight. Water will be abstracted at a maximum pump rate of 40 l/s during the construction of the shaft.

Water Quality

The water abstracted from the tunnel shafts may be brackish in nature especially at greater depth. The water abstracted will be subject to treatment on site and the selection of materials used in the construction will minimise the potential for pollution.

Water abstracted from the tunnel shafts and TBM slurry circuit will be treated prior to re-use in the process or will be discharged to the Afon Glaslyn (from Garth) or Nant yr Efail immediately upstream of the Afon Dwyryd (from Cilfor). Details of the water treatment stages are included in Appendix E. The water treatment proposals will achieve the following levels of treatment prior to release to a watercourse:

- Total suspended solids 60mg/l
- pH 6-9
- Total iron <5mg/l

A Materials Approval Schedule (document reference C0233-HUK-GES-XX-SH-W-0002) supports the abstraction license applications and details the control measures proposed to minimise the risk to the groundwater environment and to comply with the Environmental Permitting (England and Wales) Regulations 2010, SI 2010 No. 675 ('the Regulations'). The Regulations transpose the Groundwater Directive 1980 (GWD), the Water Framework Directive 2000 (WFD) and Groundwater Daughter Directive 2006 (GWDD). These Directives require that inputs (discharges) of pollutants to groundwater are either prevented or limited, to avoid or control groundwater pollution. Doing such measures should also prevent the deterioration of the chemical status of groundwater bodies and avoid (environmentally) significant and sustained upward trends in the concentration of pollutants in groundwater.

Programme of Works

Garth Compound

Shaft excavation at Garth is expected to start in Quarter 4 of 2023. The construction of the shaft and associated dewatering is expected to take 3 months. Once the shaft construction is complete, the pressure relief pumping is expected for a period of 20 months (up to the fourth Quarter of 2025), however may be extend until December 2026 subject to unforeseen construction delays. The shaft at Garth will be backfilled on completion of the tunnel and abstraction ceased.

The discharge from the TBM slurry circuit will take place from the TBM launch (expected in Quarter 2 of 2024) for a period of 20 months (up to the fourth Quarter of 2025), however may be increase until December 2026 subject to construction delays.

Cilfor Compound

Shaft excavation at Cilfor is expected to start in Quarter 3 of 2024. The construction of the shaft and associated dewatering is expected to take 3-5 months. The shaft will be made watertight on completion of construction.

Following completion of the tunnelling, a new abstraction license will be submitted for up to $5m^3$ from the permanent Cilfor tunnel shaft. The abstraction of $5m^3$ per day will allow for abstraction of any groundwater leakages from the completed tunnel.

Vibration Impact on Fish in the Dwyryd Estuary

The potential impact of noise and vibration on fish within the Dwyryd Estuary above the tunnel during the tunnel's construction was considered in a specialist report appended to the SVIP scheme's Marine Habitats Regulations Assessment. This concluded "The underwater sound pressure levels that reach the seabed are therefore unlikely to result in any disturbance to fish in the estuary for the duration of construction activities". This analysis assumed the TBM would be 35m below the Estuary. In practice, the crown of the tunnel is expected to be more than 50m below the Estuary seabed. The tunnel's greater depth beneath the seabed will provide more sound and vibration attenuation than assumed in the Marine HRA.

Conclusions

The proposed abstraction from the Garth and Cilfor Construction Compounds is considered to have negligible impact on the local water environment (both groundwater and surface waters).

The use of modern construction techniques and latest technologies will ensure groundwater ingress to the tunnel shafts and tunnel is minimal, subsequently limiting abstraction quantities. Abstracted water will be treated and re-used in the process where possible. Where discharge of abstracted water to a watercourse is required, the proposed discharge locations are selected to ensure negligible impact to surface waters.

Supporting Information

The documents / drawings which support the abstraction licenses are detailed below together with a brief description of the information they contain:

1) *Intertek, Visual Impact Provision Snowdonia, Marine Habitats Regulations Assessment: Stage 1 screening and Stage 2 information to inform Appropriate Assessment. Appendix A, VIP Snowdonia Project: Underwater Noise Assessment, dated 28-02-20.*

   This document details the impact on fish within the Dwyryd Estuary from vibration effects of the TBM.

2) *HTUK Drawing: TUNNEL ALIGNMENT PLAN AND PROFILE SHEET 2 OF 5 - Dwg Ref. C0233-ACM-PCX-UX-DR-C-0002 dated 13-12-22*

   This drawing shows the proposed tunnel depth and expected geology beneath the Dwyryd Estuary.

3) *HTUK Drawing: TUNNEL ALIGNMENT PLAN AND PROFILE SHEET 3 OF 5 - Dwg Ref. C0233-ACM-PCX-UX-DR-C-0003 dated 13-12-22*

   This drawing shows the proposed tunnel depth and expected geology beneath the Dwyryd Estuary.

4) *HTUK Drawing: TUNNEL ALIGNMENT HORIZONTAL & VERTICAL PROFILES - EXCLUSION ZONES – Dwg ref. C0233-HUK-GDM-ZZ-DR-W-0001 dated 14.10.2022*

   This drawing shows the proposed tunnel depth for the entire tunnel length.

5) HTUK Drawing Geological Plan and Long Section – Dwg ref: C0233-ACM-PGT-UX-DR-Y-0006-P01 dated 13/12/2022.

   This drawing shows the proposed tunnel depth and expected geology beneath the entire tunnel length.

6) *SVIP - GI Phase 1 Factual Report PDD-33494-REP-012*

   This report details the ground investigations undertaken along the proposed tunnel route.

7) *SVIP - GI Phase 2 Factual Report PDD-33494-REP-019*

This report details the ground investigations undertaken along the proposed tunnel route.

8) *Chapter 10 'Geology, Soils and Contaminate Land' of the 'Environmental Appraisal Volume 1' together with associated figures 10.2 'Superficial Geology' and 10.3 'Bedrock Geology'.*

   This extract provides further details on geology along the tunnel route.

9) *HTUK Report C0233-HUK-GES-XX-SH-W-0002-P01-Materials Approval Schedule (NRW) dated 8/03/2023.*

   This report sets out the control measures proposed to minimise the risk to the groundwater environment with respect to selection of materials used in the construction.

10) *HTUK Report C0233-HUK-GES-ZZ-PL-W-0001_TBM PlanOfAdvance dated 13/03/2023.*

    This Report provides detail of the tunnel boring machine, the tunnel construction process and use of grouts / sealing elements in the tunnel.

11) *Waterco drawings 'Garth Construction Compound - Process Water Abstraction Location Plan' & 'Cilfor Construction Compound - Abstraction Location Plan'.*

    Plans showing the proposed location of the abstractions.

12) *HTUK drawing Garth Launch Shaft C0233-HTE-PTW-AS-DR-C-0002*

    Drawing showing a cross section of the launch shaft at Garth.

13) *HTUK* drawing *Cilfor Launch shaft 108-3-HTE-SSP-CS-DR-C-0005*

    Drawing showing a cross section of the receiving shaft at Cilfor

14) *NRW pre-application response PPN-00945-6.*

15) *HTUK document C0233-HUK-GES-ZZ-PL-W-0001 – P01 TBM Drive*

    Method statement detailing the method of construction for the tunnel.

16) *HTUK document C0233-HUK-GES-AS-PL-W-0001 – P01 – TBM Shaft (Garth)*

    Method statement detailing the method of construction for the tunnel shaft at Garth.

17) HTUK document C0233-HUK-GES-IS-PL-W-0001 *P01 – TBM Shaft (Cilfor)*

    Method statement detailing the method of construction for the tunnel shaft at Cilfor.

Appendix A NRW Pre-Application Response

Cyfoeth Naturiol Cymru
Natural Resources Wales

Ein cyf/Our ref: PPN-00945 & PPN-00946

Tŷ Cambria, 29 Newport Road, Cardiff, CF24 0TP

Ebost/Email:
deri.mcdonagh@cyfoethnaturiolcymru.gov.uk
:

Aled Williams
Waterco Limited
Lon Parcwr Business Park
Ruthin
LL15 1NJ

By email: aled.williams@waterco.co.uk

Dyddiad/Date: 30/01/2023

Dear Mr Williams,

Proposal to abstract groundwater for the purpose of dewatering during the construction of a tunnel beneath the Dwyryd estuary.

Thank you for your pre-application enquiry, which we received on 29/11/2022.

In this letter we provide advice on the types of licence you may need from us and other environmental considerations that you will need to take into account whilst developing your proposal.

Our advice is based on the information you have provided with your pre-application enquiry. It should guide you in developing a proposal that will have a low impact on river habitats and wildlife.

Please note that if you do submit a formal application for an abstraction and/or impoundment licence, we may still need to ask you for further information once the licence determination process begins. Occasionally this may lead to a revision to some aspects of our pre-application advice.

Having assessed your pre-application enquiry we would like to make you aware of the following points:

Licence requirements

If the proposal is to abstract over 20 cubic metres of groundwater per day, then an abstraction licence will be required for this activity. As you have indicated that a portion of the water will be used for dust suppression/cooling purposes, then a full abstraction licence will be required.

Currently, we do not have enough information to determine how many abstraction licences will be required, given the possibility that groundwater will be abstracted from discrete aquifers. The following actions will aid us in determining how many groundwater abstraction licences are required:

Further information

We recommend the following actions before submitting your formal application:

Test pump

We recommend that a test pump (a Groundwater Investigation Consent) should be conducted to determine the degree of continuity between surface water and groundwater. You can find details of how to apply for this consent on our website at the following link: Natural Resources Wales / Prepare an application for a groundwater investigation consent

We strongly recommend employing a professional hydrogeological advisor to design and supervise your pumping test.

Hydrological Impact Appraisal

A detailed hydrogeological impact appraisal for dewatering should be undertaken in line with recommended guidance, which can be found at the following link : https://www.gov.uk/government/publications/hydrogeological-impact-appraisal-for-dewatering-abstractions.

This appraisal should be completed following the results of a licenced test pump, and submitted with your formal application.

It is recommended that the hydrogeological impact appraisal should address the full anticipated impacts to local water features, including information on the following:

- Both mineshafts are are approximately 35m from nearby surface water drains. Further information is required regarding interaction of pumped groundwater with these drains.

- The instantaneous rate of abstraction, and the rates of abstraction from each end of the tunnel

- The quality of water to be dewatered – whether it is expected to be brackish or freshwater

- The timing of the abstraction - will dewatering continue after construction, or be limited to just the construction itself?

- The location of discharge and volumes to be discharged.

Method Statement

- A full method statement should be submitted with the formal application. This method statement should include the following information:

- The time of year that the works will take place;

- The number of hours per day that dewatering will take place

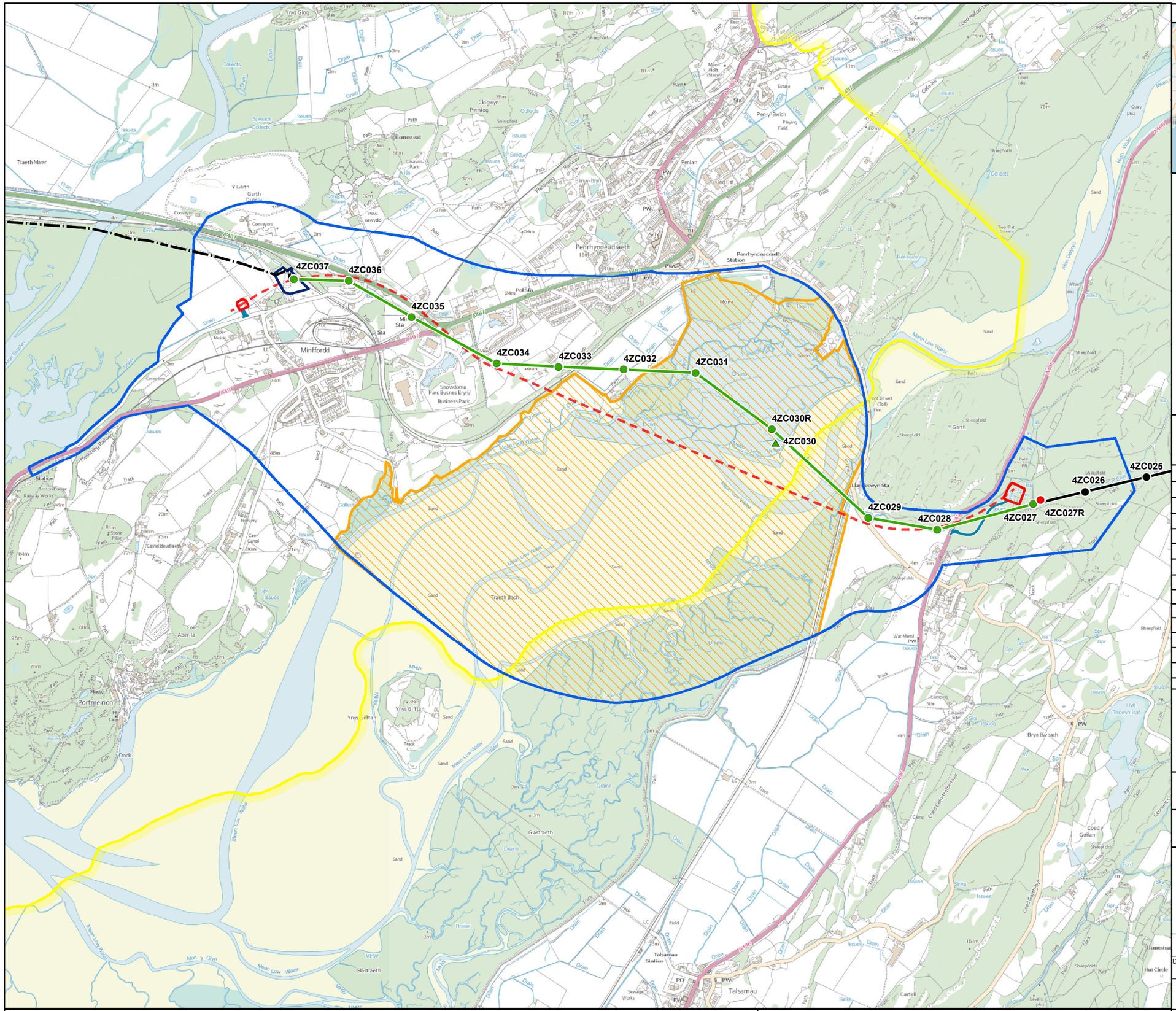
- The potential impact (noise, vibration) to fish within the estuary above the tunnel during operations.

Yours sincerely,

Deri McDonagh
Water Resources Permitting Officer

Direct dial : 0300 065 3978
Direct e-mail : deri.mcdonagh@cyfoethnaturiolcymru.gov.u

Appendix B Project Overview Plan



Overview

Legend

- Area of Search for Permanent and Temporary Works
- National Grid Land Ownership Boundary
- Tunnel Headhouse Compound
- Proposed Permanent Access Road
- Marine Environment Area
- Snowdonia National Park
- Overhead Line to be Removed
- Existing National Grid Underground Cable
- Existing National Grid Overhead Line
- Proposed Tunnel
- Foundation of Former Pylon 4ZC030 to be Removed
- Existing National Grid Pylon to be Removed
- Existing National Grid Pylon to be Retained
- Proposed New National Grid Pylon

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Rev	Description	Cre'd	Chk'd	App'd	Date
14	National Park Boundary	NH	SR	SR	13/02/2020
13	remove SEC search, add THH	NH	SR	SR	04/11/2019
12	SEC Search Extent	NH	SR	SR	05/06/2019
11	SEC Search Extent	NH	SR	SR	01/05/2019
10	NG Ownership	NH	SR	SR	06/11/2018
09	NG Ownership	NH	SR	SR	10/10/2018
08	Temporary diversion added	NH	SR	SR	05/10/2018
07	Defunct tower location added	NH	SR	SR	26/09/2018
06	Junction Area removed	NH	SR	SR	16/08/2018
05	SEC & Junction Areas	NH	SR	SR	12/08/2018
04	Marine Environment	NH	SR	SR	11/05/2018
03	SEC search area and AoS update	NH	SR	SR	30/04/2018
02	Revised Tunnel Alignment	NH	SR	SR	03/04/2018
01	Study Area Extended	NH	SR	SR	07/03/2018

nationalgrid

Master Scheme No:	Sub-Scheme No:	Site:
-	-	

Scheme Name:
Visual Impact Provision (VIP) Snowdonia Project

Document Title:

Figure 1.1: Proposed Project Overview

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
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Appendix C Construction Method Statements

HOCHTIEF UK CONSTRUCTION

SNOWDONIA VISUAL IMPACT PROVISION PROJECT

GARTH SHAFT CONSTRUCTION

C0233-HUK-GES-AS-PL-W-0001

Project No: **9.100.1.233**	Issue: **Rev P01**
	Date: **23/03/2023**

	Name	Position (Role)	Signature	Date
Prepared by	Zuzanna Sykes	Administrator		23/03/2023
Approved by:	David Grantham	Environmental & Consents Manager		23/03/2023
Accepted:	Lars Bayer	Project Director		23/03/2023

Revision	Date	Prepared	Checked	Approved	Reason for Issue
P01	23/03/2023	M Gohlke	D. Grantham	L Bayer	For Information

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BIM Design & Construction Capital/Delivery VERIFIED VC 653436

Contents

1.0 Shaft Design Evolution

The Launch-shaft at Garth has been reduced in depth, from a 25m deep circular shaft (with underground mined addits) to a 13m deep rectangular temporary shaft. This has eliminated the need for extensive ground-improvement grouting and reduced the need for concrete, shotcrete and underground excavations.

The shallow rectangular launch-shaft 69m x 8.5m wide will be constructed with a concrete headwall and temporary sheetpiles (AZ48-700) along three sides. A permanent concrete base-slab will be constructed approximately 10m below ground level.

The shaft design change is shown schematically in Figure 1 below. The red rectangle is the revised shaft outline overlaid on the original deep circular shaft design.

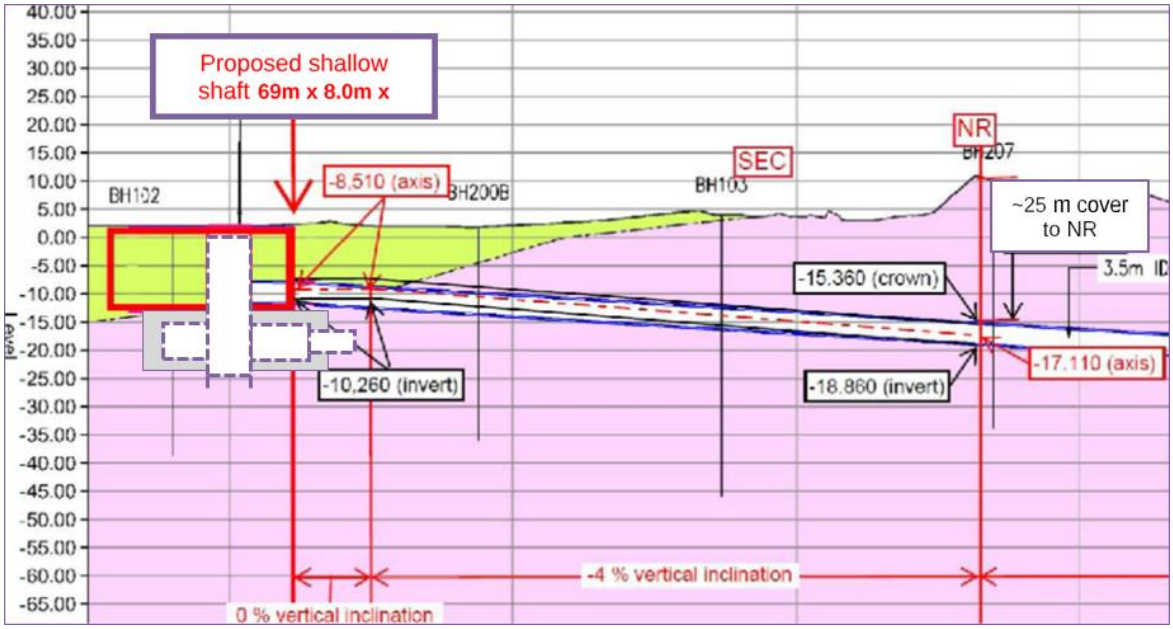


Figure 1 Tunnel Vertical Alignment

2.0 Brief Method Statement

The rectangular shaft will be aligned on the tunnel route.

A concrete headwall made from 1.2m diameter concrete secant piles will be created for the TBM to cut through. These concrete piles will be 18 m long. They will extend approximately 3m above existing ground level for flood protection reasons and 15m into the ground. These concrete secant-piles will be constructed using full length temporary steel casings which will contain the liquid concrete while it hardens.

The three remaining shaft sides will be made from 18m long steel sheetpiles. The sheet pile wall will extend approximately 3m above existing ground level for flood protection reasons and will extend 15m into the ground. These will be installed through the Alluvium into the Mudstone by pre-drilling (auger) and vibro-block. Percussion driving will not be used because it is too noisy.

By inserting the sheetpiles into the mudstone in a pre-augered socket very little groundwater is expected to flow into the shaft. Sheetpiles joints will be sealed with a clutch-sealant (WADIT-type or similar) to prevent seepage through sheet pile joints.

After installing the sheetpiles and the launch-shaft's perimeter is closed a pump-test will be carried out to confirm the pit is sufficiently watertight and that residual seepage is acceptable. If the pump-test shows unacceptable inflow of water into the shaft then sealing grout will be injected at sheet pile toe and/or along clutches of the piles to seal the shaft.

Once the shaft is suitably sealed then the material within the shaft walls will be excavated. Once excavated to formation level a concrete base slab will be constructed.

The base-slab has not been designed to be fully water tight. Some pressure relief valves will be incorporated into the base slab to release excess hydrostatic water pressure at the bottom of the shaft. Mudstone at the bottom of the excavation will be treated by injection to keep groundwater flow into the shaft to a minimum expected to be between 80 - 110m3/day.

3.0 Garth Shaft Construction Materials

	Use	Material	Quantity	Specifications	Method of use	Contact with soil / gndwater	Programme
1	Secant pile wall	Concrete. **(note 1&2)**	**250 m^3**	Male pile:C32/40 Female pile:C8/10 Head wall (soft) piles: to be 66% concrete + 33% bentonite	Bored piles insitu concreted	**Y**	Start 07.2023 End 08.2023
2	Ground improvement TBM launch	Grout **(note 3)**	**240 m^3**	Ultra Fine Cement	Jet Grouting (Injections) from above ground.	**Y**	Start 08.2023 End 09.2023
3	Sheet piles Temp. extracted after 26-30 months	Steel **(note 4)**	**3564 m²**	S240 GP rolled steel sheet piles.	Installed using vibrohammer or similar method.	**Y**	Start 06.2023 End 09.2023
4	Sheet piles joint seal	Swelling tape or equivalent **(note 5)**	**108 m²**	Clutch Sealant 6 Corner joints of the sheet piles 6 x 18 m = 108 m	Applied in site of the sheet piles.	**N**	Start 06.2023 End 09.2023
5	Base slab	Concrete **(note 1)**	**490 m²**	C28/35 An area of approximately 7m x 70m will be in direct contact with the ground	Base slab insitu concreted.	**Y**	Start 10.2023 End 01.2024

Notes.

1. The concrete will be supplied by TG Concrete and Cambrian Services
2. The Berkbent CGB bentonite is manufactured by Tolsa Gp.
3. The ground improvement grouts will be supplied by Zublin AG UK
4. The steel sheet piles will be manufactured by ArcelorMittal
5. The steel sheet piles will be sealed with Akila or Wadit products

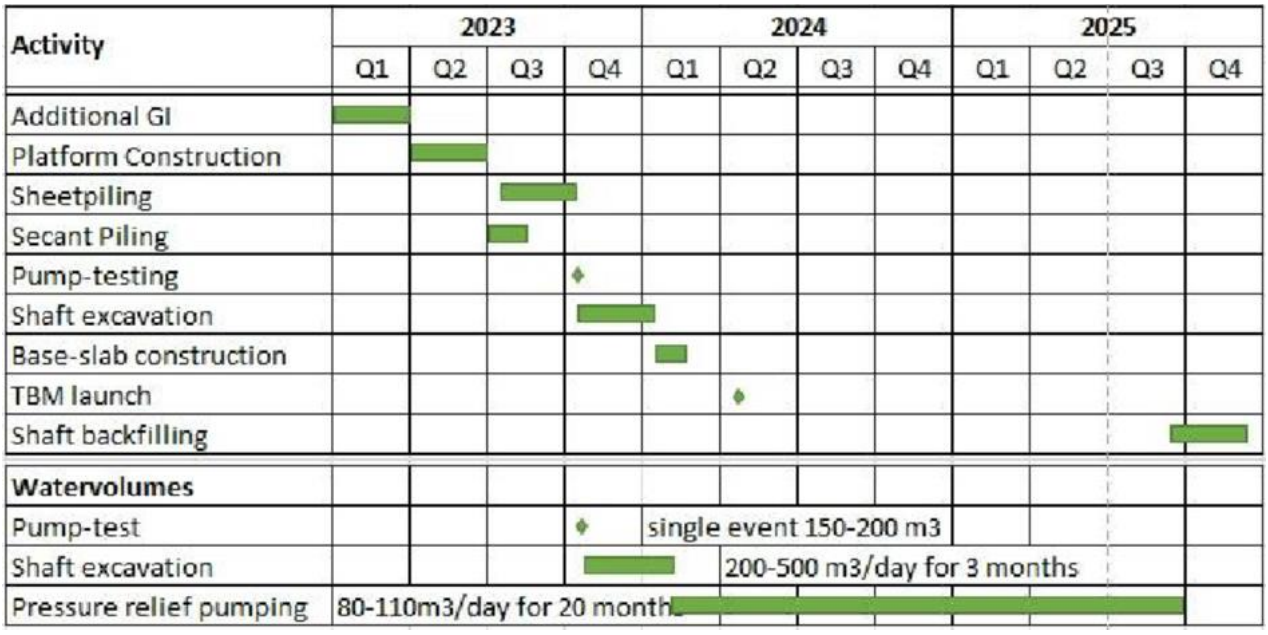
4.0 Estimated water abstraction during shaft construction

During the three month excavation of the Garth shaft the water ingress requiring dewatering is expected to range between 200 - 500m3/day. Although shaft walls are inserted into the competent mudstone some water will enter the construction works through faults and fissures. Once completed the concrete slab in the base of the shaft will not be water tight but will have pressure relief valves built into it.

It is expected that the groundwater flowing into the shaft via the base slab's pressure relief valves will range between 300-450m3/day. Sealing grouts will be injected into the underlying mudstone to reduce the groundwater flows into the shaft via the slab. It is expected that the groundwater flowing into the shaft via the base slab's pressure relief valves will range between 80-110 m3 /day once moderated by injections of sealing grout. Therefore the peak groundwater flow into the shaft is expected to be during the initial excavation and reduce during the TBM drive.

Most of the Garth shaft will be removed on completion of the tunnel leaving a smaller footprint permanent shaft that will be made water tight on completion. The water seepage into the permananet structure comprising both shafts and the tunnel is expected to be up to 5 m3/day. The seepage water will be continuously pumped from the Cilfor shaft to maintain dry conditions in the tunnel.

5.0 Garth Shaft Construction Programme Summary



HOCHTIEF UK CONSTRUCTION

SNOWDONIA VISUAL IMPACT PROVISION PROJECT

CILFOR SHAFT CONSTRUCTION

C0233-HUK-GES-IS-PL-W-0001

Project No: **9.100.1.233**	Issue: **Rev P01**
	Date: **23/03/2023**

	Name	Position (Role)	Signature	Date
Prepared by	Zuzanna Sykes	Administrator		23/03/2023
Approved by:	David Grantham	Environmental & Consents Manager	D. J. Grantham	23/03/2023
Accepted:	Lars Bayer	Project Director		23/03/2023

Revision	Date	Prepared	Checked	Approved	Reason for Issue
P01	23/03/2023	Z Sykes	D. Grantham	L Bayer	For Information

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ISO 45001 Occupational Health and Safety Management CERTIFIED OHS 531558
ISO 50001 Energy Management CERTIFIED ENMS 632421
BIM Design & Construction Capital/Delivery VERIFIED VC 653436

Contents

1.0 Brief Method Statement & Sequence Drawings

The Cilfor shaft construction sequence is shown schematically in Figures 1 – 3 below. The shaft will be approximately 64m deep with an outer diameter of 16.3m and an inner diameter of 12.5m on completion.

Cilfor shaft-construction is considered in two phases:

- Phase one will construct a circular secant-pile-wall to cut off the soft and wet ground conditions in the superficial deposits (Peat, Clay, Sands and Gravel, 4 to 8m deep) overlying the competent mudstone;
- Phase two will excavate rock in the competent mudstone which will be pre-treated with grout injections to control potential water infiltration through possible fissures and voids.

At the start of the works a raised working platform 5.0m above ground level will be constructed made of unbound aggregates from local quarries.

The raised working platform will be used by two to four drilling-rigs to drill down into the bedrock to pressure-grout fissures or voids present in the underlying mudstone. This will create a grout curtain wall and shaft base with low permeability ground needed for shaft sinking (see Figure 1 below).

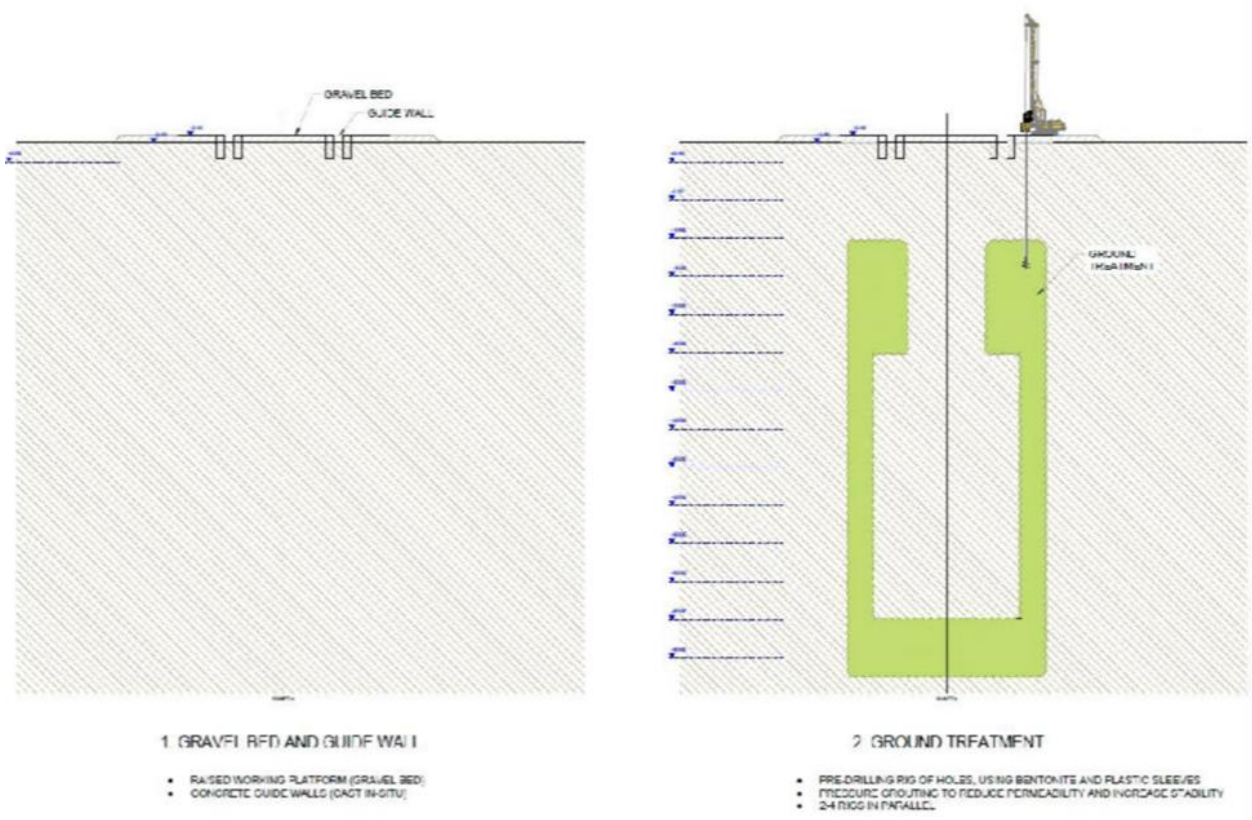

Figure 1

A minimum 10% of the grout injection holes will be re-drilled for post grouting permeability testing. Drilling of grout injection holes and permeability testing holes shall be by water flush methods only (i.e, rotary, rotary percussive or down hole hammer). The grouting shall be by means of open hole injections only.

After ground treatment a circular secant-pile wall will be constructed tied together by a capping-beam at the top. This will limit groundwater ingress during shaft excavation through water logged superficial deposits. The concrete secant piles will be made with full length temporary steel casings to contain liquid concrete while it hardens (see Figure 2 below).

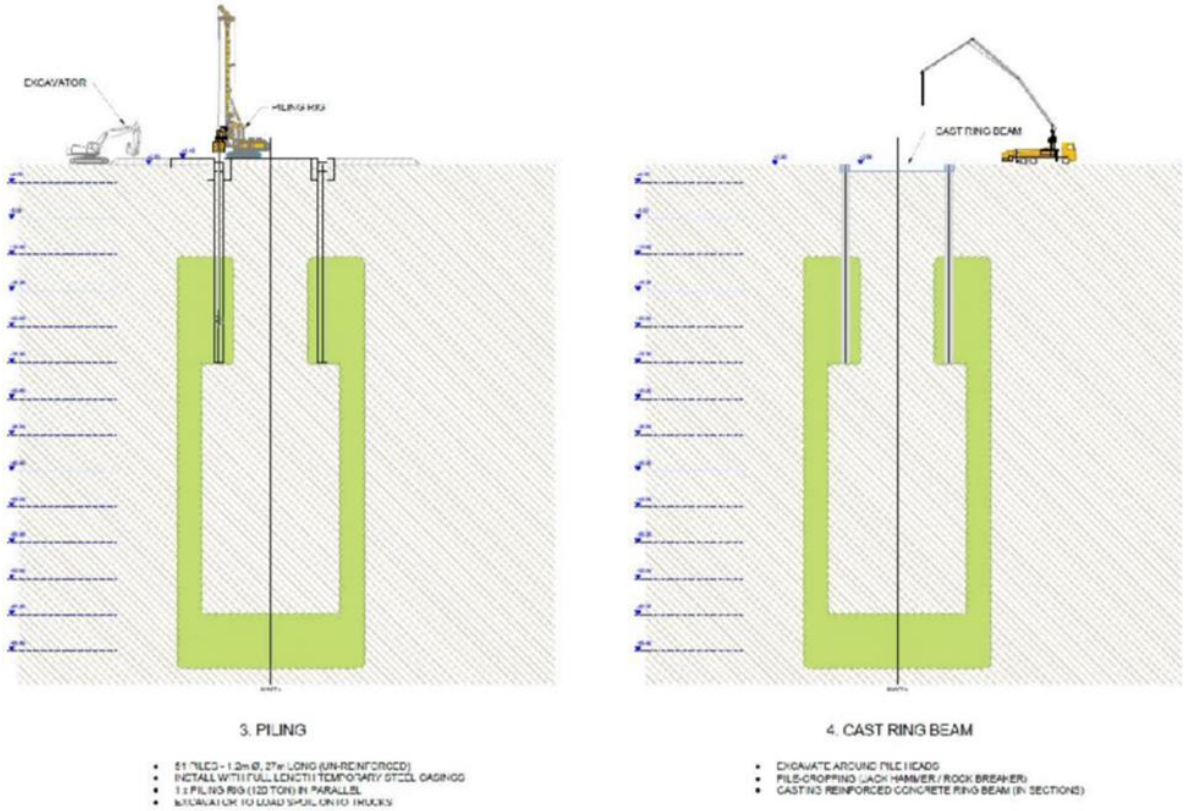

Figure 2

A pump-test will be undertaken inside the cut-off shaft prior to excavation. The expected volume of water-seepage during the excavation is between 2 - 5m3/hr (increasing with depth). The resulting permeability of the mudstone is tested by re-drilling some of the holes during the grouting,

The phase one excavation of the upper part of the shaft (within the secant piles):

- will be progress downwards in vertical increments of up to 4m. A smoothing layer of sprayed concrete (shotcrete) will be applied to the secant pile wall in the shaft and a cast in situ reinforced concrete lining constructed;
- the shaft base perimeter will be strengthened with a reinforced concrete circular support beam tied into the grouted zone by sub-horizontal rock bolts.

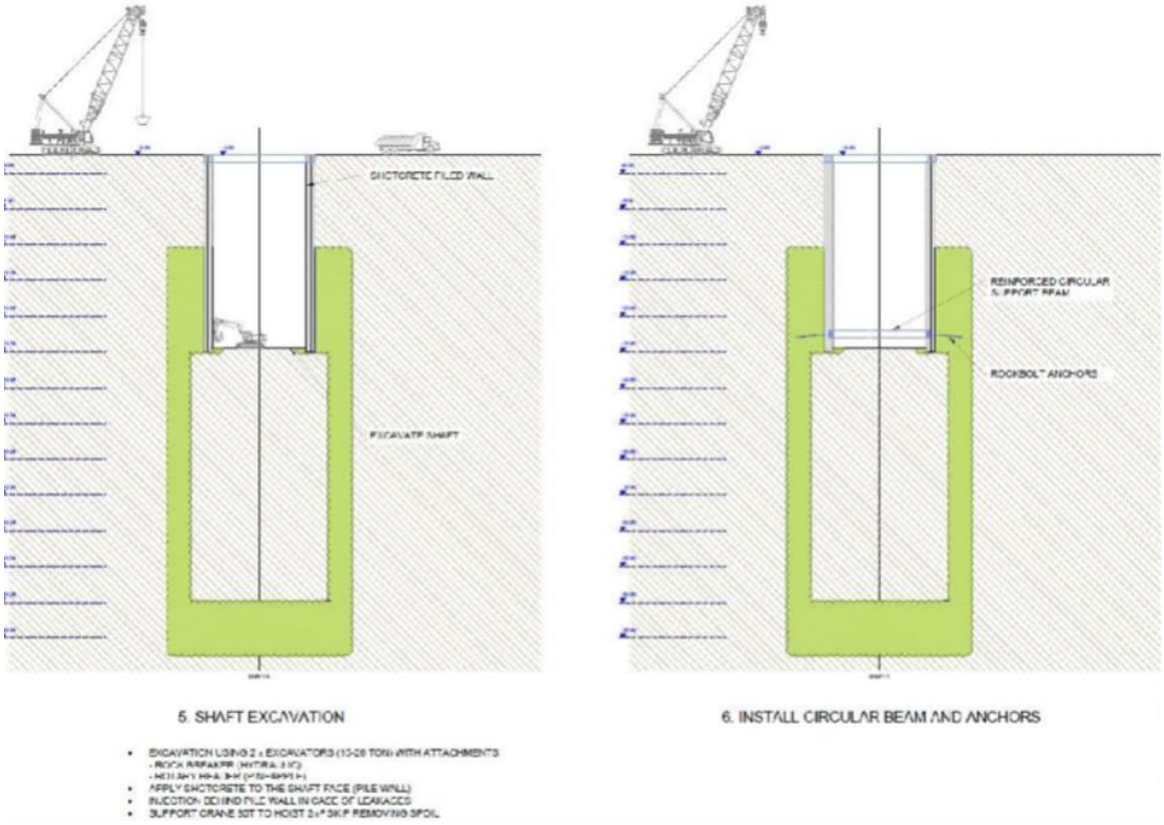

Figure 3

The phase two excavation of pre-treated rock (see Figure 4 and 5 below):

- will be progress downwards in vertical increments of up to 4m;
- to 40.0m below ground level the shaft sides will be supported by spot rock bolting as required;
- from 40.0m to 60.0m below ground level the shaft sides will be supported by sub-horizontal rock bolting on a regular grid;
- on reaching the base of the shaft a cast in situ reinforced concrete base slab will be constructed. This will have an underlying drainage layer and blinding and overlaying mass concrete fill. The underside of the concrete slab will be approximately 63.3m below ground level;
- after casting the permanent base-slab the sides of the excavation will receive a watertight membrane and geotextile, and a cast in situ reinforced concrete lining will be constructed (slip-forming up to the top).

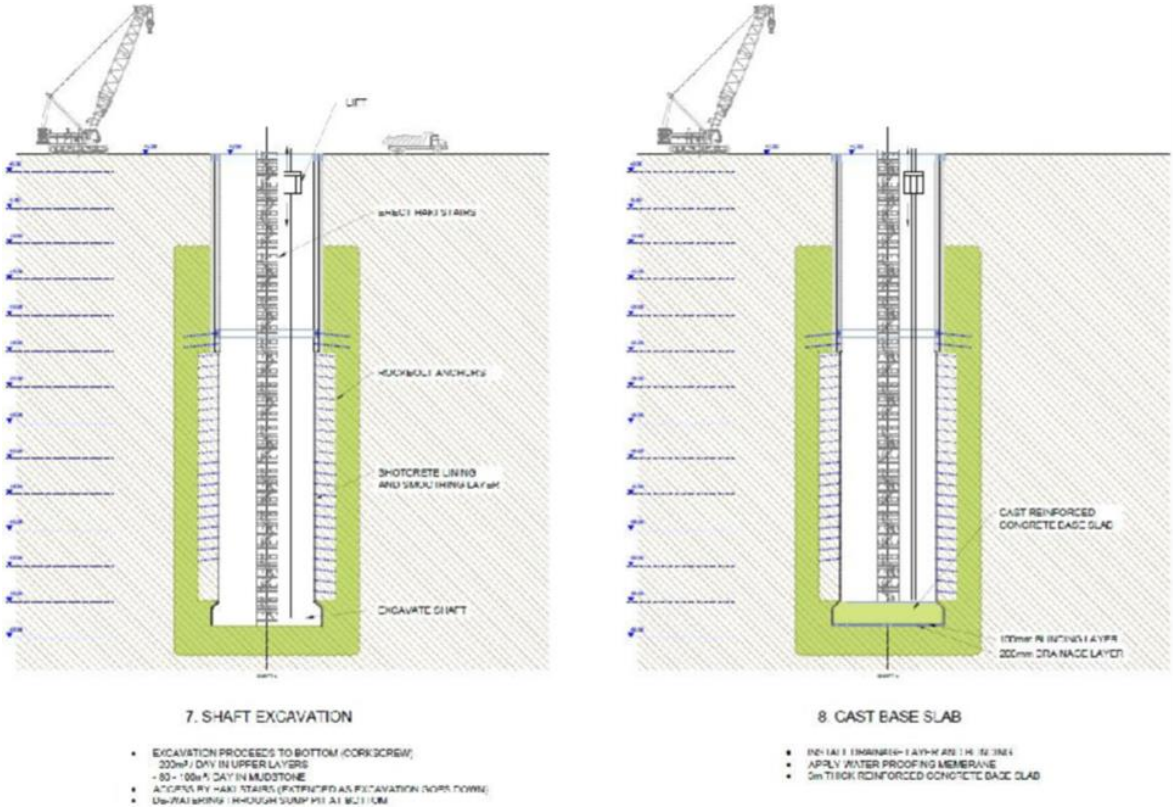

Figure 4

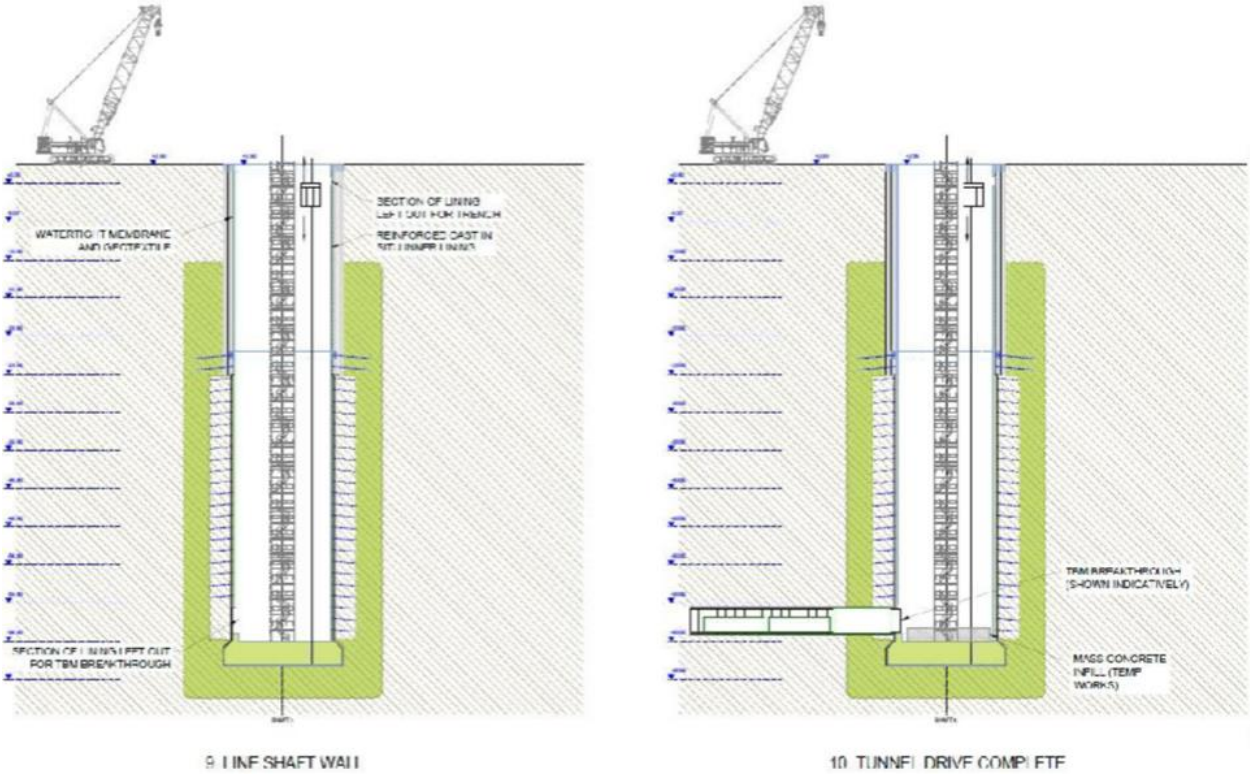

Figure 5

2.0 Cilfor Shaft Construction Materials

	Use	Material	Quantity	Specifications	Method of use	Contact with soil / gndwater	Programme
1	Ground improvement Shaft	Grout **(note 1)**	**411 m³**	Ultra Fine Cement	Jet Grouting (Injections) from above ground.	**Y**	Start 08.2023 End 02.2024
2	Ground improvement TBM reception	Grout **(note 1)**	**66 m³**	Ultra Fine Cement	Jet Grouting (Injections) from above ground.	**Y**	Start 08.2023 End 02.2024
3	Secant pile wall	Concrete **(note 2)**	**1939 m³**	Male pile: C32/40 Female pile:C8/10	Bored piles in-situ concreted.	**Y**	Start 02.2024 End 06.2024
4	Excavation	Shotcrete **(note 3)**	**1930 m²**	Shotcrete. 24m - 69 m = 35m Area Ø17.5m	Spraying against Ground improvement	**N**	Start 07.2024 End 10.2024
5	Mass Concrete Base slab	Concrete **(note 2)**	**240 m²**	C28/35 Area approximately 240 m²	Base slab in-situ concreted.	**Y**	Start 11.2024 End 11.2024

Notes.
1. The ground improvement grouts will be supplied by Zublin AG UK
2. The concrete will be supplied by TG Concrete and Cambrian Services
3. The annulus grout and shotcrete concrete additives supplied by Normet

3.0 Estimated water abstraction during shaft construction

The Cilfor shaft construction will involve extensive ground improvement works to reduce the permeability of the ground that the shaft is excavated into. Although shaft walls are inserted into the competent mudstone some water will enter the construction works through faults and fissures. During the 5 month excavation the volume of water expected to seep into the shaft will range between 50 - 120m3/day. During excavation the flow into the shaft will be controlled by:

- only exposing a small section of rock-face as we excavate down;
- apply rocknails and shotcrete, and possibly do additional injections when required.

Once the shaft is excavated a waterproofing membrane and permanent inner lining will be installed from the bottom of the shaft to the top of the shaft. Once the shaft is lined it is expected to be effectively water tight.

4.0 Cilfor Shaft Construction Programme Summary

Activity	2023				2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Additional GI												
Platform Construction												
Ground Treatment												
Secant Piling												
Pump-testing												
Shaft excavation												
Shaft permanent lining												
TBM reception												
Shaft cover slab												
Watervolumes												
Pump-test	single event 10-20 m3											
Shaft excavation	50-120m3/day for 3-5 months											
TBM reception	single event 20 m3											

HOCHTIEF UK CONSTRUCTION

SNOWDONIA VISUAL IMPACT PROVISION PROJECT

PLAN OF ADVANCE – TBM drive

C0233-HUK-GES-ZZ-PL-W-0001

Project No: **9.100.1.233**	Issue: **Rev P01**
	Date: **13/03/2023**

	Name	Position (Role)	Signature	Date
Prepared by	Mirja Gohlke	Survey and Monitoring Manager		13/03/2023
Approved by:	David Grantham	Environmental & Consents Manager		14/03/2023
Accepted:	Lars Bayer	Project Director		14/03/2023

Revision	Date	Prepared	Checked	Approved	Reason for Issue
P01	13/03/2023	M Gohlke	D. Grantham	L Bayer	For Information

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ISO 50001 Energy Management CERTIFIED ENMS 632421
BIM Design & Construction Capital/Delivery VERIFIED VC 653436

Contents

1.0 Introduction

The Snowdonia VIP (SVIP) Project will enable a visually intrusive 3.5km section of National Grid's (NG) 400kV (and 132kV) overhead line (OHL) to be buried underground within a cable tunnel.

The new cable tunnel will stretch from a location close to Sealing End Compound (SEC) at Garth on the western side of the Dwyryd Estuary to the eastern side of the estuary at Cilfor (see Figure 1 below).

The Project will include the construction of:

- a tunnel with shafts at either end of the tunnel;
- tunnel head houses (THH) with permanent access at either end of the tunnel;
- SEC at the eastern side of the Dwyryd estuary;
- electrical infrastructure laid within the tunnel;
- new high voltage cables connecting the Garth SEC to the new SEC at Cilfor.

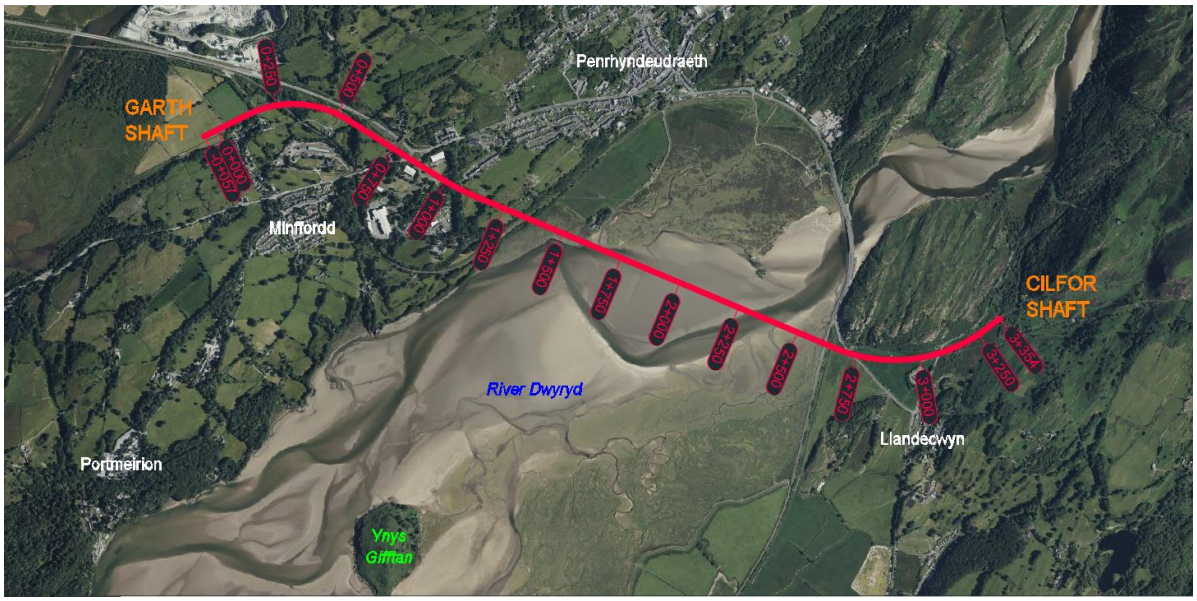


Figure 1: Overview Snowdonia Visual Impact Provision Project

The SVIP Project is led by NG as the Client, with HOCHTIEF (UK) Construction Ltd. appointed as the Design and Construction Contractor for the tunnel works. The SVIP Project obtained planning permission in December 2021 from both Gwynedd Council (GC) and Snowdonia National Park Authority (SNPA).

The existing SEC at Garth and the western construction compound is within GC's planning jurisdiction. The new SEC at Cilfor and the eastern construction compound is within SNPA's planning jurisdiction.

2.0 The Tunnel Boring Machine

The tunnel will be excavated using a refurbished Slurry Pressure Balance Tunnel Boring Machine (TBM) with the following characteristics:

- Cutting Diameter 4295mm
- Tunnel Diameter 3500mm
- TBM type Slurry TBM
- Manufacturer Herrenknecht AG / Germany

- Average advance rate 15.1m/day
- 24/7 regime
- Maintenance carried out on the 7th day

Figure 2: Slurry TBM

3.0 Outline description of the TBM's tunnel construction process

The TBM's rotating cutter head will be propelled forward by rams thrusting against the previously installed precast tunnel ring. Each 1.2m wide section of tunnel ring will be made of six tunnel segments.

There will be an annular gap of 150mm between the outside of the tunnel segments and the cut diameter. The annulus will be filled using a two-component grout. This grout will be pumped through grouting ports located in the rear tailskin and grouting of the annulus will occur during the TBM excavation advance.

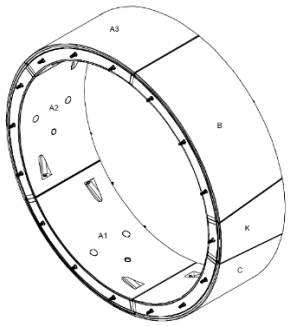


Figure 3: 3D Isometric View on Ring from Trailing Edge

Excavated material will be mixed with water pumped into the TBM to create a slurry. The slurry will be pumped back to a slurry treatment plant (STP) in the Garth construction compound. The STP will separate the slurry's water from the excavated material. The water will be reused in the TBM and the excavated material will be transported off site. Four booster pump stations will be installed at 1000m intervals to pump the slurry as the tunnel progresses

4.0 Expected Geology

The TBM will pass through several distinct ground conditions:

- Ch. 0+022 – Ch. 0+075 – Tidal Flat Deposits
- Ch. 0+075 – Ch. 1+300 – Dol-Cyn-Afon Formation
- Ch. 1+300 – Ch. 1+450 – Dolgellau Formation
- Ch. 1+450 – Ch. 3+165 – Ffestiniog Flags Formation
- Ch. 3+165 – Ch. 3+354 – Maentwrog Formation

Figure 4 and 5 below summarise the geology of the SVIP tunnel drive.

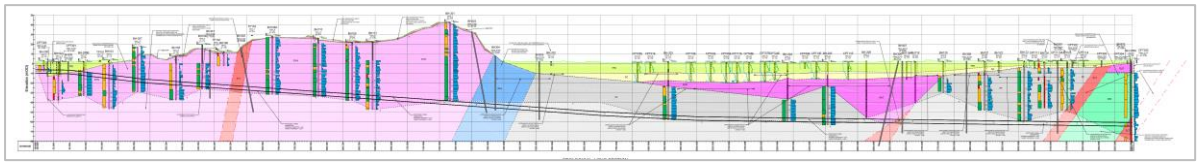


Figure 4: Geological Longitudinal Section

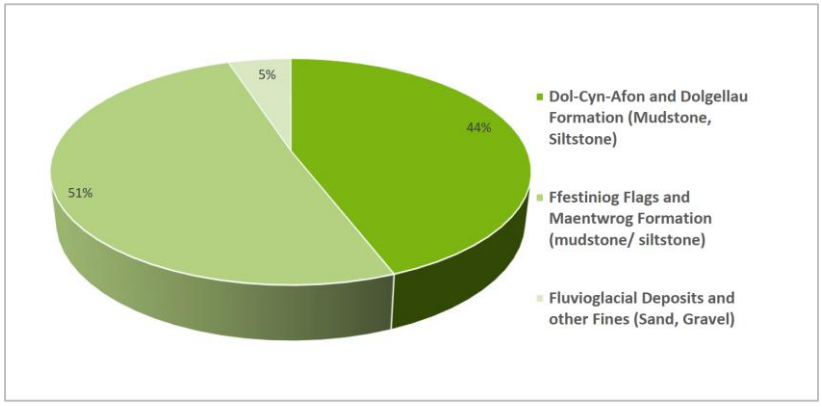


Figure 5: Proportion of geological formation to be excavated

5.0 TBM Plan Of Advance

A mix-shield TBM can be used as a slurry-shield or a compressed air shield. The mix-shield TBM consists of a steel cylinder which is a few centimetres larger than the outer diameter of the tunnel lining (see Figure 6). At the front of the TBM is the cutter head. Behind the cutter head is the pressure chamber or excavation chamber which is divided by a submerged wall. The slurry rises behind the submerged wall and a compressed air cushion applies the necessary pressure onto the slurry to compensate for pressure fluctuations in this part of the machine. The excavated soil is mixed with the slurry and is pumped out at the bottom of the excavation chamber for separation at the slurry treatment plant outside the tunnel. For compressed air support, the pressure chamber is partly or fully filled with compressed air.

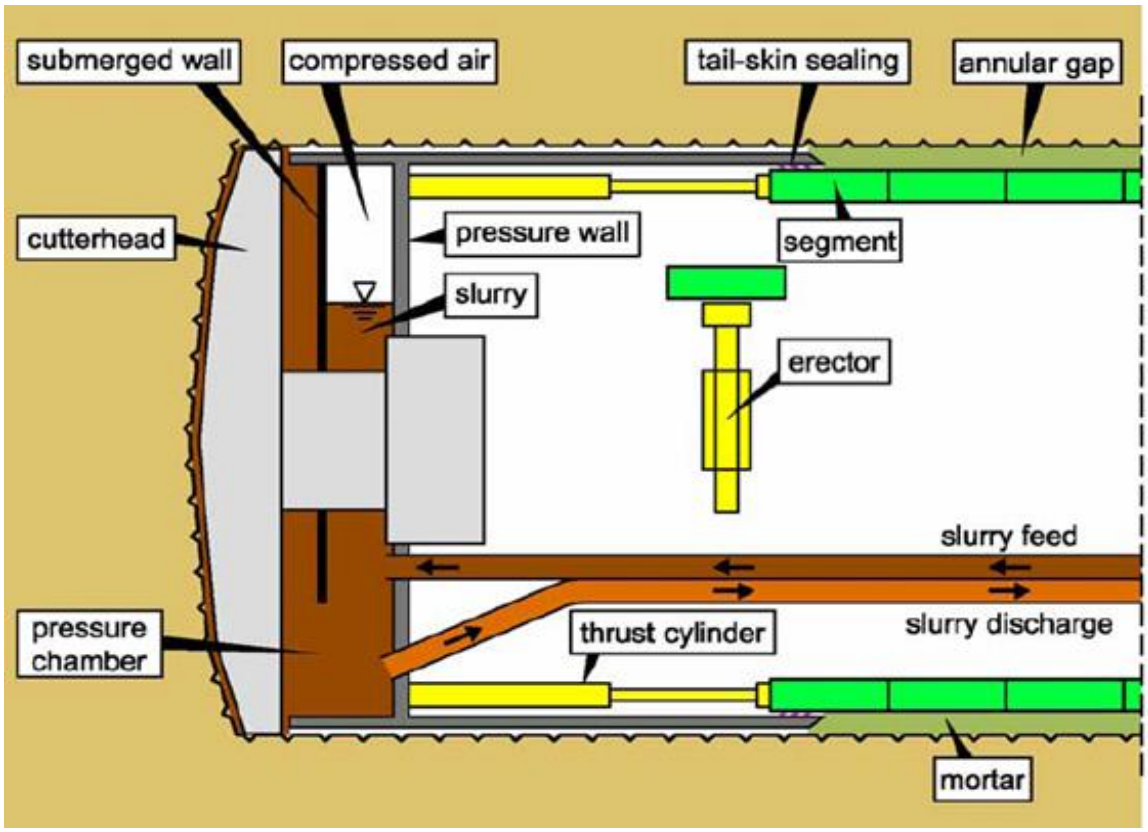


Figure 6: Schematic of Slurry TBM Operation

Behind the pressure wall are the thrust cylinders which jack against the previously placed segmental ring. For the TBM launch the thrust cylinders will push against a temporary support until the first permanent ring is built.

Face Support Pressure

A Slurry TBM maintains the stability of the tunnel face with a combination of compressed air and the level of slurry in the working chamber. The slurry filled working chamber and a compressed air cushion are moderated to balance the external forces at the tunnel face. This prevents groundwater entering the tunnel via the tunnel face.

The slurry volume in the cutting face can be reduced to enable maintenance. This is done by increasing reliance on compressed air pressure. This shown schematically in Figure 6 below.

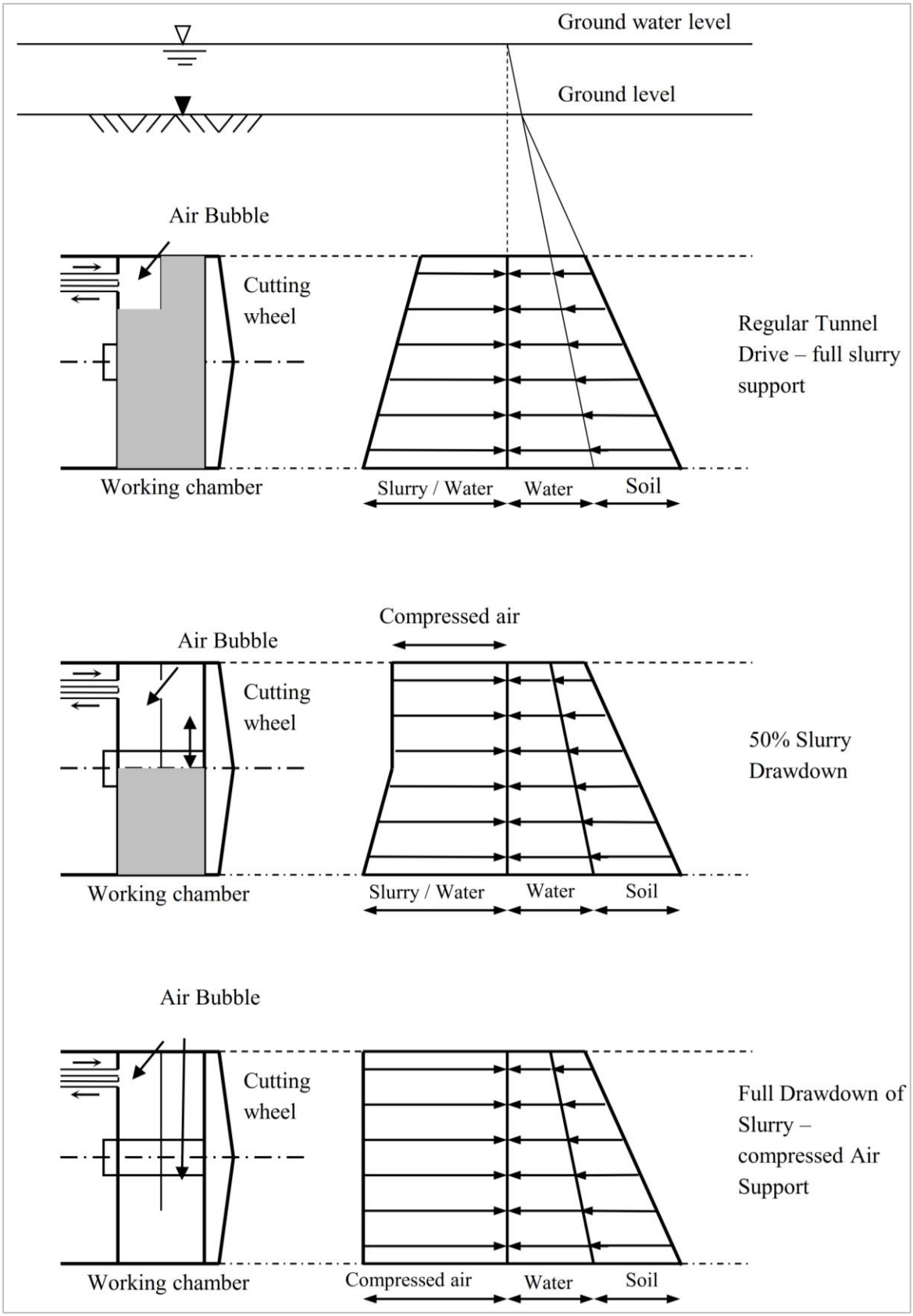


Figure 7: Operational Stages for the support of the tunnel face showing regular drive and maintenance phases.

Annulus Grouting

A+B component grouting will be adopted. Component A consists of: cement; bentonite; water and admixtures mixed to a liquid state and Component B, sodium silicate, acts as an accelerator for quick hardening.

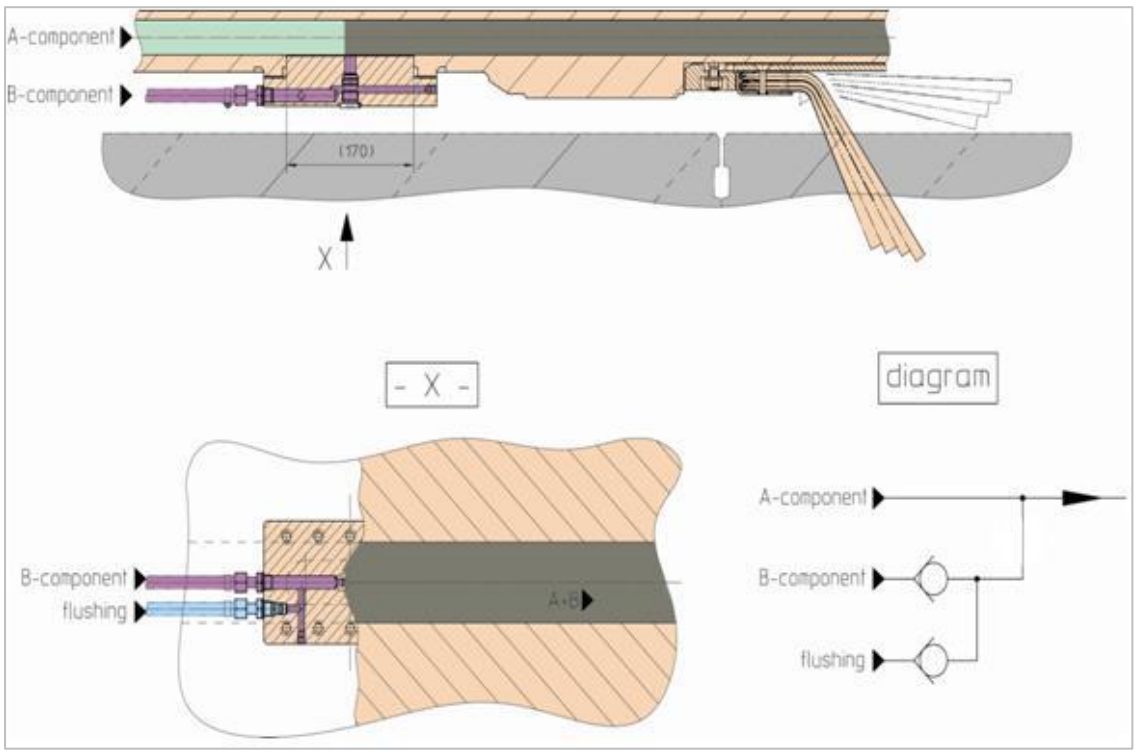


Figure 8: Principle of the grouting in the tail skin

The injection of grout is essential to prevent settlement of ground within annular tail void which could otherwise displace tunnel segments. The theoretical grout volume to fill the gap between bored diameter and outer ring diameter is 2.4 m^3 per advance of 1.2 m (one complete ring). The grout is injected into the annulus via four grout ports in the tail shield. Each grout port is served an independent grout pump.

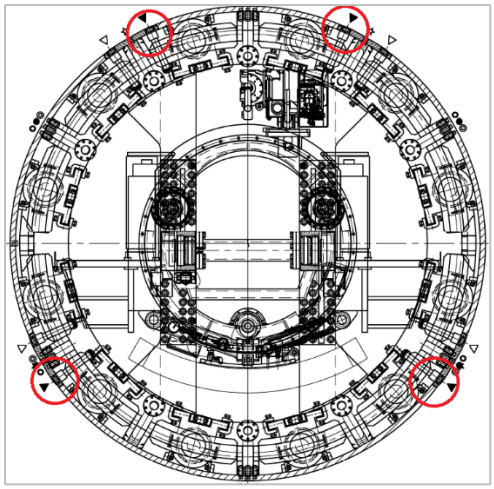


Figure 9: View of grout line positions

Tailskin Sealing

During the advance of the shield, the tail skin has to be sealed against the tunnel rings to avoid slurry and grout coming into the pressurised working area.

The seal is made with four parallel rows of steel wire brush elements sandwiched between two steel plates. The brushes and the openings between them are filled up with special sealing grease. A row of spring plates prevents ingress of grout between the tail skin and the surrounding earth.

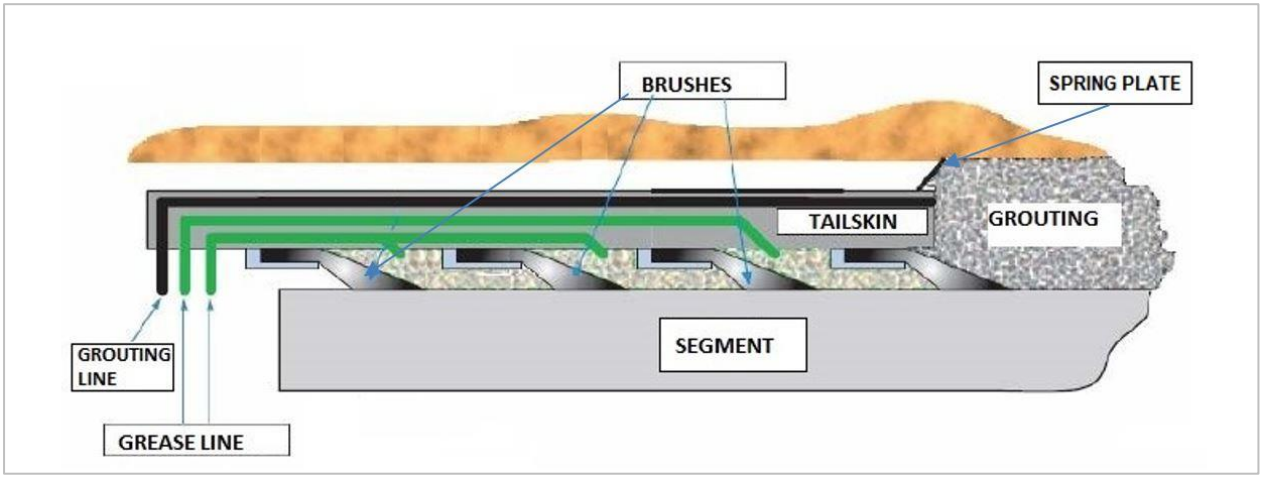
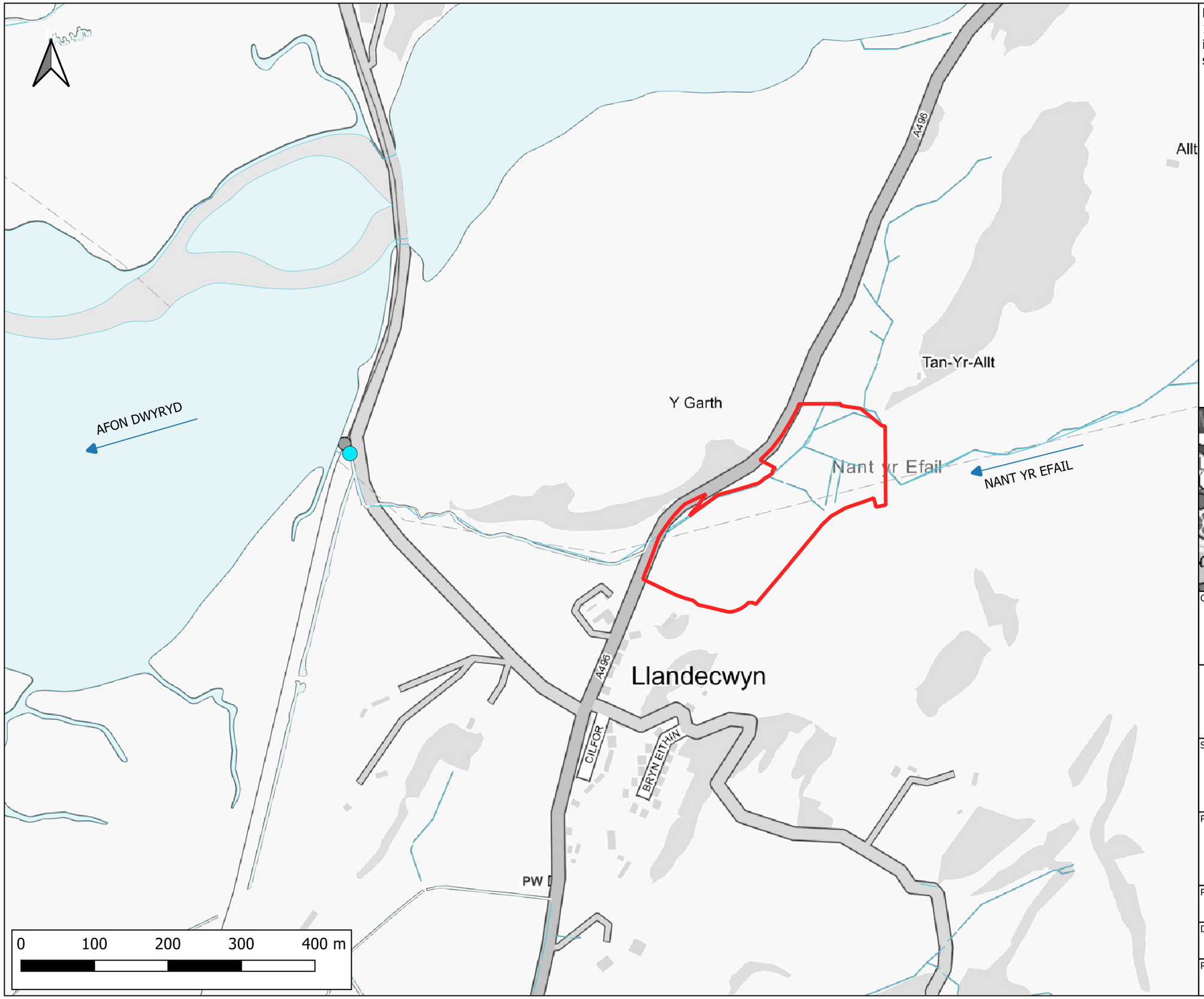


Figure 10: Schematic View of Brush/Spring Plate Arrangement

When sliding over the built-in segments, the brushes and the grease come into contact with the rough outer surface of the segments so that the grease sticks to the concrete and seals it. A proportion of the grease will be lost and is refilled automatically by a grease pumping system in the TBM.

Figure 11: Picture of Tail Skin Sealing Element

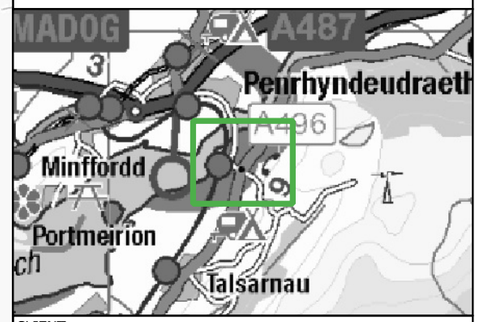
Appendix D Discharge Location Plans



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Discharge Location
- Watercourses
- Waterbodies



CLIENT:
Hochtief (UK) Construction Ltd

waterco
www.waterco.co.uk

SCHEME:
Hochtief - Snowdonia VIP Tunnel

PLOT TITLE:
Cilfor Construction Compound
Location Plan - Discharge Location

PLOT STATUS:	DATE:
FINAL	21-03-2023

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	AW	AW	1:5000

PLOT NAME:	REVISION:
15055_Cilfor_Location_Plan_Discharge_Location	-

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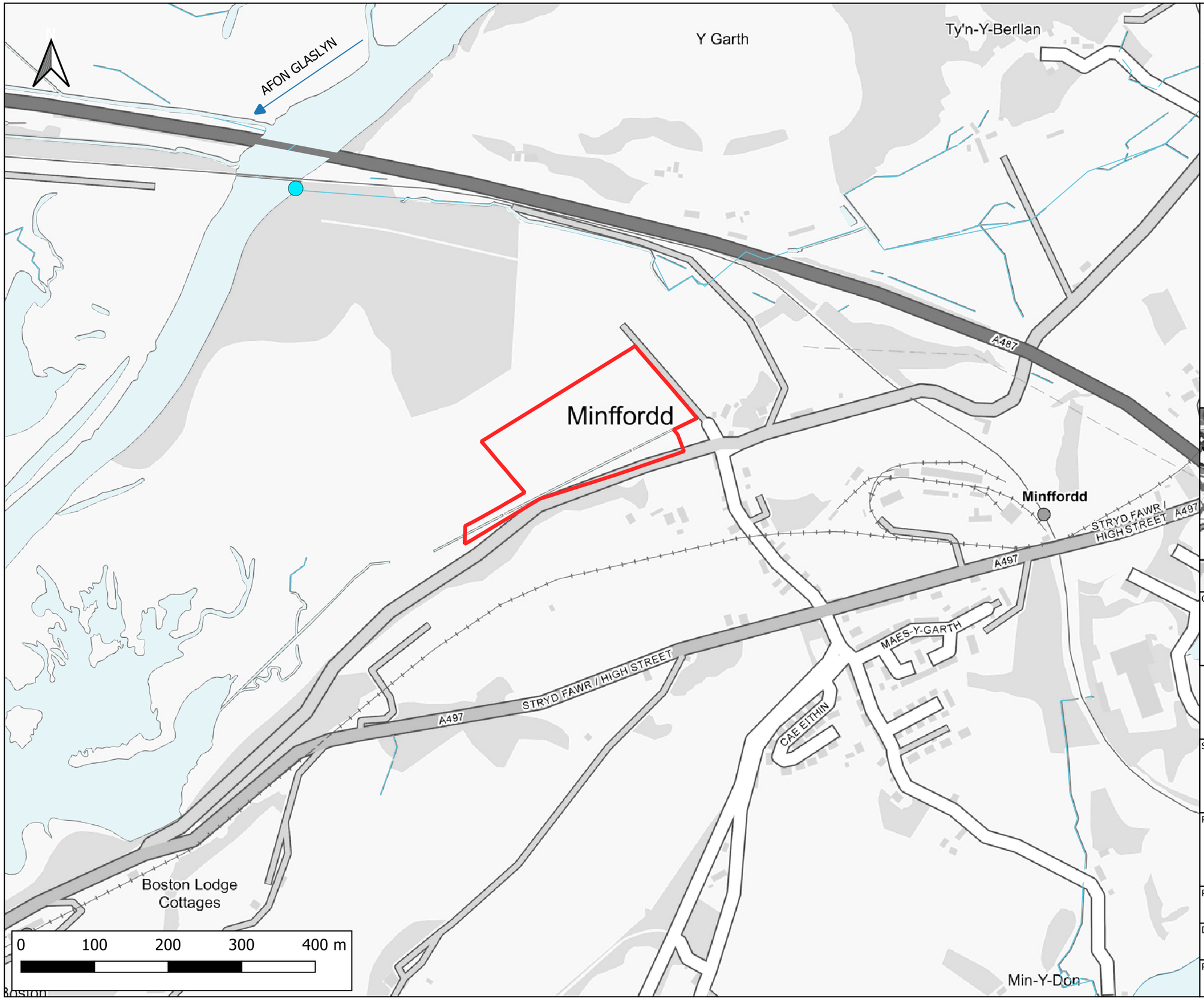

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LEGEND

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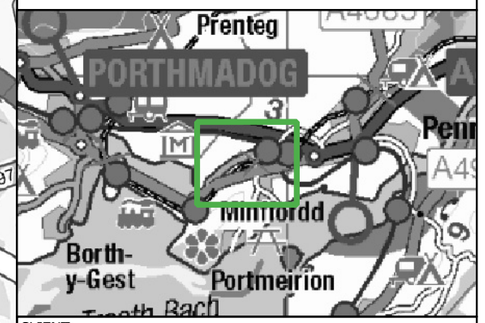
- Discharge Location
- Watercourses
- Waterbodies



CLIENT:
Hochtief (UK) Construction Ltd

waterco
www.waterco.co.uk

SCHEME:
Hochtief - Snowdonia VIP Tunnel

PLOT TITLE:
Garth Construction Compound
Location Plan - Discharge Location

PLOT STATUS:	DATE:
FINAL	21-03-2023

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	AW	AW	1:5000

PLOT NAME:	REVISION:
15055_Garth_Location_Plan_Discharge_Location	-

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Appendix E Treatment Details

Snowdonia VIP – Cilfor Compound Process Water Treatment

February 2023

This document sets out the water treatment proposals for extracted water at Cilfor Construction Compound, Talsarnau, Llandecwyn, Gwynedd, LL47 6YL.

Dewatering from the tunnel shaft will be directed to a settlement lagoon on site. Water from the lagoon will discharge to a wastewater treatment plant prior to discharge to watercourse. A package water treatment plant will be supplied by Siltbuster Ltd and will include the following treatment process:

- **Flow chamber** to measure flow rate into the treatment plant
- **Coagulant dosing pump** with flow proportional mixing of Poly Aluminium Chloride
- Flocculant addition and mixing (Anionic Flocculent)
- **pH** monitoring and carbon dioxide gas injection
- **filter press** for the dewatering of waste water sludges.
- **Tilted plate separator**
- **pH monitoring caustic sods (NaHO) addition (for peat geology or pyrite excavation)**
- **Treated water quality, flow out, pH turbidity.**

Details of the Siltbuster water treatment plant are included in Appendix A.

The water treatment proposals will achieve the following levels of treatment:

- **Total suspended solids 60mg/l**
- **pH 6-9**

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Form Ref: W042-F-17.S-Letter-General Letter Format Ruthin

- **Total iron <5mg/l**

Background water quality sampling has been undertaken and is included as Appendix B. Table 1 shows the existing levels of total suspended solids, pH and total iron for sample locations within the Cilfor Construction Compound and in the location of the proposed discharge location. A corresponding sample location plan is also included in Appendix B.

	Total Suspended Solids (mg/l)	pH	Total Iron (mg/l)
Sample Location 1	1	5.7	<0.23
Sample Location 2	6	5.4	<0.23
Sample Location 3	4	5.9	<0.23
Sample Location 4	No data – sample to be re-taken, results awaited	6.3	<0.23

**Analysis taken in wet weather conditions with high flow / water levels witnessed. Additional sampling undertaken in dry conditions (results awaited).*

The temperature of the discharge will be similar to that of the water abstracted for use in the process (fresh river water) and will be subject to atmospheric temperature. Water temperatures above 25°C are not expected.

No hazardous chemicals or substances are expected or used within the water process / treatment system. As such, hydraulic modelling of the discharge is not required.

The potential impacts of the discharge to the receiving environment are considered within the supporting Habitats Regulations Assessment (HRA) (reference C0233-ATM-GES-ZZ-RP-X-004) prepared by Atmos Consulting in February 2023. The HRA is included as Appendix C.

The permit application is also supported by the following information which will be provided as supplementary information:

- Cilfor Site Installation Plan (Drawing 108-3-HUK-GFP-CW-DR-W-0001 P04)

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- Fish Habitat Assessment Report (reference C0233-ATM-GES-ZZ-RP-X-0005) prepared by Atmos Consulting in January 2023.

- Invasive Non-native Species Report (reference C0233-ATM-GES-ZZ-RP-X-0006) prepared by Atmos Consulting in January 2023.

- Ecological Baseline Report (reference C0233-ATM-GES-ZZ-RP-X-0001) prepared by Atmos Consulting in January 2023.

Water Management Plan (reference C0233-HUK-PDR-ZZ-PL-W-0001 – P01) prepared by Hochtief UK Construction in January 2023

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Appendix A – Siltbuster Proposals

Waterco Limited
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Form Ref: W042-F-17.S-Letter-General Letter Format Ruthin

Siltbuster Ltd., Williams Building,
Kingswood Gate, Monmouth NP25 4EE
Tel: 01600 772256 Fax: 01600 775312
E-mail: enquires@siltbuster.com
Web: www.siltbuster.com

SE30755-JB-01
09 December 2022

David Grantham
Careys

By Email: David.Grantham@hochtief.co.uk

Dear David,

Siltbuster 2-stage + CO_2 MT8 and HB40R SPX40 water treatment plant for slow settling solids and alkaline conditions

Further to your request for a water treatment plant to support powerline works in Snowdonia, I provide an outline proposal for supply of a Siltbuster water treatment plant. The proposal and scope of supply will change as and when new information becomes available, such as laboratory testing on a representative sample of water from the site.

1.1 Introduction

It is our understanding of your particular application that:

- You are working on the Eryri Visual Impact Provision scheme in North Wales
- There will be 2No. construction compounds for the tunnel drive
- You request a water treatment plant at each location to tackle surface water runoff and excess water separated from tunnel arisings by the slurry dewatering system (by others)
- Excess water will be disposed to the environment and is a regulated activity
- The principal contaminants of concern are considered to be:
    - suspended solids, ranging in particle size from silt-sized through to clay-sized (circa 30µm to circa 1µm in diameter)
    - alkaline pH conditions associated with water coming into direct contact with cementitious materials
- Secondary, or possible, other contaminants are yet to be determined, but may include:
    - possible acidic pH conditions associated with soils including peat
    - the presence of ‘ochre’ is a possibility. Therefore dissolved and/or particulate iron may be present
- The treatable flowrate will be circa 20m^3/hr for the initial phase(s) potentially reaching 60m^3/hr in later phases
- Specific numeric quality criteria for release of water to the environment is not known, but the following may be appropriate:
    - Total suspended solids (TSS) less than 60mg/l (i.e. visually clear water – see below)
    - pH6 to pH9
    - Less than 5mg/l total iron

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- Hochtief will create an attenuation lagoon to capture and store surface water runoff, you will use a submersible pump to transfer water to a Siltbuster treatment plant for gravity drain of treated water to the disposal point
- Hochtief will seal all water discharges from the lagoon thus ensuring only compliant water leaves the site via the Siltbuster unit
- Hochtief will create a designed sump with raised suction so that excessive solids are not drawn from the base of the lagoon and into the pump
- Coarse solids will accumulate in the lagoon and will require manual removal from time to time. The Siltbuster water treatment plant is designed to accept dirty/discoloured water, not slurry and not large particles (sand/stones/gravel etc.)
- Hochtief will provide a laydown area, feed pump and controls, pipework, discharge pipework, power supply and attendance to operate and maintain the treatment plant
- Suspended solids (soil particles) which are removed from the water will be collected in a hopper with the consistency of thin slurry and will require timely removal and management
- The proposed system includes a hose pump for simple 'push-button' desludging on a manual or auto-timer basis
- Treated water will gravity drain from a 6" Bauer outlet to the nominated disposal point
- As with any water treatment plant and particularly when using chemical dosing, best performance is seen under **steady-state conditions**. That is to say, the pump should be trimmed/valved to give smooth and continuous flow as much as possible. Allowing the pump to 'slurp' water/air, or pump pulsing (very large flows over a short time period) WILL result in poor performance and inadequate treatment
- The proposed water treatment plant is comprised from standard modular hire fleet units, therefore typically additional units can be mobilised at a later date to add treatable flowrate capacity

CLAY particles suspended in water at different TSS concentrations

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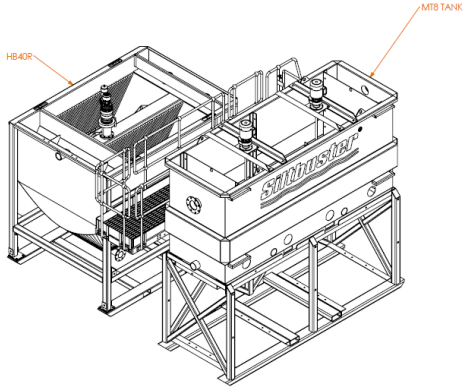
1.2 Plant Selection



Example setup – 3-stage +CO_2 MT8 HB50 (for pH correction, suspended solids reduction)

The proposed system will be in general accordance with:

1. Inlet magnetic flow meter, to record the volume of water treated and allow flow proportional dosing of coagulant and polymer
2. Elevated mixing tank with walkway to allow the controlled mixing of the treatment chemicals ensuring flocculation of the solids
3. Coagulant dosing pump and associated pipe-work to allow the automatic flow proportional addition of the coagulant. The use of flow proportional dosing system minimises the risk associated with the overdosing of the treatment chemicals
4. Automated, pH controlled release of carbon dioxide gas to maintain near neutral pH and minimise the risk of alkaline conditions
5. Flocculant make-up system complete with 1,000 litre make up tank, mixer bridge 110V (32 Amp) mixer complete with paddle (potable water will be required on site for polymer dilution – to be provided by others) and flow proportional dosing pump (peristaltic or similar)
6. 1 No iCDS3 secure bunded chemical containment for storage of duty chemicals
7. 1 No. Siltbuster HB40R Lamella Clarifier to retain the settling solids from the water
8. SPX40 hose pump with start/stop local controls and timer
9. Automated, pH controlled addition of caustic to maintain near neutral pH and minimise the risk of acidic conditions (optional, may be required for peat geology)
10. Treated water quality monitoring with local datalog to USB (total flow, pH and turbidity)

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2.1 Costs

Item	Hire Rate
Hire of water treatment system, items 1 to 8 above	£1,605 per system per week or part thereof
Hire of caustic dosing capability to neutralise acidic conditions, item 9	£190 per week
Hire of water quality monitoring for flow, pH, tubidity/TSS	£412 per week
Setup, commissioning and training by Siltbuster Process Engineer (**allow 3 days**)	£495 per day including travel
Additional day rate, if required (e.g. decommission)	£495 per day including travel
Delivery from Monmouth to Snowdonia	£1,775 via HIAB (may be artic) non-FORS
Collection from Snowdonia to Monmouth	£ tbc at the time of offhire

Site-Specific lift plan by AP
Siltbuster cannot supply an AP for a site-specific lift plan. If a site-specific plan is required we suggest 'Standard' delivery with offloading by the client would be the most appropriate selection.

Transport Terms of Cancellation
*Before 12pm the day before - No Charge
*After 12pm and before end of play that day - 75% of chargeable rate
*Day of job - 100% chargeable rate
*85tpm cancelled at any point the day before the job - 50% of chargeable rate
Please do consult our Pre Delivery Questionnaire and advise us about your site-specific requirements for deliveries

We suggest it would be more cost effective and efficient for Hochtief make their own arrangements for chemical supply, however if supplied through Siltbuster, reagents are supplied at the following rates.

	25kg Drum	1,000 litre IBC
Coagulant (Poly Aluminium Chloride - PAC)		£705
Caustic		£2,262
Anionic Flocculent	£116.60	
Reagent re-order	£80 per order (min. order value of £250)	

Chemicals are typically supplied direct from the manufacturer on a 5-working day leadtime, on a curtain sided vehicle and require offloading by the client. At this stage and without laboratory testing, it is difficult to forecast chemical consumption.

If by Siltbuster, vapour withdrawal carbon dioxide will be supplied at the following rates.

Carbon Dioxide Cost	500Kg Gas Bank - (15 No. Bottles)
Gas bank rental	£45 per bank per week
Gas charge per cylinder bank	£1,100 per bank (comprises 15No. cylinders)
Deposit	£500 per Bank (Refundable upon return undamaged)
Reorder and delivery/collection charges (Applicable on each order for replacement cylinders	£105 per visit Applicable on all gas deliveries to site

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delivered to site) BOC wagon requires offloading by the client Note, at the time of writing, supply issues for industrial CO_2 across the sector are causing lead times to extend beyond the normal 5-working days	

3.1 Lead Time

Currently 6 to 10-weeks from receipt and processing of your formal written purchase order but is dependent on the current status of the hire fleet and availability of transport and any necessary account processing requirements having already been completed (See note II of the Siltbuster Terms and Conditions listed below).

4.1 Exclusions and considerations

We have excluded the following items from our scope of supply:

- Electrical wiring, connections and protection not to the standard Siltbuster method
- Designed attenuation lagoon, sump, feed pump, controls and associated feed pipework to the 4" female Bauer coupling on the inlet of the water treatment plant
- Haul road to allow the HIAB delivery vehicle and engineer's van to access the proposed location of the treatment plant
- Level surface of sufficient bearing capacity to support the plant when full of water
- Power supply, mains supply 415V (3-phase+Neutral+Earth) with 300mA RCD or adjustable earth leakage and 32A or 63A sockets
- Supply of potable water for polymer make up, estimated at <1m^3 per week
- Attendance to maintain and operate the equipment
- Pipework to attach to base of hoppers for desludging
- Disposal or management of wastes, sludges, excess chemicals or empty containers
- Large particles >10mm diameter should be prevented from entering the feed pump to avoid damage to the flowmeter sensors and accumulation in the mix tank
- Freeze protection (insulation and trace heating)
- Any approvals or permits required by the EA, Local Authority, etc.
- Monitoring or quality checks – we assume the site staff will adopt daily O&M
- Treatment or dewatering of sludges – the scope of supply is for a *water* treatment plant
- Treatment for contaminants other than those specified above (e.g. oil/water emulsions, dissolved metals)
- Site-specific lift plans. If this is required we suggest delivery on flatbed wagons with offloading organised by the client's AP
- Demurrage (charged at £65 per wagon per hour)

As with any water treatment plant and particularly when using chemical dosing, best performance is seen under steady state conditions. That is to say, the pump should be trimmed/valved to give smooth and continuous flow as much as possible. Allowing the pump to 'slurp' water/air, or pump pulsing (very large flows over a short time period) WILL result in poor performance and inadequate treatment

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Note, we have allowed for a treatment system capable of handling 4m^3/hr up to circa 35m^3/hr. This upper figure is a ***potential* maximum** and the actual flowrate achieved will depend upon the characteristics of the particulate matter suspended in the water column and how well the chemical dosing is optimised to the variable instantaneous solids concentration.

The proposal and scope of supply will change as and when new information becomes available, such as laboratory testing on a representative sample of water from the site.

5.1 Our Standard Terms and Conditions of Hire & Sales are as follows:

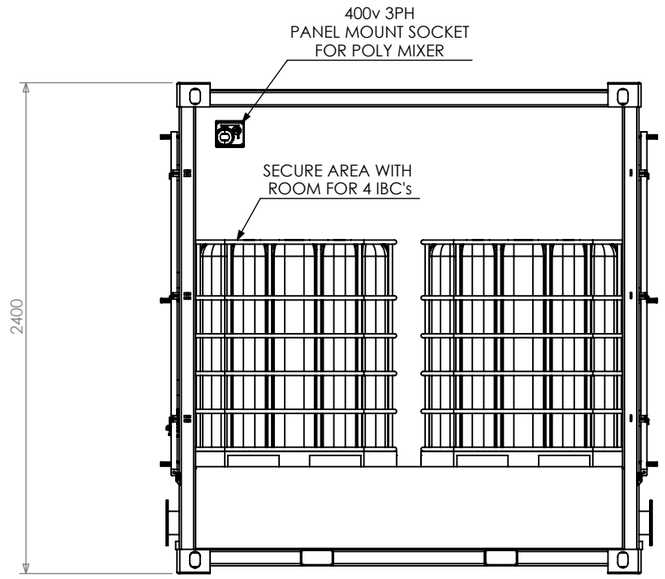
I. All costs are in pounds Sterling and exclude VAT
II. Proforma invoice on all new accounts and those which have been dormant for 6 months or more, covering:
    - Hires: delivery, collection, installation costs and first months hire
    - Purchases: 40% of purchase cost
III. Costs are valid for 30 days from 09 December 2022.
IV. Hire terms are standard Construction Plant Hire Association Conditions, Latest Edition
V. Equipment is supplied on a 7-day working week.
VI. Sale terms are Siltbuster standard conditions of sale (available on request)
VII. Invoices are raised monthly and payment terms are strictly 30 days from date of invoice.
VIII. No other terms and conditions are accepted, including those purported to apply under any purchase or confirmation order placed by the Client.
IX. Client is responsible for the operation/maintenance of the equipment whilst on hire and ensuring the treated water is discharged/disposed of in accordance with the relevant legislation. The client is also responsible for any site specific operational permits/authorisations/consents required and Health and Safety issues relating to the storage and use of chemicals on site.
X. All hired units are to be visually cleaned of all settled sludge & oil residues before return. Units returned containing sludge and or oil residues will incur a cleaning cost plus any waste disposal fees (charged at cost) and the unit will remain on hire whilst the waste is tested to determine an appropriate disposal method in accordance with the relevant statutory regulations.
XI. Transport costs for delivery & collection are as quoted above. Collection charge may vary if individual units from multiple unit deliveries are off-hired and collected separately.

We trust that the above information is sufficient for your current needs. However, should you have any queries please do not hesitate to get in contact.

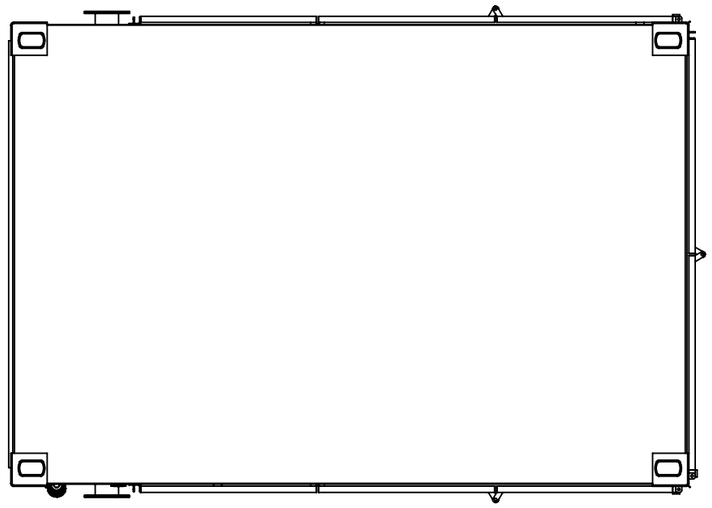
Yours sincerely,

James Baylis
Technical Sales (Northern England and North Wales)

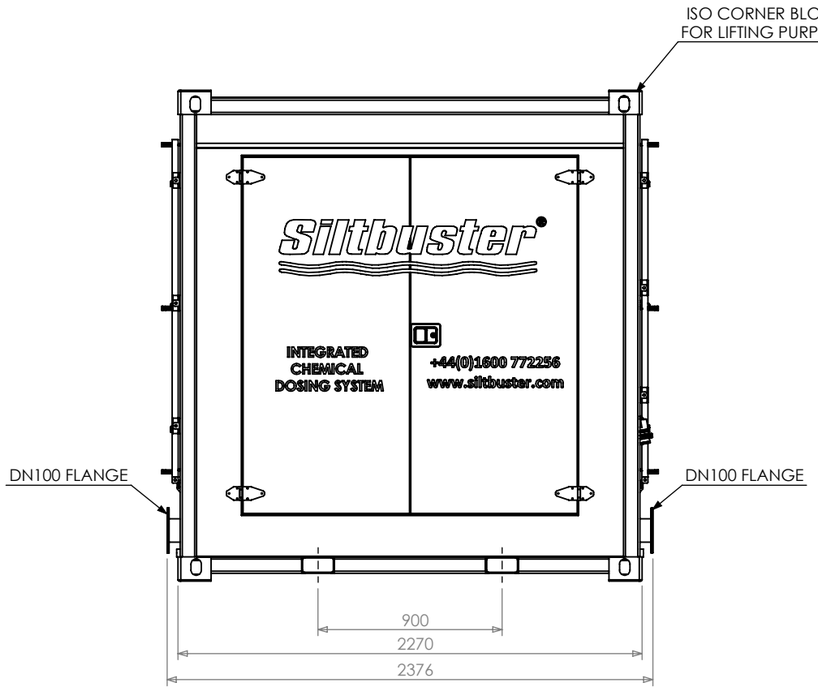
Tel: 01600 772256
Fax: 01600 775312
Mobile: 07889 535876
Email: james.baylis@siltbuster.com
www.siltbuster.com



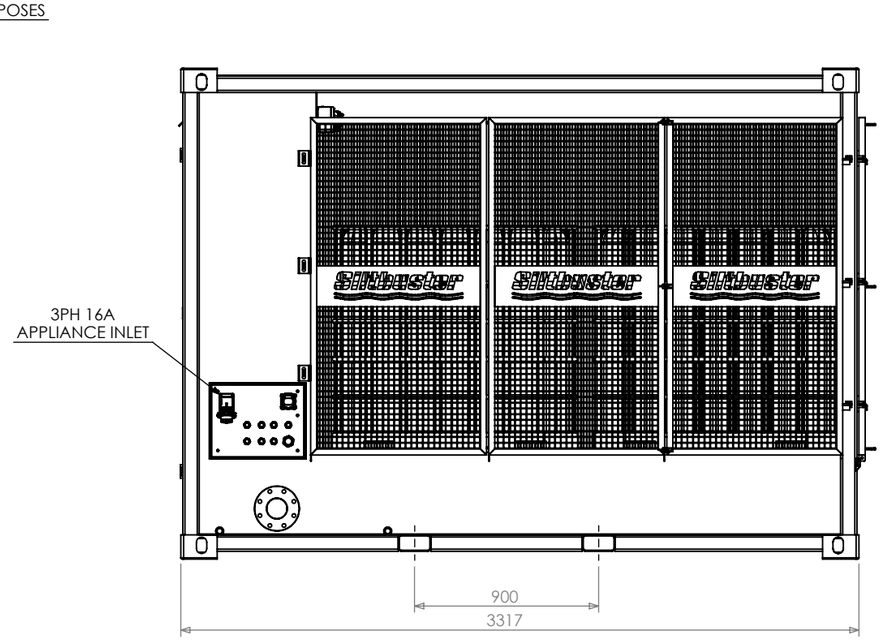
REAR ELEVATION
GUARD REMOVED
FOR CLARITY



PLAN VIEW



FRONT ELEVATION



SIDE ELEVATION

Unit Specifications:

1 Materials of Construction

Frame:	S275 Mild Steel
Pipework:	Stainless Steel 304

2 Corrosion Prevention (Primer Internal)

Frame

Surface Prep:	Blast Clean SA2.5 (SSPC-SP-10)
Primer Coat:	2 Pack High Build Anti-Corrosive Epoxy Primer @DFT: 100µm
Top Coat:	Standard RAL 5001 (Blue/Green) @DFT: 50µm
Total Thickness:	DFT: 150µm

3 Weight

Empty:	1.9t
Operating:	5.9t (Approx.)

4 Additional Information

Lifting Eye Design:	Iso Corner Blocks

5 Power Supply Requirements

Appliance Inlet	400v 16A 3PH+N+E

6 Flow Rate

Flow Rate Range	$4m^3/hr$ - $100m^3/hr$

7 Bund Capacity

Bunded Area Capacity	$2.06m^3$

TITLE:	**Integrated Chemical Dosing System**
MODEL:	ICDS 3.0
DATE:	11/05/2021

SILTBUSTER LTD.
WILLIAMS BUILDING,
KINGSWOOD GATE,
MONMOUTH,
MONMOUTHSHIRE
NP25 4EE
TEL: 01600 772256
FAX: 01600 775312
EMAIL: enquiries@siltbuster.com

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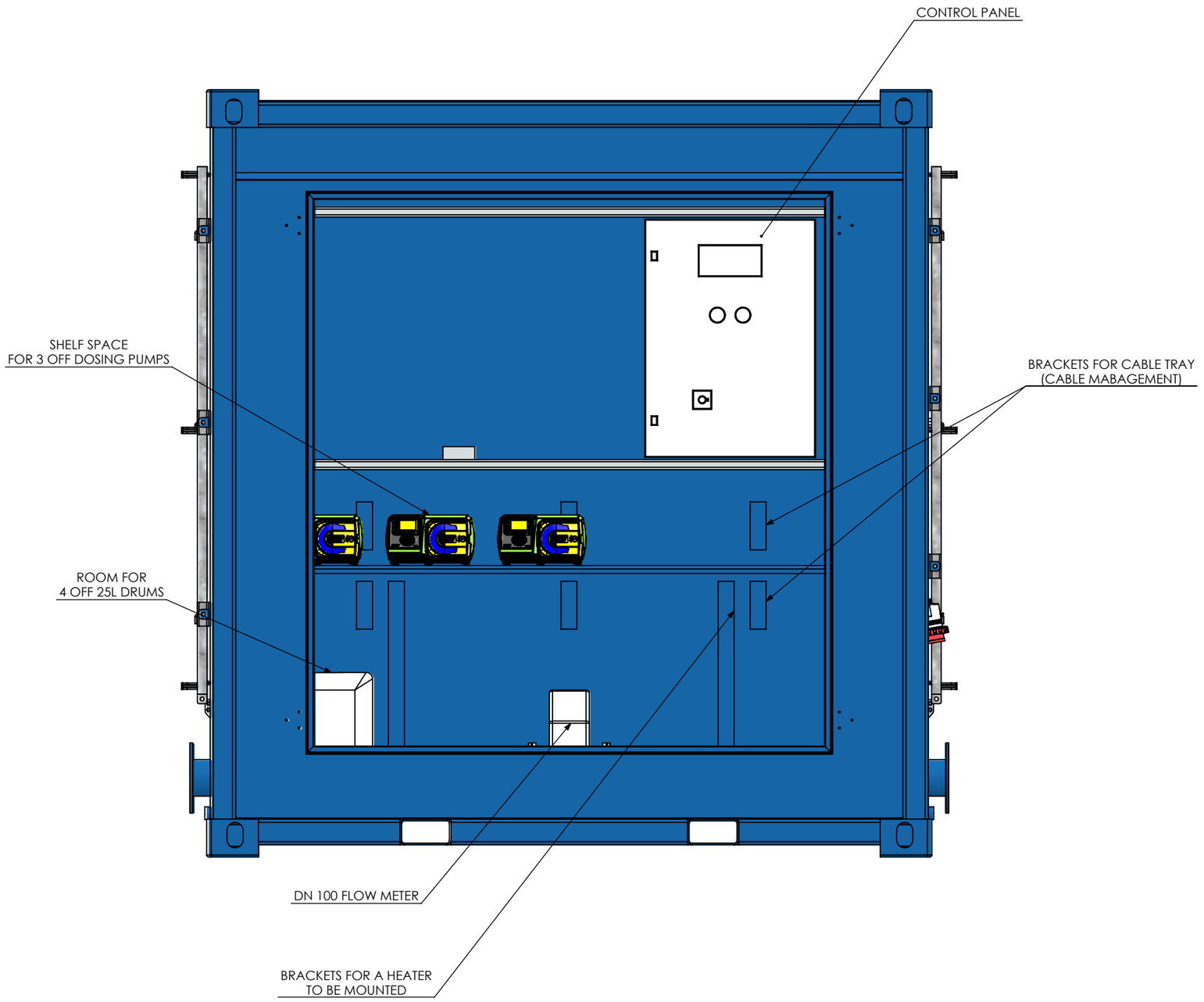

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Primer Coat:	2 Pack High Build Anti-Corrosive Epoxy Primer @DFT: 100µm
Top Coat:	Standard RAL 5001 (Blue/Green) @DFT: 50µm
Total Thickness:	DFT: 150µm

3 Weight

Empty:	1.9t
Operating:	5.9t (Approx.)

4 Additional Information

Lifting Eye Design:	Iso Corner Blocks

5 Power Supply Requirements

Appliance Inlet	400v 16A 3PH+N+E

6 Flow Rate

Flow Rate Range	$4m^3/hr$ - $100m^3/hr$

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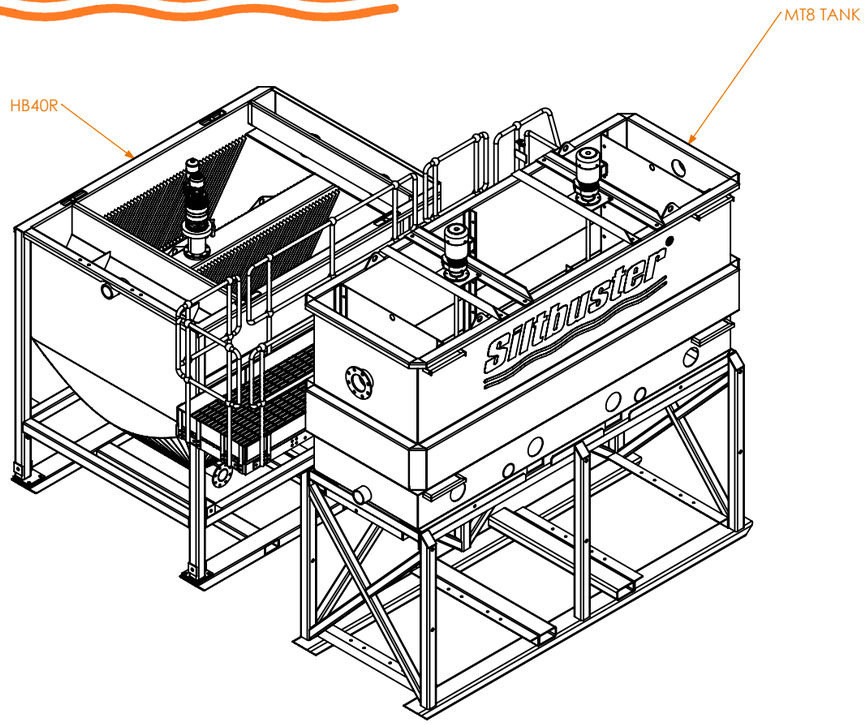
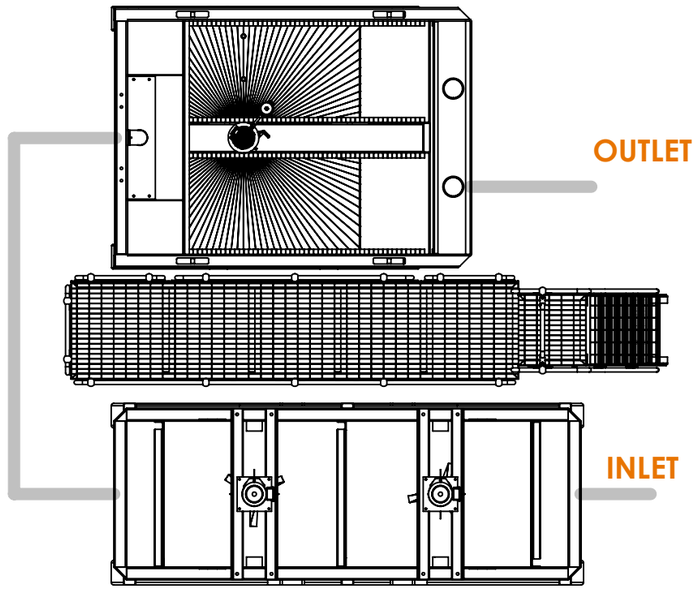
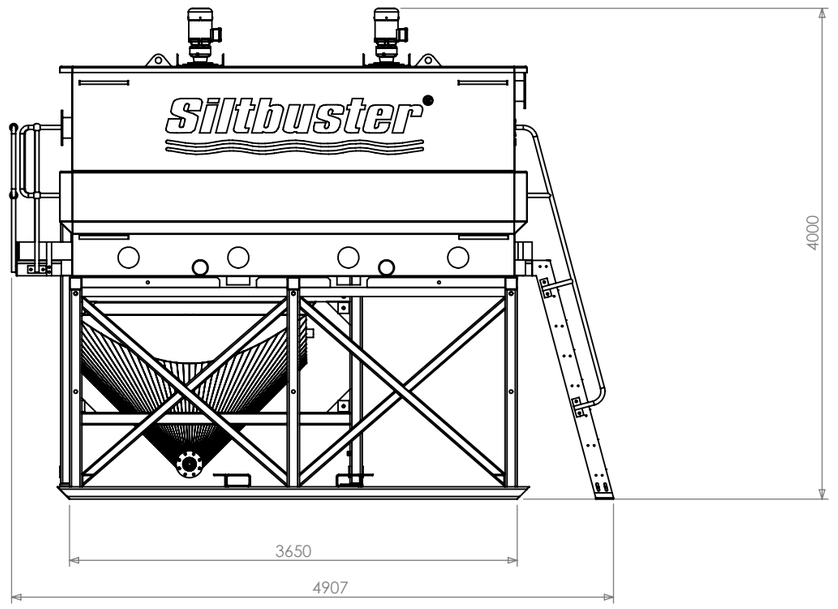
Siltbuster®





PLAN ELEVATION

FRONT ELEVATION



SIDE ELEVATION

ISSUE	DESCRIPTION	DRN BY	CKD	DATE

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Dimensions are indicative and due to ongoing product development are subject to change without notice.
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Project

HB40R and MT50

SILTBUSTER LTD.
WILLIAMS BUILDING,
KINGSWOOD GATE,
MONMOUTH,
MONMOUTHSHIRE
NP25 4EE

TEL: 01600 772256
FAX: 01600 775312

Siltbuster®

Title

Proposed GA

Drawing No.

Rev

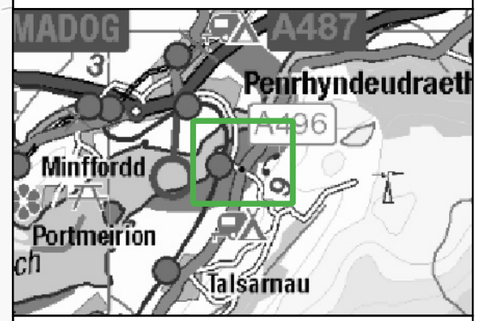
Appendix B – Water Sampling Data and Sample Location Plan

Waterco Limited
Registered in England and Wales | Company Number: 03577754
Eden Court, Lon Parcwr Business Park, Ruthin, LL15 1NJ
Form Ref: W042-F-17.S-Letter-General Letter Format Ruthin

Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Water Sampling Locations
- Watercourses
- Waterbodies



AFON DWYRYD

Sample 4

Sample 1

Sample 2

Sample 3

Nant Yr Efail

NANT YR EFAIL

Tan-Yr-Allt

Y Garth

Llandecwyn

A496

CILFOR

BRYN EITHIN

0 100 200 300 400 m

CLIENT:
Hochtief (UK) Construction Ltd

www.waterco.co.uk

SCHEME:
Hochtief - Snowdonia VIP Tunnel

PLOT TITLE:
Cilfor Construction Compound
Water Sampling Locations Plan

PLOT STATUS:	DATE:
FINAL	03-02-2023

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	AW	AW	1:5000

PLOT NAME:	REVISION:
15055_Cilfor_Water_Sampling_Locations_Plan	-

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ALS Laboratories (UK) Limited
Torrington Avenue
Coventry
CV4 9GU

T: +44 (0)24 7642 1213
F: +44 (0)24 7685 6575
www.alsenvironmental.co.uk

Mr Williams
Waterco Ltd
Lon Parcwr Business Park
Ruthin LL15 1NJ

03 February 2023

Test Report: COV/2425753/2023

Dear Mr Williams

Analysis of your sample(s) submitted on 13 January 2023 is now complete and we have pleasure in enclosing the appropriate test report(s).

An invoice for the analysis carried out will be sent under separate cover.

Should you have any queries regarding this report(s) or any part of our service, please contact Customer Services on +44 (0)24 7642 1213 who will be happy to discuss your requirements.

If you would like to arrange any further analysis, please contact Customer Services. To arrange container delivery or sample collection, please call the Couriers Department directly on 024 7685 6562.

Thank you for using ALS Laboratories (UK) Limited and we look forward to receiving your next samples.

Yours Sincerely,

Signed:

Name: A. Zunzunegui

Title: Organics Chemistry Manager

UKAS TESTING 1314

bsi ISO 14001 Environmental Management CERTIFIED EMS675527 ISO 45001 Occupational Health and Safety Management CERTIFIED OHS 542058

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

This communication has been sent to you by ALS Laboratories (UK) Limited. Registered in England and Wales. Registration No.02391955.
Registered Office: ALS Laboratories (UK) Limited, Torrington Avenue, Coventry, CV4 9GU.

Report Summary

ANALYSED BY

Mr Aled Williams
Waterco Ltd
Lon Parcwr Business Park
Ruthin
LL15 1NJ

Date of Issue: **27 January 2023**

Report Number: **COV/2425753/2023** Issue **1**

This issue replaces all previous issues

Job Description: Waterco Ltd

Job Location: Snowdonia VIP

Number of Samples included in this report **10**

Job Received: **13 January 2023**

Number of Test Results included in this report **207**

Analysis Commenced: **16 January 2023**

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

ALS Laboratories (UK) Limited was not responsible for sampling unless otherwise stated.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested and where relevant sampled.
Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.
This test report is not a statement of conformity to any specification or standard.

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Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412979**	Sample	**1** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Sample 1**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **13:45**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	6.9	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	177	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.4	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Solids, Total	123	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	19.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412979:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure.

{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412980**	Sample	**2** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Sample 2**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **13:50**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	381	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	34.2	ug/l	19/01/2023	N	Cov	WAS049
pH	6.7	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	260	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	5.82	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	5.7	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	5.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	2.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	3.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	209	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	19.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412980:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412981** Sample **3** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Garth Sample 3**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **14:00**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	26/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	26/01/2023	N	Cov	WAS049
Iron, Total as Fe	695	ug/l	26/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	26/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	26/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	26/01/2023	N	Cov	WAS049
pH	6.8	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	170	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	3.64	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.9	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	26/01/2023	N	Cov	WAS049
Total Suspended Solids	8.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	115	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	44.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412981:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Copper Total as Cu, Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412982**	Sample	**4** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Sample 4**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **14:20**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	934	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	0.02	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	4.98	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	40.8	ug/l	19/01/2023	N	Cov	WAS049
pH	7.1	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	203	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	22.9	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.1	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	47.0	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	7.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	40.0	mg/l	18/01/2023	N	Cov	WAS006
BOD + ATU (5 day)	3	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	78.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	2000	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412982: This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412983**	Sample	**5** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Quarry Sample**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **14:50**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	6.6	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	37.6	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	1.62	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	<0.5	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	7.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	3.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	42	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	16.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412983: This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412984** Sample **6** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 1**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **15:30**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	3.02	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.7	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	63.2	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	1.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	1.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	<2.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	27	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	13.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412984:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412985** Sample **7** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 2**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **15:40**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.4	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	67.2	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	1.61	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	<0.5	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	6.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	1.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	5.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	50	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	2	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	14.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412985:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412986** Sample **8** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 3**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **15:50**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	3.37	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.9	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	69.0	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	4.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	2.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	2.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	44	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	18.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412986:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412987** Sample **9** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 4**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **16:00**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	6.3	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	86.0	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	1.53	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Solids, Total	53	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	14.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412987:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure.
It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412988**	Sample	**10** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Lagoon**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023**	**14:55**	
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	895	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	8.0	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	399	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	2.03	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	0.55	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	3.2	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	20.0	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	18.0	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	2.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	283	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	15.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412988: This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

ANALYST COMMENTS FOR REPORT COV/2425753/2023 Issue 1

This issue replaces all previous issues

Date of Issue: **27 January 2023**

Sample No	Analysis Comments
22412979	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure. {*/}
22412980	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412981	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Copper Total as Cu, Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412982	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412983	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412984	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412985	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412986	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412987	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure. It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412988	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

DETERMINAND COMMENTS FOR REPORT COV/2425753/2023

ISSUE 1

This issue replaces all previous issues

Date of Issue: 27 January 2023

Sample No	Description	Determinand	Comments

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

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Appendix C – HRA

Waterco Limited
Registered in England and Wales | Company Number: 03577754
Eden Court, Lon Parcwr Business Park, Ruthin, LL15 1NJ
Form Ref: W042-F-17.S-Letter-General Letter Format Ruthin

atmos CONSULTING

C0233-ATM-GES-ZZ-RP-X-0004

Technical Document

Snowdonia Visual Impact – Discharge and abstraction Consents

Habitats Regulations Assessment

Hochtief UK Ltd

February 2023

Contents

Tables

Figures

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Version	Date	Reason
P01	7th February 2023	Draft for client review

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1 Introduction

1.1 Terms of Reference

Atmos Consulting Ltd (Atmos) were commissioned by Hochtief UK Ltd (HUK) in October 2022 to provide ecological support in relation discharge consent being sought for four discharge locations at the Garth and Cilfor sites.

The Site is split over two locations, either side of the Dwyryd Estuary, located in Gwynedd, Wales. The first site is the Cilfor site, which is located just outside of Llandecwyn, within Snowdonia National Park. The second site is the Garth site and this is located just outside of Minffordd, within the jurisdiction of Gwynedd County Council. The works involve undergrounding an existing overhead line, and the two tunnel head houses are located in each of the sites above. Planning permission has been granted for the works on the Cilfor site by Snowdonia National Park Authority (Ref: NP5/77/336B) and by Gwynedd County Council (Ref: C20/0244/08/LL) on the Garth site.

There are four locations, one located within the Pen Llyn a`r Sarnau/ Lleyn Peninsula SAC and three which drain into existing watercourses, which are tributaries to the SAC. drain into. The works on the Garth side are in close proximity to Meirionnydd Oakwoods and Bat Sites SAC, with one point being within this SAC.

In Article 6(3) of the EC Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora – The Habitats Directive, any project or plan which is not directly connected with or necessary to the management of a European site but would be likely to have a significant effect either alone or in combination with other plans or projects shall be subject to an Appropriate Assessment of its implications for the European site in view of that site's conservation objectives. In light of the findings and subject to the provisions of Article 6(4) of the Habitats Directive, the Competent Authority shall agree to the plan or project only after ensuring that it will not affect the integrity of the European site. Whilst mitigation may be considered at the Appropriate Assessment stage it is not to be considered when initially screening the project in order to determine whether or not an Appropriate Assessment is needed.

Article 6(4) makes provision that if a negative assessment is made of the implications of the project on the site, and in the absence of other alternative solutions, the plan or project can go ahead for imperative reasons of overriding interest (IROPI) but that compensatory measures must be taken to ensure that the overall coherence of the site is protected/maintained. A distinction is to be drawn between mitigation and compensation.

Since this is a project, as defined by the Habitats Directive, and transposed into English and Welsh law in The Conservation of Habitats and Species Regulations (2017), which is not directly connected with or necessary to the management of the Lleyn Peninsula and the Sarnau SAC, and Meirionnydd Oakwoods and Bat Sites SAC, then a Habitats Regulations Assessment (HRA) will be required. This will be carried out by the Competent Authority, advised by the Statutory Nature Conservation Body. Although the United Kingdom has now left the European Union, the requirement has been transposed over into English and Welsh law as part of the departure arrangements and so it is still necessary to be carried out.

Hochtief UK Ltd has commissioned Atmos Consulting to prepare the HRA on the behalf of National Grid. This report should be read in conjunction with the Fish Habitat Assessment (Atmos ref: c0233-ATM-GES-ZZ-RP-X0005) which was undertaken alongside the HRA to inform the assessment.

1.2 Objectives of this Report

The purpose of this report, which has been commissioned by Hochtief UK Ltd and National Grid is to carry out a HRA, for discussion with the statutory nature conservation advisor, Natural Resources Wales and to fulfil National Grid's legal requirement to carry out an HRA. To do this, a two-stage assessment will be carried out:

- Screening – the determination of whether there is a likely significant effect (LSE) on the qualifying features of the SACs; and
- Appropriate assessment (only if a likely significant effect is identified).
- The appropriate assessment assesses the LSE to determine the scale of the effect and if it could adversely affect the integrity of the site. This is done by assessing the potential impacts against the conservation objectives of the SACs to determine if the conservation objectives can be maintained in light of the project going ahead.

1.3 Proposed works

The proposed works are in addition to the works granted in the aforementioned planning applications.

Site Location

There are four locations in total, two on the Garth side, and two on the Cilfor side. Table 1 below includes grid references for these locations, and they are illustrated in Figure 1 & 2.

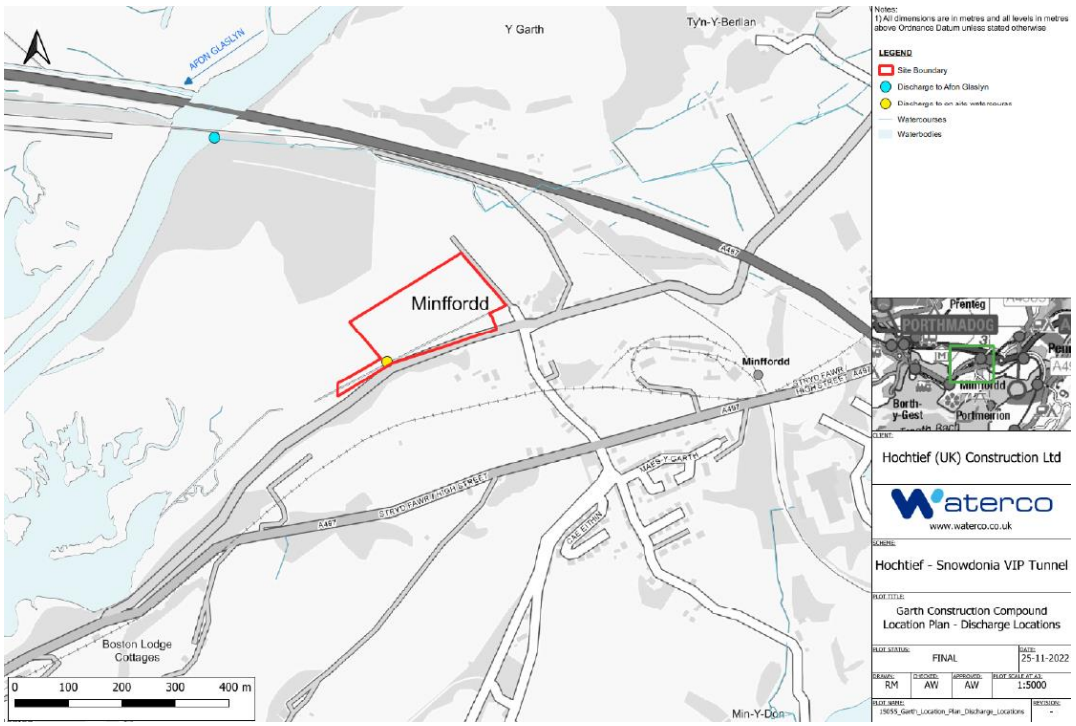
Table 1: Discharge/Abstraction Location Points

Location	Grid Reference	Proximity to designated site
Point 1 – Cilfor, discharge	SH6225337816	0.9 km from Oakwood Bat SAC and 0.4 km from Lleyn Peninsula SAC.
Point 2 – Cilfor, abstraction/discharge	SH61813788	1.6 km from Oakwood Bat SAC and within Lleyn Peninsula SAC.
Point 3 – Garth, discharge	SH59243857	0.1 km from Oakwood Bat SAC and 1.1 km from Lleyn Peninsula SAC.
Point 4 – Garth, abstraction/discharge	SH58963902	Within Oakwood Bat SAC and 1.3 km from Lleyn Peninsula SAC.

Nature of Works

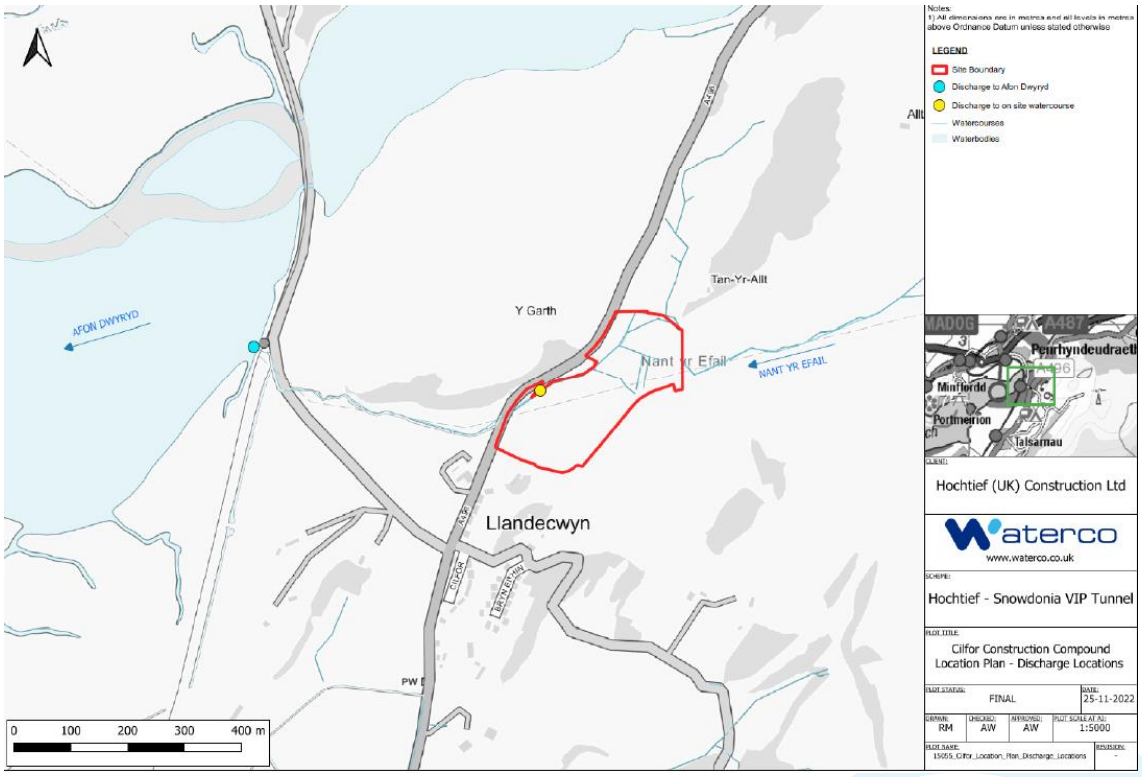
There are four points in total, with two discharge points located within ditches on site, one in Garth and one in Cilfor, shown as yellow dots in Figure 1 & 2 below. The remaining two points, which will be used for abstraction and discharge purposes, are located in Afon Glaslyn and Afon Dwyryd, shown as blue dots also in Figures 1 & 2.

Figure 1



Source: Waterco Ref 15055_Garth_Location_Plan_Discharge_Locations

Figure 2



Source: Waterco Ref 15055_Cilfor_Location_Plan_Discharge_Locations

Discharge;

- Is of saline process water encountered during tunnelling and/or launch pit/shaft excavation works for Garth and Cilfor sites;
- Up to 400m3/day of water will be abstracted from each construction sites' excavations at Cilfor and Garth; and
- The maximum discharge rate will be 20m3/hr for most of the tunnel bore. 60m3/hr treatment plant capacity for clay rich geology.

Abstraction;

- The volume of fresh water required to operate the Tunnel Boring Machine (TBM) will vary depending on the geology being excavated. Most of the time during the tunnelling work 100m3/day will need to be supplied for the TBM's operation. The peak flow required is expected to be up to 500m3/day.

Treatment processes

A Slurry Treatment Plant (STP) will dewater TBM excavated material and recycle the recovered water back to the TBM.

Timescales

Works are due to commence in June 2023 and completed by December 2026.

2 Statutory Designations

All abstraction and discharge locations are situated within watercourses that directly drain into the estuary and therefore enter the Lleyn Peninsula and the Sarnau SAC. Point 2 on the Cilfor side is located within this SAC.

Point 4 on the Garth side is located within the Meirionnydd Oakwoods and Bat Sites SAC and points 1, 3 and 4 are within 1.5 km of this SAC.

Due to the works taking place in or near these designated sites, before works can commence, SSSI Assent will be sought, and a Habitats Regulations Assessment (HRA) submitted to NRW.

2.1 Lleyn Peninsula and the Sarnau SAC

The Pen Llyn a`r Sarnau/ Lleyn Peninsula SAC encompasses 146,010 ha of sea, coast and estuary that support a wide range of marine habitats and species. It has been selected as an SAC for the presence of nine marine habitat types and associated species (Habitats Directive Annex I habitat types) and three mammal species (Habitats Directive Annex II species). Annex I habitats that are a primary reason for selection of this site is considered to be one of the best areas in the UK for:

- Reefs
- Large shallow inlets and bays
- Sandbanks which are slightly covered by seawater all the time
- Estuaries
- Coastal lagoons

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Mudflats and sandflats not covered by seawater at low tide
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- *Salicornia* and other annuals colonising mud and sand
- Submerged and partially submerged sea caves

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Grey seal *Halichoerus grypus*
- Bottlenose dolphin *Tursiops truncatus*
- Otter *Lutra lutra*

These features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations. A number of the habitats and species listed within the SAC are also listed in the Section 7 list of habitats and Species of Principal Importance (SPI) in Wales (Environment (Wales) Act, 2016) and in the OSPAR List of Threatened and/or Declining Species and Habitats.

2.2 Meirionnydd Oakwoods and Bat Sites SAC

The Meirionnydd Oakwoods and Bat Sites SAC comprises 2,812 ha of various woodlands and heaths that support a wide range of habitats and species. It has been selected as

an SAC for the presence of seven habitat types and associated species (Habitats Directive Annex I habitat types) and one mammal species (Habitats Directive Annex II species). Annex I habitats that are a primary reason for selection of this site is:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- *Tilio-Acerion* forests of slopes, screes and ravines
- Bog woodland

Annex II species that are a primary reason for selection of this site:

- Lesser horseshoe bat *Rhinolophus hipposideros*

Conservation Objectives

The conservation objectives for the Pen Llyn a`r Sarnau/ Lleyn Peninsula SAC and Meirionnydd Oakwoods and Bat Sites SAC (Countryside Council for Wales, 2009) are listed below.

To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status.

- Range- The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.
- Structure and function: The physical, biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded.
- Typical species- The presence, abundance, condition and diversity of typical species are such that habitat quality is not degraded.

3 Stage 1- Screening

In the first stage of HRA, a project is screened to establish if there will be a likely significant effect, either alone or in combination with other proposals/projects with potential to have an effect upon the SACs. In reaching this conclusion it is settled law that a precautionary approach should be taken to this assessment and that an LSE should be assumed unless the risk can be excluded. Essentially, this test of likely significant effect (LSE) determines whether the second stage of the process, Appropriate Assessment (AA) is required. Where no LSE is identified, then AA is not required; conversely, where LSE is identified, then AA is required to determine if there will be adverse impacts which would prevent the conservation objectives from being met and therefore the integrity of the European site being adversely affected.

3.1 Data Obtained to inform this Assessment

As part of a Fish Habitat Assessment (FHA), the watercourses in the areas, and their suitability to support protected and notable species was assessed (Atmos ref: C0233-ATM-GES-ZZ-RP-X-0004).

There are four points, with point 2 being located within the Lleyn Peninsula and the Sarnau SAC and point 4 being within the Meirionnydd Oakwoods and Bat Sites SAC. All four points are within close proximity to both SACs.

Point 1 is located within the ditch on the western boundary of the Cilfor site. The ditch was heavily vegetated at the time of the survey with goat willow *Salix caprea* gorse *Ulex europaeus*, common reeds *Phragmites australis* and soft rush *Juncus effusus*.

Point 2 was surveyed from the station platform due to lack of access to this area. It is situated within the salt marsh in the SAC. The ditch up stream lies within an improved grassland grazed by sheep, species included perennial rye grass *Lolium perenne*, red fescue Festuca rubra and soft rush. The ditch held water at the time of the survey and the banks had recently been cut. Species on the ditch banks included common reeds, bramble *Rubus fruticosus*, gorse, bracken *Pteridium aquilinum* and goat willow.

Point 3 is on the western boundary of the Garth site. This discharge point lies within a densely vegetated ditch, species include bramble, perennial rye grass and cow parsley *Anthriscus sylvestris*. The surrounding fields are improved grassland used for grazing. The sward was short at the time of the survey with species such as perennial rye grass and ribwort plantain *Plantago lanceolata*.

Point 4 again was not accessible by foot, so the survey was carried out from the bridge. The abstraction/discharge point is situated on the eastern banks of Afon Glaslyn. It is within an area of trees which then leads to the salt marsh further south.

Data previously obtained from Cofnod, Local Environmental Records Centres (LERC) Wales was used. The highest number of otter records are around point 2 and point 4. There are records of otters at point 3, but these records are located further downstream. The nearest record to point 2 is located approximately 0.2 km south of the discharge point and dating from 2017. There is a record at point 4 dating from 2018. There are several records of spraints and feeding remains within this area. There is a record of a grey seal *Halichoerus grypus* located on the adjacent western bank of Afon

Glaslyn. Otter and grey seal are an Annex II species present as a qualifying feature of Lleyn Peninsula and the Sarnau SAC, but not a primary reason for site selection.

The nearest record of lesser horseshoe bat was located 0.15 km north of point 3 dating from 2018. The other records of the species were concentrated in the Gwaith Powdwr Nature Reserve located 0.75 km north of point 2. Lesser horseshoe bat is an Annex II species present as a qualifying feature of Meirionnydd Oakwoods and Bat Sites SAC, but not a primary reason for site selection.

3.2 Proposed Construction Works

The proposed works involves the discharge and abstraction of water. They are described in section 1.3. All four points are linked to Atlantic Salt Meadows, a habitat which is listed under the designated features within the Lleyn Peninsula and the Sarnau SAC. The habitat at point 2 is considered saltmarsh, but species identification was not possible due to access restraints.

The locations are not situated within any of the habitats listed under the designated features of the Meirionnydd Oakwoods and Bat Sites SAC.

3.2.1 Lleyn Peninsula and the Sarnau SAC

All four points are either located within the SAC or are directly connected and are located in proximity to Atlantic salt meadows.

The following features of the SAC do not occur in direct proximity to the discharge and abstraction points and they are sufficiently far enough away from the areas that it is considered there is no mechanism for a likely significant effect:

- Reefs
- Large shallow inlets and bays
- Sandbanks which are slightly covered by seawater all the time
- Coastal lagoons
- Submerged or partially submerged sea caves
- Salicornia and other annuals colonising mud and sand features
- Bottlenose dolphin *Tursiops truncates*

The following features of the SAC are within a distance of the points that there is a potential for a likely significantly effect:

- Atlantic salt-meadows
- Estuaries
- Otter *Lutra lutra*
- Grey seal *Halichoerus grypus*

Connectivity and Impact Pathways

As set out in Section 1.3, the proposed works involves discharge and abstraction points within existing watercourses in and near the SAC, therefore, habitats and species listed above could be affected by the works. There will be no habitat loss to the saltmarsh and the main potential impacts are pollution and sedimentation. There is potential for scouring of the riverbeds during discharge over and extended period of time, causing erosion of the habitats within the SAC. Otters may also frequent the watercourses for the discharge points and grey seal may be present at the Garth abstraction/discharge

point, without mitigation, actions could affect the species which could be part of the SAC population.

As a result, there is a finding of likely significant effect on features of the SAC, at all four points, in the absence of mitigation, and therefore AA is required in order to establish whether proposed works would have an adverse impact such that the integrity of the SAC could not be maintained and if so whether appropriate mitigation can be developed which would allow the integrity of the SAC to be maintained.

Meirionnydd Oakwoods and Bat Sites SAC

The Garth abstraction/discharge point is located within the SAC and does not support habitats for which the SAC is designated, nor could the species for which the SAC is designated be present. There is potential that the Annex II species lesser horseshoe bat may use the area for foraging as it is present in the wider area.

Disturbance

As set out in Section 1.3, all works to install the discharge and abstraction equipment, as well as monitoring, will take place during daylight hours. There will be no artificial lighting at the points.

Once installed, there will be minimal works at the points and no habitat loss. The points are in a relatively small, localised area compared to the extent of the SAC. Given the works are not likely to affect any terrestrial habitat, it is not considered to indirectly affect lesser horseshoe bats which may be utilising the woodland and surrounding habitats for foraging or roosting.

Disturbance effects on lesser horseshoe bats are therefore not considered to be significant.

There will be no adverse effects on site integrity for Meirionnydd Oakwoods and Bat Sites SAC. As a result, no further mitigation measures or appropriate assessment are required.

4 Stage 2 – Appropriate Assessment

Given that an LSE has been determined due to the effects of actions taken within the Lleyn Peninsula and the Sarnau SAC to features indirectly linked to it, AA is required to determine if there is a potential adverse impact on the SAC, and if so whether it can be mitigated so as to avoid any such effect. In particular, an assessment must be made as to whether as a result of the works, without mitigation, the effects on the habitat feature are such that the conservation objectives could no longer be met/upheld.

4.1 Current Use of the Area

Point 1 is located at the Cilfor site and has recently been subject to reptile trapping. The area is also grazed by a small number of sheep. Point 2 is located within the Lleyn Peninsula and the Sarnau SAC and during the drier months, is grazed by sheep. Point 3 is located within a ditch downstream from the Garth compound, the surrounding area is used for grazing. Point 4 is located on the bank of the Afon Glaslyn, south of the train line and the area is not currently in use.

4.1.1 Atlantic salt meadows

Baseline

Atlantic salt meadows develop when halophytic vegetation colonises soft intertidal sediments of mud and sand in areas protected from strong wave action. This vegetation forms the middle and upper reaches of saltmarshes, where tidal inundation still occurs but with decreasing frequency and duration. A wide range of community types is represented, and the saltmarshes can cover large areas, especially where there has been little or no enclosure on the landward side. The vegetation varies with climate and the frequency and duration of tidal inundation. Grazing by domestic livestock is particularly significant in determining the structure and species composition of the habitat type and in determining its relative value for plants, for invertebrates and for wintering or breeding waterfowl.

Likely Effects on Qualifying Feature

This habitat is situated at point 2 and functionally linked to the remaining points. There will be no habitat loss and the risk to this feature is from pollution, sedimentation and other materials that would affect the water quality and would have an effect on the integrity of the SAC in the short term. The salinity levels of the water to be discharged is unknown, there is likely to be a local effect on the habitat at discharge point 2 dependant on salinity levels.

4.1.2 Estuaries

Baseline

Pen Llyn a'r Sarnau has representative examples of bar-built estuaries in north-west Wales, and includes the Glaslyn/Dwyryd, Mawddach and Dyfi estuaries. There is a continuous gradient between the clean sands near the entrance to the sea and the mud or muddy sands in the sheltered extremes of the estuaries. The intertidal sandflats

support communities of burrowing invertebrates, including dense populations of polychaete worms, crustaceans, bivalve molluscs and gastropod molluscs. Saltmarsh fringing the shores of the estuaries, and the saltmarsh creeks and pools, are important habitat features for juvenile fish. Again, dependant of the salinity levels, there is a potential for the estuarine habitats to become damaged.

Likely Effects on Primary Feature

Each point is directly or indirectly linked to this feature. There would be no habitat loss but there is potential to damage to the estuary in the form of scouring of the riverbeds during discharge of water. Other effects to this primary feature would be pollution, sedimentation and release of other materials into the estuary. Both events would have an effect on the integrity of the SAC in the short term.

4.1.3 Otter

Baseline

The highest number of otter records are around point 2 and point 4. There are records of otters at point 3, but these records are located further downstream. The nearest record to point 2 is located approximately 0.2 km south of the discharge point and dating from 2017. There is a record at point 4 dating from 2018. There are several records of spraints and feeding remains within this area. The ditches near each point are not considered suitable for otter holts, and there was no evidence of otter recorded during the survey. It is considered that the species may range through the areas, as they are present in the wider landscape.

Effects on Qualifying Feature

It is not deemed likely that otter holts will be present in the immediate surroundings of the points. Being highly mobile nocturnal animals, individuals could become injured or entrapped in the discharge/abstraction machinery at night or could suffer indirectly through pollution going into the watercourse. Point 2 lies adjacent to an active rail line, if present, they will be habituated to trains and disturbance during the daytime. Points 1, 3 and 4 are subject to less disturbance. Any effects on fish could also indirectly affect the otter population through food availability. It is therefore considered that without mitigation there will be a likely significant effect on otters based on disturbance to ranging otters or pollution.

4.1.4 Grey seal

Baseline

The south-west Wales population is the most southerly in Europe of any significant size and is relatively isolated from those elsewhere in the UK. It forms around 4% of the UK population or about 3.5% European population. This sub-population or stock is centred on the west Pembrokeshire coast. The grey seals of the Pen Llŷn a'r Sarnau SAC may be part of the west Wales breeding population. Grey seals present within the SAC at any one time are thought to be a part of a wider North Wales population. It is not known at present to what extent they form a discrete colony as part of the larger assemblage of seals found in Pembrokeshire (and whether this assemblage is a discrete Welsh

population), or whether they form part of a larger population, for example distributed throughout the Irish Sea. There arev seal records adjacent to point 2 dating from 2011 and adjacent to point 4 dating from 2008.

Effects on Qualifying Feature

The points and the surrounding areas do not support breeding seal, but it likely they range into the area to forage with North Wales's largest breeding colony at Bardsey Island being located 50 km west. The works are not likely due to disturb the species as the points are situated within areas with regular human disturbance. Any pollution has the potential to cause ill-health and release of sedimentation has the potential to effect food resources. It is therefore considered that without mitigation there will be a likely significant effect on grey seal based on pollution.

4.2 Assessment of effects

A summary of the impacts of the works against the Conservation Objectives is provided in Table 2.

Table 2: Assessment of effects on Conservation Objectives

Attribute	Specified Limit	Predicted Effects from Proposed Works
Feature 1 & 2: Atlantic salt meadows and Estuaries		
Range	For estuaries this includes the stability of sandy sediments in proportion to the muddy sediments.	There will be no overall loss of habitat, however the points are directly or indirectly linked to these features. There could be damage to the habitats dependant on if there are significant variations to the base line salinity levels. It is worth noting that scouring could wash away estuary habitat at Cilfor site. Scour boards will be in place but flow over an extended period could lead to some habitat being lost.
Structure and Function	This includes a need for nutrient levels in the water column and sediments to be: • at or below existing statutory guideline concentrations • within ranges that are not potentially detrimental to the long-term maintenance of the features species populations, their abundance and range. Contaminant levels in the water column and sediments derived from human activity to be: • at or below existing statutory guideline concentrations • below levels that would potentially result in increase in contaminant concentrations within sediments or biota • below levels potentially detrimental to the long-term maintenance of the features	If sediments or pollution were to be released into the estuary it could potentially cause a change in nutrient levels, contaminating the water and having a negative impact on species present.

Attribute	Specified Limit	Predicted Effects from Proposed Works
	species populations, their abundance or range. For Atlantic salt meadows this includes the morphology of the saltmarsh creeks and pans	
Typical Species	As part of this objective, it should be noted that: • populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve maximum sustainable yield and secure in the long term • the management and control of activities or operations likely to adversely affect the habitat feature, is appropriate for maintaining it in favourable condition and is secure in the long term.	As mentioned above, is sediment or pollution is released into the estuary it could adversely affect the species present. Dependant on salinity levels, there may be an effect on species.
Feature 3 & 4: Otter and Grey seal		
Populations	As part of this objective, it should be noted that: • for otter and grey seal; contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression; and grey seal populations should not be reduced as a consequence of human activity	If the works resulted in the death of an otter, this would affect their population. Pollution has the potential to affect otter and grey seal food source and therefore negatively affect the population. Increase in human activity will be short-term primarily during installation and sporadically for maintenance. Each area is currently subject to varying levels of human disturbance.
Range	The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. As part of this objective, it should be noted that for otter and grey seal • Their range within the SAC and adjacent inter-connected areas is not constrained or hindered • There are appropriate and sufficient food resources within the SAC and beyond the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing	The works will not reduce the otter's or grey seals range nor introduce any permanent barriers that would change the way in which effects to their movement. Machinery and associated pipework will be installed along areas that will not impact ranging otters.
Supporting Habitats and Species	As part of this objective, it should be noted that; • The abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term. • The management and control of activities or operations likely to adversely affect the species	Otter holts have not been found in and around the working area, but they are known to pass through. The works will not affect the availability of food resources for otter's and grey seal.

Attribute	Specified Limit	Predicted Effects from Proposed Works
	feature, is appropriate for maintaining it in favourable condition and is secure in the long term. • Contamination of potential prey species should be below concentrations potentially harmful to their physiological health. • Disturbance by human activity is below levels that suppress reproductive success, physiological health or long-term behaviour • For otter there are sufficient sources within the SAC and beyond of high-quality freshwater for drinking and bathing.	

The review of the Conservation Objectives for the SAC has identified that there is the potential for features of the SAC to be affected and therefore would adversely impact the integrity of the SAC.

Given the sensitivity of the area, a review of mitigation which would be undertaken, including that designed into the works from an early stage has been provided in section 4.5.

4.3 In-combination effects

A HRA (Ref: C0233-ATM-GES-ZZ-RP-X-0003) for ground investigation works adjacent to the SAC has been submitted to NRW. The ground investigation works has the potential to cause pollution and sedimentation to the SAC and appropriate mitigation measures are in place. The ground investigation works will take place well in advance of any discharge/abstraction and therefore no in-combination effects are considered.

A search of the Gwynedd County Council and Snowdonia National Park Authority Planning Portal was carried out on 16th January 2023 to search for planning applications in the vicinity of the discharge/abstraction points. There were no pending planning applications on or adjacent to the points, upstream or downstream or the nearby surrounding area that are of a similar nature to these works. As such, there are not known to be any other works taking place on this area during this time, therefore no in-combination effects are considered.

4.4 Conclusions

Without mitigation the works will have an effect on the integrity of the SAC. As set out in Table 1, potential LSE are identified on features 1, 2, 3 and 4.

Mitigation is therefore required to reduce these LSE, as set out below.

4.5 Mitigation

Mitigation is required in order to pass the appropriate assessment as the work will be occurring within sensitive habitats where there would otherwise be direct and indirect effects on the primary and qualifying features. The following mitigation measures are incorporated into the proposals:

- All machinery and associated pipework will be installed along areas that will not impact ranging otters.
- Outfall pipe and scour boards will be installed to prevent scouring of the riverbanks. The discharge points will be regularly monitored, with scouring boards moved or extended if any scouring takes place.
- Treatment processes specified in Section 1.3 will be used to minimise any release of pollution, sedimentation or other materials into the SAC.
- The pH value of the discharge range will be 6 – 9 range, with a target of 6.9 – 7.5.
- Discrete spills of oils or grease within the tunnel will be collected using spill kits and then disposed of as hazardous solid waste.

Treatment processes

A Slurry Treatment Plant (STP) will dewater TBM excavated material and recycle the recovered water back to the TBM. The STP will include the following sequence of treatment processes:

- Screens for the physical separation of large solids from water;
- Cyclonic separation for the mechanical separation of fine solids from water;
- Flocculation sedimentation for the chemically enhanced settlement of fine solids;
- pH adjustment using carbon dioxide gas injection; - filter press for the dewatering of wastewater sludges.

Treated water from the STP will be recycled back to the TBM. Excess water not used by the TBM will pass to onsite settlement lagoons. The water in the lagoons will be available for reuse on site and or will be discharged off site following further water treatment.

Water from the lagoons to be discharged off site will be treated in a wastewater treatment plant prior to discharge. It is proposed to use a package water treatment plant supplied by Siltbuster Ltd. The Siltbuster wastewater treatment plant (Siltbuster WWTP) will include the following water treatment processes:

- Flow chamber to measure flow rate into the treatment plant;
- Coagulant dosing pump (flow proportional mixing of Poly Aluminium Chloride);
- Flocculant addition and mixing (Anionic Flocculent);
- pH monitoring and CO2 addition;
- tilted plate separator;
- pH monitoring caustic soda (NaHO) addition (peat geology or pyrite excavation); and
- treated water quality: flow out, pH turbidity

5 Conclusions

A HRA has been carried out for the discharge and abstracted points at Cilfor and Garth. This went through the following stages:

- Stage 1 – the project was screened and a likely significant effect was identified for the proposed works;
- Stage 2 – a Appropriate Assessment was carried out which assessed features of the SAC within and immediately adjacent to the working areas. This showed that the habitats and species present would be significantly affected and that the conservation objectives of the SAC would not be maintained if the works went ahead without mitigation.
- Mitigation was introduced and has considered all the LSE anticipated on the primary and qualifying features and are reduced such that there is not anticipated to be any effects from the work on the integrity of the SAC, therefore, following the implementation of mitigation, the works pass appropriate assessment;

As a result, the HRA has shown that work can proceed without affecting the integrity of the Pen Llyn a`r Sarnau/ Llyn Peninsula and the Sarnau SAC and the Meirionnydd Oakwoods and Bat Sites SAC. Appropriate good working practices are to be put in place to minimise damage to habitats and minimise disruption of the typical species found within the SAC during the proposed works.

Snowdonia VIP – Garth Compound Process Water Treatment

February 2023

This document sets out the water treatment proposals for extracted process water at Garth Construction Compound, Minffordd, Penrhyndeudraeth, Gwynedd, LL48 6HP.

Water will be extracted from the tunnel in a slurry mix. The following hierarchal treatment process is proposed:

- Process water will be directed to a Slurry Treatment Plant which will dewater the excavated material and recycle the recovered water back to the tunnel boring machine (TBM). The Slurry Treatment Plant will include the following sequence of treatment processes:
  - **Screens** for the physical separation of large solids from water
  - **Cyclonic** separation for the mechanical separation of fine solids from water
  - **Flocculation** sedimentation for the chemically enhanced settlement of fine solids
  - **pH** adjustment using carbon dioxide gas injection
  - **filter press** for the dewatering of waste water sludges.
- Excess water not used by the TBM will pass to on site settlement lagoons. The water stored in the lagoons will be available for re-use in the process or, when the lagoons are full, will be discharged off-site following further water treatment.
- Water from the lagoons which will be discharged off-site will be treated in a package water treatment plant supplied by Siltbuster Ltd. The Siltbuster water treatment plant will include the following water treatment processes:
  - **Flow chamber** to measure flow rate into the treatment plant
  - **Coagulant dosing pump (flow proportional mixing of Polyaluminium Chloride)**

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- **Flocculant addition and mixing (Anionic Flocculent)**
- **pH monitoring and CO2 addition**
- **Tilted plate separator**
- **pH monitoring caustic sods (NaHO) addition (for peat geology or pyrite excavation)**
- **Treated water quality, flow out, pH turbidity.**

- Monitoring will be included for salinity content in the extracted water. Where the extracted water is saline, the preferred discharge point is to the Afon Glaslyn at National Grid Reference: 258918, 338998. Where no saline content is found, the preferred discharge point is to the ordinary watercourse crossing the site at approx. National Grid Reference: 259245, 338576.

Details of the Siltbuster water treatment plant are included in Appendix A.

The water treatment proposals will achieve the following levels of treatment:

- **Total suspended solids 60mg/l**
- **pH 6-9**
- **Total iron <5mg/l**

The treatment process will be designed to cope with potential acid rich geology associated with a section of pyrite rich rock evidenced by borehole data.

Background water quality sampling has been undertaken and is included as Appendix B. Table 1 shows the existing levels of total suspended solids, pH and total iron for 3no. sample locations within the Garth Construction Compound. A corresponding sample location plan is also included in Appendix B.

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	Total Suspended Solids (mg/l)	pH	Total Iron (mg/l)
Sample Location 1	No data (sample re-taken, results awaited)	6.9	0.23
Sample Location 2	5	6.7	0.38
Sample Location 3	8	6.8	0.695

**Analysis taken in wet weather conditions with high flow / water levels witnessed. Additional sampling undertaken in dry conditions (results awaited).*

The temperature of the discharge will be similar to that of the water abstracted for use in the process (fresh river water) and will be subject to atmospheric temperature. Water temperatures above 25°C are not expected.

No hazardous chemicals or substances are expected or used within the water process / treatment system. As such, hydraulic modelling of the discharge is not required.

The potential impacts of the discharge to the receiving environment are considered within the supporting Habitats Regulations Assessment (HRA) (reference C0233-ATM-GES-ZZ-RP-X-004) prepared by Atmos Consulting in February 2023. The HRA is included as Appendix C.

The permit application is also supported by the following information which will be provided as supplementary information:

- Garth Site Layout Plan (Drawing C0233-HUK-AX-DR-W-0001 P04)
- Fish Habitat Assessment Report (reference C0233-ATM-GES-ZZ-RP-X-0005) prepared by Atmos Consulting in January 2023.
- Invasive Non-native Species Report (reference C0233-ATM-GES-ZZ-RP-X-0006) prepared by Atmos Consulting in January 2023.
- Ecological Baseline Report (reference C0233-ATM-GES-ZZ-RP-X-0001) prepared by Atmos

Consulting in January 2023.

- Water Management Plan (reference C0233-HUK-PDR-ZZ-PL-W-0001 – P01) prepared by Hochtief UK Construction in January 2023.

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Appendix A – Siltbuster Proposals

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Web: www.siltbuster.com

SE30755-JB-01
09 December 2022

David Grantham
Careys

By Email: David.Grantham@hochtief.co.uk

Dear David,

Siltbuster 2-stage + CO_2 MT8 and HB40R SPX40 water treatment plant for slow settling solids and alkaline conditions

Further to your request for a water treatment plant to support powerline works in Snowdonia, I provide an outline proposal for supply of a Siltbuster water treatment plant. The proposal and scope of supply will change as and when new information becomes available, such as laboratory testing on a representative sample of water from the site.

1.1 Introduction

It is our understanding of your particular application that:

- You are working on the Eryri Visual Impact Provision scheme in North Wales
- There will be 2No. construction compounds for the tunnel drive
- You request a water treatment plant at each location to tackle surface water runoff and excess water separated from tunnel arisings by the slurry dewatering system (by others)
- Excess water will be disposed to the environment and is a regulated activity
- The principal contaminants of concern are considered to be:
    - suspended solids, ranging in particle size from silt-sized through to clay-sized (circa 30µm to circa 1µm in diameter)
    - alkaline pH conditions associated with water coming into direct contact with cementitious materials
- Secondary, or possible, other contaminants are yet to be determined, but may include:
    - possible acidic pH conditions associated with soils including peat
    - the presence of ‘ochre’ is a possibility. Therefore dissolved and/or particulate iron may be present
- The treatable flowrate will be circa 20m^3/hr for the initial phase(s) potentially reaching 60m^3/hr in later phases
- Specific numeric quality criteria for release of water to the environment is not known, but the following may be appropriate:
    - Total suspended solids (TSS) less than 60mg/l (i.e. visually clear water – see below)
    - pH6 to pH9
    - Less than 5mg/l total iron

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- Hochtief will create an attenuation lagoon to capture and store surface water runoff, you will use a submersible pump to transfer water to a Siltbuster treatment plant for gravity drain of treated water to the disposal point
- Hochtief will seal all water discharges from the lagoon thus ensuring only compliant water leaves the site via the Siltbuster unit
- Hochtief will create a designed sump with raised suction so that excessive solids are not drawn from the base of the lagoon and into the pump
- Coarse solids will accumulate in the lagoon and will require manual removal from time to time. The Siltbuster water treatment plant is designed to accept dirty/discoloured water, not slurry and not large particles (sand/stones/gravel etc.)
- Hochtief will provide a laydown area, feed pump and controls, pipework, discharge pipework, power supply and attendance to operate and maintain the treatment plant
- Suspended solids (soil particles) which are removed from the water will be collected in a hopper with the consistency of thin slurry and will require timely removal and management
- The proposed system includes a hose pump for simple 'push-button' desludging on a manual or auto-timer basis
- Treated water will gravity drain from a 6" Bauer outlet to the nominated disposal point
- As with any water treatment plant and particularly when using chemical dosing, best performance is seen under **steady-state conditions**. That is to say, the pump should be trimmed/valved to give smooth and continuous flow as much as possible. Allowing the pump to 'slurp' water/air, or pump pulsing (very large flows over a short time period) WILL result in poor performance and inadequate treatment
- The proposed water treatment plant is comprised from standard modular hire fleet units, therefore typically additional units can be mobilised at a later date to add treatable flowrate capacity

CLAY particles suspended in water at different TSS concentrations

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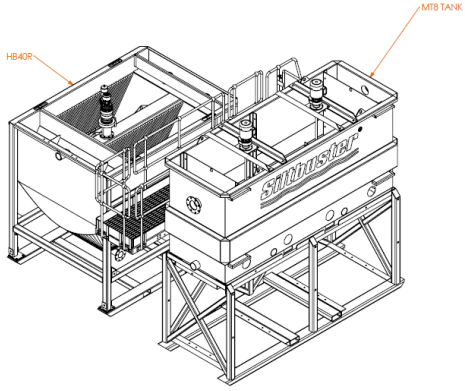
1.2 Plant Selection



Example setup – 3-stage +CO_2 MT8 HB50 (for pH correction, suspended solids reduction)

The proposed system will be in general accordance with:

1. Inlet magnetic flow meter, to record the volume of water treated and allow flow proportional dosing of coagulant and polymer
2. Elevated mixing tank with walkway to allow the controlled mixing of the treatment chemicals ensuring flocculation of the solids
3. Coagulant dosing pump and associated pipe-work to allow the automatic flow proportional addition of the coagulant. The use of flow proportional dosing system minimises the risk associated with the overdosing of the treatment chemicals
4. Automated, pH controlled release of carbon dioxide gas to maintain near neutral pH and minimise the risk of alkaline conditions
5. Flocculant make-up system complete with 1,000 litre make up tank, mixer bridge 110V (32 Amp) mixer complete with paddle (potable water will be required on site for polymer dilution – to be provided by others) and flow proportional dosing pump (peristaltic or similar)
6. 1 No iCDS3 secure bunded chemical containment for storage of duty chemicals
7. 1 No. Siltbuster HB40R Lamella Clarifier to retain the settling solids from the water
8. SPX40 hose pump with start/stop local controls and timer
9. Automated, pH controlled addition of caustic to maintain near neutral pH and minimise the risk of acidic conditions (optional, may be required for peat geology)
10. Treated water quality monitoring with local datalog to USB (total flow, pH and turbidity)

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2.1 Costs

Item	Hire Rate
Hire of water treatment system, items 1 to 8 above	£1,605 per system per week or part thereof
Hire of caustic dosing capability to neutralise acidic conditions, item 9	£190 per week
Hire of water quality monitoring for flow, pH, tubidity/TSS	£412 per week
Setup, commissioning and training by Siltbuster Process Engineer (**allow 3 days**)	£495 per day including travel
Additional day rate, if required (e.g. decommission)	£495 per day including travel
Delivery from Monmouth to Snowdonia	£1,775 via HIAB (may be artic) non-FORS
Collection from Snowdonia to Monmouth	£ tbc at the time of offhire

Site-Specific lift plan by AP
Siltbuster cannot supply an AP for a site-specific lift plan. If a site-specific plan is required we suggest 'Standard' delivery with offloading by the client would be the most appropriate selection.

Transport Terms of Cancellation
*Before 12pm the day before - No Charge
*After 12pm and before end of play that day - 75% of chargeable rate
*Day of job - 100% chargeable rate
*85tpm cancelled at any point the day before the job - 50% of chargeable rate
Please do consult our Pre Delivery Questionnaire and advise us about your site-specific requirements for deliveries

We suggest it would be more cost effective and efficient for Hochtief make their own arrangements for chemical supply, however if supplied through Siltbuster, reagents are supplied at the following rates.

	25kg Drum	1,000 litre IBC
Coagulant (Poly Aluminium Chloride - PAC)		£705
Caustic		£2,262
Anionic Flocculent	£116.60	
Reagent re-order	£80 per order (min. order value of £250)	

Chemicals are typically supplied direct from the manufacturer on a 5-working day leadtime, on a curtain sided vehicle and require offloading by the client. At this stage and without laboratory testing, it is difficult to forecast chemical consumption.

If by Siltbuster, vapour withdrawal carbon dioxide will be supplied at the following rates.

Carbon Dioxide Cost	500Kg Gas Bank - (15 No. Bottles)
Gas bank rental	£45 per bank per week
Gas charge per cylinder bank	£1,100 per bank (comprises 15No. cylinders)
Deposit	£500 per Bank (Refundable upon return undamaged)
Reorder and delivery/collection charges (Applicable on each order for replacement cylinders	£105 per visit Applicable on all gas deliveries to site

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delivered to site) BOC wagon requires offloading by the client Note, at the time of writing, supply issues for industrial CO_2 across the sector are causing lead times to extend beyond the normal 5-working days	

3.1 Lead Time

Currently 6 to 10-weeks from receipt and processing of your formal written purchase order but is dependent on the current status of the hire fleet and availability of transport and any necessary account processing requirements having already been completed (See note II of the Siltbuster Terms and Conditions listed below).

4.1 Exclusions and considerations

We have excluded the following items from our scope of supply:

- Electrical wiring, connections and protection not to the standard Siltbuster method
- Designed attenuation lagoon, sump, feed pump, controls and associated feed pipework to the 4" female Bauer coupling on the inlet of the water treatment plant
- Haul road to allow the HIAB delivery vehicle and engineer's van to access the proposed location of the treatment plant
- Level surface of sufficient bearing capacity to support the plant when full of water
- Power supply, mains supply 415V (3-phase+Neutral+Earth) with 300mA RCD or adjustable earth leakage and 32A or 63A sockets
- Supply of potable water for polymer make up, estimated at <1m^3 per week
- Attendance to maintain and operate the equipment
- Pipework to attach to base of hoppers for desludging
- Disposal or management of wastes, sludges, excess chemicals or empty containers
- Large particles >10mm diameter should be prevented from entering the feed pump to avoid damage to the flowmeter sensors and accumulation in the mix tank
- Freeze protection (insulation and trace heating)
- Any approvals or permits required by the EA, Local Authority, etc.
- Monitoring or quality checks – we assume the site staff will adopt daily O&M
- Treatment or dewatering of sludges – the scope of supply is for a *water* treatment plant
- Treatment for contaminants other than those specified above (e.g. oil/water emulsions, dissolved metals)
- Site-specific lift plans. If this is required we suggest delivery on flatbed wagons with offloading organised by the client's AP
- Demurrage (charged at £65 per wagon per hour)

As with any water treatment plant and particularly when using chemical dosing, best performance is seen under steady state conditions. That is to say, the pump should be trimmed/valved to give smooth and continuous flow as much as possible. Allowing the pump to 'slurp' water/air, or pump pulsing (very large flows over a short time period) WILL result in poor performance and inadequate treatment

Registered Office: *Siltbuster* Ltd., 32-36 Bournemouth Road, Chandler's Ford, Eastleigh, SO53 3ZL, Registered in England & Wales No.4737424

Note, we have allowed for a treatment system capable of handling 4m^3/hr up to circa 35m^3/hr. This upper figure is a ***potential* maximum** and the actual flowrate achieved will depend upon the characteristics of the particulate matter suspended in the water column and how well the chemical dosing is optimised to the variable instantaneous solids concentration.

The proposal and scope of supply will change as and when new information becomes available, such as laboratory testing on a representative sample of water from the site.

5.1 Our Standard Terms and Conditions of Hire & Sales are as follows:

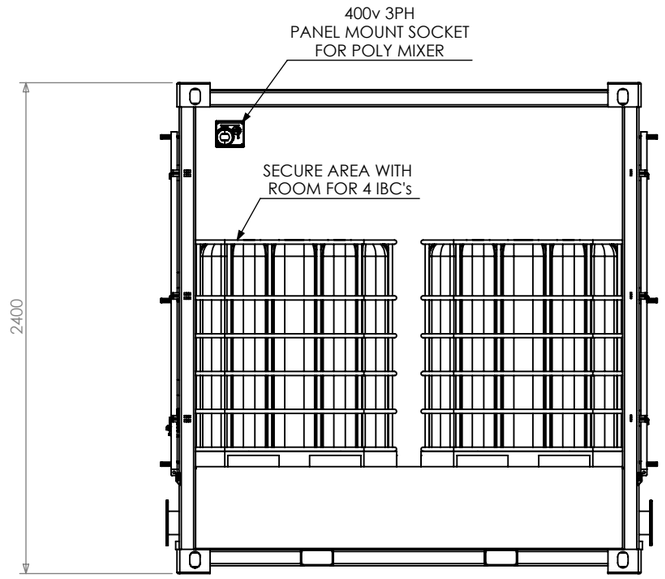
I. All costs are in pounds Sterling and exclude VAT
II. Proforma invoice on all new accounts and those which have been dormant for 6 months or more, covering:
    - Hires: delivery, collection, installation costs and first months hire
    - Purchases: 40% of purchase cost
III. Costs are valid for 30 days from 09 December 2022.
IV. Hire terms are standard Construction Plant Hire Association Conditions, Latest Edition
V. Equipment is supplied on a 7-day working week.
VI. Sale terms are Siltbuster standard conditions of sale (available on request)
VII. Invoices are raised monthly and payment terms are strictly 30 days from date of invoice.
VIII. No other terms and conditions are accepted, including those purported to apply under any purchase or confirmation order placed by the Client.
IX. Client is responsible for the operation/maintenance of the equipment whilst on hire and ensuring the treated water is discharged/disposed of in accordance with the relevant legislation. The client is also responsible for any site specific operational permits/authorisations/consents required and Health and Safety issues relating to the storage and use of chemicals on site.
X. All hired units are to be visually cleaned of all settled sludge & oil residues before return. Units returned containing sludge and or oil residues will incur a cleaning cost plus any waste disposal fees (charged at cost) and the unit will remain on hire whilst the waste is tested to determine an appropriate disposal method in accordance with the relevant statutory regulations.
XI. Transport costs for delivery & collection are as quoted above. Collection charge may vary if individual units from multiple unit deliveries are off-hired and collected separately.

We trust that the above information is sufficient for your current needs. However, should you have any queries please do not hesitate to get in contact.

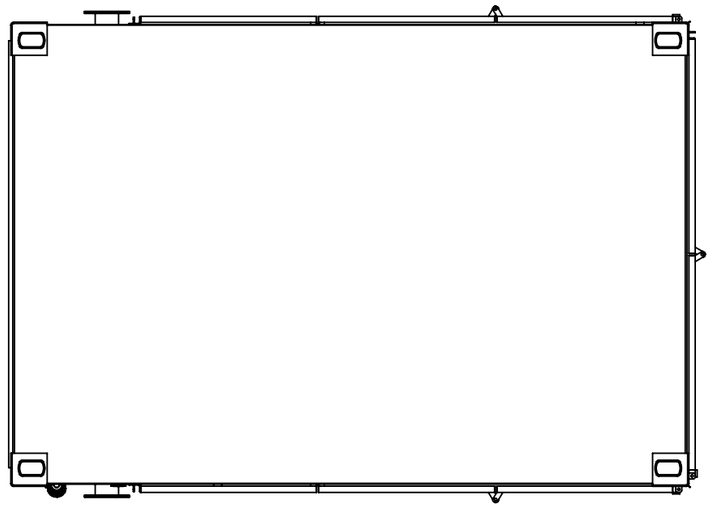
Yours sincerely,

James Baylis
Technical Sales (Northern England and North Wales)

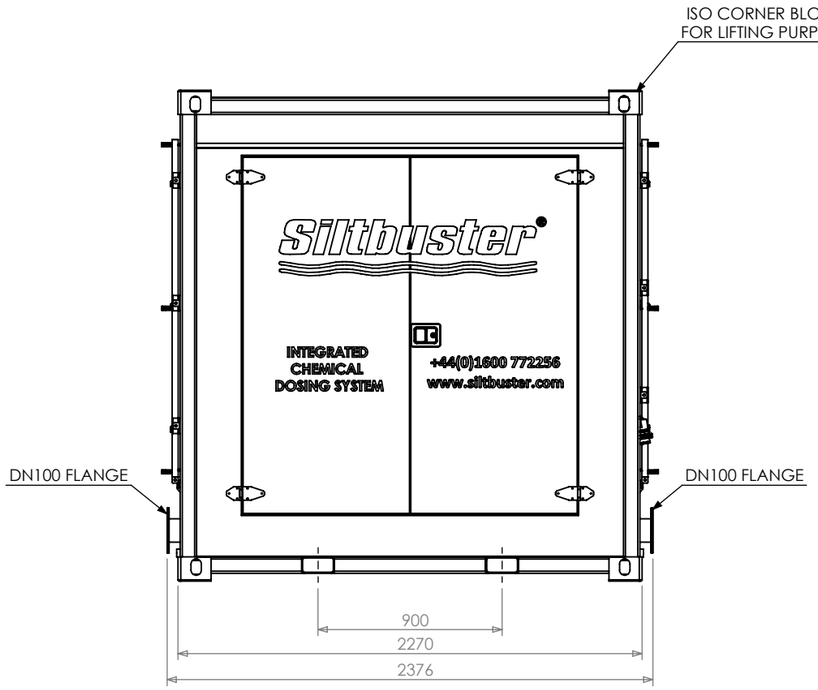
Tel: 01600 772256
Fax: 01600 775312
Mobile: 07889 535876
Email: james.baylis@siltbuster.com
www.siltbuster.com



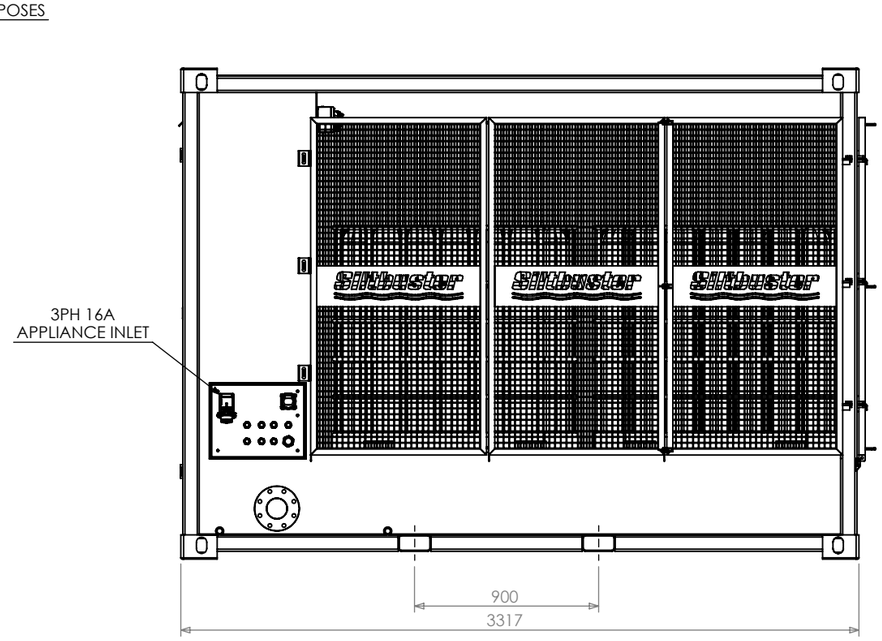
REAR ELEVATION
GUARD REMOVED
FOR CLARITY



PLAN VIEW



FRONT ELEVATION



SIDE ELEVATION

Unit Specifications:

1 Materials of Construction

Frame:	S275 Mild Steel
Pipework:	Stainless Steel 304

2 Corrosion Prevention (Primer Internal)

Frame

Surface Prep:	Blast Clean SA2.5 (SSPC-SP-10)
Primer Coat:	2 Pack High Build Anti-Corrosive Epoxy Primer @DFT: 100µm
Top Coat:	Standard RAL 5001 (Blue/Green) @DFT: 50µm
Total Thickness:	DFT: 150µm

3 Weight

Empty:	1.9t
Operating:	5.9t (Approx.)

4 Additional Information

Lifting Eye Design:	Iso Corner Blocks

5 Power Supply Requirements

Appliance Inlet	400v 16A 3PH+N+E

6 Flow Rate

Flow Rate Range	$4m^3/hr$ - $100m^3/hr$

7 Bund Capacity

Bunded Area Capacity	$2.06m^3$

TITLE:	**Integrated Chemical Dosing System**
MODEL:	ICDS 3.0
DATE:	11/05/2021

SILTBUSTER LTD.
WILLIAMS BUILDING,
KINGSWOOD GATE,
MONMOUTH,
MONMOUTHSHIRE
NP25 4EE
TEL: 01600 772256
FAX: 01600 775312
EMAIL: enquiries@siltbuster.com

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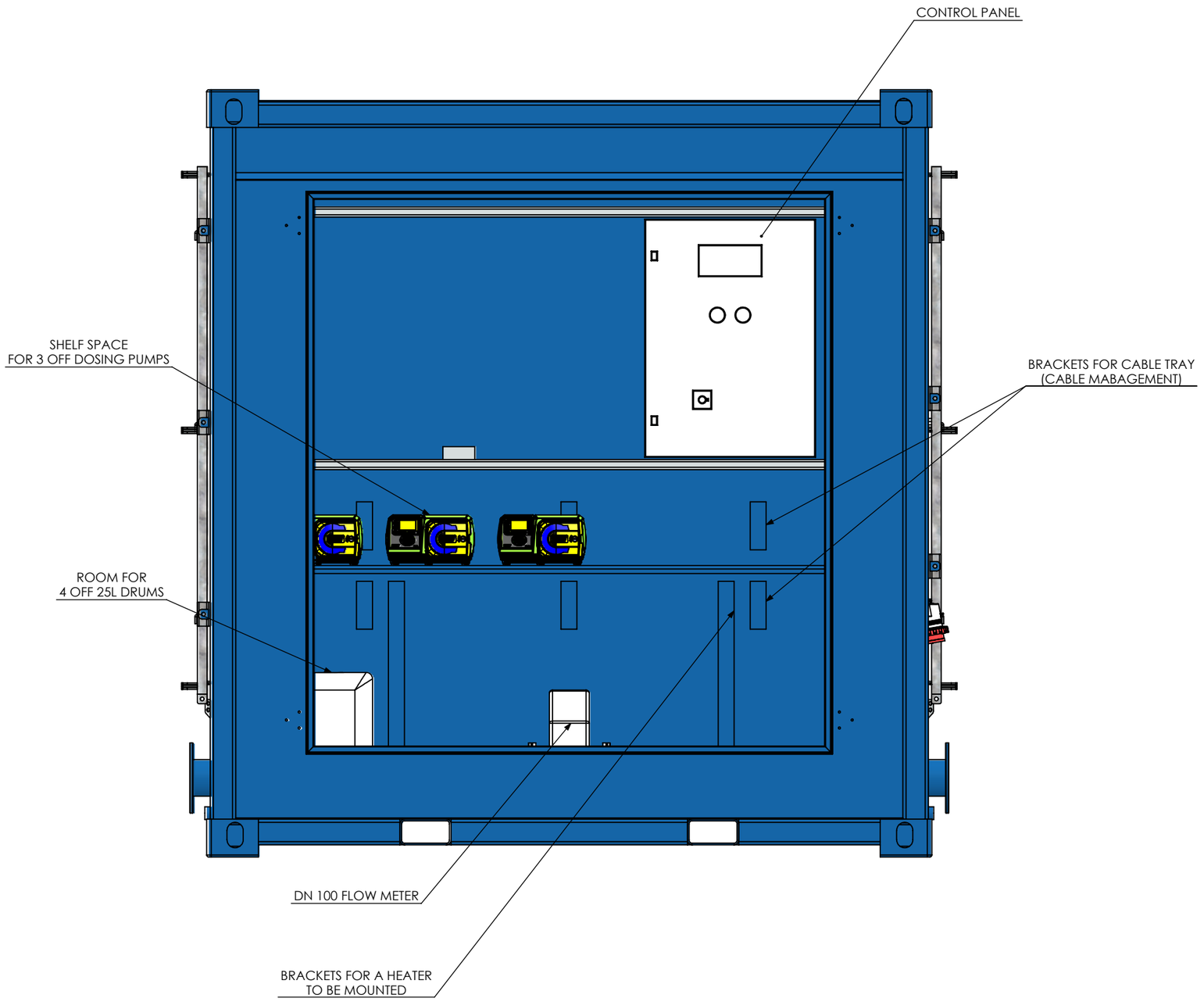

Unit Specifications:

1 Materials of Construction

Frame:	S275 Mild Steel
Pipework:	Stainless Steel 304

2 Corrosion Prevention (Primer Internal)

Frame

Surface Prep:	Blast Clean SA2.5 (SSPC-SP-10)
Primer Coat:	2 Pack High Build Anti-Corrosive Epoxy Primer @DFT: 100µm
Top Coat:	Standard RAL 5001 (Blue/Green) @DFT: 50µm
Total Thickness:	DFT: 150µm

3 Weight

Empty:	1.9t
Operating:	5.9t (Approx.)

4 Additional Information

Lifting Eye Design:	Iso Corner Blocks

5 Power Supply Requirements

Appliance Inlet	400v 16A 3PH+N+E

6 Flow Rate

Flow Rate Range	$4m^3/hr$ - $100m^3/hr$

7 Bund Capacity

Bunded Area Capacity	$2.06m^3$

TITLE:	**Integrated Chemical Dosing System**
MODEL:	ICDS 3.0
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SILTBUSTER LTD.
WILLIAMS BUILDING,
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NP25 4EE
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EMAIL: enquiries@siltbuster.com

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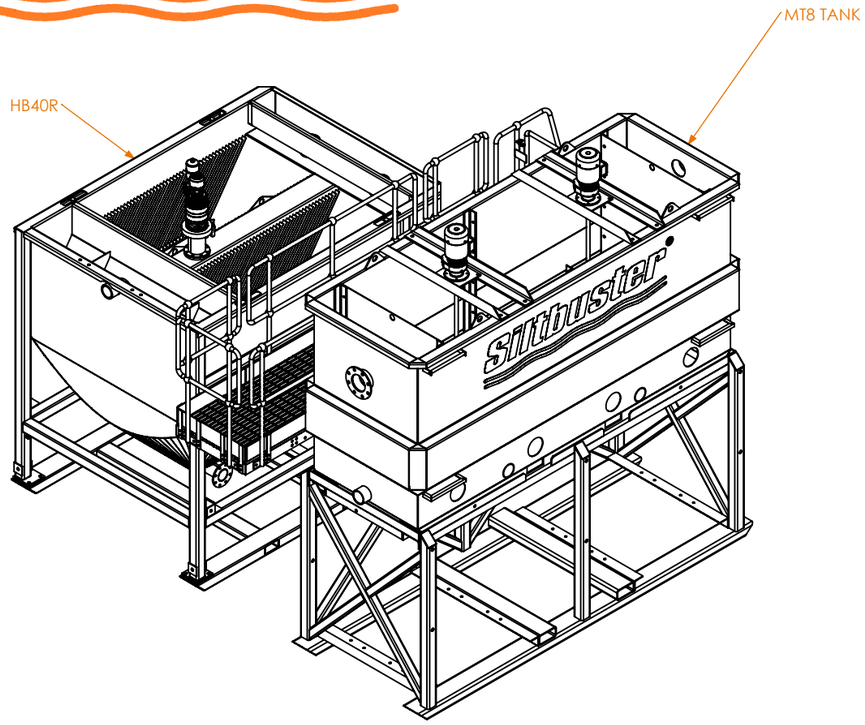
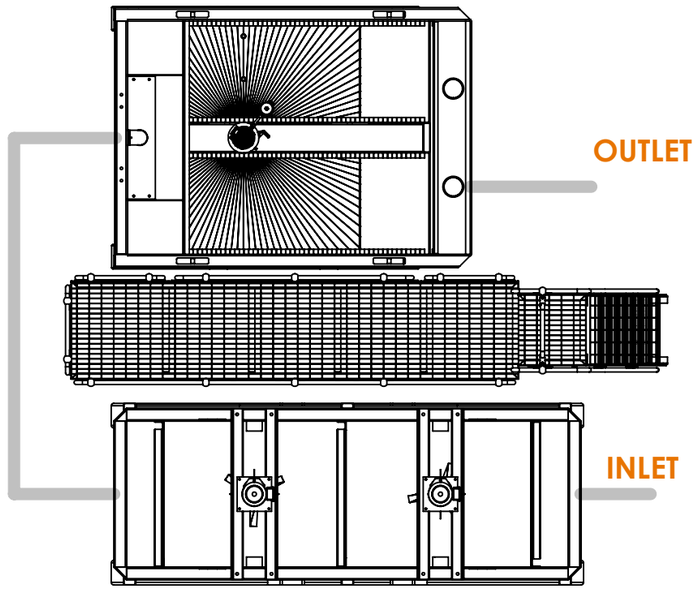
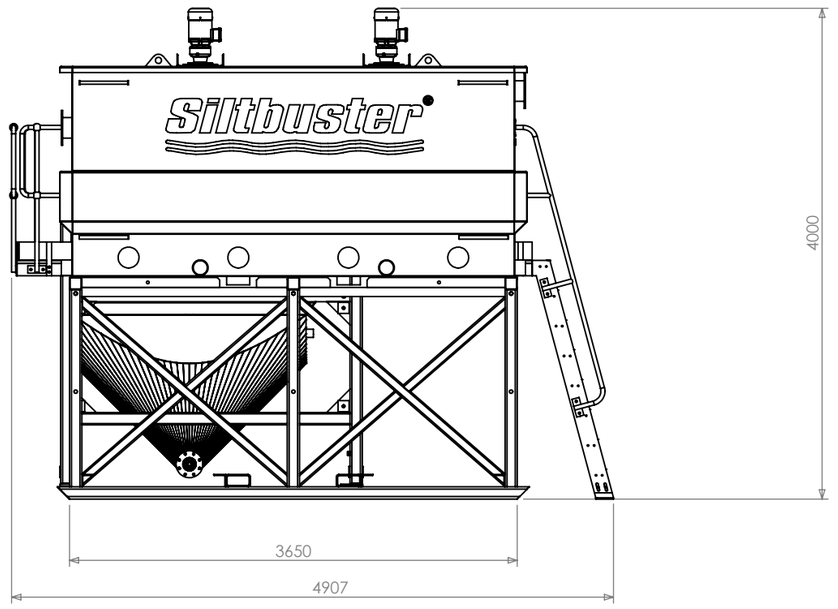
Siltbuster®





PLAN ELEVATION

FRONT ELEVATION



SIDE ELEVATION

ISSUE	DESCRIPTION	DRN BY	CKD	DATE

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Dimensions are indicative and due to ongoing product development are subject to change without notice.
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Project

HB40R and MT50

SILTBUSTER LTD.
WILLIAMS BUILDING,
KINGSWOOD GATE,
MONMOUTH,
MONMOUTHSHIRE
NP25 4EE

TEL: 01600 772256
FAX: 01600 775312

Siltbuster®

Title

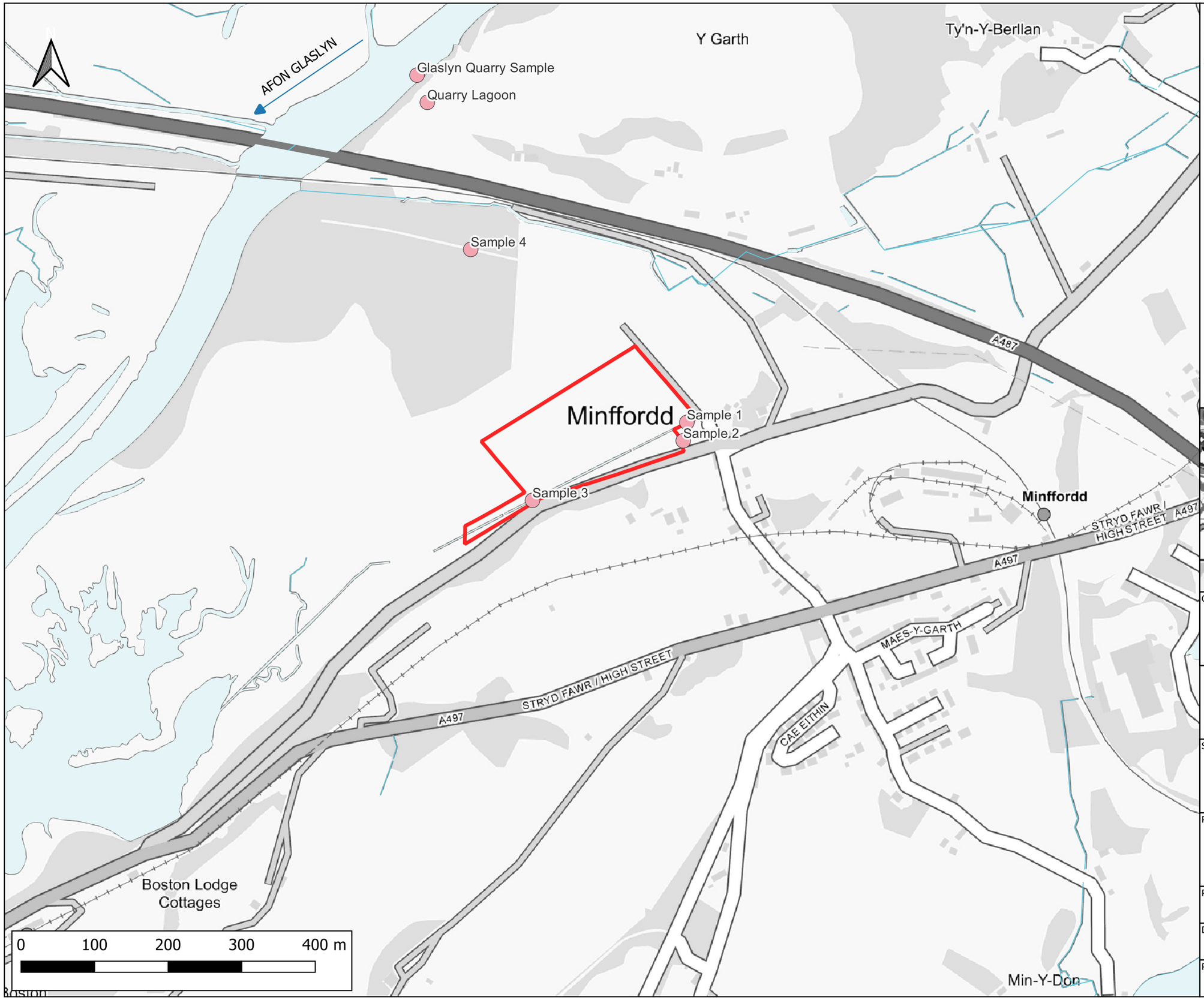
Proposed GA

Drawing No.

Rev

Appendix B – Water Sampling Data and Sample Location Plan

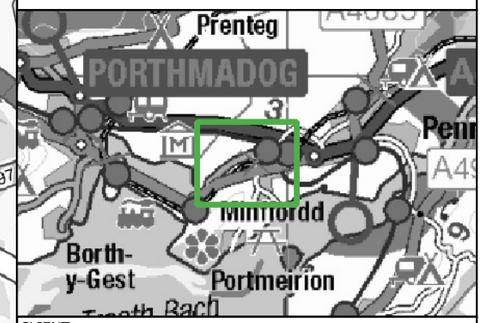
Waterco Limited
Registered in England and Wales | Company Number: 03577754
Eden Court, Lon Parcwr Business Park, Ruthin, LL15 1NJ
Form Ref: W042-F-17.S-Letter-General Letter Format Ruthin



Notes:
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

LEGEND

- Site Boundary
- Water Sampling Locations
- Watercourses
- Waterbodies



CLIENT:
Hochtief (UK) Construction Ltd

waterco
www.waterco.co.uk

SCHEME:
Hochtief - Snowdonia VIP Tunnel

PLOT TITLE:
Garth Construction Compound
Water Sampling Location Plan

PLOT STATUS:	DATE:
FINAL	06-02-2023

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE AT A3:
RM	AW	AW	1:5000

PLOT NAME:	REVISION:
15055_Garth_Water_Sampling_Location_Plan	-

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ALS Laboratories (UK) Limited
Torrington Avenue
Coventry
CV4 9GU

T: +44 (0)24 7642 1213
F: +44 (0)24 7685 6575
www.alsenvironmental.co.uk

Mr Williams
Waterco Ltd
Lon Parcwr Business Park
Ruthin LL15 1NJ

03 February 2023

Test Report: COV/2425753/2023

Dear Mr Williams

Analysis of your sample(s) submitted on 13 January 2023 is now complete and we have pleasure in enclosing the appropriate test report(s).

An invoice for the analysis carried out will be sent under separate cover.

Should you have any queries regarding this report(s) or any part of our service, please contact Customer Services on +44 (0)24 7642 1213 who will be happy to discuss your requirements.

If you would like to arrange any further analysis, please contact Customer Services. To arrange container delivery or sample collection, please call the Couriers Department directly on 024 7685 6562.

Thank you for using ALS Laboratories (UK) Limited and we look forward to receiving your next samples.

Yours Sincerely,

Signed:

Name: A. Zunzunegui

Title: Organics Chemistry Manager

UKAS TESTING 1314

bsi ISO 14001 Environmental Management CERTIFIED EMS675527 ISO 45001 Occupational Health and Safety Management CERTIFIED OHS 542058

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

This communication has been sent to you by ALS Laboratories (UK) Limited. Registered in England and Wales. Registration No.02391955.
Registered Office: ALS Laboratories (UK) Limited, Torrington Avenue, Coventry, CV4 9GU.

Report Summary

ANALYSED BY

Mr Aled Williams
Waterco Ltd
Lon Parcwr Business Park
Ruthin
LL15 1NJ

Date of Issue: **27 January 2023**

Report Number: **COV/2425753/2023** Issue **1**

This issue replaces all previous issues

Job Description: Waterco Ltd

Job Location: Snowdonia VIP

Number of Samples included in this report **10**

Job Received: **13 January 2023**

Number of Test Results included in this report **207**

Analysis Commenced: **16 January 2023**

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

ALS Laboratories (UK) Limited was not responsible for sampling unless otherwise stated.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation. The results relate only to the items tested and where relevant sampled.
Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.
This test report is not a statement of conformity to any specification or standard.

This communication has been sent to you by ALS Laboratories (UK) Limited. Registered in England and Wales. Registration No. 02391955. Registered Office: ALS Laboratories (UK) Limited, Torrington Avenue, Coventry, CV4 9GU.
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Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412979**	Sample	**1** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Sample 1**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **13:45**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	6.9	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	177	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.4	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Solids, Total	123	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	19.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412979:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure.

{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412980**	Sample	**2** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Sample 2**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **13:50**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	381	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	34.2	ug/l	19/01/2023	N	Cov	WAS049
pH	6.7	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	260	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	5.82	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	5.7	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	5.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	2.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	3.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	209	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	19.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412980:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412981** Sample **3** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Garth Sample 3**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **14:00**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	26/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	26/01/2023	N	Cov	WAS049
Iron, Total as Fe	695	ug/l	26/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	26/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	26/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	26/01/2023	N	Cov	WAS049
pH	6.8	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	170	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	3.64	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.9	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	26/01/2023	N	Cov	WAS049
Total Suspended Solids	8.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	115	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	44.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412981:

ALS Laboratories (UK) Limited
Torrington Avenue, Coventry, CV4 9GU
Tel:+44 (0)24 7642 1213 Fax:+44 (0)24 7685 6575

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Copper Total as Cu, Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412982**	Sample	**4** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Sample 4**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **14:20**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	934	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	0.02	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	4.98	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	40.8	ug/l	19/01/2023	N	Cov	WAS049
pH	7.1	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	203	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	22.9	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	1.1	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	47.0	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	7.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	40.0	mg/l	18/01/2023	N	Cov	WAS006
BOD + ATU (5 day)	3	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	78.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	2000	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412982: This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

ANALYSED BY

Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412983**	Sample	**5** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Quarry Sample**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023** **14:50**		
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	6.6	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	37.6	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	1.62	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	<0.5	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	7.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	3.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	4.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	42	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	16.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412983: This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

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Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412984** Sample **6** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 1**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **15:30**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	3.02	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.7	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	63.2	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	1.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	1.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	<2.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	27	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	13.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412984:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

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Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412985** Sample **7** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 2**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **15:40**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.4	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	67.2	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	1.61	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	<0.5	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	6.00	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	1.00	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	5.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	50	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	2	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	14.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412985:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

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Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412986** Sample **8** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 3**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **15:50**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	3.37	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	5.9	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	69.0	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	<1.40	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	4.00	mg/l	17/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	2.00	mg/l	17/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	2.00	mg/l	17/01/2023	N	Cov	WAS006
Solids, Total	44	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	18.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412986:

This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
Analysed at: CHE = Chester(CH5 3US), COV = Coventry(CV4 9GU), OTT = Otterbourne(SO21 2RU), S = Subcontracted, TRB = Subcontracted to Trowbridge(BA14 0XD), WAK = Wakefield(WF5 9TG), F = Data supplied by customer.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

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Report Number: **COV/2425753/2023** Issue **1**

Laboratory Number: **22412987** Sample **9** of **10**

Sample Source: **Waterco Ltd**
Sample Point Description:
Sample Description: **Cilfor Sample 4**
Sample Matrix: **Not In Project**
Sample Date/Time: **11 January 2023** **16:00**
Sample Received: **13 January 2023**
Analysis Complete: **27 January 2023**

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	<230	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Mercury, Total as Hg	<0.01	ug/l	17/01/2023	N	Cov	WAS013
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	6.3	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	86.0	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	1.53	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	<0.41	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	0.6	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	Analyst Com	mg/l	24/01/2023	N	Cov	WAS006
Solids, Total	53	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	<1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	14.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412987:

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This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure.
It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

This issue replaces all previous issues
Accreditation Codes: Y = UKAS / ISO17025 Accredited, N = Not UKAS / ISO17025 Accredited, M = MCERTS.
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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

Certificate of Analysis

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Report Number:	**COV/2425753/2023**	Issue	**1**
Laboratory Number:	**22412988**	Sample	**10** of **10**
Sample Source:	**Waterco Ltd**		
Sample Point Description:			
Sample Description:	**Garth Lagoon**		
Sample Matrix:	**Not In Project**		
Sample Date/Time:	**11 January 2023**	**14:55**	
Sample Received:	**13 January 2023**		
Analysis Complete:	**27 January 2023**		

Test Description	Result	Units	Analysis Date	Accreditation		Method
Temperature at sampling, C	Analyst Com	Deg C	16/01/2023	N	F	FIELD
Cadmium , Total as Cd	<0.600	ug/l	19/01/2023	N	Cov	WAS049
Copper , Total as Cu	<9.00	ug/l	19/01/2023	N	Cov	WAS049
Iron, Total as Fe	895	ug/l	19/01/2023	N	Cov	WAS049
Lead , Total as Pb	<6.00	ug/l	19/01/2023	N	Cov	WAS049
Nickel , Total as Ni	<3.00	ug/l	19/01/2023	N	Cov	WAS049
Zinc , Total as Zn	<18.0	ug/l	19/01/2023	N	Cov	WAS049
pH	8.0	pH units	17/01/2023	N	Cov	WAS039
Conductivity- Electrical 20C	399	uS/cm	17/01/2023	N	Cov	WAS039
Turbidity	2.03	NTU	26/01/2023	N	Cov	WAS066
Ammoniacal Nitrogen as N	0.55	mg/l	17/01/2023	N	Cov	WAS036
Nitrogen, Total as N	3.2	mg/l	24/01/2023	N	Cov	WAS022
Phosphates , Total as P	<0.120	mg/l	19/01/2023	N	Cov	WAS049
Total Suspended Solids	20.0	mg/l	18/01/2023	N	Cov	WAS006
Suspended Solids 1hour Settle	18.0	mg/l	18/01/2023	N	Cov	WAS006
Settleable Solids 1hour Settle	2.00	mg/l	18/01/2023	N	Cov	WAS006
Solids, Total	283	mg/l	18/01/2023	N	Cov	WAS010
BOD + ATU (5 day)	1	mg/l	22/01/2023	N	Cov	WAS001
COD (Total)	15.0	mg/l	18/01/2023	N	Cov	WAS040
Salinity	<1600	mg/l	20/01/2023	N	Cov	WAS059

Analyst Comments for 22412988: This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

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For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered.
I/S=Insufficient sample For soil/sludge samples: AR=As received, DW=Dry weight.

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

ANALYST COMMENTS FOR REPORT COV/2425753/2023 Issue 1

This issue replaces all previous issues

Date of Issue: **27 January 2023**

Sample No	Analysis Comments
22412979	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure. {*/}
22412980	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412981	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Copper Total as Cu, Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412982	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412983	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412984	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412985	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412986	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412987	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}Unable to report for total suspended solids and 1 hour setled solids due to insufficient sample after quality check failure. It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}
22412988	This sample has been analysed for pH, Turbidity, BOD + ATU (5 day), COD (Total), Nitrogen, Total as N outside recommended stability times. It is therefore possible that the results provided may be compromised. No temp provided by client {/*}It was noted that the particulates within the sample settled on standing. The reported turbidity result was the maximum observed.{*/}

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

DETERMINAND COMMENTS FOR REPORT COV/2425753/2023

ISSUE 1

This issue replaces all previous issues

Date of Issue: 27 January 2023

Sample No	Description	Determinand	Comments

Signed: 

Name: **A. Zunzunegui** Date: **27 January 2023**

Title: **Organics Chemistry Manager**

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Appendix C – HRA

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Form Ref: W042-F-17.S-Letter-General Letter Format Ruthin

atmos CONSULTING

C0233-ATM-GES-ZZ-RP-X-0004

Technical Document

Snowdonia Visual Impact – Discharge and abstraction Consents

Habitats Regulations Assessment

Hochtief UK Ltd

February 2023

Contents

Tables

Figures

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Version	Date	Reason
P01	7th February 2023	Draft for client review

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1 Introduction

1.1 Terms of Reference

Atmos Consulting Ltd (Atmos) were commissioned by Hochtief UK Ltd (HUK) in October 2022 to provide ecological support in relation discharge consent being sought for four discharge locations at the Garth and Cilfor sites.

The Site is split over two locations, either side of the Dwyryd Estuary, located in Gwynedd, Wales. The first site is the Cilfor site, which is located just outside of Llandecwyn, within Snowdonia National Park. The second site is the Garth site and this is located just outside of Minffordd, within the jurisdiction of Gwynedd County Council. The works involve undergrounding an existing overhead line, and the two tunnel head houses are located in each of the sites above. Planning permission has been granted for the works on the Cilfor site by Snowdonia National Park Authority (Ref: NP5/77/336B) and by Gwynedd County Council (Ref: C20/0244/08/LL) on the Garth site.

There are four locations, one located within the Pen Llyn a`r Sarnau/ Lleyn Peninsula SAC and three which drain into existing watercourses, which are tributaries to the SAC. drain into. The works on the Garth side are in close proximity to Meirionnydd Oakwoods and Bat Sites SAC, with one point being within this SAC.

In Article 6(3) of the EC Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora – The Habitats Directive, any project or plan which is not directly connected with or necessary to the management of a European site but would be likely to have a significant effect either alone or in combination with other plans or projects shall be subject to an Appropriate Assessment of its implications for the European site in view of that site's conservation objectives. In light of the findings and subject to the provisions of Article 6(4) of the Habitats Directive, the Competent Authority shall agree to the plan or project only after ensuring that it will not affect the integrity of the European site. Whilst mitigation may be considered at the Appropriate Assessment stage it is not to be considered when initially screening the project in order to determine whether or not an Appropriate Assessment is needed.

Article 6(4) makes provision that if a negative assessment is made of the implications of the project on the site, and in the absence of other alternative solutions, the plan or project can go ahead for imperative reasons of overriding interest (IROPI) but that compensatory measures must be taken to ensure that the overall coherence of the site is protected/maintained. A distinction is to be drawn between mitigation and compensation.

Since this is a project, as defined by the Habitats Directive, and transposed into English and Welsh law in The Conservation of Habitats and Species Regulations (2017), which is not directly connected with or necessary to the management of the Lleyn Peninsula and the Sarnau SAC, and Meirionnydd Oakwoods and Bat Sites SAC, then a Habitats Regulations Assessment (HRA) will be required. This will be carried out by the Competent Authority, advised by the Statutory Nature Conservation Body. Although the United Kingdom has now left the European Union, the requirement has been transposed over into English and Welsh law as part of the departure arrangements and so it is still necessary to be carried out.

Hochtief UK Ltd has commissioned Atmos Consulting to prepare the HRA on the behalf of National Grid. This report should be read in conjunction with the Fish Habitat Assessment (Atmos ref: c0233-ATM-GES-ZZ-RP-X0005) which was undertaken alongside the HRA to inform the assessment.

1.2 Objectives of this Report

The purpose of this report, which has been commissioned by Hochtief UK Ltd and National Grid is to carry out a HRA, for discussion with the statutory nature conservation advisor, Natural Resources Wales and to fulfil National Grid's legal requirement to carry out an HRA. To do this, a two-stage assessment will be carried out:

- Screening – the determination of whether there is a likely significant effect (LSE) on the qualifying features of the SACs; and
- Appropriate assessment (only if a likely significant effect is identified).
- The appropriate assessment assesses the LSE to determine the scale of the effect and if it could adversely affect the integrity of the site. This is done by assessing the potential impacts against the conservation objectives of the SACs to determine if the conservation objectives can be maintained in light of the project going ahead.

1.3 Proposed works

The proposed works are in addition to the works granted in the aforementioned planning applications.

Site Location

There are four locations in total, two on the Garth side, and two on the Cilfor side. Table 1 below includes grid references for these locations, and they are illustrated in Figure 1 & 2.

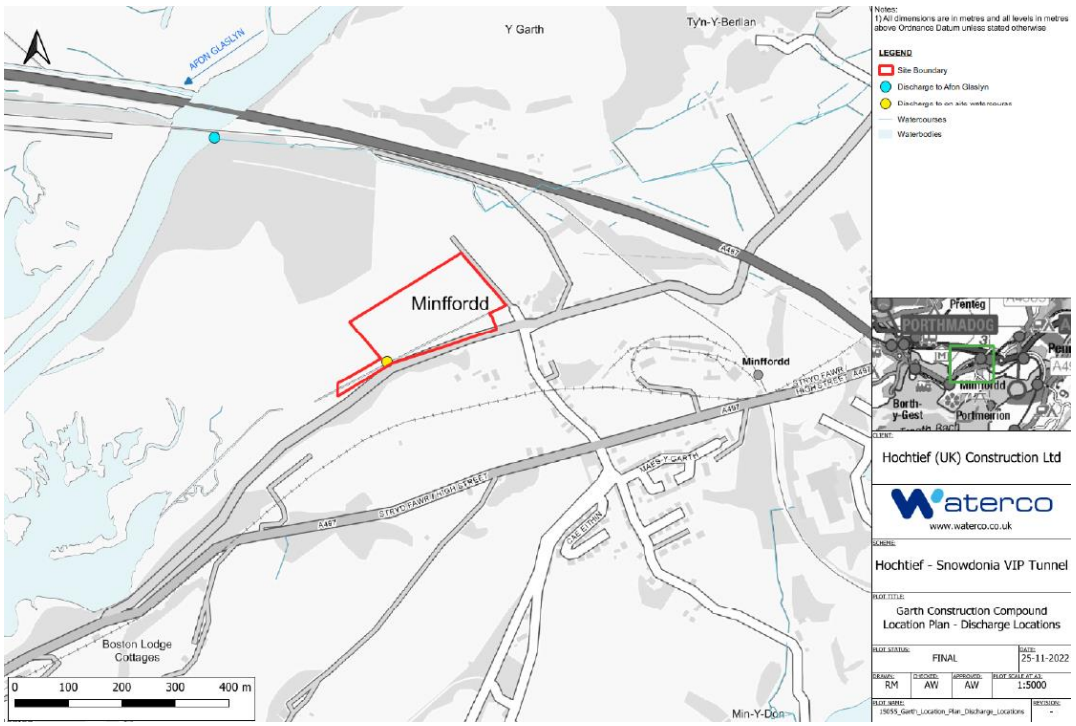
Table 1: Discharge/Abstraction Location Points

Location	Grid Reference	Proximity to designated site
Point 1 – Cilfor, discharge	SH6225337816	0.9 km from Oakwood Bat SAC and 0.4 km from Lleyn Peninsula SAC.
Point 2 – Cilfor, abstraction/discharge	SH61813788	1.6 km from Oakwood Bat SAC and within Lleyn Peninsula SAC.
Point 3 – Garth, discharge	SH59243857	0.1 km from Oakwood Bat SAC and 1.1 km from Lleyn Peninsula SAC.
Point 4 – Garth, abstraction/discharge	SH58963902	Within Oakwood Bat SAC and 1.3 km from Lleyn Peninsula SAC.

Nature of Works

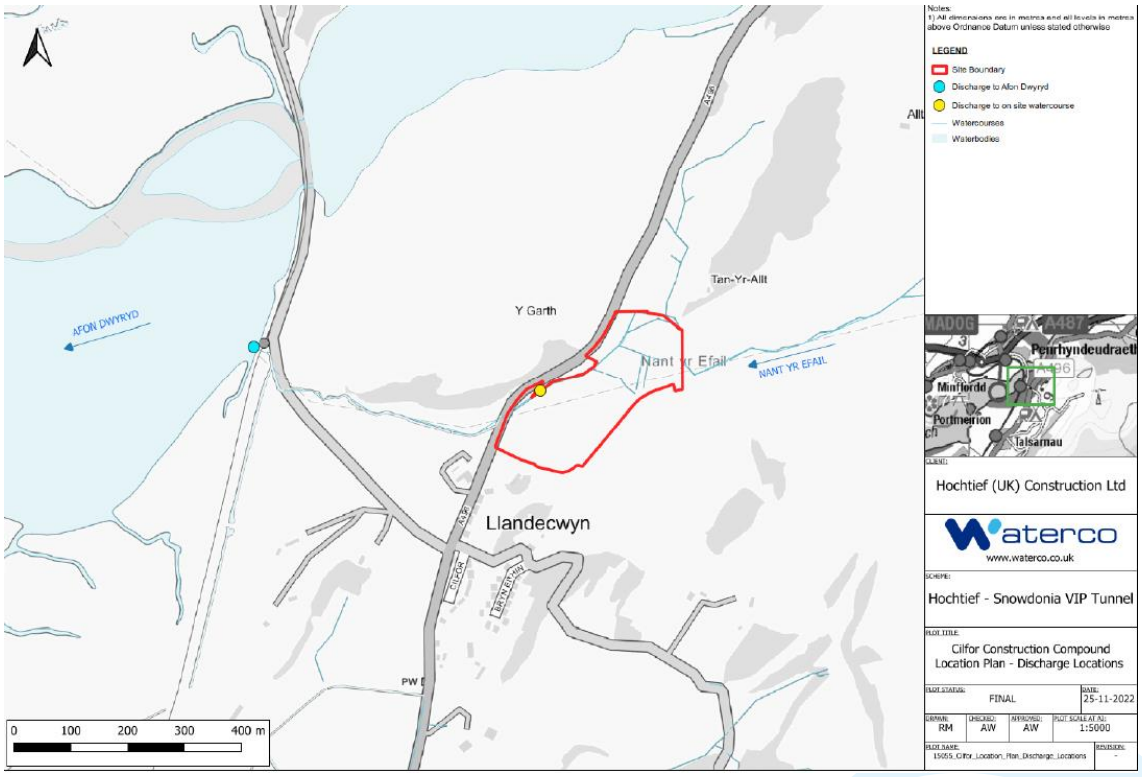
There are four points in total, with two discharge points located within ditches on site, one in Garth and one in Cilfor, shown as yellow dots in Figure 1 & 2 below. The remaining two points, which will be used for abstraction and discharge purposes, are located in Afon Glaslyn and Afon Dwyryd, shown as blue dots also in Figures 1 & 2.

Figure 1



Source: Waterco Ref 15055_Garth_Location_Plan_Discharge_Locations

Figure 2



Source: Waterco Ref 15055_Cilfor_Location_Plan_Discharge_Locations

Discharge;

- Is of saline process water encountered during tunnelling and/or launch pit/shaft excavation works for Garth and Cilfor sites;
- Up to 400m3/day of water will be abstracted from each construction sites' excavations at Cilfor and Garth; and
- The maximum discharge rate will be 20m3/hr for most of the tunnel bore. 60m3/hr treatment plant capacity for clay rich geology.

Abstraction;

- The volume of fresh water required to operate the Tunnel Boring Machine (TBM) will vary depending on the geology being excavated. Most of the time during the tunnelling work 100m3/day will need to be supplied for the TBM's operation. The peak flow required is expected to be up to 500m3/day.

Treatment processes

A Slurry Treatment Plant (STP) will dewater TBM excavated material and recycle the recovered water back to the TBM.

Timescales

Works are due to commence in June 2023 and completed by December 2026.

2 Statutory Designations

All abstraction and discharge locations are situated within watercourses that directly drain into the estuary and therefore enter the Lleyn Peninsula and the Sarnau SAC. Point 2 on the Cilfor side is located within this SAC.

Point 4 on the Garth side is located within the Meirionnydd Oakwoods and Bat Sites SAC and points 1, 3 and 4 are within 1.5 km of this SAC.

Due to the works taking place in or near these designated sites, before works can commence, SSSI Assent will be sought, and a Habitats Regulations Assessment (HRA) submitted to NRW.

2.1 Lleyn Peninsula and the Sarnau SAC

The Pen Llyn a`r Sarnau/ Lleyn Peninsula SAC encompasses 146,010 ha of sea, coast and estuary that support a wide range of marine habitats and species. It has been selected as an SAC for the presence of nine marine habitat types and associated species (Habitats Directive Annex I habitat types) and three mammal species (Habitats Directive Annex II species). Annex I habitats that are a primary reason for selection of this site is considered to be one of the best areas in the UK for:

- Reefs
- Large shallow inlets and bays
- Sandbanks which are slightly covered by seawater all the time
- Estuaries
- Coastal lagoons

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Mudflats and sandflats not covered by seawater at low tide
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- *Salicornia* and other annuals colonising mud and sand
- Submerged and partially submerged sea caves

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Grey seal *Halichoerus grypus*
- Bottlenose dolphin *Tursiops truncatus*
- Otter *Lutra lutra*

These features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations. A number of the habitats and species listed within the SAC are also listed in the Section 7 list of habitats and Species of Principal Importance (SPI) in Wales (Environment (Wales) Act, 2016) and in the OSPAR List of Threatened and/or Declining Species and Habitats.

2.2 Meirionnydd Oakwoods and Bat Sites SAC

The Meirionnydd Oakwoods and Bat Sites SAC comprises 2,812 ha of various woodlands and heaths that support a wide range of habitats and species. It has been selected as

an SAC for the presence of seven habitat types and associated species (Habitats Directive Annex I habitat types) and one mammal species (Habitats Directive Annex II species). Annex I habitats that are a primary reason for selection of this site is:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- Northern Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- *Tilio-Acerion* forests of slopes, screes and ravines
- Bog woodland

Annex II species that are a primary reason for selection of this site:

- Lesser horseshoe bat *Rhinolophus hipposideros*

Conservation Objectives

The conservation objectives for the Pen Llyn a`r Sarnau/ Lleyn Peninsula SAC and Meirionnydd Oakwoods and Bat Sites SAC (Countryside Council for Wales, 2009) are listed below.

To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status.

- Range- The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.
- Structure and function: The physical, biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded.
- Typical species- The presence, abundance, condition and diversity of typical species are such that habitat quality is not degraded.

3 Stage 1- Screening

In the first stage of HRA, a project is screened to establish if there will be a likely significant effect, either alone or in combination with other proposals/projects with potential to have an effect upon the SACs. In reaching this conclusion it is settled law that a precautionary approach should be taken to this assessment and that an LSE should be assumed unless the risk can be excluded. Essentially, this test of likely significant effect (LSE) determines whether the second stage of the process, Appropriate Assessment (AA) is required. Where no LSE is identified, then AA is not required; conversely, where LSE is identified, then AA is required to determine if there will be adverse impacts which would prevent the conservation objectives from being met and therefore the integrity of the European site being adversely affected.

3.1 Data Obtained to inform this Assessment

As part of a Fish Habitat Assessment (FHA), the watercourses in the areas, and their suitability to support protected and notable species was assessed (Atmos ref: C0233-ATM-GES-ZZ-RP-X-0004).

There are four points, with point 2 being located within the Lleyn Peninsula and the Sarnau SAC and point 4 being within the Meirionnydd Oakwoods and Bat Sites SAC. All four points are within close proximity to both SACs.

Point 1 is located within the ditch on the western boundary of the Cilfor site. The ditch was heavily vegetated at the time of the survey with goat willow *Salix caprea* gorse *Ulex europaeus*, common reeds *Phragmites australis* and soft rush *Juncus effusus*.

Point 2 was surveyed from the station platform due to lack of access to this area. It is situated within the salt marsh in the SAC. The ditch up stream lies within an improved grassland grazed by sheep, species included perennial rye grass *Lolium perenne*, red fescue Festuca rubra and soft rush. The ditch held water at the time of the survey and the banks had recently been cut. Species on the ditch banks included common reeds, bramble *Rubus fruticosus*, gorse, bracken *Pteridium aquilinum* and goat willow.

Point 3 is on the western boundary of the Garth site. This discharge point lies within a densely vegetated ditch, species include bramble, perennial rye grass and cow parsley *Anthriscus sylvestris*. The surrounding fields are improved grassland used for grazing. The sward was short at the time of the survey with species such as perennial rye grass and ribwort plantain *Plantago lanceolata*.

Point 4 again was not accessible by foot, so the survey was carried out from the bridge. The abstraction/discharge point is situated on the eastern banks of Afon Glaslyn. It is within an area of trees which then leads to the salt marsh further south.

Data previously obtained from Cofnod, Local Environmental Records Centres (LERC) Wales was used. The highest number of otter records are around point 2 and point 4. There are records of otters at point 3, but these records are located further downstream. The nearest record to point 2 is located approximately 0.2 km south of the discharge point and dating from 2017. There is a record at point 4 dating from 2018. There are several records of spraints and feeding remains within this area. There is a record of a grey seal *Halichoerus grypus* located on the adjacent western bank of Afon

Glaslyn. Otter and grey seal are an Annex II species present as a qualifying feature of Lleyn Peninsula and the Sarnau SAC, but not a primary reason for site selection.

The nearest record of lesser horseshoe bat was located 0.15 km north of point 3 dating from 2018. The other records of the species were concentrated in the Gwaith Powdwr Nature Reserve located 0.75 km north of point 2. Lesser horseshoe bat is an Annex II species present as a qualifying feature of Meirionnydd Oakwoods and Bat Sites SAC, but not a primary reason for site selection.

3.2 Proposed Construction Works

The proposed works involves the discharge and abstraction of water. They are described in section 1.3. All four points are linked to Atlantic Salt Meadows, a habitat which is listed under the designated features within the Lleyn Peninsula and the Sarnau SAC. The habitat at point 2 is considered saltmarsh, but species identification was not possible due to access restraints.

The locations are not situated within any of the habitats listed under the designated features of the Meirionnydd Oakwoods and Bat Sites SAC.

3.2.1 Lleyn Peninsula and the Sarnau SAC

All four points are either located within the SAC or are directly connected and are located in proximity to Atlantic salt meadows.

The following features of the SAC do not occur in direct proximity to the discharge and abstraction points and they are sufficiently far enough away from the areas that it is considered there is no mechanism for a likely significant effect:

- Reefs
- Large shallow inlets and bays
- Sandbanks which are slightly covered by seawater all the time
- Coastal lagoons
- Submerged or partially submerged sea caves
- Salicornia and other annuals colonising mud and sand features
- Bottlenose dolphin *Tursiops truncates*

The following features of the SAC are within a distance of the points that there is a potential for a likely significantly effect:

- Atlantic salt-meadows
- Estuaries
- Otter *Lutra lutra*
- Grey seal *Halichoerus grypus*

Connectivity and Impact Pathways

As set out in Section 1.3, the proposed works involves discharge and abstraction points within existing watercourses in and near the SAC, therefore, habitats and species listed above could be affected by the works. There will be no habitat loss to the saltmarsh and the main potential impacts are pollution and sedimentation. There is potential for scouring of the riverbeds during discharge over and extended period of time, causing erosion of the habitats within the SAC. Otters may also frequent the watercourses for the discharge points and grey seal may be present at the Garth abstraction/discharge

point, without mitigation, actions could affect the species which could be part of the SAC population.

As a result, there is a finding of likely significant effect on features of the SAC, at all four points, in the absence of mitigation, and therefore AA is required in order to establish whether proposed works would have an adverse impact such that the integrity of the SAC could not be maintained and if so whether appropriate mitigation can be developed which would allow the integrity of the SAC to be maintained.

Meirionnydd Oakwoods and Bat Sites SAC

The Garth abstraction/discharge point is located within the SAC and does not support habitats for which the SAC is designated, nor could the species for which the SAC is designated be present. There is potential that the Annex II species lesser horseshoe bat may use the area for foraging as it is present in the wider area.

Disturbance

As set out in Section 1.3, all works to install the discharge and abstraction equipment, as well as monitoring, will take place during daylight hours. There will be no artificial lighting at the points.

Once installed, there will be minimal works at the points and no habitat loss. The points are in a relatively small, localised area compared to the extent of the SAC. Given the works are not likely to affect any terrestrial habitat, it is not considered to indirectly affect lesser horseshoe bats which may be utilising the woodland and surrounding habitats for foraging or roosting.

Disturbance effects on lesser horseshoe bats are therefore not considered to be significant.

There will be no adverse effects on site integrity for Meirionnydd Oakwoods and Bat Sites SAC. As a result, no further mitigation measures or appropriate assessment are required.

4 Stage 2 – Appropriate Assessment

Given that an LSE has been determined due to the effects of actions taken within the Lleyn Peninsula and the Sarnau SAC to features indirectly linked to it, AA is required to determine if there is a potential adverse impact on the SAC, and if so whether it can be mitigated so as to avoid any such effect. In particular, an assessment must be made as to whether as a result of the works, without mitigation, the effects on the habitat feature are such that the conservation objectives could no longer be met/upheld.

4.1 Current Use of the Area

Point 1 is located at the Cilfor site and has recently been subject to reptile trapping. The area is also grazed by a small number of sheep. Point 2 is located within the Lleyn Peninsula and the Sarnau SAC and during the drier months, is grazed by sheep. Point 3 is located within a ditch downstream from the Garth compound, the surrounding area is used for grazing. Point 4 is located on the bank of the Afon Glaslyn, south of the train line and the area is not currently in use.

4.1.1 Atlantic salt meadows

Baseline

Atlantic salt meadows develop when halophytic vegetation colonises soft intertidal sediments of mud and sand in areas protected from strong wave action. This vegetation forms the middle and upper reaches of saltmarshes, where tidal inundation still occurs but with decreasing frequency and duration. A wide range of community types is represented, and the saltmarshes can cover large areas, especially where there has been little or no enclosure on the landward side. The vegetation varies with climate and the frequency and duration of tidal inundation. Grazing by domestic livestock is particularly significant in determining the structure and species composition of the habitat type and in determining its relative value for plants, for invertebrates and for wintering or breeding waterfowl.

Likely Effects on Qualifying Feature

This habitat is situated at point 2 and functionally linked to the remaining points. There will be no habitat loss and the risk to this feature is from pollution, sedimentation and other materials that would affect the water quality and would have an effect on the integrity of the SAC in the short term. The salinity levels of the water to be discharged is unknown, there is likely to be a local effect on the habitat at discharge point 2 dependant on salinity levels.

4.1.2 Estuaries

Baseline

Pen Llyn a'r Sarnau has representative examples of bar-built estuaries in north-west Wales, and includes the Glaslyn/Dwyryd, Mawddach and Dyfi estuaries. There is a continuous gradient between the clean sands near the entrance to the sea and the mud or muddy sands in the sheltered extremes of the estuaries. The intertidal sandflats

support communities of burrowing invertebrates, including dense populations of polychaete worms, crustaceans, bivalve molluscs and gastropod molluscs. Saltmarsh fringing the shores of the estuaries, and the saltmarsh creeks and pools, are important habitat features for juvenile fish. Again, dependant of the salinity levels, there is a potential for the estuarine habitats to become damaged.

Likely Effects on Primary Feature

Each point is directly or indirectly linked to this feature. There would be no habitat loss but there is potential to damage to the estuary in the form of scouring of the riverbeds during discharge of water. Other effects to this primary feature would be pollution, sedimentation and release of other materials into the estuary. Both events would have an effect on the integrity of the SAC in the short term.

4.1.3 Otter

Baseline

The highest number of otter records are around point 2 and point 4. There are records of otters at point 3, but these records are located further downstream. The nearest record to point 2 is located approximately 0.2 km south of the discharge point and dating from 2017. There is a record at point 4 dating from 2018. There are several records of spraints and feeding remains within this area. The ditches near each point are not considered suitable for otter holts, and there was no evidence of otter recorded during the survey. It is considered that the species may range through the areas, as they are present in the wider landscape.

Effects on Qualifying Feature

It is not deemed likely that otter holts will be present in the immediate surroundings of the points. Being highly mobile nocturnal animals, individuals could become injured or entrapped in the discharge/abstraction machinery at night or could suffer indirectly through pollution going into the watercourse. Point 2 lies adjacent to an active rail line, if present, they will be habituated to trains and disturbance during the daytime. Points 1, 3 and 4 are subject to less disturbance. Any effects on fish could also indirectly affect the otter population through food availability. It is therefore considered that without mitigation there will be a likely significant effect on otters based on disturbance to ranging otters or pollution.

4.1.4 Grey seal

Baseline

The south-west Wales population is the most southerly in Europe of any significant size and is relatively isolated from those elsewhere in the UK. It forms around 4% of the UK population or about 3.5% European population. This sub-population or stock is centred on the west Pembrokeshire coast. The grey seals of the Pen Llŷn a'r Sarnau SAC may be part of the west Wales breeding population. Grey seals present within the SAC at any one time are thought to be a part of a wider North Wales population. It is not known at present to what extent they form a discrete colony as part of the larger assemblage of seals found in Pembrokeshire (and whether this assemblage is a discrete Welsh

population), or whether they form part of a larger population, for example distributed throughout the Irish Sea. There arev seal records adjacent to point 2 dating from 2011 and adjacent to point 4 dating from 2008.

Effects on Qualifying Feature

The points and the surrounding areas do not support breeding seal, but it likely they range into the area to forage with North Wales's largest breeding colony at Bardsey Island being located 50 km west. The works are not likely due to disturb the species as the points are situated within areas with regular human disturbance. Any pollution has the potential to cause ill-health and release of sedimentation has the potential to effect food resources. It is therefore considered that without mitigation there will be a likely significant effect on grey seal based on pollution.

4.2 Assessment of effects

A summary of the impacts of the works against the Conservation Objectives is provided in Table 2.

Table 2: Assessment of effects on Conservation Objectives

Attribute	Specified Limit	Predicted Effects from Proposed Works
Feature 1 & 2: Atlantic salt meadows and Estuaries		
Range	For estuaries this includes the stability of sandy sediments in proportion to the muddy sediments.	There will be no overall loss of habitat, however the points are directly or indirectly linked to these features. There could be damage to the habitats dependant on if there are significant variations to the base line salinity levels. It is worth noting that scouring could wash away estuary habitat at Cilfor site. Scour boards will be in place but flow over an extended period could lead to some habitat being lost.
Structure and Function	This includes a need for nutrient levels in the water column and sediments to be: • at or below existing statutory guideline concentrations • within ranges that are not potentially detrimental to the long-term maintenance of the features species populations, their abundance and range. Contaminant levels in the water column and sediments derived from human activity to be: • at or below existing statutory guideline concentrations • below levels that would potentially result in increase in contaminant concentrations within sediments or biota • below levels potentially detrimental to the long-term maintenance of the features	If sediments or pollution were to be released into the estuary it could potentially cause a change in nutrient levels, contaminating the water and having a negative impact on species present.

Attribute	Specified Limit	Predicted Effects from Proposed Works
	species populations, their abundance or range. For Atlantic salt meadows this includes the morphology of the saltmarsh creeks and pans	
Typical Species	As part of this objective, it should be noted that: • populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve maximum sustainable yield and secure in the long term • the management and control of activities or operations likely to adversely affect the habitat feature, is appropriate for maintaining it in favourable condition and is secure in the long term.	As mentioned above, is sediment or pollution is released into the estuary it could adversely affect the species present. Dependant on salinity levels, there may be an effect on species.
Feature 3 & 4: Otter and Grey seal		
Populations	As part of this objective, it should be noted that: • for otter and grey seal; contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression; and grey seal populations should not be reduced as a consequence of human activity	If the works resulted in the death of an otter, this would affect their population. Pollution has the potential to affect otter and grey seal food source and therefore negatively affect the population. Increase in human activity will be short-term primarily during installation and sporadically for maintenance. Each area is currently subject to varying levels of human disturbance.
Range	The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. As part of this objective, it should be noted that for otter and grey seal • Their range within the SAC and adjacent inter-connected areas is not constrained or hindered • There are appropriate and sufficient food resources within the SAC and beyond the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing	The works will not reduce the otter's or grey seals range nor introduce any permanent barriers that would change the way in which effects to their movement. Machinery and associated pipework will be installed along areas that will not impact ranging otters.
Supporting Habitats and Species	As part of this objective, it should be noted that; • The abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term. • The management and control of activities or operations likely to adversely affect the species	Otter holts have not been found in and around the working area, but they are known to pass through. The works will not affect the availability of food resources for otter's and grey seal.

Attribute	Specified Limit	Predicted Effects from Proposed Works
	feature, is appropriate for maintaining it in favourable condition and is secure in the long term. • Contamination of potential prey species should be below concentrations potentially harmful to their physiological health. • Disturbance by human activity is below levels that suppress reproductive success, physiological health or long-term behaviour • For otter there are sufficient sources within the SAC and beyond of high-quality freshwater for drinking and bathing.	

The review of the Conservation Objectives for the SAC has identified that there is the potential for features of the SAC to be affected and therefore would adversely impact the integrity of the SAC.

Given the sensitivity of the area, a review of mitigation which would be undertaken, including that designed into the works from an early stage has been provided in section 4.5.

4.3 In-combination effects

A HRA (Ref: C0233-ATM-GES-ZZ-RP-X-0003) for ground investigation works adjacent to the SAC has been submitted to NRW. The ground investigation works has the potential to cause pollution and sedimentation to the SAC and appropriate mitigation measures are in place. The ground investigation works will take place well in advance of any discharge/abstraction and therefore no in-combination effects are considered.

A search of the Gwynedd County Council and Snowdonia National Park Authority Planning Portal was carried out on 16th January 2023 to search for planning applications in the vicinity of the discharge/abstraction points. There were no pending planning applications on or adjacent to the points, upstream or downstream or the nearby surrounding area that are of a similar nature to these works. As such, there are not known to be any other works taking place on this area during this time, therefore no in-combination effects are considered.

4.4 Conclusions

Without mitigation the works will have an effect on the integrity of the SAC. As set out in Table 1, potential LSE are identified on features 1, 2, 3 and 4.

Mitigation is therefore required to reduce these LSE, as set out below.

4.5 Mitigation

Mitigation is required in order to pass the appropriate assessment as the work will be occurring within sensitive habitats where there would otherwise be direct and indirect effects on the primary and qualifying features. The following mitigation measures are incorporated into the proposals:

- All machinery and associated pipework will be installed along areas that will not impact ranging otters.
- Outfall pipe and scour boards will be installed to prevent scouring of the riverbanks. The discharge points will be regularly monitored, with scouring boards moved or extended if any scouring takes place.
- Treatment processes specified in Section 1.3 will be used to minimise any release of pollution, sedimentation or other materials into the SAC.
- The pH value of the discharge range will be 6 – 9 range, with a target of 6.9 – 7.5.
- Discrete spills of oils or grease within the tunnel will be collected using spill kits and then disposed of as hazardous solid waste.

Treatment processes

A Slurry Treatment Plant (STP) will dewater TBM excavated material and recycle the recovered water back to the TBM. The STP will include the following sequence of treatment processes:

- Screens for the physical separation of large solids from water;
- Cyclonic separation for the mechanical separation of fine solids from water;
- Flocculation sedimentation for the chemically enhanced settlement of fine solids;
- pH adjustment using carbon dioxide gas injection; - filter press for the dewatering of wastewater sludges.

Treated water from the STP will be recycled back to the TBM. Excess water not used by the TBM will pass to onsite settlement lagoons. The water in the lagoons will be available for reuse on site and or will be discharged off site following further water treatment.

Water from the lagoons to be discharged off site will be treated in a wastewater treatment plant prior to discharge. It is proposed to use a package water treatment plant supplied by Siltbuster Ltd. The Siltbuster wastewater treatment plant (Siltbuster WWTP) will include the following water treatment processes:

- Flow chamber to measure flow rate into the treatment plant;
- Coagulant dosing pump (flow proportional mixing of Poly Aluminium Chloride);
- Flocculant addition and mixing (Anionic Flocculent);
- pH monitoring and CO2 addition;
- tilted plate separator;
- pH monitoring caustic soda (NaHO) addition (peat geology or pyrite excavation); and
- treated water quality: flow out, pH turbidity

5 Conclusions

A HRA has been carried out for the discharge and abstracted points at Cilfor and Garth. This went through the following stages:

- Stage 1 – the project was screened and a likely significant effect was identified for the proposed works;
- Stage 2 – a Appropriate Assessment was carried out which assessed features of the SAC within and immediately adjacent to the working areas. This showed that the habitats and species present would be significantly affected and that the conservation objectives of the SAC would not be maintained if the works went ahead without mitigation.
- Mitigation was introduced and has considered all the LSE anticipated on the primary and qualifying features and are reduced such that there is not anticipated to be any effects from the work on the integrity of the SAC, therefore, following the implementation of mitigation, the works pass appropriate assessment;

As a result, the HRA has shown that work can proceed without affecting the integrity of the Pen Llyn a`r Sarnau/ Llyn Peninsula and the Sarnau SAC and the Meirionnydd Oakwoods and Bat Sites SAC. Appropriate good working practices are to be put in place to minimise damage to habitats and minimise disruption of the typical species found within the SAC during the proposed works.