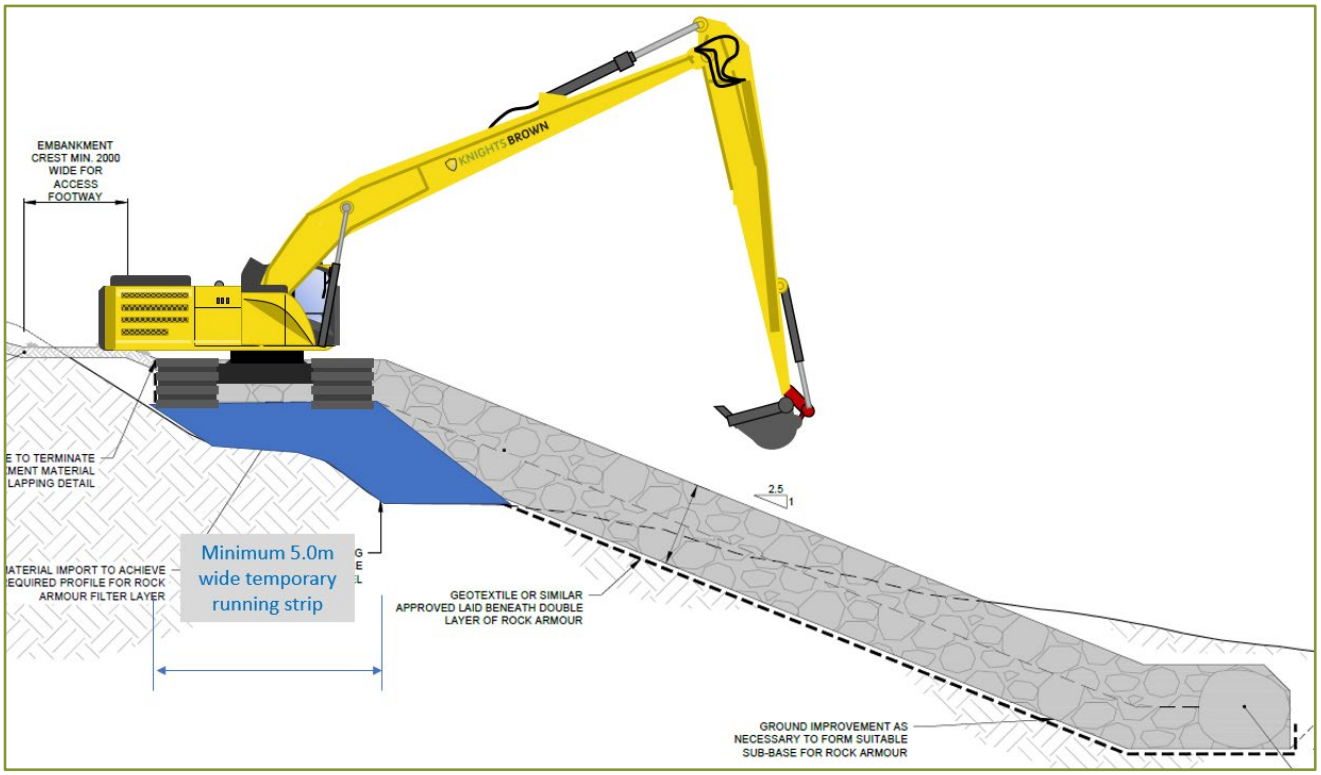
1. Construction Sequencing

Our proposed construction sequence is indicated on the outline programme T9014/ECI/01 which is included as an appendix.

AREA 1

Location 12 – Drawing nr 003/S2/P01

For this section we propose to work from three points of access as indicated within our response to Q5. However, the critical path will be dictated by the supply of blockstone. The basic sequence of works will be to install temporary access track into the works up to approximate midpoint between access points and then to construct the permanent works on the way out.



Our proposed construction sequence would be

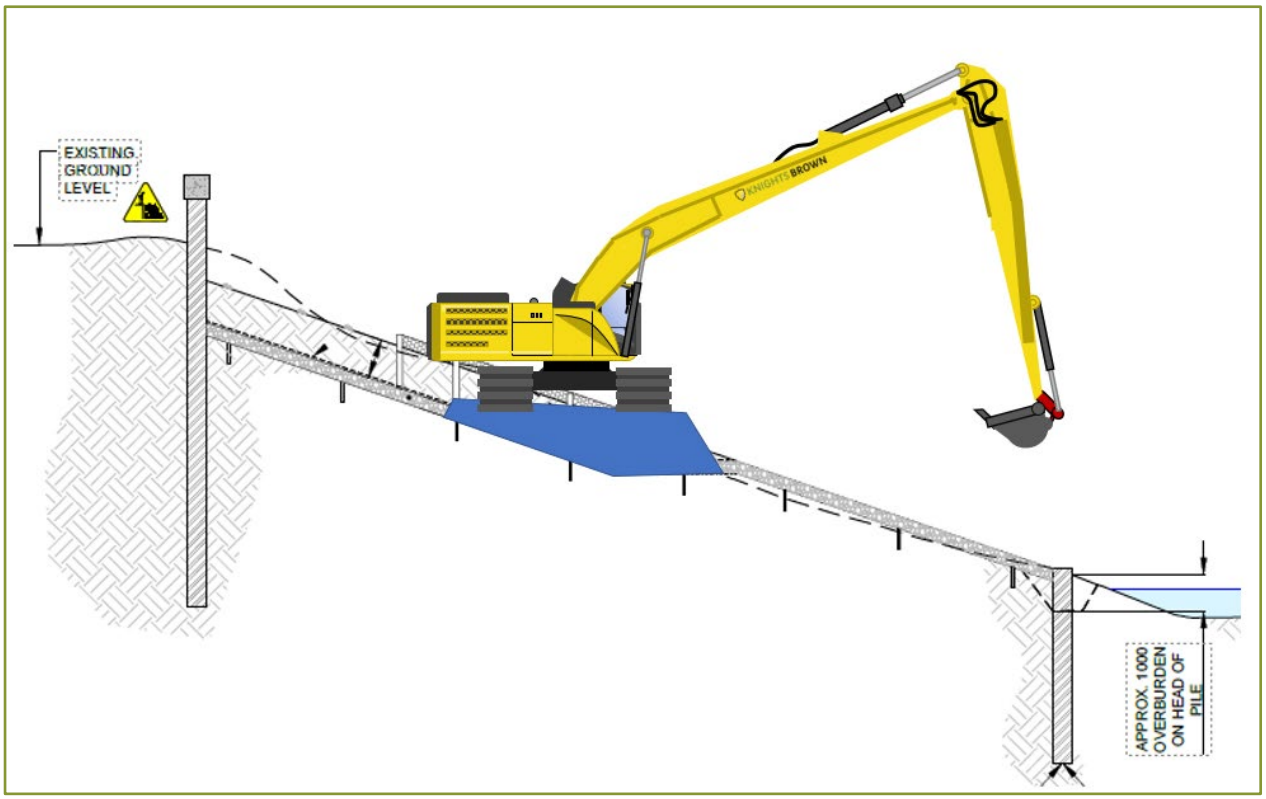
1. Stockpile rock armour
2. Carry out initial excavation to form the crest
3. Install geotextile and sufficient depth of stone along the length crest to provide a running surface / access track for plant movement
4. This will be constructed in line with permanent construction specification but used as temporary access platform.
5. Thereby most of the temporary imported stone will be reused within the permanent works.
6. Construct embankment using long reach excavator situated on crest .
7. Complete crest construction
8. Install embankment fill / topsoil

Location 22 – Drawing nr 005/S2/P01

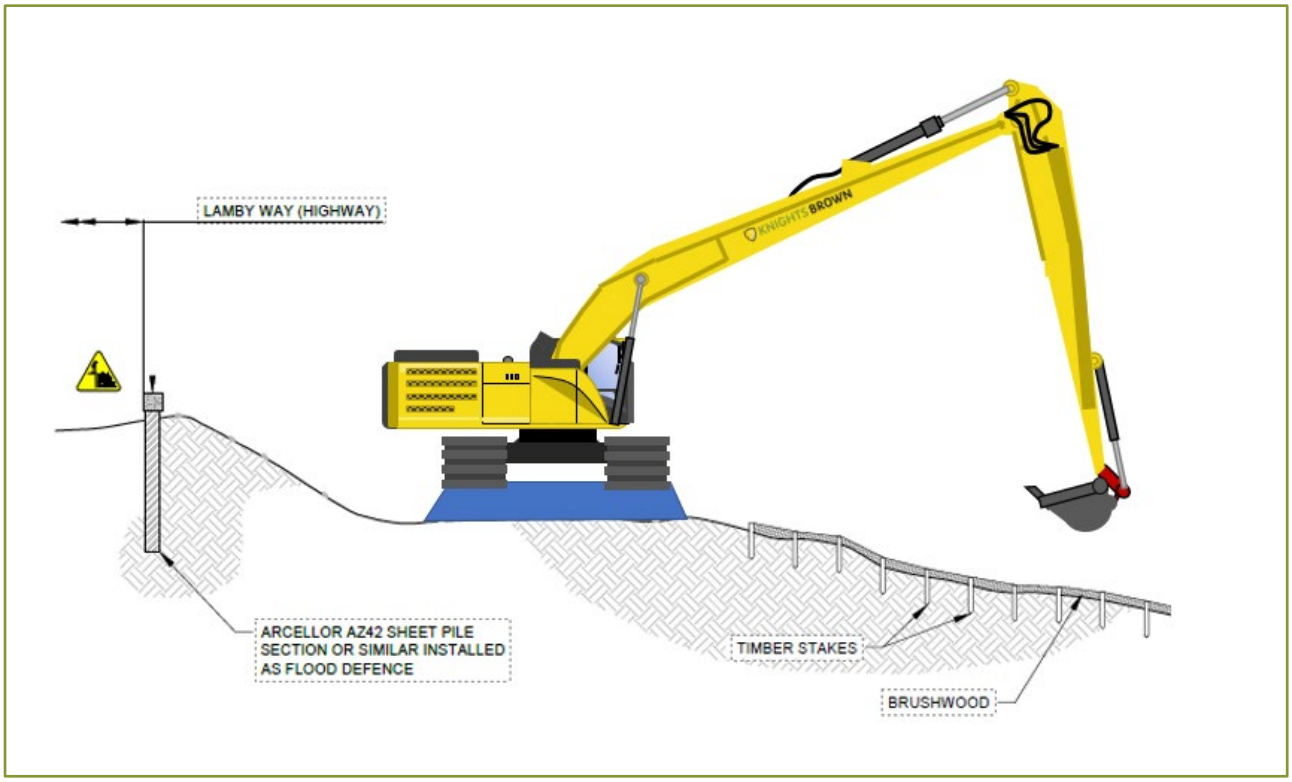
Our high level construction sequence would be

1. Carry out initial excavation to form benches
2. Install geotextile and sufficient depth of stone along the width of the embankment to provide a running surface / access track for plant movement
3. Construct embankment fill in layers.
4. Complete topsoil

Location 32– Drawing nr 007/S2/P01



1. Carry out initial excavation to provide access to mid platform level
2. Install geotextile and sufficient temporary stone along the width of this section to provide a running surface / access track for plant movement
3. Install sheet piles along line of top of embankment – adjacent to highway
   NB:- this will require lane 1 closure on the roundabout and highway and will therefore be carried out off-peak.
4. Install sheet piles along toe level
5. Complete excavation and Install scour protection from line of piles to mid-level platform.
6. Complete installation of scour protection
7. Construct embankment fill in over scour protection
8. Install timber stakes 7 brushwood



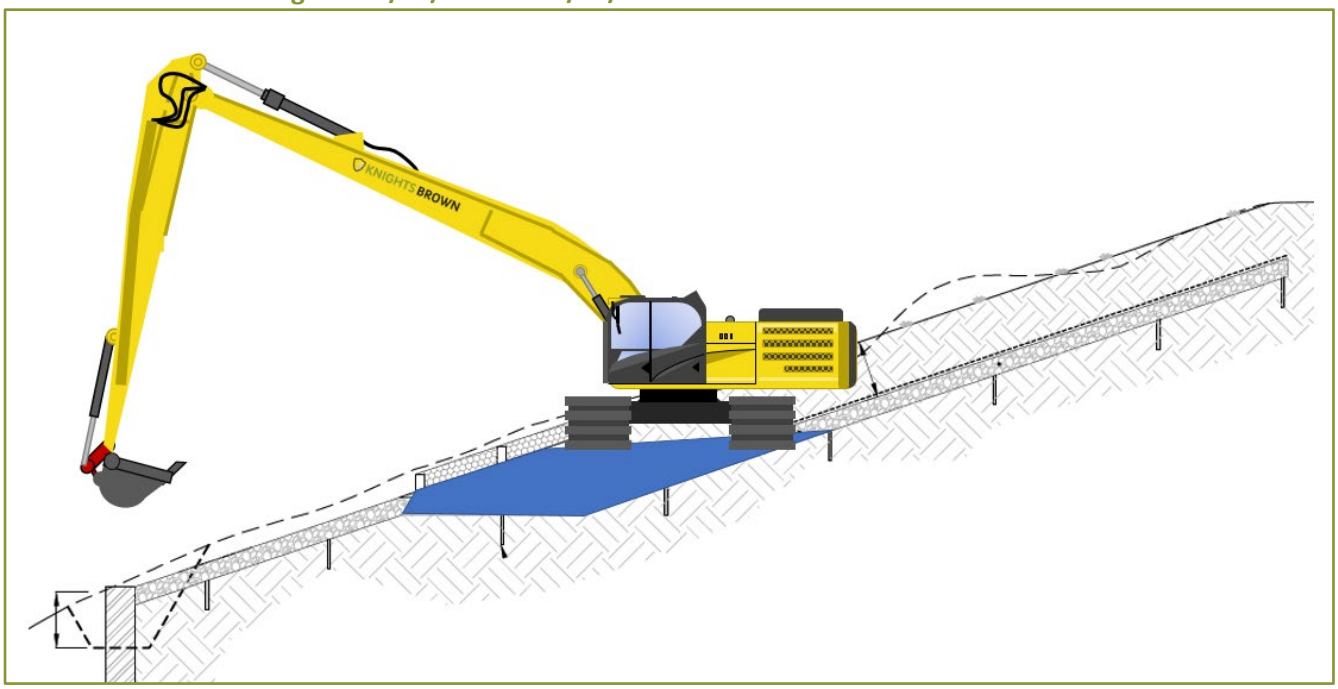
AREA 2

Location 11 – Drawing nr 002/S2/P01

Our proposed construction sequence would mirror that for Location 12 above as follows: -

1. Stockpile rock armour
2. Carry out initial excavation to form the crest
3. Install geotextile and sufficient depth of stone along the length crest to provide a running surface / access track for plant.
4. This will be constructed in line with permanent construction specification but used as temporary access platform.
5. Thereby most imported stone will be reused within the permanent works.
6. Construct embankment using long reach excavator situated on crest .
7. Complete crest construction
8. Install / tie in topsoil

Location 21 & 31 – Drawing nr 004/S2/P01 & 006/S2/P0



Our high level construction sequence would be as follows, this applies equally to both Locations 21 and 31

1. Carry out initial excavation to provide access to mid platform level
2. Install geotextile and sufficient temporary stone along the width of this section to provide a running surface / access track for plant movement
3. Install sheet piles along line of toe
4. Install scour protection from line of piles to mid-level platform.
5. Complete installation of scour protection
6. Construct embankment fill in over scour protection
7. Install timber stakes 7 brushwood

AREA 3

Location 42 & 52– Drawing nr 008/S2/P01 & 009/S2/P01

Works to these areas will be carried out concurrently since we propose to use a single point of access off Lamby Way. We propose to work our way in using the permanent works of Location 42 to provide access to Location 52. We will then construct the work at Location 52 and then complete the works working back towards Lamby way.

1. **Location 42 -** Carry out initial excavation to form benches
2. Install geotextile and sufficient depth of stone along the width of the embankment to provide a running surface / access track for plant movement
3. This will be required to provide access through Location 42 towards Location 52. In addition, we will extend the temporary access underneath the A4232 to Location 52.
4. **Location 52 -** Carry out initial excavation to provide access
5. Install geotextile and sufficient temporary stone along the width of this section to provide a running surface / piling platform
6. Install sheet piles along line of top of embankment
7. Complete excavation and Install scour protection.
8. Install timber stakes 7 brushwood
9. **Location 52 / 42 -** Construct embankment fill in layers.
10. Complete topsoil

2. Schedule of Construction Materials

The table below has been prepared by JBA based on the drawings provided to date and these form the basis of our budget price and programme.

CONSTRUCTION MATERIAL VOLUMES											
	Geotextile	Geocell	Embankment fill material	Topsoil	Rock Armour Volume	Excavation volume	Reno Mattress or other scour protection	Brushwood	6m long SSP	15m long SSP	RC capping beam
Location	m^2	m^2	m^3	m^3	m^3	m^3	m^2	m^2	lm	lm	m^3
Area 11	14351	-	2801	583	19178	13092	-	-	-	-	-
Area 12	26899	-	5073	1017	35222	17509	-	-	-	-	-
Area 21	3354	-	-	-	-	-	4515	753	215	50	-
Area 22	10548	12708	10682	2542	-	2943	-	-	-	-	-
Area 31	4860	-	21789	-	-	-	6480	664	162	78	-
Area 32	6565	-	-	-	-	-	10379	8305	340	644	378
Area 42	4005	4065	6465	801	-	2505	-	-	-	-	-
Area 52	1720	1728	2760	344	-	944	-	2340	-	227	145
TOTALS	**72301**	**18501**	**49570**	**5286**	**54400**	**36993**	**21374**	**12062**	**717**	**999**	**523**

Rock Armour.

This will be key to the successful delivery of the scheme and needs to be considered well in advance of start on site

We have recently completed a Coastal protection scheme for Neath and Port Talbot at Aberavon promenade which required 27,000 tonnes of blockstone ranging in size from 1t to 3t. Supply was relatively straightforward since the local quarry at Stormy Down had been advised of the scheme and had prepared a quantity of blockstone in advance.

However, the volume required for the Cardiff Coastal scheme is approx. 110,000 tonnes which represents a 4 fold increase. We would therefore recommend early consultation with the local quarries to discuss the scheme and the possibility of them putting aside / storing an element of blockstone within the quarry.

The other alternative would be to arrange several laydown areas within the red-line boundary to stockpile the material ahead of commencement.

Material Disposal.

Our budget contained in Appendix 10 is based on retaining excavated material on site. This will require

- Material testing to classify the material
- Development of a material management plan under the Claire protocol.
- Allocating suitable storage areas to process and dry out materials.
- Incorporate materials within permanent works design.

NB it is worth noting that we estimate the cost of disposal of material to be in the order of £1.5m to £2.0m depending on material classification.

3. Schedule of Main Construction Plant and Machinery

We have reviewed the drawings and scope of works and our thoughts are that the works will be carried out form landside. We would not propose the use of marine based plant such as a jack-up or spud leg barges. The estuary has a large tidal range and the barges would only be able to operate when the tide is out i.e. when they are able to gain access to the working areas.

However, we do consider that there will be a requirement for some marine plant such as a workboat and floating pontoons which may be needed to provide a safe working access along the toe of the works.

We therefore consider that land-based plant should be employed, and we have provided a list below of the key plant that we suggest

Type of Plant	Description
35/ 45 tonne long reach excavators	Exact size would be subject to the final design / methodology; however, our plan would be to prepare an access road / working area at a convenient location such as top of the embankment and then use the long reach excavator to excavate / place the blockstone and rock armour
28 – 35 tonne tracked Excavators	These will be used for general excavation works – ➢ forming access tracks ➢ construction of embankments
Volvo dump-trucks	Will be used to ➢ transport excavated material to stockpile for disposal ➢ transport rock armour/ blockstone from stockpile to work place
Movax Piling Hammer	This will be used as an attachment to the long reach to install the sheet piles along the toe.
Sheet pile Leada rig (alternative)	This may be employed to install the longer 15m sheet piles along the roadside – although this will be subject to ground investigation which will inform the driving conditions
Marine Plant: • Work boat • Safety Boat • Floating pontoons	Provide working access platform at tidal level

4. Outline Construction programme

Our Outline construction Programme T9014/ECI/01 is attached and sonly covers the actual construction activities on site. We have made no allowance for the pre-construction works required prior to commencement on site.

We consider that supply, delivery and placement of rock armour and rip-rap material will be key to the critical path of this project. We also consider that there may be a need for some enabling works (6 to 8 weeks) in advance of the construction activities to set up and stockpile the rock armour

Our programme is subdivided into three key areas and is based on commencing the works to the main area along the forefront first

AREA 1 – Overall programme duration 72 weeks.

This covers all the works along the seafront off Rover way

Location	Comments	Programme Duration
➢ **Location 12 – Drawing nr 003/S2/P01**:	this involves the largest volumes of rock armour and is therefore on the critical path and will commence first	52 weeks
➢ **Location 22 – Drawing nr 005/S2/P01:**	this will follow on from the completion of the enabling works at Location 11	31 weeks
➢ **Location 32– Drawing nr 007/S2/P01**	These works will again follow on from Location 22	46 weeks

AREA 2 – overall programme duration 48 weeks

This covers the works to the Northern seafront and northern Bank of the Rhymney River

Location	Comments	Programme Duration
➢ **Location 11 – Drawing nr 002/S2/P01**:	This section has been programed to commence following completion of the rock armour to Location 12 above.	32 weeks
➢ **Location 21 – Drawing nr 004/S2/P01:**	Both these sections of works will be carried out concurrently with Location 11 above since they will share access, site compound and offices	25 weeks
➢ **Location 31 – Drawing nr 006/S2/P01**		34 weeks

AREA 3– overall programme duration 29 weeks

This covers the works North of Lamby way alongside the Rhymney river-bank

Location	Comments	Programme Duration
➢ **Location 42 – Drawing nr 008/S2/P01**:	These areas of works will run concurrently since they share the same access off Lamby Way. They can be carried out independent of any other works and can "float" within the overall programme. Currently they are linked to the works in Location 32 since the site access will be at the same location off Lamby way	13 weeks
➢ **Location 52 – Drawing nr 009/S2/P01:**		16 weeks

The above durations are based on the following outputs against each key activity. These have been assessed based on tidal working and include an element of time risk allowance.

Nr	Item	Output	Comment
1	Topsoil strip	100 m^3 per day	Included delivery to stockpile
2	Rock Armour (Critical Activity)	250 m^3 per day	This covers the rate of placement and include supplementary activities such as selection and transport from stockpile.
3	Excavation	250 m^3 per day	Includes general excavation, transport to stockpile and preparation of formation
4	Reno mattress or another scour protection	100 m^2 per day	Guideline outputs -although activities will not be critical
5	Brushwood	100 m^2 per day	
6	6m Sheet piles	12 lm per day	Based on a single gate length per shift
7	15m sheet piles	12 lm per day	
8	RC capping beam	6 m^3 per day	

5. Identification of Construction Access Methods and Routes

Location 12 – Drawing nr 003

Due to the overall length of this section we will require multiple access points the exact location of which will be subject to agreement and permission

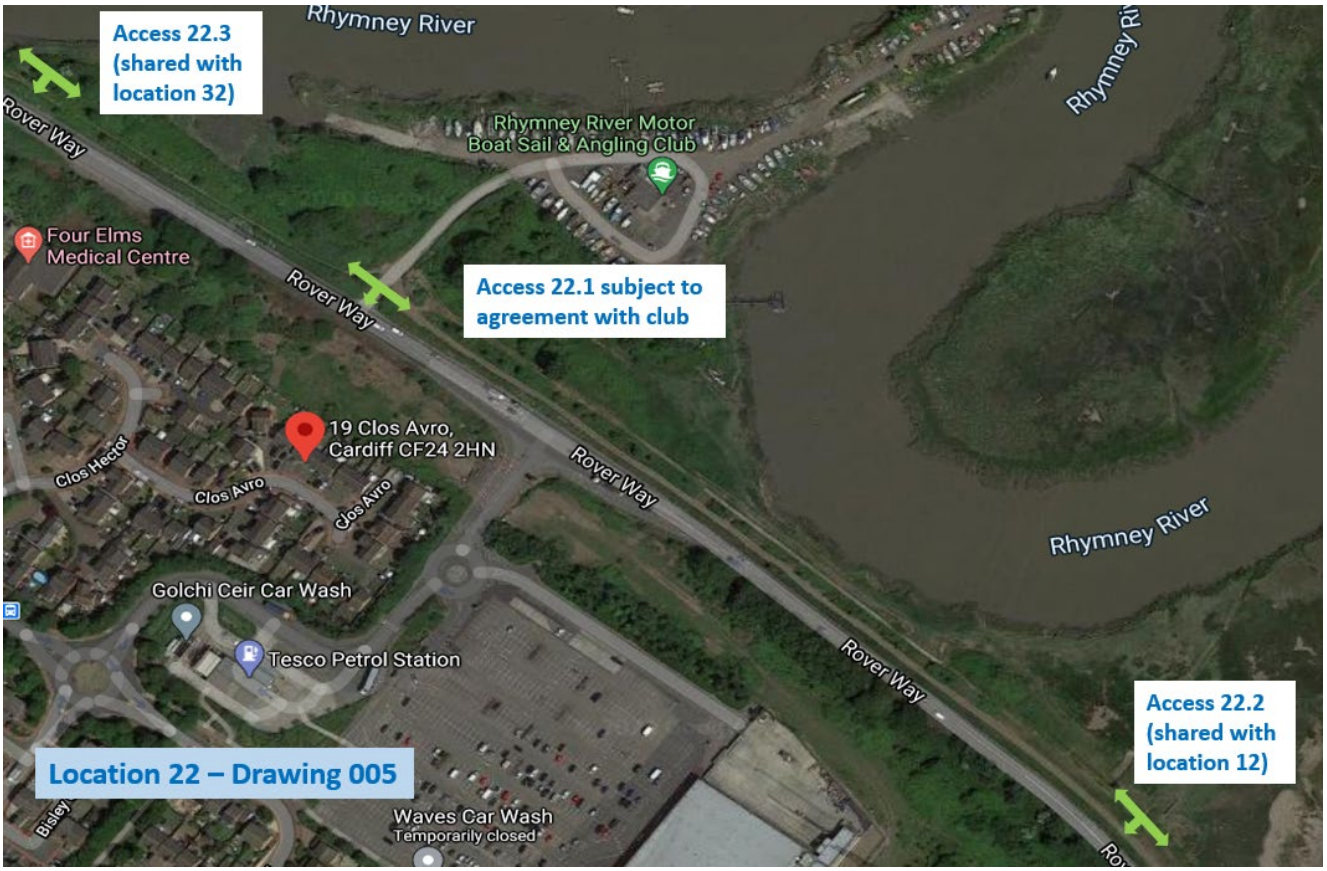
- **Access 12.1 –** there appears to be an existing layby approximately 100m North of Seawall Road which would provide an ideal Main Site Entrance directly off Rover way to the centre of the works. We would also suggest setting up the main site compound at this location

- **Access 12.2 –** there appears to be an existing gate off "Tide Fields Road" that allows access to the southern end of the works. We recognise that this is through an existing industrial estate and will be subject to permission, but it does provide existing tarmac road that we can use, and the existing gate enables control of deliveries.

- **Access 12.3 –** Site entrance directly off the bend in Rover Way at a convenient location subject top sigh line. This would provide secondary access to the northernmost section of the works and also provide access to the Southernmost starting point of **Location 22**

Location 22 – Drawing nr CCD-JBAU-00-12-SK-Z-005

Ideal situation would be to create 3 separate access points for this section of works.



- **Access 22.1 –** would be the Main point of access and providing permission is available we propose to create a North and South access off the entrance to Rhymney River Motorboat, Sail and Angling club.

- **Access 22.2 –** would be shared with Location 12 and created off the bend in Rover Way

- **Access 22.3 –** this would be created towards the end of this section of works and would serve to also provide access to the start of Location 32

Location 11 – Drawing nr 002/S2/P01

The main site access to this area would ideally be through the Household Waste Recycling Centre located directly off the roundabout. This would provide the main artery to the works with an option to provide secondary access routes to the works in both Locations 21 and 31. This would also be the ideal location for a secondary Site Set-up the exact location of which would be subject to agreement of availability of land with HWRC

Location 21 – Drawing nr CCD-JBAU-00-12-SK-Z-004

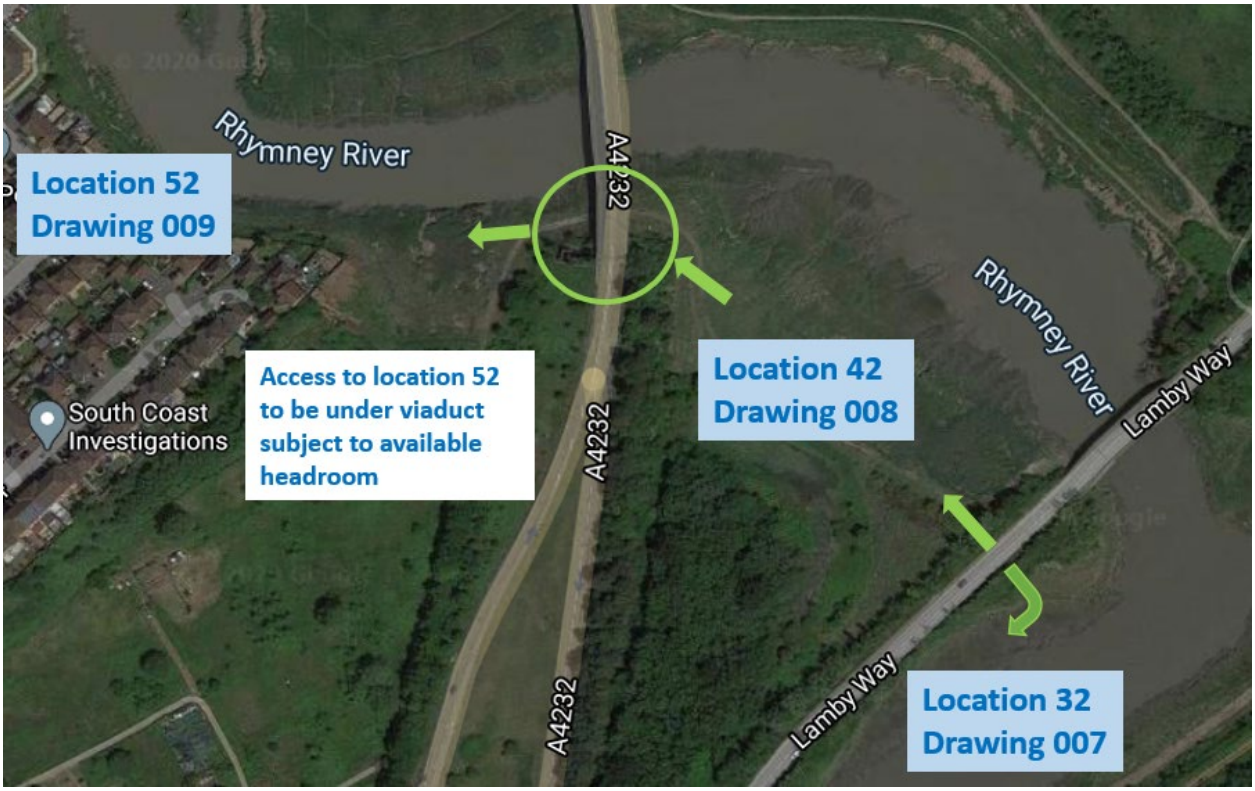
As indicated above the access to Location 11 would provide the main route into the area and then a secondary access road will be set up along an agreed line to Location 21

Location 31 – Drawing nr CCD-JBAU-00-12-SK-Z-006

As indicated above the main access to Location 11 would provide main route into the area and then a secondary access road will be set up along an agreed line to Location 31

Location 42 – Drawing nr 008

We propose to gain access to Location 42 directly off Lamby Way, as close as possible to the river bridge. However, the exact location can be agreed to suit the traffic flow and the maturity of the existing hedgerow.



Location 52 – Drawing nr 008

This access will be shared with Location 42 i.e. directly off Lamby way and a temporary haul road will be constructed along the riverbank and, subject to height restriction underneath the A4232

Location 32 – Drawing nr 007

We propose to create an access at each end of this section of works

- Northern access will be created off Lamby way directly opposite the access to Locations 42 and 52.
- Southern access will be from Location 22

NB: – Installation of the sheet piles adjacent to the highway will require Lane 1 Traffic closure so will be carried out off-peak.

6. General measures that will be implemented to manage the construction process, including construction environmental management (such as general provisions to reduce the risk of environmental pollution/contamination and site waste management procedures)

Archaeological written scheme of Investigation	
Marine License Consent	NRW
Planning consent	
Planning - discharge of conditions	Precommencement conditions will need to be discharged
UXO survey / risk assessment / Desk top study	Prior to piling
Environmental Survey	
Ecological survey	
Traffic Management Plan	
Stakeholder Engagement / Consultation	NRW Local Tenants CCC Highways Rhymney Boat & Sail club Statutory undertakers

7. Indication of a proposed 'red line' boundary to include construction access, routes from the public highway and construction compounds

Our propose access arrangements are detailed in Q5 i.e. based on obtaining access from existing highways. We do not envisage the use of marine based plant such as jack-up barges apart from the use of a safety boat / pontoons. All plant and materials will be delivered by road transport. there we do not envisage any requirement for access outside the red line boundary shown i.e. the central area of the River Rhymney.

8. Details of possible approach to decommissioning various project elements at the end of their life

We do not envisage the need to decommission the works, the only element likely to corrode would be the sheet piles which would need to be designed accordingly