MOTT MACDONALD

Old Colwyn Coastal Defence and Active Travel Scheme

Outline Environmental Management Plan

July 2020

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Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	July 2020	A. Jones	N. Spofforth	C. Williams	First Issue

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Contents

Tables

1 Introduction and Background to the Scheme

1.1 Purpose of this Environmental Management Plan

This document is the first iteration of the Environmental Management Plan (EMP), known as the Outline EMP (OEMP) for the Old Colwyn Coastal Defence and Active Travel scheme (hereafter referred to as the "Scheme"). The purpose of the EMP is to manage the environmental effects of the Scheme as identified within the associated Environmental Statement (ES)[1] and to demonstrate compliance with environmental legislation, providing clear and concise information which states how the mitigation and management of environmental effects will be delivered and maintained.

This EMP is based on the current design for which planning permission and the Marine Licence is being applied. It has been prepared in accordance with the Design manual for Roads and Bridges (DMRB) Volume 11, Section 2, Sustainability and Environment Appraisal, LA 120 *Environmental Management Plans.*

In accordance with LA 104[2] *'Environmental Assessment and Monitoring'*, the results of monitoring shall be used to update the EMP during the construction and handover phase.

1.2 EMP Evolution

The EMP sets out the control of environmental effects through all lifecycle stages from the design stage in accordance with Table 1.1. This document is currently in the design stage.

Table 1.1: Evolution of the EMP[3]

Project Stage	EMP Iteration	Produced/ Refined
Design	**First iteration of EMP (outline, OEMP) produced during the design stage for the preferred option.**	**Produced**
Construction (refined for the consented project)	Second iteration of EMP for construction phase (CEMP) refined during the construction stage of the consented project, in advance of construction.	Refined
End of Construction	Third iteration of EMP for handover (HEMP) building on the CEMP refined at the end of the construction stage to support future management and operation.	Refined

Source: DMRB LA104

The EMP is a live document and shall be refined and updated when additional information comes to light to capture any necessary alterations to the proposed mitigation and management of environmental effects. Such additional information or alterations can include:

1. New or updated survey data;

[1] Old Colwyn Coastal Defence and Active Travel Scheme, Environmental Statement Volume 1: Main Text, 415437-MMD-00-XX-RP-N-1719, August 2020

[2] Highways England, 2019. LA 104, 'Environmental assessment and monitoring [Online] Available at: https://standardsforhighways.co.uk/dmrb/search/78a69059-3177-43dc-94bd-465992cfda82 [Accessed: July 2020]

[3] Highways England, 2020. Design Manual for Roads and Bridges Volume 11 Section 2 LA 120, Environmental Management Plans [online] Available at: https://www.standardsforhighways.co.uk/dmrb/search/a3a99422-41d4-4ca1-bd9e-eb89063c7134 [Accessed: July 2020]

2. Changes in the physical characteristics of the project;
3. Changes in the design and mitigation assumptions;
4. Changes in the level of understanding of the current state of the environment and the potential effects of the development (e.g. due to greater data availability);
5. Changes in legislation, policy and guidance/advice relating to any environmental topic; and
6. Changes response to stakeholder consultation.

1.3 EMP Scope and Objectives

1.3.1 Scope

In accordance with LA120, this EMP:

- Provides a clear audit trail outlining the modifications made from any previous iteration;
- Identifies roles and responsibilities;
- Identifies risks, their associated control measures (including a date of completion), compliance and corrective actions; and
- Establishes procedures for communication, monitoring, audit mechanisms and reporting of control measures.

This document also includes details of induction, training and briefing along with:

- A description of the main difficulties encountered in delivery of measures to mitigate and manage the environmental effects; and
- The main uncertainties involved in the forecasting of measures to mitigate and manage the environmental effects.

This EMP takes due consideration of the documents submitted to Conwy County Borough Council (CCBC) and Natural resources Wales (NRW) as part of the planning and Marine Licence applications. It identifies mitigation and environmental issues from commencement to completion and included the following phases of construction:

- Demolition and site clearance;
- Prior to construction (for example advanced works);
- During construction (works); and
- Post construction until completion (when the HEMP will replace it).

1.3.2 Objectives

The overall objectives of this EMP are as follows:

- To document all environmental actions and commitments that are required to manage and minimise environmental effects reported within the ES;
- To minimise the risk of any type of pollution incident or other form of unauthorised discharge;
- To minimise any nuisance to the nearby receptors;
- To maintain communication between the Client (Employer), the Project Manager and relevant third parties, with assignment of any specific and / or statutory reporting duties to third parties, where these are to remain their statutory duty;
- To be compliant with statutory legislation and contract specifications; and
- To provide a framework for the implementation and review of the EMP and other relevant documents.

These objectives are in accordance with and align with the requirements in Landscape Design (LD 117)[4].

1.4 EMP Preparation and Structure

1.4.1 Competent Expert Declaration

Checker: The competent expert holds a masters level degree in Earth Sciences and also in Water Resources Technology and Management, is a Chartered Water and Environment Manager, Chartered Scientist and Chartered Environmentalist. The competent expert has over 13 years' experience as an environmental consultant.

Approver: The competent expert is a Chartered Geologist with 28 years of consultancy experience. They are registered as a specialist in land condition, a suitably qualified and experienced person under the National Quality Mark Scheme and CL:AIRE Definition of Waste Development Industry Code of Practice qualified person.

1.4.2 EMP Structure

The structure of this document is as follows:

1. Introduction and Background to the Scheme (including purpose of EMP)
2. Purpose of this Environmental Management Plan
3. Project Team Roles and Responsibilities (including site roles, project management organisation and environmental responsibilities);
4. Record of Environmental Actions and Commitments;
5. Consents and Permissions (details and recording);
6. Details of Maintenance and EMP Monitoring Activities;
7. Induction, Training and Briefing Procedures for Staff; and
8. Glossary.

Appendices comprise:

- Appendix A Relevant Management Plans;
- Appendix B Environmental Method Statements;
- Appendix C Emergency Procedures and Record of Environmental Incidents;
- Appendix D Monitoring Reports; and
- Appendix E Supporting Drawings.

This EMP contains several outline management plans to be developed into full management plans (Appendix A) during the second iteration of the EMP, and also indicates plans that will need to be developed by the Principal Contractor or CCBC prior to construction.

Outline plans developed to date comprise:

- A.1 Outline Site Waste Management Plan;
- A.7 Landscape and Ecological Management Plan;
- A.9 Outline Carbon Management Plan; and
- A.10 Marine Bio-security Risk Assessment.

[4] Highways England, 2020. LD 117, 'Landscape Design'.

Plans to be developed by the principal Contractor:

- A.2 Materials Management Plan;
- A.3 Arboricultural Method Statement;
- A.4 Traffic Management Plan;
- A.5 Communications Relations Strategy;
- A.7 Construction Flood Risk Management Plan;
- A.8 Transhipment Management Plan;
- A.11 Marine Pollution Contingency Plan; and
- A.12 Surface Water Management Plan.

Plans to be developed by CCBC:

- A.13 Operational Flood Management Plan.

1.5 Overview of the Scheme (the project)

1.5.1 Colwyn Bay

Colwyn Bay is a seaside town in Conwy County Borough on the north Wales coastline. Principal settlements comprise Rhos-on-Sea to the west, the town of Colwyn Bay in the centre and Old Colwyn to the east. The A55 Expressway passes through the town, running parallel to and south of, the London to Holyhead mainline railway (referred throughout this document as the North Wales Coast (NWC) Railway Line), both of which separate Old Colwyn and Colwyn Bay town from the waterfront.

1.5.2 Old Colwyn – Existing Structures

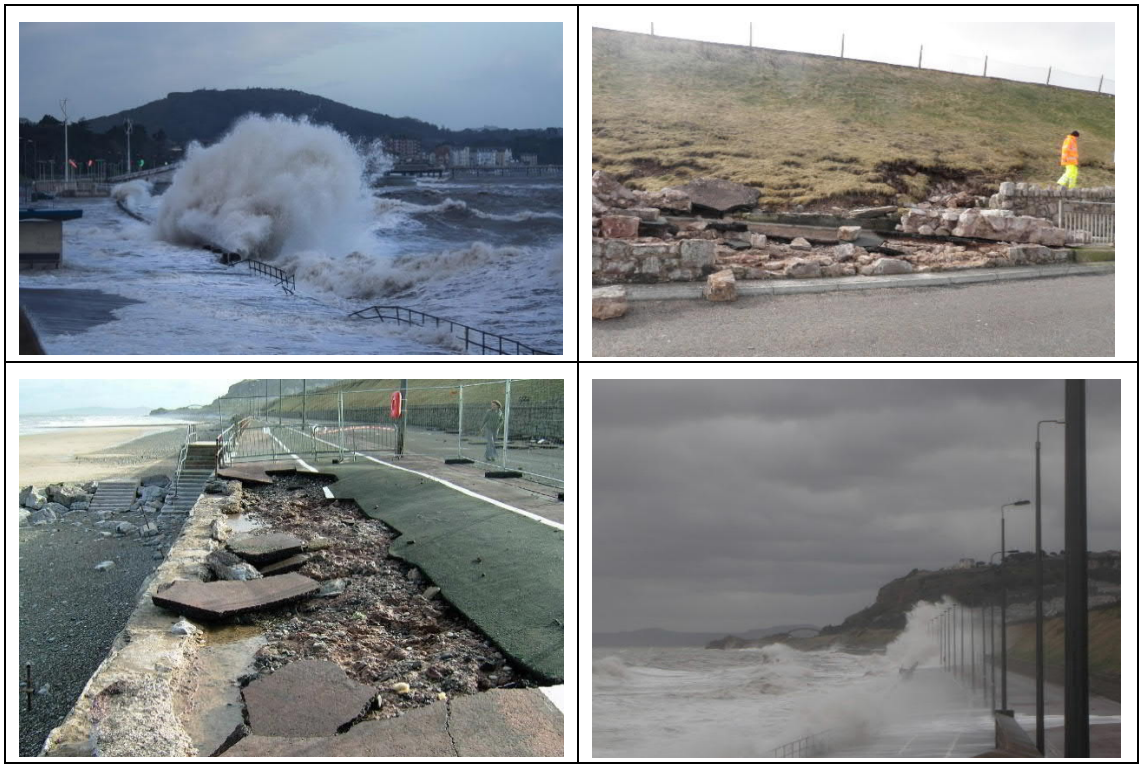
Defences were constructed for the majority of the coastline in the late nineteenth century comprising vertical sea walls in general composed of either masonry or concrete. Due to the construction of these defences, during the 20th century, a gradual lowering of beach levels was experienced adjacent to the defences which resulted in continual maintenance and repairs to the toe of the defences to ensure their integrity and stability. In response to beach lowering, timber groynes were constructed in the 1950s to help retain the sand, however these generally failed or became redundant.

1.5.3 Need for Scheme

The Promenade which runs along the waterfront at Old Colwyn is currently under threat from storm damage and tidal flooding (overtopping). Regular overtopping of the existing coastal defences is causing damage to the Promenade and defences themselves, sections of which are at imminent risk of failure (see Figure 1.1 for representative photographs). Important infrastructure assets which run parallel to the waterfront, such as the North Wales Coast Railway Line, A55 Expressway and buried Welsh Water sewerage services are at risk from overtopping and associated coastal erosion, as are the active travel (walking and cycling) routes along the Promenade.

The Promenade highway is often closed when spring high tides occur at the same time as onshore winds, during storm events and while subsequent damage is repaired. As a result of the poor standard of coastal protection, there has been a lack of investment in the Old Colwyn Promenade area in comparison to the Colwyn Bay Waterfront Project Phase 1 area to the immediate west with the construction of Porth Eirias and the recharged beach.

Figure 1.1: Examples of Coastal Overtopping and Damage at Old Colwyn



1.5.4 Scheme Location

The Scheme is located along the easternmost section of the promenade at Old Colwyn, from the eastern side of Porth Eirias in the west to Splashpoint in the east. The Scheme footprint is divided into two principal areas:

- Area 1 – From the picnic area to the east of Porth Eirias car park (approximate National Grid Reference (NGR) 285822, 378870) to the east of Rotary Way (approximate NGR 286347, 378756) where the road currently reduces in height from the junction back down to promenade level; and
- Area 2 – From the eastern edge of Area 1 (approximate NGR 286347, 378756) to Splashpoint in the far east (approximate NGR 287029, 378701).

The red line boundary has been extended beyond the footprint to as shown in Figure 1.2 to allow for access during construction.

Figure 1.2: Location of the Scheme

Source: Environmental Statement. Red Line Boundary Plan Drawing 410895-MMD-00-XX-DR-N-1707

1.5.5 Scheme Proposals

The proposed scope of work for the Scheme comprises a combination of coastal defence, promenade and active travel improvements.

- The construction of a rock revetment along the entire length of the Scheme;
- Temporary traffic management on the promenade in order to safely construct the works including temporary restrictions such as road closures, reduced lane widths and speed limits, along with traffic signal controls and public rights of way (PROW) diversions;
- The elevation of the pedestrian promenade for the entire length of the Scheme. The highway between Rotary Way and Splash Point would also be raised to match the new promenade. Earthworks would be required to construct the embankment required for the designed highway alignment, as well as drainage, structures and landscaping works;
- Drainage systems would be constructed to accommodate highway drainage and run off from adjacent land. This drainage would, where practicable, be used to manage temporary flows during construction;
- A number of new structures would be constructed, including outfall extensions, ramps, steps, fishing platforms and retaining walls These works would require a combination of local earthworks and drainage, foundation construction, including piling and structural concrete and steelwork; and
- As revetment, earthworks, drainage and structures elements are completed, construction of the new and improved sections of highway would be carried out. This would include the carriageway construction, traffic signs, road markings and street lighting.

Scheme location and general arrangement drawings are included within Appendix E.

Additionally, the current picnic area will be improved, and an outdoor education area will be added. There will also be various promenade landscape improvements, parking improvements

and a new concession building. Ecological and educational enhancement measures have also been incorporated into the Scheme.

1.6 Environmental Context

Environmental Constraints Drawings are included in Appendix E.

The Scheme itself is not located within a European Site of Conservation Importance, however the Liverpool Bay Special Protection Area (SPA) is located approximately 150m northwards from the sea wall at its closest point (to the north-east of Splashpoint) designated for the red-throated diver and common scoter as well as other overwintering birds. The majority of the Scheme footprint including the construction works buffer area would be located within 50-60m of the sea wall, with the exception of any rock deliveries by barge (if this method of delivery is selected), temporary storage and movement of the rock revetment across the intertidal area following delivery and minor ecological habitat enhancement works to the existing rock groynes.

The Scheme construction footprint extends into the North Wales Important Bird Area, the boundary of which is located approximately 40m northwards of the sea wall at its closest point.

A blue mussel (*Mytilus Edulis*) best is located within the Scheme red line boundary to the east of the site, with Honeycomb Worm (*Saballeria aveolata*) reef along the groynes and in small, isolated patches. However, the blue mussel habitat is small and in poor condition and the Honeycomb Worm habitat is patchy and not considered to be a high-quality example of this priority habitat.

The Scheme is within a bathing water quality monitoring point, located at Porth Eirias and three surface watercourses are culverted and discharge onto the beach:

- Nant-y-Groes (Main River);
- The Llwd (Main River); and
- The Nant-y-Fynnon (Ordinary Watercourse)

Areas of Flood Zone 3 are present along the length of the northern pedestrian promenade and across the Promenade highway and pedestrian promenade along the alignment of the Nant-y-Groes and Nant-y-Fynnon. High surface water flood risk is present along the same alignment of the Nant-y-Groes and where Rotary Way joins the Promenade highway. Frequent overtopping occurs along the pedestrian promenade and Promenade highway when high tides are associated with onshore winds.

There are not considered to be any sensitive properties within the Scheme area given its waterfront location, segregated from residential areas by the NWC Railway Line and A55 Expressway. The closest residential properties are located on Min-y-Don Avenue approximately 70m to the south of the Promenade highway. Other sensitive land uses are all separated from the Scheme by the NWC Railway Line and A55 Expressway. The NWC Railway Line is partially within the Scheme and the A55 Expressway is located approximately 30m south.

The area is not considered to have any specific features of cultural heritage significance – the site of the former Cadw Grade II listed Victoria Pier (location of a proposed new truncated pier) is around 600m to the west of the western Scheme extent (at its closest point). The Old Colwyn conservation area is segregated from the Scheme by the A55 Expressway and the NWC Railway Line. National Cycle Route 5 runs along the promenade within the Scheme area.

The local business Porth Eirias is immediately adjacent to the west of the Scheme and the North wales Coast Path, National Cycle Route 5, Old Colwyn beach, pedestrian Promenade, Promenade Highway and Public rights of way are all within the Scheme boundary.

2 Project Team Roles and Responsibilities

2.1 Site Roles and Responsibilities

The site-based roles and the organisation of responsibilities in relation to environmental management are summarised below. The Principal Contractor will be required to delegate responsibilities to onsite personnel within key areas of the site and compounds. The delegation of responsibility will be clearly identified within relevant documents and site files.

2.2 Project Management Organisation

Overseeing management of the scheme will be directed by CCBC and any appointed Employer's Agent for the scheme. CCBC will delegate some site supervision roles such as the Engineering Clerk of Works and procure specialist consultants to supervise, monitor or check the Principal Contractor's Method Statements and sensitive activities where required. The key scheme roles for CCBC and the Principal Contractor are listed in Table 2.1. Individual names and contact details will need to be confirmed and inserted where applicable by CCBC and the Principal Contractor once appointed and confirmed.

Table 2.1: General Site Contacts and Responsibilities

Role	Contact and Organisation	Telephone	Email
Project Manager	[TBC]	[TBC]	[TBC]
Principal Contractor Environmental Manager	[TBC]	[TBC]	[TBC]
Principal Contractor Environmental Clerk of Works	[TBC]	[TBC]	[TBC]
Principal Contractor Environmental Specialist(s)	[TBC]	[TBC]	[TBC]
Community Liaison Officer	[TBC]	[TBC]	[TBC]

[Note: Individual names and contact details will need to be inserted into Table 2.1 by CCBC/Principal Contractor].

2.3 Environmental Management Responsibilities

The Principal Contractor will have a contractual responsibility for producing the second iteration of EMP (CEMP) once the design and construction plans have been finalised.

CCBC and delegated consultants acting on their behalf, Principal Contractor and subcontractors are all responsible for complying with the scheme's environmental policies, relevant environmental legislation and regulations. It is a requirement that all persons on site will be made aware of their duty of care to the environment and will be provided with sufficient training, supervision or instruction through Site Inductions, toolbox talks (TBTs) and specific Method Statements as necessary.

Responsibilities for the site environmental management will be delegated to key personnel by the Principal Contractor who will manage all reporting and monitoring of environmental mitigation during the contract period. Where required, environmental specialists will be

consulted to provide advice on specific issues or site activities, in consultation with the Principal Contractor. The main environmental roles and responsibilities are shown in Table 2.2.

Table 2.2: Environmental Roles and Responsibilities

Role	Responsibility
CCBC	• Oversee implementation of whole project and the individuals undertaking specific roles and duties. To be reported to as per Contract requirements and internal organisation EMS.
Principal Contractor Environmental Clerk of Works	• Provide site induction on environmental practises, toolbox talks, organise specialist surveys, and oversee monitoring and testing of materials as required; • Monitoring PC site environmental compliance; • Undertake day to day monitoring and compliance checks; • Monitor control of dust, noise and vibration; • Maintain and update site specific Method Statements; • Hours of working to meet accepted noise and vibration limits set in consultation with Environmental Health Officer (EHO); • Develop with PC Site Health & Safety Officer an Emergency Spillage Response Plan and associated protocols for incidents; and • Ensure local NRW requirements are implemented for consents and permits.
Principal Contractor Environmental Specialist(s)	• Contamination and remediation specialist. • Project Waste Management controller - may be member of PC dedicated Quality and Safety Team. • Ecologist: Supervision if protected species presence confirmed or risk identified during works. • Landscape Manager to supervise planting and aftercare. • Other as required.
Community Liaison Officer	• Key liaison with all above and Highways England Public Liaison Officer: • Maintain and develop Community Relations Strategy. • Maintain comment and enquiries log and disseminate identified comment for response and implementation of action.

3 Record of Environmental Actions and Commitments

The Record of Environmental Actions and Commitments (REAC) contained in Table 3.1: REAC Table identifies the environmental commitments included within the ES[1] to address the potential environmental effects of the Scheme. This REAC is an integral part of this OEMP and will continue to be integral to the iterations of the CEMP and HEMP throughout the progression of the Scheme.

This is the main vehicle for passing essential environmental information to the Client and crucially to the body responsible for the future maintenance and operation of the asset.

Table 3.1: REAC Table

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
CONSTRUCTION							
ES Chapter 4 (Scheme Construction) and Chapter 5 (Consultation)							
ES Ch4	Construction strategy to minimise disruption.	The Contractor would be required to register for the Considerate Constructors Scheme on this Project. Once registered, the contractor would follow the Site Code of Considerate Practice.	Successful registration onto the scheme	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Waste minimisation and management.	The outline SWMP to be developed in full by the PC	Completed SWMP to be live document throughout construction	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Minimisation of noise and vibration from construction activities.	The Environmental Health Officer (EHO) of CCBC would be consulted on the noise and vibration limits to be included within the CEMP. Where necessary, noise and vibration monitoring at key receptors would be advised by the EHO to ensure compliance with the limits set.	To be included in CEMP	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Construction delivery routing to avoid residential areas.	Delivery of materials and plant would be via road delivery, exiting the A55 Expressway at the immediately adjacent Junction 22. This route does not pass any properties or other sensitive receptors and avoids the requirement for construction traffic through the streets of Colwyn Bay and Old Colwyn.	To be included in CEMP	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Appropriate rock revetment delivery and stockpiling and minimising effects associated with transhipment (if necessary).	Storage of revetment stone would be either on the upper beach directly seaward of where it is needed (this would provide additional protection to the sea wall during the construction works) or on the Promenade (should tides not permit beach access on delivery) awaiting transfer to the beach (if being delivered by road).	Transhipment Plan	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
		If barge delivery is deemed to be necessary and the rocks are to be transported on larger vessels (flat top barges or coasters) and then transferred onto smaller vessels with lower drafts in order to access the intertidal area, a Transhipment Plan would be produced by the contractor in agreement with CCBC, NRW, ecologists and other local stakeholder (e.g. local fishermen, water sports clubs etc). This would depend on the draft of the vessels being proposed by the contractor. The Transhipment Plan would need to include how the rocks are going to be safely transferred from one vessel to the other, tolerances for each vessel in terms of movement, how the rocks would be stopped from falling into the sea and how they would log a fallen overboard rock. The transfer of rocks from the vessels to the beach would need to be monitored appropriately in terms of noise and vibration and a Section 61 agreed.	Transhipment Plan	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES CH4	Minimising effects associated with travel of construction workers.	Construction workers travelling from outside the area would be encouraged to access the Scheme from the A55 Expressway Junction 22. It is anticipated that there are likely to be between 20-30 site staff present within the Scheme area on a daily basis during construction.	Traffic Management Plan	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Appropriate traffic management	Traffic management would be designed in consultation with the CCBC Highways Department to ensure it would: • Minimise disruption to road users during the works; • Minimise disruption to local communities and businesses and emergency services during the works, providing access throughout; • Provide a safe working area for the construction workforce; • Provide safe and clearly signed traffic routes through the works; and • Ensure non-motorised users are provided with suitable facilities. Deliveries to be timed to miss peak times on morning and evening	Traffic Management Plan	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
ES Ch4	Maintaining public highway free of debris	Principal Contractor to install wheel wash facilities	Maintain a log of incidents including complaints about debris on roads	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Maintain safe and effective temporary highway lighting	Ensure any temporary lighting is compliant with highways standards	Agreement with CCBC Highways for any lighting set ups	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Management of site working hours to limit noise, vibration and other disturbance.	The normal working hours within the Site would be Monday to Friday between 07:00 and 20:00 hours and Saturday between 08:00 and 12:00. There may be exceptions to these hours for oversize deliveries and tie-ins or for traffic management or tidal reasons. The normal working hours within the Site for piling activities would be Monday to Friday between 08:00 and 18:00 hours and Saturday between 10:00 and 16:00 hours. The Contractor would not carry out works on Sundays or Public Holidays nor during the week immediately following Christmas, Easter and Whitsun Bank Holiday, nor would deliveries of materials or plant be permitted after 12:00 hours on Saturdays. Due to tidal cycles, traffic management restrictions, safety and operational constraints, some limited operations would need to be carried out at night. CCBC would be liaised with where notable operations are to be carried out at night, such as depositing rock armour on the beach in readiness for placement (if delivery by barge is deemed necessary by the Contractor). Liaison would also be carried out with the local community, businesses and other key stakeholders. Where construction works could have a significant impact on neighbouring properties, businesses and residents, the affected parties would be advised of these works prior to their occurrence. Environmental Health Officers (EHOs) from the Local Authorities would be consulted with regard the nature and extent of any such works. In addition, the Applicant would liaise closely with members of the public, businesses and the EHOs to minimise the disruption and impacts resulting from the construction works.	To be included in CEMP	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:
ES Ch4	Waste minimisation relating to site clearance.	Where items removed would have the potential for re-use elsewhere they would be taken to CCBC's Llanelian nursery for storage.	Not required	Principal Contractor to arrange with CCBC	Principal Contractor /CCBC	C	Signature: Date:
ES Ch4	Restrictions on Plant Movements and Stockpiling in the Intertidal Area to minimise adverse effects in coastal processes and ecology.	Plant and equipment movements on the beach are to be restricted to within 20m-30m of the revetment toe for the vast majority of the construction works. No stockpiling would be permitted on the area of spare or dense blue mussel bed which would be demarcated by a marine ecologist and the Contractor prior to works commencing. No plant movements would be permitted across the area of dense blue mussel bed, although some limited movements would be permitted across the south-western corner of the sparse mussel bed if necessary given its very poor condition. Activity on the lower beach would be limited to revetment delivery by barge (if it is not to arrive by road) and ecological enhancement works to the three existing longer groynes, currently anticipated to involve the installation of two ecological rock armouring unit (or similar) per groyne. For any plant movements and stockpiling of rock armour in the lower intertidal area (beyond 20m-30m from the revetment toe), plant movements would be restricted given the presence of the blue mussel bed and intertidal patches of honeycomb worm with suitable buffer zones to be established by the marine biologist and Contractor at the walkover 6 weeks prior to works commencing.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch4	Construction Flood Risk Management.	During site clearance, existing rock armour is to be removed and re-used where appropriate in accordance with specification. The Contractor would produce a Construction Flood Risk Management Plan to set out the methodology to be followed during construction to ensure coastal protection of the site is maintained throughout the construction phase.	Adherence to Construction Flood Risk Management Plan	Principal Contractor to prepare plan	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		This plan would also set out the emergency access and egress procedures and specific site precautions necessary to protect both human life and the environment in the case of storm overtopping events occurring during the construction period. The placement of stockpiled rock armour immediately seaward of where it is to be used within the revetment would help to dissipate wave energy and provide some limited additional protection during any storm events.					
ES Ch5	Protection of cultural heritage assets.	Archaeological watching brief required for GI works. If assets of cultural heritage significance are encountered, additional mitigation may be required for the construction phase.	Any archaeological finds to be reported.	Principal Contractor to appoint Archaeologist	Principal Contractor in liaison with CCBC Heritage Team	P	Signature: Date:
ES Ch5	Protection of beach sediments for maintenance of sediment budget.	NRW advise against any beach sediment being used as construction infill as this would deplete the local sediment budget and leave a negative legacy of sediment available for beach building in times of increased sea level rise. Locking the sediment within the proposal would create a deficit of marine sand to the environment and interrupt sediment downdrift to the east. NRW recommend that any marine sediment of the appropriate type, and which does not present contamination issues, should be retained within the marine environment for the sustainable management of natural resources.	No net loss of sand from beach	Method Statements and surveys	Principal Contractor	C	
ES Ch5	Flood risk management.	NRW advise that any works in, over, under or within 8m of either of the main rivers may be subject to a FRAP.	Not required	Principal Contractor to apply for FRAP as necessary	Principal Contractor	C	Signature: Date:
ES Chapter 7 (Air Quality)							
ES Ch7	Air quality management	Best practice mitigation measures for a site with a low risk of dust effects, as outlined in the IAQM guidance, are presented below: General • Display the name and contact details of person(s) accountable for air quality and dust issues on site boundary; • Display contractor's head or regional office contact information; and • Develop and implement a Dust Management Plan (DMP) as part of the CEMP, including regular site inspections. Site Management • Record all dust and air quality complaints, identify causes and take appropriate action and record measures to reduce emissions. Make a complaints log available to the local authority when requested; and • Record any exceptional incidents that cause dust and air quality pollutant emission either on or off the site and the action taken to resolve it. Monitoring • Undertake daily on-site and off-site inspection where receptors are nearby to monitor dust; • Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked; and • Increase the frequency of site inspections by the person accountable for air quality and dust issue on site when activities with a potential to produce dust are being carried out during dry or windy conditions. Preparing and Maintaining the Site • Plan site layout so that machinery and dust causing activities are away from receptors, as far as is possible; • Erect solid screens or barriers around dusty activities or the application site boundary that are at least as high as any stockpiles on site. Keep screens clean using wet methods; • Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period; • Avoid site run-off of water or mud. A record of any site run off should be kept and actions to prevent reoccurrence;	To be included in CEMP	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		• Keep site fencing, barrier and scaffolding clean using wet methods; • Remove materials that have a potential to produce dust from site as soon as possible unless being re-used on site; • Cover, seed or fence stockpiles to prevent wind whipping; • Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques; • Ensure an adequate water supply on the site for effective dust/ particulate matter suppression/ mitigation using non-potable water where possible and appropriate; • Use enclosed chutes and conveyors and covered skips; • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling; • Ensure equipment is readily available on site to clean any dry spillages; and • No burning of waste. Operating Vehicle/Machinery and Sustainable Travel • Ensure all vehicles switch off engines when stationary - no idling vehicles; • Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable; and • Impose and signpost a maximum speed limit (15mph on surfaced road, 10mph on un surfaced road). Construction • Avoid surface treatments to concrete or stone (scabbling) if possible; and • Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out. Unless this is required for a particular process, in which case ensure that appropriate additional controls are in place. Trackout • Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use; • Avoid dry sweeping of large areas; • Ensure vehicles entering and leaving the site are covered to prevent escape of materials during transport; • Record all inspections of haul routes and any subsequent action in a site logbook; and • Implement a wheel washing system.					
ES Ch8 Biodiversity (Terrestrial and Marine)							
ES Ch8	Timings of any vegetation clearance to protect ecological receptors	• Nesting Birds: Any woody vegetation clearance or building demolition to be undertaken outside of the nesting bird season (widely considered to be from March to August inclusive but can vary depending on the species/or seasonal constraints). Where this is not possible, pre-clearance checks must be undertaken by an experienced ecologist to identify if any birds are nesting within or close to the vegetation due to be removed. If a bird's nest is found, it must be left in-situ and protected from the works. No works can be undertaken in that area until the young birds have fledged from the nest site, which may take up to 6 weeks depending on the species; • Reptiles: Vegetation clearance (railway embankments) to be undertaken between April and the end of October, if possible, whilst reptiles are active. Vegetation clearance would be undertaken in a phased manner under ecological supervision and preceded by a hand search for reptiles. Any reptiles encountered would be moved to outside of the working area; and • Badgers (and other mammals): An update check would be undertaken 12 weeks prior to the commencement of works on the railway embankments to ascertain whether there is any evidence of badger or other mammals. Works should avoid any recorded or potential tunnels or burrows, where possible. In the unlikely event badgers are recorded, setts would be avoided during works. General best practice should be followed within the construction zone (including avoiding storage of large piles of earth near the woodland and no open excavations to be left overnight without a mammal ladder or ramp).	Not required	Method Statements	Principal Contractor with ecological advice from ECoW	P and C	Signature: Date:
ES Ch8	Protection of Marine Ecology (*Sabellaria alveolata* and *Mytilus edulis*)	Delivery via barge and stockpiling would not be permitted in the area of the blue mussel bed to avoid any potential physical impact on as a result of offloading revetment rocks. Delivery via barge and stockpiling would not be permitted in the isolated areas of Honeycomb Worms located near the low tide mark to avoid any potential physical impact on as a result of offloading revetment rocks.	Transhipment Plan	Contractual responsibilities between CCBC and the Principal Contractor	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
ES Ch8	Protection of Marine Ecology	Site walkover to be undertaken by a marine ecologist 6-8 weeks prior to construction commencing. This would ensure any changes in the extent of marine habitats (notably *Mytilus edulis* and *Sabellaria alveolata)* are fully accounted for and mapped within the environmental constraints plan as an accurate preconstruction baseline would have been obtained. A copy of this constraints plan should be shown to workers during toolbox talks to ensure minimal damage occurs to these areas (no tracking of plant or vehicles over these habitats) and a copy should be made available to workers on site (e.g. on the site noticeboard).	Updates to constraints plan as required	Walkover survey	Principal Contractor and ECoW	P	Signature: Date:
ES Ch8	Protection of Marine and Terrestrial Ecology	Pollution prevention measures and contingency planning should be implemented to ensure all habitats and species are safeguarded during the works from pollution/oil spill events.					Signature: Date:
ES Ch8	Protection of Marine Ecology	Rock revetment construction would be undertaken within an approximate working buffer of 20m-30m from the base of the proposed 30m deep revetment (approximate maximum of 50-60m from the sea wall). This would avoid unnecessary tracking across the intertidal area from machinery and plant associated with the construction, thus avoiding likelihood of physical damage to marine features.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Marine and Terrestrial Ecology	Soil erosion prevention measures (to include restricting plant movement on vegetated and unvegetated ground (including intertidal sands), avoidance of repeated tracking and the buffer area of 20m for plant to track from the rock revetment (50m from seawall in total)).	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Terrestrial Ecology	Use of tree-protection fencing (in line with BS5837-2012) and other demarcation fencing to protect retained habitats from construction encroachment.	Compliance with arboricultural method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Marine Ecology	The unloading of rocks from the barge would be undertaken at high tide to allow the rocks to be pushed off the barge onto an area slightly covered by water, reducing the repeated underwater noise and vibration impacts through the water column on marine receptors.	Compliance with Transhipment Plan	Principal Contractor to prepare	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Fish species	The unloading of rocks from the barge would be supervised by an ECoW who is able to temporarily halt works if any individual fish or shoals are observed nearby.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Marine Ecology and Birds	Any piling undertaken on site would be via vibropiling with variable frequency control that would adhere to high frequencies. This would minimise noise and vibration impact on the mussel bed and on birds within close proximity to shore.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Marine and Terrestrial Ecology	Toolbox talks would be undertaken with site staff prior to works commencing to highlight the importance of ecological habitats and species and to ensure avoidance of potential damage or disturbance during the works / what action to take if species are encountered during works.	Record of staff inductions including toolbox talks attended	Induction procedures and site briefings	Principal Contractor with ecological advice from ECoW	C	Signature: Date:
ES Ch8	Protection of Marine and Terrestrial Ecology	Standard best practice measures are required to minimise effects on habitats, including: • Best practice measures to reduce noise and vibration during construction; • Damping down of dust sources and other measures to minimise air quality effects to habitats; and • Best practice construction and hygiene measures (avoiding littering, fires, storage of foods, etc).	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Marine and Terrestrial Ecology	If night-time working is required to make use of certain stages of the tide (e.g. unloading of rocks by barge), lighting of the water column, intertidal area and marine habitats would be avoided where possible, with a low frequency light used to minimise light pollution. If lighting cannot be avoided,	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		light spill would be minimised through positioning of lighting, use of directional lighting, hoods, shields and low-level lighting.					Date:
ES Ch8	Protection of Marine Ecology	A walkover should be undertaken on site 6-8 weeks prior to the commencement of works by a marine ecologist to identify any areas of INNS (Invasive and Non-Native Species).	Updates to constraints plan as required	Walkover survey	Principal Contractor and ECoW	P	Signature: Date:
ES Ch8	Protection of Marine Ecology	The biosecurity risk assessment should be included within the CEMP and closely followed to avoid any potential spread of INNS within, into, or out of the site.	Not required	Implement recommendations in biosecurity risk assessment	PC	C	Signature: Date:
ES Ch8	Protection of Terrestrial Ecology (Nesting Birds)	Any woody vegetation clearance or building demolition to be undertaken outside of the nesting bird season (widely considered to be from March to August inclusive but can vary depending on the species/or seasonal constraints). Where this is not possible, pre-clearance checks must be undertaken by an experienced ecologist to identify if any birds are nesting within or close to the vegetation due to be removed. If a bird's nest is found, it must be left in-situ and protected from the works. No works can be undertaken in that area until the young birds have fledged from the nest site, which may take up to 6 weeks depending on the species.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch8	Protection of Terrestrial Ecology (Reptiles)	Vegetation clearance (railway embankments) to be undertaken between April and the end of October, if possible, whilst reptiles are active. Vegetation clearance would be undertaken in a phased manner under ecological supervision and preceded by a hand search for reptiles. Any reptiles encountered would be moved to outside of the working area.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor in liaison with Network Rail	C	Signature: Date:
ES Ch8	Protection of Terrestrial Ecology (Badgers and other mammals)	An update check would be undertaken 12 weeks prior to the commencement of works on the railway embankments to ascertain whether there is any evidence of badger or other mammals. Works should avoid any recorded or potential burrows, where possible. In the unlikely event badgers are recorded, setts would be avoided during works. General best practice should be followed within the construction zone (including avoiding storage of large piles of earth near the woodland and no open excavations to be left overnight without a mammal ladder or ramp).	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	P	Signature: Date:
ES Ch8	Protection of sensitive habitats	Production of a guidance note for the council maintenance team on the optimal timing of maintenance activities for use in programme planning Provision of an information leaflet for council maintenance workers and inclusion of this in contractor briefing packs (this would identify known locations of sensitive habitats such as the presence of Sabellaria alveolata and blue mussel beds, along with newly enhanced areas that need to be left undisturbed to allow colonisation by marine species. This would ensure these areas can be avoided during future maintenance works	Production of guidance note and inclusion in maintenance schedules given to contractors	CCBC to arrange for production of guidance note	CCBC	A	Signature: Date:
ES Ch8	Protection of sensitive habitats	Erection of wildlife information boards and signage along the Promenade, close to vehicular access points to the beach, to highlight the importance and sensitivity of birds and marine species in the area, along with information outlining the importance of the new ecological enhancements on site and how the changes made would benefit local species	Production and erection of information signs	CCBC to arrange for production of signage	CCBC	O	Signature: Date:
ES Ch9 Climate and Carbon Management Plan							
ES Ch9	To reduce carbon emissions	In line with the Prosperity for All Plan and the UK Government's carbon reduction plan, the Scheme should continue through construction to seek to reduce GHG emissions as far as practicable to contribute to the national net reduction in carbon emissions and maximise the potential for reducing GHG emissions. Throughout the Scheme's construction, plant equipment and vehicles to be used would be selected based on their relative environmental performance taken from a technical specification. Construction works would be carried out in accordance with the best practicable means, as described in Section 79 (9) of the Environmental Protection Act (EPA) 1990, to reduce fumes or emissions. This would include all vehicle engines and plant motors to be switched off when not in use.	Compliance with traffic management Plan and Site Waste Management plan	Principal Contractor to prepare plans	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
Carbon Management Plan	To reduce carbon emissions	To continue the reduction of carbon the following measures are required to be implemented wherever possible, confirmed or further explored. These ideas will be considered and justified if not possible to implement: • Recycled steel to be used for rebar where possible at a minimum of 85% recycled steel; • Recycled material to be used as a cement replacement. 36-85% ground granulated blast furnace slag as a suggested material; • Transport of rock revetment potentially to be by boat from Scotland or Norway. The further investigation should consider the distance required to move the rock from the quarry to the port also. For calculations see the following – by boat approx. 0.92 tCO^2e per km versus by road approx. 55.36 tCO^2e per km; • During quarrying and armourstone extraction, use byproduct as underlayers, fill, aggregate or roadstone; • Source slate waste as fill to use for raising levels; • Reuse of fill from other sites for prom raising/behind revetment; • Re-use of existing materials e.g. lighting, parking meters, ramp, benches.	Resource efficiency targets to be set in SWMP	Principal Contractor to develop SWMP	Principal Contractor	C	Signature: Date:
ES Ch10 Coastal processes and Flood Risk							
ES Ch10	Prevention of pollution of controlled waters	Throughout the construction and operational phases, best practice guidance in reference to pollution prevention would be followed; CIRIA (Construction Industry Research and Information Associated) (2015).	Adherence to Marine Pollution Contingency Plan and Surface Water Management Plan	Principal Contractor to develop plans	Principal Contractor	C	Signature: Date:
ES Ch10	Prevention of adverse effects on coastal processes.	Deliveries would be made at high tide and deposited as close to the working area (as high up the beach) as possible. Following the appointment of a Contractor, and the selection of a delivery method for the revetment rock (barge or road), the CEMP would be updated to outline the routes where the construction vehicles can travel to minimise the area of beach affected. These routes would be finalised in agreement with CCBC and NRW, but as a minimum would exclude the blue mussel bed, and areas of Honeycomb Worm reef patch (see Drawing 410895-MMD-00-XX-DR-N-1711 along with the avoidance of disturbing the existing rock groyne areas where Honeycomb Worm has been identified (other than for ecological enhancement works – placement of ecological armouring units). A site walkover by a marine ecologist 6-8 weeks prior to works commencing would be completed to make any necessary changes to plant movement routes and proposed stockpiling areas. Where material is disturbed localised reinstatement of the beach would be undertaken.	Compliance with method statements	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch10	Prevention of adverse effects on coastal processes.	Stockpile locations would be agreed in advance with CCBC and NRW once a Contractor has been appointed (to be recorded in the CEMP) and the revetment rock delivery method has been selected. Where this is not possible, the size of the stockpile should be assessed to ensure that changes to the current flows are not creating areas of scour. Monitoring of the beaches around the stockpile should be undertaken and the beach levels reinstated should beach lowering be recorded. A Contractor-led beach inspection scheme would be required, to be agreed in advance with CCBC and NRW and detailed in the CEMP. Stockpiles would only be temporary and would not be permitted to remain beyond the end of the construction phase in question.	Compliance with CEMP	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:
ES Ch10	Prevention of adverse effects relating to transhipment of rock revetment.	If transhipment of revetment rock is considered necessary, the Contractor would produce a Transhipment Management Plan in consultation with CCBC, NRW and other local stakeholders prior to construction. It is proposed that this plan would include the identification of the transhipment locations offshore and a bathymetric survey of the area prior to works commencing. The plan could also include shipping corridors to the frontage, along with bathymetric surveys of these areas. The methodology for transferring rocks between barges would also be included to minimise the loss of rocks overboard. A plan for recovering any lost rocks off the seabed should also be included should this be required by NRW.	Compliance with Transhipment Plan	Principal Contractor to prepare	Principal Contractor	C	Signature: Date:
ES Ch10	Management of flood risk during construction.	The contractor would be required to develop and implement a robust Construction Flood Risk Management Plan prior to commencement of the construction phase. To reduce the potential increase in flood risk and increased erosion during the temporary removal of defences, works should be scheduled as far as is practicable for lower tides and reduced storm periods (i.e. outside the winter period). Alternatively, enforced temporary closures of the Promenade may be required during the works. If damage to the Promenade and existing sea wall occurs temporary works to shore-up the structures should be undertaken to prevent failure.	Compliance with Construction Flood Risk Management Plan and Surface Water Management Plan	Principal Contractor to prepare	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
ES Ch10	Prevention of import of INNS	The Biosecurity Risk Assessment covers the measures required to safely manage the import of materials from other sites into the intertidal area.	Compliance with Biosecurity Risk Assessment	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch10	Pollution prevention	Sediment samples taken during the ground investigation would determine sediment quality and whether contaminants are likely to be released during construction (currently considered to be unlikely). Should contamination be identified, an appropriate risk assessment would be completed to ascertain any additional mitigation measures considered necessary.	Preparation of ground investigation report	Ground investigation procured	Designer/CCBC	P	Signature: Date:
ES Ch11 Landscape							
ES Ch11	Mitigation of adverse landscape effects.	The following mitigation measures are proposed to mitigate any significant adverse construction effects: • Lighting during construction would be designed to minimise light pollution during the hours of darkness. Lighting would be directional to prevent light spill and designed to reduce skyglow; • Site fencing around the construction sites would be well maintained throughout the construction period; • Cycleways would be diverted to allow access where possible; • Footpaths would be diverted to allow access where possible; • During offloading of materials, the affected beach area would be off limits to recreational users of the beach and water. Users would be encouraged to use other stretches of the coastline. • All areas of land within the Scheme red line boundary that have been temporarily occupied during the construction phase (areas not to be re-developed) would be re-instated to pre-construction condition.	Adherence to landscape and ecological management plan	Principal Contractor to prepare method statements	Principal Contractor	C	Signature: Date:
ES Ch11	Mitigation of adverse landscape effects.	The significant construction landscape and visual effects anticipated would require further mitigation and monitoring, summarised as follows: • The Contractor would adopt sensitive policies towards reducing visual impact as far as possible. Wherever possible viewing platforms would be provided so that members of the public can safely view the ongoing work; • Areas where works are complete would be reopened to the public as soon as safely possible; • Complaints from residents would be collated by the Contractor and wherever possible mitigation undertaken to reduce that impact; and • Where planned activities are anticipated to cause a visual disturbance, the Council would be informed in advance to allow notification of the proposed works to be disseminated.	Compliance with CEMP	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:
ES Ch12 Materials							
ES Ch12	Reduction in materials usage and waste generation. .	A Materials Management Plan (MMP) would be compiled by the Contractor, if required, as part of the Construction Environmental Management Plan (CEMP), if required. It would identify ways to re-use site-won or excavated materials within the construction of the Scheme, provided they meet the requirements of the CL:AIRE Code of Practice (CoP).	A verification plan is required if an MMP is used	Principal Contractor to prepare MMP	Principal Contractor	C	Signature: Date:
ES Ch12		A site waste management plan (SWMP) would also be developed by the Contractor as part of the CEMP. It would contain specific information on how material with the potential to become waste is reused or managed on- or off-site during the construction of the proposed Scheme. The SWMP is a key part of the CEMP and would be a live document based on construction operations as they occur	SWMP to be completed	Principal Contractor to prepare SWMP	Principal Contractor	C	Signature: Date:
ES Ch12		Mitigation measures that would be implemented on-site to ensure efficient use of material resources, are as follows: • Materials would be delivered on an ‘as required’ basis to avoid damage or contamination and limit the generation of waste; • Where site-won material is not available or suitable for re-use; secondary or recycled materials would be procured where available and practicable; • All suitable excavated material would be re-used in the construction of the Scheme and in landscaping features to reduce the requirement to import materials for construction and reducing the need to remove surplus materials from site;	SWMP to be completed	Principal Contractor to prepare SWMP	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		• Excavating activities would be confined to the minimum areas required for the works to minimise the quantity of contaminated material removed; • Temporary stockpiling of fill materials prior to incorporation in the Scheme would be avoided where possible, to ensure double handling and damage is minimised and therefore avoidance of waste. However, where required, materials would be stockpiled in accordance with best practice and managed appropriately to limit the likelihood of damage or contamination; • Locally sourced materials and suppliers would be identified and used, where practicable, to reduce fuel requirements and cost of delivery, for example sand along the coast where permitted. This also reduces greenhouse gas emissions resulting from transportation; • Pre-cast elements would be used, where practicable, to ensure efficient use of materials and avoid the generation of waste arisings from off-cuts; • Collaborating with nearby projects to provide and use surplus material, where suitable; • The waste hierarchy would be implemented throughout the construction to minimise disposal and maximise re-use and recycling of site-won material. Opportunities for re-use and recycling include (but are not limited to): – Re-using excavated soils on-site in the landscaping features of the Scheme; – Chipping green waste on-site for use in the landscaping for the Scheme; – Composting of green waste; – Recycling of inert material by crushing, blending and subsequent re-use, as an aggregate; – Re-using waste on other nearby schemes, subject to permitting requirements and suitability of the material; and – Re-using waste for uses with clear benefits to the environment, for example in the remodelling of agricultural land or in the restoration of nearby quarries or other excavation sites. • Facilities e.g. site compounds and skips would be provided on-site to separate out waste, for example for recycling.				
ES Ch12		Material and waste audits would be undertaken throughout the construction phase. This would ensure that re-use and recycling targets are met on-site and would ensure that there is no surplus of materials. By conducting audits regularly this would give an indication of where continual improvements to waste management and minimisation of material use can be made throughout the construction phase. The Contractor would report on the types and quantities of C&D waste taken off-site, who removed it and where to. It would also require the Contractor to report on performance against re-use and recycling targets throughout the construction phase and justify any deviations from the forecasted waste quantities, to minimise material import requirements. The MMP, if required, would also require a verification report to confirm that only the material identified suitable for use in the MMP was used and placed in accordance with the MMP.					Signature: Date:
ES Ch13 Noise and Vibration							
ES Ch13	The effective management and reduction of construction noise.	Piling activities at the Perpendicular Step No.2 area (located in the middle of Area 2, Construction Phase 1) would be avoided during the weekend beyond 1300hr.	Not required	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:
ES Ch13		Mitigation measures would help to further reduce the scale of the effects on the environment. BS5228-1:2009+A1:2014 recommends that, in some circumstances, a greater noise level may be tolerated if the overall duration of construction and therefore length of disruption is reduced. The following would be considered: • Unnecessary revving of engines would be avoided, and equipment would be switched off when not in use; • Internal haul routes would be kept well maintained; • Rubber linings in, for example, chutes and dumpers would be used to reduce impact noise; • Drop heights of materials would be minimised; • Plant and vehicles would be sequentially started up rather than all together; • Use of effective exhaust silencer systems or acoustic engine covers as appropriate; • As far as reasonably practicable, sources of significant noise would be enclosed;	Records of complaints and actions to be kept	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		• Plant would always be used in accordance with manufacturers' instructions. Care would be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading would also be carried out away from such areas; • Regular and effective maintenance by trained personnel would be undertaken to keep plant and equipment working to manufacturers specifications; • Screening e.g. noise barriers and blinds would be used as appropriate; • Consideration should be given to traffic routing, timing and access points to the Site so as to minimise noise impacts at existing receptors following contractor appointment, and as construction working methods are developed. However, increases in road traffic noise levels during works would be temporary, relatively short term, and although the effect would be dependent on the actual number of HGV deliveries, it is considered that significant effects can be managed and avoided; • Contractors would issue a project route map and delivery schedule to control construction traffic. Traffic management would be employed to guide and control both public and construction traffic during deliveries; • All work outside these hours would be subject to prior agreement of, and/or reasonable notice to CCBC. Night-time working would be restricted to exceptional circumstances, and minor work internally within buildings.					
ES Ch13	The effective management and reduction of construction traffic noise (including diverted traffic)	To mitigate potential disturbance traffic calming measures and/or enforcement would potentially be effective if traffic is perceived as noisier due to increases in combination with speeding vehicles. To prevent complaints, good community consultation and communication would be vital along with effective complain management. It would be important to gather information on any received complaints and respond quickly.	Records of complaints and actions to be kept	Principal Contractor to prepare Traffic Management plan	Principal Contractor	C	Signature: Date:
ES Ch13	The effective management and reduction of construction vibration.	A risk assessment identifying the probability of vibration from any piling activities should also be carried out prior to commencement of construction activities, to determine the need for periodic or continuous vibration monitoring. It is recommended that the contractor uses techniques such as rotary piling methods that are least likely to cause vibration. Should the need arise, additional means of mitigating potential effects would be considered as the construction arrangements are developed further. It is likely that the magnitude of the potential vibration effects can be reduced, if not avoided altogether, as a result of these further considerations. For the general control of vibration, BS5228-2:2009+A1:2014 recommends: • Selection of appropriate pilling technique and energy input; • Provision of cut off trenches (which are similar to noise screens in that they interrupt the direct path between source and receiver); • Pre-boring which can reduce resistance to penetration; • Site management and planning; • Working methods such as hours of work; • Control of vibration at source by replacing plant/methods of works at or near vibration sensitive premises, where reasonably practicable, with less intrusive plant and/or methods of working; • Where reasonably practicable, vibrating equipment would be located as far from sensitive premises as possible, and, if on a structure, not on one which is continuous with that of the sensitive premises; and • Identify any opportunities to reduce vibrations from piling activities through identifying any alternative methods available and removal of obstructions to reduce the exacerbation of transmission of vibration. BS5228-2:2009+A1:2014 includes guidance on measures to mitigate vibration arising due to construction activity. The level of vibration at the point of the receptor would normally be a function of many variables including: • Energy per blow or cycle of the piling activity; • Distance between source and receiver; • The conditions of the intervening ground between the source and receiver e.g. soft or hard ground; • Soil-structure interaction, i.e. the nature of the connection between soil and structure being monitored; and	Records of complaints and actions to be kept	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		• Type and nature of structure and location of point of reception, for example: on the soil surface; on a building foundation; or on an internal structural element.					
ES Ch13		Noise and vibration monitoring are generally used to control exposure where significant adverse effects are anticipated. The predictions show that with mitigation in place, no significant adverse effects would be anticipated, although some piling activities and construction traffic on Marine Road may come close to the proposed limits. It is therefore considered that monitoring would not be needed but should be kept as an option in the event that levels are exceeded in practice.	Noise monitoring results reported	Principal Contractor to prepare noise monitoring plans if required	Principal Contractor	C	Signature: Date:
ES Ch14 Population and Human Health							
ES Ch14	Minimisation of disruption for users of the waterfront area.	The Contractor would develop a CEMP to minimise disruption to businesses for customers, deliveries and staff and to minimise disruption to pedestrians, cyclists and users of the beach;	Records of complaints and actions to be kept	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:
ES Ch14		Temporary diversions and other management procedures would be advertised throughout the WIA	Records of advertisements	Principal Contractor to prepare CEMP	Principal Contractor	C	Signature: Date:
ES Ch14		The Contractor would develop a Traffic Management Plan to minimise disruption to motorised users.	Records of complaints and actions to be kept	Principal Contractor to prepare Traffic Management Plan	Principal Contractor	C	Signature: Date:
OPERATION							
ES Ch3 Scheme Description							
ES Ch3	To ensure longevity of structures and effectiveness of Scheme in the long term.	• Regular inspection, reactive maintenance and repair of revetment, structures, groynes access-build out, steps and fishing platform as identified following routine inspections (this is anticipated to be minimal in the short-medium term); • Routine maintenance and repair of Promenade including pavement, drainage system, vegetation management of soft landscaped areas including the picnic area and outdoor classroom; • Cleaning and maintenance of slipways and flood gates (hinges and seals) with a suitable inspection regime; • Maintenance of landscape features such as benches, guards and handrails; and • Monitoring of beach levels at the toe of the revetment and along the beach: The revetment design has allowed for a 0.5m fall in beach levels (beach levels have been relatively stable for the past 15 years. Should beach levels be noted to fall more than 0.5m following inspections, localised recycling of beach material would be required. Conversely should accretion be noted of more than 1m, this could be detrimental to accesses or ecological enhancements and some limited beach management may be required. • During the occurrence of particular events (in general spring/highest tides coinciding with onshore winds or storm events) CCBC would monitor conditions as they do currently and potentially close the Promenade when overtopping levels may exceed safe limits for pedestrians/vehicles (the number of these occasions are anticipated to fall significantly following Scheme completion).	Condition surveys	Maintenance plans	CCBC	O	Signature: Date:
ES Ch8 Biodiversity (Terrestrial and Marine)							
ES Ch8	To manage biodiversity assets optimally.	• Habitats and Faunal Enhancements: Monitoring, maintenance and aftercare for newly created marine and terrestrial habitats, in order to ensure these establish and develop as required to be of biodiversity benefit. This would include annual checks to ensure that these are on track (in line with the management prescriptions), in good condition and, in the case of point features, are not missing or damaged	Condition surveys	Maintenance plans	CCBC	O	Signature: Date:
ES Ch8		• Sabellaria alveolata and Mytilus edulis (blue mussel bed): Pre-construction photographic condition surveys have been undertaken of the marine habitats on site. It is important to take ongoing images of the site immediately after construction is completed as this would enable records to be taken of the amount of existing habitat that was lost to incorporate the site	Condition surveys	Maintenance plans	CCBC	O	Signature:

Reference	Objective	Action (including specific location and any monitoring required)	Achievement criteria and reporting requirements (if applicable)	How the action is to be implemented	Responsible person(s)	When P= Pre-construction C= Construction O= Operation A= All	Completion record
		enhancements (e.g. sections of groynes and associated Sabellaria alveolata that were removed to enable the installation of ecological armouring units). This would provide a suitable baseline against which to assess any improvement in colonisation of the enhanced areas of the site over the future years.					Date:
ES Ch8		• It is anticipated that the above monitoring as well as prescriptions for the creation and management of new terrestrial and intertidal habitats would be set out within a Landscape and Ecological Management Plan (LEMP), to be delivered by an appointed contractor under the guidance of, and with specialist input from, ecologists as needed. It is recommended that this LEMP takes into account management of the marine environmental enhancements over a ten year period to ensure enough time for establishment once construction and then colonisation by marine species.	Condition surveys	Maintenance plans	CCBC	O	Signature: Date:
ES Ch10 Coastal processes and Flood Risk							
ES Ch10	Monitoring to ensure structures and ecological enhancements operate optimally.	Regular beach monitoring would be undertaken along this section of the frontage and a beach monitoring regime would need to continue throughout the life of the coastal defence works to record how the beach is evolving in front of the new rock revetment, enabling any remedial action to be planned if required. Should the beach level drop below 0.5m CCBC would be required to undertake localised beach recycling and if it should rise by over 1m, localised beach management may be required to ensure ecological enhancement and outfalls remain operational.	Condition surveys	Maintenance plans	CCBC	O	Signature: Date:
ES Ch10	Prolonging structure life.	Rock structures proposed would require minimal maintenance. Inspections would be carried out to recognise any movement or potential failure of the structures	Condition surveys	Maintenance plans	CCBC	O	Signature: Date:
ES Ch10	Management of flood risk.	During the occurrence of particular events (in general spring/highest tides coinciding with onshore winds or storm events) CCBC would monitor conditions as they do currently and potentially close the Promenade when overtopping levels may exceed safe limits for pedestrians/vehicles (the number of these occasions are anticipated to fall significantly following Scheme completion). The process for closing the Promenade follows the methodology provided in current CCBC management arrangements.	Not required	Emergency plans	CCBC	O	Signature: Date:
ES Ch10	Pollution prevention.	Chemicals used for cleaning of the beach access points (stairs and slipways) must be specified to be non-hazardous to ensure that there is no adverse impact on the sediment and water quality.	Not required	Maintenance plans	CCBC	O	Signature: Date:
Flood Consequence Assessment							
FCA	Flood risk management	An Operational Flood Management Plan will need to be produced by CCBC	Not required	Emergency plans	CCBC	O	Signature: Date:

4 Consents and Permissions

4.1 Consents and Permissions

To be updated as necessary by Principal Contractor.

The following will be required for the Scheme construction:

- Flood Risk Activity Permit;
- Work below mean high water spring will require a Marine Licence; and
- Crown Estate Permission.

4.2 Consents and Permission Record

To be updated by Principal Contractor.

5 Details of Maintenance and EMP Monitoring Activities

This EMP:

- Will be updated with results of monitoring during construction and handover phases including:
  - The mitigation needed to manage environmental effects associated with a project and identify all necessary measures to avoid, reduce and offset a project's environmental impact and the methods for implementation;
  - The statutory monitoring commitments, including the need to evaluate the monitoring, identify remedial actions and report on environmental monitoring; and
  - Environmental management actions should include all monitoring requirements, success criteria, and specify a mechanism for reporting on progress against environmental requirements and commitments.

The EMP is an iterative document and continually updated to reflect progress on achieving the identified actions throughout the project lifecycle and respond to any assessment assumption and design changes identified by the change management process.

A summary of the tertiary mitigation/monitoring requirements identified within this ES[1] for the identified potentially Significant Adverse effects (and in addition where identified as being necessary elsewhere in the ES) is provided in Table 5.1.

Table 5.1: Summary of Tertiary Mitigation/Monitoring Requirements

Discipline	Potential Residual Significant Effect	Tertiary Mitigation/Monitoring Proposed
Biodiversity	N/A	Overall only a slight adverse effect has been concluded from the construction phase in respect of Liverpool Bay SPA and a number of marine receptors. As such, there are no long-term requirements of monitoring. However, in line with best practice, monitoring of certain receptors is proposed in order to inform on-going maintenance and enhancements. This includes: • Habitats and Faunal Enhancements: Monitoring, maintenance and aftercare for newly created marine and terrestrial habitats, in order to ensure these establish and develop as required to be of biodiversity benefit. This would include annual checks to ensure that these are on track (in line with the management prescriptions), in good condition and, in the case of point features, are not missing or damaged; and • *Sabellaria alveolata* (Honeycomb Worm) and *Mytilus edulis* (Blue Mussel bed): Pre-construction photographic condition surveys have been undertaken of the marine habitats on site. It is important to take ongoing images of the site immediately after construction is completed as this would enable records to be taken of the amount of existing habitat that was lost to incorporate the site enhancements (e.g. sections of groynes and associated Sabellaria alveolata that were removed to enable the installation of ecological armouring units). This would provide a suitable baseline against which to assess any

Discipline	Potential Residual Significant Effect	Tertiary Mitigation/Monitoring Proposed
		improvement in colonisation of the enhanced areas of the site over the future years. It is anticipated that the above monitoring as well as prescriptions for the creation and management of new terrestrial and intertidal habitats would be set out within a Landscape and Ecological Management Plan (LEMP), to be delivered by an appointed Contractor as part of the CEMP under the guidance of, and with specialist input from, ecologists as needed. It is recommended that this LEMP takes into account management of the marine environmental enhancements over a ten year period to ensure enough time for establishment once construction and then colonisation by marine species.
Coastal processes: Hydromorp-hology	N/A	During the construction of the Scheme, monitoring of the beach levels and the impacts of localised scour would need to be undertaken by the Contractor, in addition, monitoring of the tides and any storm events would also be necessary. A management plan for a response to storms would be included in the Contractors Flood Risk Management Plan. Following the construction of the Scheme, ongoing monitoring of the beach levels would be undertaken and the results reviewed against historic and as-built information. This would allow any erosion or accumulation to be assessed to determine if action is required. This action could include beach recycling should the beach fall by 0.5m or localised beach management should levels rise by 1.0m. CCBC would be required to produce an Operational Flood Risk Management Plan.
Landscape	Temporary, partial loss or alteration to key elements/ features/charact eristics of the Colwyn Bay Waterfront LCA. Temporary Promenade/cycl eway/beach closure or diversion. Temporary effects on views from Porth Eirias.	The significant construction landscape and visual effects anticipated in this report would require further mitigation and monitoring, summarised as follows: • The Contractor would adopt sensitive policies towards reducing visual impact as far as possible. Wherever possible viewing platforms would be provided so that members of the public can safely view the ongoing work; • Areas where works are complete would be reopened to the public as soon as safely possible; • Complaints from residents would be collated by the Contractor and wherever possible mitigation undertaken to reduce that impact; and • Where planned activities are anticipated to cause a visual disturbance the Council would be informed in advance to allow notification of the proposed works to be disseminated.
Materials	Impacts on the availability of secondary (recycled) material resources, and	Material and waste audits would be undertaken throughout the construction phase. This would ensure that re-use and recycling targets are met on-site and would ensure that there is no surplus of materials. By conducting audits regularly this would give an indication of where continual improvements to waste

Discipline	Potential Residual Significant Effect	Tertiary Mitigation/Monitoring Proposed
	subsequent impacts on the demand for key construction materials. Depletion of non-renewable resources (virgin materials).	management and minimisation of material use can be made throughout the construction phase. The SWMP and CEMP should include monitoring measures to prevent the significant effects from the use of material resources and the generation of waste, where possible. The Contractor would report on the types and quantities of construction and demolition waste taken off-site, who removed it and where to. It would also require the Contractor to report on performance against re-use and recycling targets throughout the construction phase and justify any deviations from the forecasted waste quantities, to minimise material import requirements. The MMP, if required, would also require a verification report to confirm that only the material identified suitable for use in the MMP was used and placed in accordance with the MMP.
Noise and vibration	N/A	Noise and vibration monitoring are generally used to control exposure where significant adverse effects are anticipated. The predictions show that with mitigation in place, no significant adverse effects would be anticipated, although some piling activities and construction traffic on Marine Road may come close to the proposed limits. It is therefore considered that monitoring would not be needed but should be kept as an option in the event that levels are exceeded in practice.

Source: Mott MacDonald, 2020

6 Induction, Training and Briefing Procedures for Staff

6.1 Introduction

Table 6.1 identifies an indicative programme of training on environmental issues relevant to the scheme that have been identified for delivery prior to and during the construction stage. On commencement of site mobilisation, the Principal Contractor will be responsible for site inductions and training of all personnel on the site, whether visitors, full time staff or subcontractors

All individuals working on or visiting the site will be required to attend the Principal Contractor's site-specific induction. Those participating in or near to specific activities that have the potential for an environmental impact will be required to attend additional training or toolbox talks, led by the PC or specialists, on ecology, pollution control, waste management and emergency procedures for minor and major incidents.

The list below is not exhaustive and the Principal Contractor or Environmental Manager onsite must highlight requirements for additional training, as the project progresses, to improve and add value to the overall site environmental awareness and compliance. Additional training or induction issues would be identified from the regular site environmental check reports, or site feedback on any noted non-compliance. It is a requirement for the site to maintain the standard of environmental management and minimise risks that could negatively impact on the environment

Any additional induction and training requirements should be inserted within Table 6.1 below as they are identified throughout the lifetime of the scheme, by the Principal Contractor.

Table 6.1: Inductions

Topic	Personnel	Delivery	Delivery Format
Competent resources (staff)	All	By lead staff resource or employer id sub-contractor prior to commencement of activities.	Supply of specific certificates, for example Construction Skills Certification Scheme (CSCS) Project Cards, training confirmation.
Reporting of environmental observations and suggestions.	All	Site induction	Presentation and environmental reporting cards to be supplied. Posters with site reporting and environment contact numbers.
Communications to public.	All	Site induction	Follow Considerate Constructors Scheme principles (CCS) or a Communication Plan, if required.
Spill kit use.	All	Site induction	Toolbox talks and Deployment Training Session.
Refuelling / mechanical repairs and maintenance (off and on site)	All	Site induction	The Principal Contractor Site Induction Pack and PowerPoint Presentation (if applicable).
Tree root protection areas (RPAs)	All staff	Site induction	The Principal Contractor Site Induction Pack and PowerPoint Presentation (if applicable).
Waste from Welfare units and offices – Sewage	All staff	Site induction	The Principal Contractor Site Induction Pack and PowerPoint Presentation (if applicable).

Topic	Personnel	Delivery	Delivery Format
Chemical handling and storage	Stores manager and any persons with access or contact	Site induction	The Principal Contractor Site Induction Pack and PowerPoint Presentation (if applicable).
Ecological sensitivities	All	Site induction. Prior to works close to sensitive areas.	Toolbox talks where relevant and daily site briefings.
Preventing nuisance (noise, vibration, dust and odours)	Any specialist installations (for example breaking out concrete, existing pavement) machine drivers and banksmen.	Site induction.	Presenting nuisance (noise, vibration, dust and odours)

6.2 Environmental Competencies

The Principal Contractor shall ensure all personnel are suitably qualified or experienced for the roles and responsibilities that they are employed to undertake and suitably supervised.

The Principal Contractor will monitor and record that all staff have attended the relevant environmental induction or training as listed above (including updated or new training) prior to undertaking any activities on site.

6.3 Training and Site Induction

All site personnel and visitors are to receive Site Safety induction and Environmental Awareness training from the Principal Contractor before commencing activities on site. The list below is not exclusive but environmental training at Induction will at least include the following:

- Company/Project Environmental Policy;
- Site environment;
- Fuel containment;
- Earthworks and Excavations (Risks of exposing contamination);
- Pollution protocol and measures for example use of spill kits;
- Defined Materials Storage area (excavated and imported);
- Defined waste areas - Domestic and construction materials;
- Wheel wash – road sweeping;
- Dust and emissions control;
- Noise control;
- Vibration control;
- Site traffic protocols and routes in the form of a Traffic Management Plan - haul routes, staff travel to site plan;
- Warning signs;
- Site Inspection and monitoring forms;
- Material procurement;

- Toolbox talks where relevant to specific works;
- Communication Systems on site – dealing with the public, incident and near miss reporting inclusive of environment;
- Site organisation, key personnel responsibilities and contact details;
- Emergency Response Plan(s) for addressing Safety and Environmental issues.
- Contamination risk management;
- Update and maintain site specific toolbox talks or advisory sheets relevant to the project; and
- Working in publicly accessible places.

6.4 Toolbox Talks and Induction Supporting Materials

Toolbox talks will be posted within common use areas such as welfare units and office reception areas. Key environmental issues linked to the programme will be targeted on the daily notice board as an aide memoir to all staff on site for example areas of construction plant avoidance due to ecological constraints.

7 Glossary

Term and abbreviation if necessary	Definition
Environmental Management Plan (EMP)	The EMP includes the specific measures that will be taken to control and manage the environmental impacts whilst the project is under construction that may otherwise occur for each of the environmental topics, such as noise, air quality, water resources and ecology. In addition, a description of the planned works and the general site arrangements should be included in the EMP. The Principal Contractor will be responsible for ensuring the measures specified within the EMP are implemented.
Contaminated Land Risk Assessment	The management and remediation of contaminated land that, in its current state, is causing or has the potential to cause significant harm or significant pollution of the water environment, is regulated by legislation contained within the Environmental Protection Act (1990) known as Part IIA.
Dust	The word ‘dust’ usually refers to particulate matter in the size range 1-75 microns in diameter. Dust can be mechanically transported either by wind or re-suspension by vehicles. It can also arise from wind erosion on material stockpiles and earth moving activities.
EMP: Outline EMP (First iteration EMP)	A management plan produced during the design stage for the preferred option.
EMP: Construction EMP (Second iteration EMP)	A management plan that is refined during the construction stage for the consented project, in advance of construction.
EMP: Handover EMP (Third iteration EMP)	A management plan that contains essential environmental information needed by the body responsible for the future maintenance and operation of the asset.
Environmental Clerk of Works	An environmental or construction professional with direct responsibility for monitoring compliance with planning consents, environmental permits, legislation and mitigation
Flood Risk Assessment (FRA)	An assessment of the likelihood of flooding in a particular area so that development needs and mitigation measures can be carefully considered.
Ground Investigation	Geotechnical investigations are performed by geotechnical engineers or engineering geologists to obtain information on the physical properties of soil and rock around a site.
ISO 14001 Environmental Management Systems (EMS)	An ISO 14001 environmental management system (or commonly referred to as an EMS) is a structured system designed to help organisations manage their environmental impacts and improve environmental performance caused by their products, services and activities.
Listed Building	A building which is considered by the Secretary of State (for Culture, Media and Sport) to be of special architectural or historic interest in accordance with the regime set out in the Town and Country Planning (Listed Buildings and Conservation Areas) Act 1990.
Local Wildlife Site (LWS)	Non-statutory sites that are given protection under the planning process.
Materials Management Plan (MMP)	The Materials Management Plan (MMP) identifies materials to be generated and clarifies how they will be reused. The Materials Management Plan must be approved by an independent Qualified Person (registered with CL:AIRE).
Mitigation	Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects.
Natural resources Wales (NRW)	NRW is responsible for environmental protection and regulation in Wales and plays a central role in implementing the government’s environmental strategy. NRW is the main body responsible for managing the regulation of water quality and resources, coastal waters (including Marine Licensing), fisheries, inland river, estuary and harbour navigations, and conservation and ecology. They are also responsible for managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.

Term and abbreviation if necessary	Definition
Operation	The functioning of a project on completion of construction.
Receptor	A defined individual environmental feature that has the potential to be affected by a project.
Special Area of Conservation	A Special Area of Conservation (SAC) is defined in the European Union's Habitats Directive (92/43/EEC), also known as the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora.
Scheduled Monument	A scheduled monument is a historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport under the regime set out in the Ancient Monuments and Archaeological Areas Act 1979.
Site of Special Scientific Interest (SSSI)	An SSSI is a conservation designation denoting a protected area in the United Kingdom, designated due to special interest in its flora, fauna, geological or physiographical features. They are protected by law to conserve their wildlife or geology.
Site Waste Management Plan (SWMP)	SWMPs encourage the effective management of materials and ensure waste is considered at all stages of a project - from design through to completion. Although no longer a regulatory requirement in England, SWMPs are still considered to be good practice.
Soils Management Plan (SMP)	A soil management plan is an important part of ensuring soil sustainability during construction projects.
Special Protection Area (SPA)	SPAs are classified in accordance with European Council Directive 2009/147/EC on the conservation of wild birds, known as the Birds Directive. SPAs protect rare and vulnerable birds (as listed on Annex I of the Birds Directive), and regularly occurring migratory species.
Written Scheme of Investigation (WSI)	A Written Scheme of Investigation outlines known and potential archaeological features and deposits or built heritage elements on a site and suggests a structure for exploring them using the latest, most appropriate and cost-effective archaeological techniques.

A. Relevant Management Plans

A.1 Outline Site Waste Management Plan

To be updated by Principal Contractor

MOTT MACDONALD

Old Colwyn Coastal Defence and Active Travel Scheme

Outline Site Waste Management Plan

July 2020

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Old Colwyn Coastal Defence and Active Travel Scheme

Outline Site Waste Management Plan

July 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	July	S. Stone	A. Manns	A. Manns C. Williams	First Issue

Document reference: 417437-MMD-00-XX-RP-N-1729

Information class: Standard

Contents

Tables

Figures

1 Administration and Planning

1.1 Introduction

This Outline Site Waste Management Plan (OSWMP) has been prepared on behalf of Conwy County Borough Council (CCBC) (hereafter referred to as the "Client") by Mott MacDonald Ltd in support of planning consent and a Marine Licence for the Old Colwyn Coastal Defence and Active Travel Scheme (hereafter referred to as the "Scheme"). The Scheme is located in the Old Colwyn area of Colwyn Bay, North Wales. The SWMP covers coastal defence works in the form of a new rock revetment and promenade raising, in combination with promenade improvements to facilitate active travel, along the Old Colwyn waterfront area between Porth Eirias car park and Splashpoint. The proposed development is given in Section 1.4.

This OSWMP identifies the strategic approach for the management of construction waste and has been produced using the most current available information at the time of writing.

Whilst the development of a SWMP is no longer mandatory, it is still considered best practice and Defra[1] encourages businesses to use SWMP's on a voluntary basis as 'flexible resource efficiency tools'. A SWMP may still be a requirement of a Local Authority planning condition, BREEAM[2] or CEEQual[3] specification, or of the Client or main contractor.

The SWMP aims to ensure that all construction waste is managed, stored and disposed of in an appropriate manner by approved contractors in accordance with the Waste Hierarchy and all relevant legislation. This is a live document and requires updating regularly as the Scheme progresses. Where the Scheme scope is subject to change, the SWMP will be updated to reflect any changes as necessary.

Best practice suggests that the SWMP approach should be applied from the early design stages and carried forward and revised throughout the Scheme delivery process. This ensures cost savings are maximised by considering waste minimisation initiatives and identifying opportunities to reduce, reuse or recycle waste materials and improve resource efficiency during the earliest design stage.

1.2 Site Location

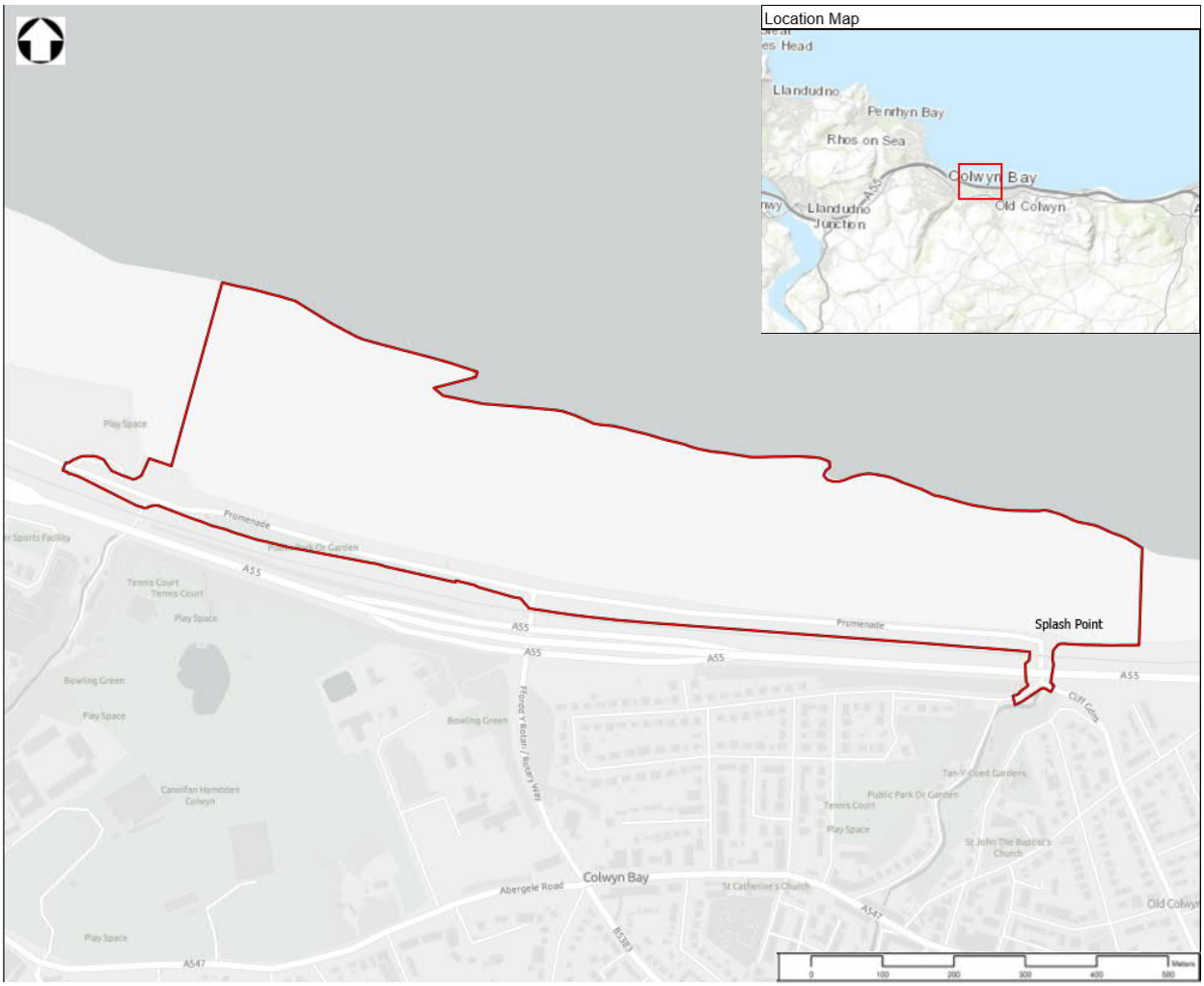
The Scheme is located in Colwyn Bay (Bae Colwyn), North Wales along the easternmost section of the promenade at Old Colwyn, from the eastern side of Porth Eirias in the west to Splashpoint in the east. The site location is given in Figure 1.1.

[1] Department of the Environment, Food and Rural Affairs

[2] Building Research Establishment Environmental Assessment Method

[3] Civil Engineering Environmental Quality Assessment and Award Scheme

Figure 1.1: Scheme Location



Source: Red Line Boundary 415437-MMD-00-XX-DR-N-1707

1.3 Existing Site Use

The Promenade features active travel (walking and cycling) routes along the waterfront at Old Colwyn. It is currently under threat from storm damage and tidal flooding (overtopping). Regular overtopping of the existing coastal defences is causing damage to the promenade and defences themselves, sections of which are at imminent risk of failure. The defences were constructed for the majority of the coastline, in the late nineteenth century, comprising vertical seawalls, in general, composed of either masonry or concrete.

1.4 Scheme description

The Scheme comprises a combination of coastal defence, promenade and active travel improvements along the Old Colwyn waterfront area. The Scheme red line boundary and area of permanent construction are illustrated in Figure 1.2.

The Scheme includes the following key components:

- The construction of a rock revetment approximately 32m in cross-sectional width and 1.15km in length, with associated modifications to existing surface water outfalls on the beach to extend them through the new revetment;
- A new access build-out area to be constructed in the western half of the Scheme area which would have several functions, including providing a greater area for pedestrian access; Equality Act compliant ramp access and stepped access to the beach, along with landscaped seating steps at varying levels, to the beach access;
- New pedestrian accesses through the proposed revetment to comprise three sets of beach access steps perpendicular to the linear rock revetment;
- A dedicated fishing platform in the Splashpoint Area
- The raising of the promenade to the west of Rotary Way and the raising of the promenade and highway to the east of rotary way;
- Pedestrian and cycle path improvements, pedestrian crossings and improved promenade access;
- Improved picnic area in a landscaped garden setting and an adjacent outdoor classroom area;
- Improvements in parking provision, street furniture and lighting and provision of space for a new concession building; and
- Marine enhancements including:
  - the creation of rock pools located within the revetment;
  - “vertipools” to retain water on vertical surfaces at lower tidal states; and
  - enhanced sea wall areas and biological armouring units (bioblocks) placed within the existing groynes.
- Terrestrial ecological enhancements include:
  - the use of planting and seeding mixes within the picnic and outdoor area; and
  - planting of wildflowers along the railway embankment (currently in considered).

Figure 1.2: Plan showing the Red Line Boundary and Area of Permanent Construction

Source: Area of Permanent Construction 415437-MMD-00-XX-DR-N-1708

1.5 Scheme information

Table 1.1: Scheme information

Client		Conwy County Borough Council
Person in charge of the Scheme		TBC
Author of SWMP	**Design Stage**	Shannon Stone
	Construction Stage	TBC
	Operational Stage	TBC
Scheme title/reference		Old Colwyn Coastal Defence and Active Travel Scheme
Scheme location		Old Colwyn, North Wales
Scheme cost (estimated)		£35million
Scheme footprint		TBC
Start date		TBC
Completion date		TBC

Description of Scheme scope	See Scheme description in section 1.4. Works will involve improvements to the coastal defence, promenade and active travel routes
Person responsible for waste management	Principal contractor (TBC)
Document controller	TBC
Version date and number	Draft issue Xx/xx/xxxx [To be updated during revision of plan in the construction and operational stages and in the event of significant design changes].
Location of SWMP	Hard copy to be kept on site

1.6 Responsibilities

1.6.1 Client and Principal Contractor

Ideally a SWMP should be produced before any work in relation to enabling works, excavation and construction for this Scheme commences on site. It is the responsibility of the Client to produce a SWMP, but usually this is undertaken in partnership with the Scheme designers and Principal Contractor.

Copies of the SWMP will be made available, to all relevant site staff and the Client. Any updates to the SWMP shall be identified to the relevant people through toolbox talks. This process will be undertaken every time the plan is updated.

2 Proposals for Minimisation, Reuse and Recycling of Waste

2.1 General Measures

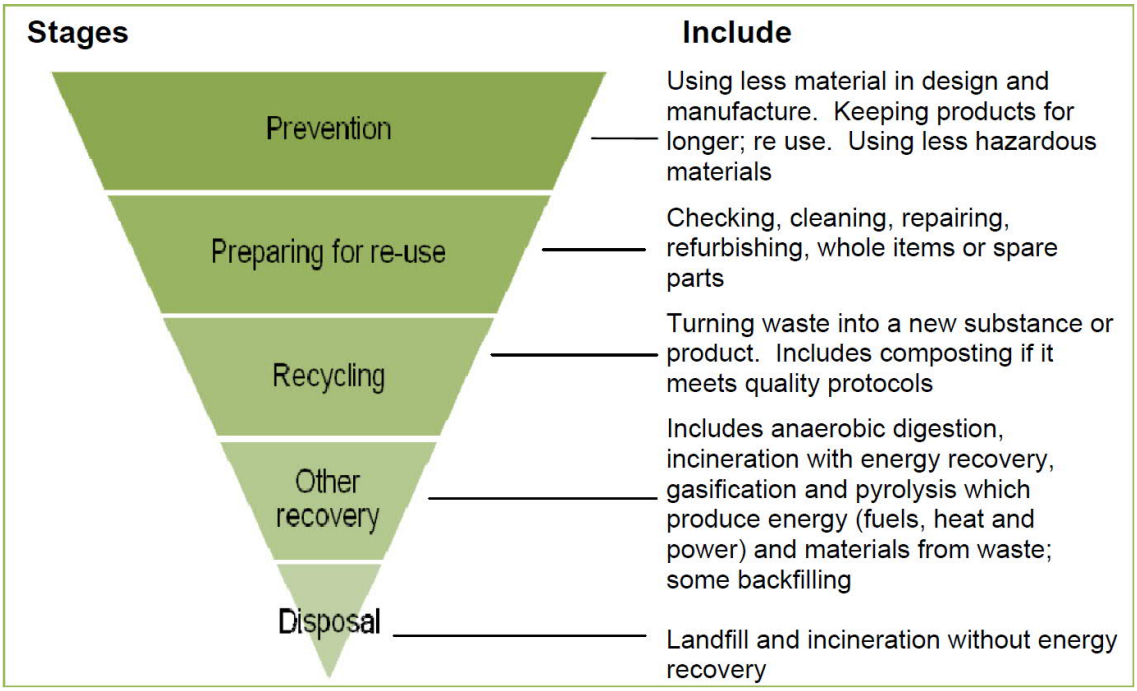
The SWMP should be used to record any early decisions, design changes, construction methods or material specifications which have helped to minimise waste arisings on site.

The waste management hierarchy illustrates the waste management options according to what is best for the environment.

It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, then recovery, and last of all disposal (e.g. landfill). The higher up the waste hierarchy waste is managed, the greater the cost and resource savings will be.

The waste management hierarchy is illustrated in Figure 2.1.

Figure 2.1: The Waste Hierarchy



Source: Guidance on applying the Waste Hierarchy, DEFRA, June 2011 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf, accessed 20 July 2020

Eliminating waste at source is the best way to make dramatic savings in waste handling and processing costs and reduce the overall impact on the environment. This can be achieved through:

- Careful procurement of materials;
- Better utilisation of materials already available on site;

- Reducing the amount of waste generated where it cannot be eliminated completely; and
- Re-use and then recycle as much as possible, once it is not possible to reduce the waste any further.

Disposal of waste to landfill or incineration (without energy recovery) should be a last resort after all the above options have been considered.

Waste prevention is at the top of the waste hierarchy and this should continue to be a priority throughout the Scheme, including during construction.

The purpose of this SWMP is to facilitate the implementation of the waste management hierarchy principles as set in order of preference; the highest options will be adopted where reasonably practicable, but usually a combination of options will be appropriate.

Waste will arise mainly from removal of vegetation, site clearance, enabling works, demolition, excavation, construction and landscaping activities. The proposed scheme will require specific construction materials (such as revetment rock, concrete, asphalt and cabling etc.) to be imported to the site. A Bill of Quantities (BoQ) or similar document has been used to identify, at high-level, the potential types and quantities of waste materials produced from this Scheme.

The Principal Contractor will be required to identify appropriately permitted facilities that can accept and treat the waste materials produced, in order to divert them from landfill. Actions to be taken to facilitate resource efficiency throughout the Scheme, and therefore, minimise waste produced, are detailed in the subsequent section below.

Potentially contaminated material should be kept separate from clean materials and sent for either recycling or recovery at appropriately permitted facilities.

Unsuitable waste materials will be separated, where possible and collected in receptacles for subsequent further separation and treatment at off-site facilities.

In order to ensure the appropriate reuse of the materials the earthworks should be carried out, where necessary, under a Materials Management Plan (MMP) in accordance with industry adopted guidance “The Definition of Waste: Development Industry Code of Practice Version 2” published by Contaminated Land Applications In Real Environments (CL:AIRE) in March 2011.

2.2 Construction Waste

Common waste streams generated by construction sites and likely to be generated by these works include:

- Surplus construction materials as a result of over-ordering;
- Materials damaged on site or in transit;
- Hazardous materials;
- Packaging materials;
- Surplus demolition and excavation materials, from site clearance and enabling works; and
- Site compound waste from canteen, accommodation and welfare areas.

2.2.1 Demolition Materials

Material arising from the demolition shall be carefully stored in segregated piles for reuse on site if possible. If any material deemed acceptable is produced from the enabling works e.g. good quality topsoil, this should be stored and re-laid within the Scheme, or if this is not possible

should be sent for reuse elsewhere or alternatively for further treatment or processing at an appropriately permitted facility off-site.

2.2.2 Excavated Soils

Any excavated materials will be carefully stored in segregated piles for subsequent reuse on the site, wherever possible. These excavated materials could be reused as deposition material for infilling or landscaping.

Any surplus materials should be removed from site for either direct beneficial use elsewhere (such as land remediation projects) or recovery at an off-site facility. Surplus excavated materials including soils, gravels, clay and man-made fill can potentially generate significant implications on disposal costs, if it cannot be reused on site.

Excavated pavement material can be stripped, stored and later re-laid, or sent for recovery off-site.

2.2.3 Vegetation

Any vegetation removed should be chipped and used for landscaping or sent for composting if reuse is not possible.

2.2.4 Packaging

Any packaging waste should be source segregated for recycling or returned to suppliers. If feasible, pre-fabricated material should be used and imported to site. In certain circumstances this will reduce the amount of packaging required and waste produced.

2.2.5 Hazardous Waste

Hazardous wastes, including any contaminated soil arisings classed as hazardous, will be identified, kept separate from inert or non-hazardous construction waste materials, tested and disposed of in accordance with the Hazardous Waste Regulations 2005, as amended. Should hazardous waste and other contaminants be encountered, it will be managed and handled appropriately, kept separate and removed off site in accordance with legislation and disposed of or treated at an appropriately permitted site by a licensed contractor in accordance with all appropriate regulation.

2.2.6 Unacceptable Materials

Other unusable construction waste materials will be collected in receptacles with mixed construction waste materials, for subsequent separation and recycling at an off-site facility.

2.2.7 Imported Materials

Surplus or waste materials arise from either the materials imported to the site or those generated on site. Imported materials are those which are brought on to the Scheme for inclusion into the permanent works. Where possible consideration should be made for the reuse of materials back into the Scheme, however, the proposed scheme will require specific materials to be imported to the site.

Any waste produced through the importation of materials needs to be monitored and included in the SWMP under construction works. Where possible consider the use of materials with a higher recycled content such as concrete e.g. for the base of any areas requiring concreting.

Materials should be ordered so that the timing of the delivery, the quantity delivered, and the storage is not conducive to the creation of unnecessary waste. Additional waste from imported material is likely to come from packaging materials and spillages, but these are difficult to quantify at this time.

2.3 Resource Efficiency

Table 2.1 highlights some of the various resource efficiency measures that can be used to minimise waste during the site works, for a typical project of this type. The table shows the responsibilities apportioned to designated personnel to ensure the measures are undertaken. It demonstrates the decisions and actions involved in facilitating a reduction in the amount of waste and surplus materials being produced. This is intended to assist in minimising the amount of material which would traditionally be sent to landfill and to help provide a cradle-to-cradle approach.

Table 2.1: Resource Efficiency Measures for the Scheme

Planning Waste Minimisation during Construction	Waste Minimisation Decisions Taken	Resource Saving	Responsibility[4]	Date Action Commenced
Design	Enabling the purchase of materials in shape/dimension and form that minimises the creation of off-cuts/waste. Ensure design considerations take into account the five principles for Resource Efficient design: • Design for Reuse and Recovery • Design for off-site Construction • Design for Materials Optimisation • Design for Resource Efficient Procurement • Design for Deconstruction and Flexibility (for the future)	Minimal waste produced	Project manager	From the design outset
Construction methods	Sequencing the works such that re-use of materials can be undertaken.	Minimal waste produced	Project manager/principal contractor	During design and planning stages and implemented during the construction.
Materials	Assess the quantities of materials required on site.	Prevents lost time in re-ordering of damaged	Project manager/principal contractor	During construction planning and

[4] It is the responsibility of the client to appoint a principal contractor for the purposes of the SWMP Regulations if one or more contractors are working on this project. If the project does not use a contractor, responsibility for updating the plan remains with the client.

Planning Waste Minimisation during Construction	Waste Minimisation Decisions Taken	Resource Saving	Responsibility[4]	Date Action Commenced
	Just in time delivery (as needed basis) to prevent over supply.	equipment, reduces need for storage if over ordering occurs.	Project manager	throughout the project construction. During design and throughout the procurement/ construction stages of the project.
	Secure storage to minimise the generation of damaged materials/theft.			
	Keeping deliveries packaged until they are ready to be used.			
	Inspection of deliveries on arrival.			
	Increase the use of recycled content; this could include traditional use of recovered material such as crushed concrete demolition waste and by procuring mainstream manufactured products with higher recycled content than their peers. Quick win areas of the Scheme in which to implement this for could be concrete frames, flooring and brick/block work.	An increase in the demand for such products would reduce the quantity of waste going to landfill. Use of recycled material results in a reduction in demand for extraction of virgin materials and subsequently the carbon and environmental footprint.		

It is anticipated that the contractor(s) will endeavour to reuse or recycle materials on the Scheme where possible.

A Design for Resource Efficiency (D4RE) workshop was held in 4 March 2020 with the design team. The aim of the workshop was to identify opportunities to improve resource efficiency during the design of the Scheme. This would ensure cost savings are maximised by identifying opportunities to reduce, reuse or recycle waste materials, identify material optimisation, improve resource efficiency and ensure the Scheme is designed for deconstruction and flexibility.

Actions to be taken to facilitate resource efficiency throughout the Scheme, and therefore minimise waste produced, are detailed in Table 2.2 which identifies recommended minimisation measures for this Scheme. The measures shown with an asterisk (*) are opportunities identified for the Scheme through the D4RE workshop and recorded in the Opportunities Matrix[5].

Table 2.2: Summary of Recommended Minimisation Measures

Summary of Recommended Minimisation Measures	
Use of prefabricated or pre-cast elements	It is recommended that as much of the construction as possible will be carried out off site, with pre-fabricated units being delivered to site when required. Some elements of the design can be pre-fabricated off-site to minimise on-site waste arisings and associated vehicle movements.

[5] The Design for Resource Efficiency Record (document reference 417437-MMD-00-XX-RP-N-1723) provides the details of identified opportunities from the D4RE workshop within an Opportunities Matrix..

Summary of Recommended Minimisation Measures

	These pre-fabricated units will generate less on-site waste through off-cuts and storage damage. Units should be sourced from a supplier that recycles off-cuts and materials at the pre-fabrication site otherwise this measure simply shifts the waste problem from one location to another.
Excavation	Surplus excavated materials including beach material, soils, gravels and man-made fill can potentially generate the largest quantities of all the construction waste streams with significant potential implications on disposal costs if these cannot be reused on site. *Excavating activities confined to the minimum areas required for the works to minimise the quantity of contaminated material removed It is recommended that excavated material (other than beach material), if possible, will be stored for reuse as landscaping material or reinstatement.
Stockpiling	*Temporary stockpiling of fill materials prior to incorporation in the Scheme would be avoided where possible, to ensure double handling and damage is minimised and therefore avoidance of waste.
Material reuse	**Concrete:** Concrete will be taken up and should be source segregated, for recycling either as fill/capping on site and/or removed to an off-site facility. ***Ensure the revetment slopes are as steep as feasible to minimise the volume of material required.
	Tarmac: Tarmac will be taken up and, if possible, should be reused on site for either tarmac hardstanding, capping or for sub-base. ***Target remediation of voids rather than the whole extent of the highway to limit material use.
	Landscaping features: If any landscaping features such as trees and shrubs are to be removed to facilitate either the demolition or construction of the works, these features should be appropriately removed and stored for the duration of the works and then replanted. If this is not possible, then they should be chipped for reuse onsite in landscaping or removed off-site for further management.
Minimisation of contaminated land arisings	Where possible contaminated material should be clearly identified and delineated prior to the works commencing to reduce the likelihood of non-contaminated material being excavated. This material could be remediated and reused on site, or, if found to pose no risk to receptors (e.g. groundwater and human health) should be left undisturbed. The latter can minimise potential transport and disposal costs. This approach should be standard practice among designers and contractors.
Contractor targets	The Principal Contractor should consider setting off-cut/surplus targets for sub-contractors with a positive incentive scheme for on-site waste champions. Good practice suggests that a maximum 3% wastage rate, based on the total amount of construction material handled on site is achievable.
Avoiding over-purchasing and accurate delivery times	Over-purchasing can lead to significant wastage and should be avoided in the first place. Ensuring materials are ordered for delivery shortly before they are used on the Scheme would also avoid possible damage and therefore wastage.
Use of take back schemes	Some suppliers offer a take back scheme, which should be utilised where practicable, particularly for packaging and pallets. *Collaborating with nearby projects to provide and use surplus material, where suitable.
Monitoring and review	The Principal Contractor should use the waste data provided from the waste removed from the Scheme and the periodic review process (required as part of the SWMP) to their advantage to assess whether the waste objectives are being met, and if not to review procedures to steer the Scheme towards achieving them. This will require clear responsibilities to be identified, supported with authority and incentives to act on any deviations from the SWMP.
Education and awareness	Waste minimisation must be underpinned by education and awareness throughout all levels of the project team, from the design team to site contractors who handle the construction materials. This could be via site inductions and frequent toolbox talks (included as part of Health and Safety updates, etc.) which all contractors and site workers will be expected to attend.

Summary of Recommended Minimisation Measures	
Consideration of End of Life materials	Consideration should be given to what will happen to the materials specified when they reach the end of their useful life. Where possible, elements should be designed for repair, modular repair, recycling at the end of life or safe disposal. The use of hazardous materials during construction, in particular, should be minimised.

* Identified opportunities from the D4RE workshop for minimisation of waste materials for the Scheme

Table 2.3 below identifies some additional measures that should be considered and implemented, where appropriate, to ensure that the Scheme is as resource efficient and cost effective as possible. The measures shown with an asterisk (*) are opportunities identified for the Scheme through the D4RE workshop and recorded in the Opportunities Matrix. Table 2.3 is not an exhaustive list and does not suggest that all measures should be implemented but aims to provide a list of possible opportunities undertaken on similar projects.

Table 2.3: Additional Considerations for Reuse and Recycling of Waste Materials for a Project of this Type

Opportunity	Description
Landscaping	Use site excavated material within landscaping design as: • drainage base; and • mound features
	Reuse or recycle tarmac and asphalt (provided there is onsite storage) for paths, construction storage space and hard standing for plant etc.
	Retain top soil, treat on site with compost (or other remediation) and use for green roofs, soft landscaping etc.
	Manufacture top soil using surplus excavated soil blended with compost
	Reuse bricks, concrete paving blocks and excavated rocks for landscaping finishes features etc.
	Chipping green waste on-site for use in the landscaping for the Scheme
	Use existing soft landscape that cannot be retained (trees, shrubs) as: • Compost; • Soft landscape top mulch; • External furniture; and • Large features e.g. trees stumps for benches
	Reuse existing landscape items by repairing rather than throwing away (e.g. existing fencing, benches etc.)
Concrete	Recycle aggregates (either on site of offsite) in concrete mix as fill etc.
	Use post tensioned floor slabs instead of reinforced slab
	Use reusable/modular shuttering for slab cores etc; e.g. PER system with integral handrails
Packaging	Reuse packaging by returning to supplier/manufacturer or using it for other purposes e.g. timber packaging pallets can be chipped and used for landscaping top mulch
Foundations	Reuse existing foundations
Existing structures	*Reuse of structural features at the site where appropriate (but not limited to): • Lighting • Parking meters • Ramp • Benches • Wave return wall
Volumetric	Use pre-fabricated solutions for, where appropriate (but not limited to): • Benches

Opportunity	Description
	• Litter bins • Picnic tables • Fishing platform
Precast concrete	Use precast concrete solutions for (but not limited to): • Stairs; • Retaining walls and other armour materials • Ramps
Steel construction	Use steel frame design
	Use prefabricated steel stairs
	Use bi-steel for lift cores and core units
	Use H -pile foundation to enable future reuse
	*Use recycled steel for rebar
Services	Rigorously plan M&E plant and distribution routes to reduce access requirements and facilitate future maintenance
	Rigorously plan M&E layout and distribution routes to reduce building works by consolidating risers, ducts etc.
	Enable consolidation of trades to reduce M&E penetrations in already finished surfaces
	Design service ducts to be shared for all services, with convenient access points
	Avoid or reduce the extent of surface water attenuation systems and pipework by reducing run-off collection areas and consider other methods: • Reduce surface areas for vehicles by use of cellular grass paving; • Greater use of soakaways
Detail Design	Review the necessity for all finishes (e.g. assess if fair faced structure and other elements suffice)
	Optimise RC promenade slabs layout any size to reduce cutting and offcuts
Avoidance of excavation	Use driven pile foundations rather than replacement piles
	Optimise structure position and levels to minimise excavation required (e.g. *keep existing asphalt in place when raising up the road and promenade levels)
	Construct new reinforced concrete (RC) seawalls on top of the existing
Standardisation and dimensional co-ordination	Use 3D modelling to avoid clashes/conflicts of services/structure etc. and thus reduce construction errors and consequent rework
	Co-ordinate structure and services so that service ducts are incorporated without the need to chase out, minimising waste production. Order services based on BIM / structure model to deliver just enough cable / ducting length and minimise generation of off-cuts.
Supply chain	Employ waste specialist consultant/contractor with expert knowledge in waste minimisation
	Discuss methods of waste minimisation with supplier/manufacturers of wall lining systems
	Discuss methods of waste minimisation with design team, potential subcontractors and suppliers at an early stage
	Discuss options for packaging reduction with subcontractors and suppliers
Specification	Specify responsibly sourced materials that reduce waste or materials with high recycled content
	Specify adequate protection to fragile materials to minimise damage on site
Contract/contractor	Involve the contractor from early design and decision stages to identify methods of waste minimisation in relation to procurement routes

Opportunity	Description
	Consider financial incentives and penalties to reduce waste
	Required the contractor to produce an SWMP at an early stage that includes a site storage and logistics plan
	Require all tendering contractors to provide information on how they plan to reduce waste through the supply chain and site activities
	Require Just-in-Time (JiT) deliveries
	Use consolidation centre to facilitate JiT delivery
	Select procurement route that minimises packaging
	Use ordering procedures that avoid waste (e.g. no over ordering take back schemes for both material surplus and offcuts)
	Plan the work sequence to reduce on site waste
	Include within the tender documents, the requirement to sign off 'the waste per work package' – waste must not exceed a contractual agreed limit
Materials	Use lime mortar or other mortars so that bricks and blocks can easily be dismantled
	*Reuse existing armour stone in the coastal defence where satisfying the specification
	Reuse suitable excavated material
	Recycle existing blacktop for use within the Scheme (cold recycling if coal tar is present)
	*Use recycled cement replacement
	Use mechanical fixings that facilitate deconstruction
	Avoid gluing and composite materials
	Specify materials that can be reused rather than recycled
	Use landscaping materials that can be easily taken up and reused (e.g. cellular grass paving)
	Use structural elements that can easily disassembled (e.g. *bolted and clamped handrails for ease of replacement in the future)
	*Use by-product of quarry/armour stone extraction as underlayers, fill, aggregate or roadstone
Logistics	Design deconstruction at an early stage
	Consider compaction of certain wastes to reduce haulage requirements

* Identified opportunities from the D4RE workshop for reuse and recycling of waste materials for the Scheme

Note: The table can be updated with actual design considerations in terms of minimising resource use and waste produced.

2.4 Waste Minimisation Statement

The purpose of the SWMP is to facilitate the implementation of the waste hierarchy principles and to minimise the production of waste from the outset of the Scheme. Such measures are to be incorporated into the design and implemented in the construction stage of the Scheme. This is in addition to ensuring correct waste disposal procedures in accordance with the waste duty of care provisions as set out under section 34 of the Environmental Protection Act (1990). Where waste cannot be reused or recycled, it should be disposed of in accordance with the Landfill Directive (1999/31/EC) and waste acceptance requirements.

2.5 Initial Review of Anticipated Waste Arisings

Table 2.4 illustrates an initial qualitative assessment of the potential and expected waste arisings for a Scheme of this type. The aim of this assessment is to identify the waste streams

anticipated to be encountered during the Scheme and consider the possible management options for these materials (which would include identification of suitable local waste management or disposal sites that can accept the waste). This initial assessment considers the reuse and recycling potential of each waste stream anticipated and identifies some indicative benchmark recycling targets which could be used to steer the detailed SWMP as the Scheme develops.

Table 2.4: Initial Review of Anticipated Waste Arisings

Activity	Anticipated Waste Stream	Anticipated Volume	Recovery Potential	Overall Priority for Recovery	Indicative Recovery Target	Management Options
Site clearance	Vegetation	Low	High	Medium	100%	Vegetation including trees, shrubs, and plants etc removed during site clearance works should be collected in skips or stockpiled on site to await removal. Where possible some vegetation could be chipped and reused back within the scheme as landscaping. If it cannot be reused in the Scheme it will need to be sent off-site for processing. A local merchant facility would be the most practicable treatment solution. All waste must be pre-treated before it is sent for final disposal, whether this is segregation on site or off-site at a transfer facility
Demolition works	Concrete, brick and block, tiles, plastics, steel, asbestos, timber, asphalt, tar products, lampposts, street furniture, shelters, key clamp railings, storm gates etc	High	Medium	High	70%	Concrete can be readily separated easily recycled with good quality assurance. Concrete can be segregated from other inert material and sent for screening and certification. Concrete may be crushed on site using mobile crusher. Metals will be segregated and sent for of site recycling. Demolition waste that cannot be reused on site will be removed by licensed contractors and recovered at appropriately permitted waste facilities.
Earthworks	Topsoil	Low	High	High	90% - 100%	Topsoil has excellent potential for reuse opportunities in landscaping around the development. A Soil Management Plan should be developed in order to facilitate the re-use.
	Beach material	Medium	High	Low	Not applicable	Locking the sediment within the Scheme would create a deficit of marine sand to the environment and interrupt sediment downdrift to the east. Beach material will be relocated along the coastline and not reused in the Scheme.
	Excavated natural ground	Medium	High	High	100%	Opportunities for the reuse of material as infill or as a base for any access routes should be explored. If the

Activity	Anticipated Waste Stream	Anticipated Volume	Recovery Potential	Overall Priority for Recovery	Indicative Recovery Target	Management Options
						material is low grade subsoil, there is potential to reuse this as a landscaping or infill material prior to the laying of topsoil.
	Excavated man-made ground	Medium	High	High	70%	Due to the properties of man-made fill, opportunities to reuse the material compared to natural or topsoil are more limited. However, reuse where possible within the Scheme or send off site for recycling.
	Contaminated soil	Low/ negligible	Low	Low	10%	All soil extracted (whether contaminated or not) will need to be stockpiled at the site and subject to laboratory analysis prior to reuse or removal to an off-site waste facility (following EU Waste Acceptance Criteria (WAC) testing if required) to identify whether the material can be reused as fill material or will require landfilling at an appropriately permitted site. Contaminated soils may be considered for reuse if it is in accordance with the CL:AiRE[6] CoP v2 and a risk assessment has been undertaken to ensure there is no environmental risk if it is reused and its reuse fits with the justification in the CL:AiRE CoP v2.
Construction	Concrete, bricks and mortar, slates	Low	High	High	100%	This could potentially create waste through damage to bricks and blocks and spillages of cement and mortar. Any arisings should be contained in an appropriate skip to be sent for off-site reprocessing.
	Cables	Low	Low	Low	80%	Cables are likely to be used in the wiring of the electrical components, such as lampposts and parking meters. Off-cuts of cable will therefore be required to be disposed of. Avenues of recycling of cable are limited, even though the copper can be recovered. Any arisings should be contained in an appropriate skip to be sent for off-site reprocessing or disposal.
	Bitumen road surface	Low	High	High	80%	Through careful ordering of material, it is likely that there will be very little (if any) waste generated from road surfacing activities. Any excess road-surfacing material

[6] CL:AIRE Contaminated Land: Applications in Real Environments

Activity	Anticipated Waste Stream	Anticipated Volume	Recovery Potential	Overall Priority for Recovery	Indicative Recovery Target	Management Options
						can be reworked into a reusable form to enable use on future highway construction projects.
	Concrete drainage pipes, kerbs and walls	Low	High	High	100%	Small quantities may arise, although pre-casting of the components prior to arrival on the site would reduce wastage in the first place. Any arisings should be placed in the skips and sent to a local recycling facility for crushing down and subsequent reuse on other projects.
	Liquid waste	Low	Low	Low	0%	Disposal of liquids from temporary welfare facilities should be undertaken by a licensed contractor. Disposal of liquid wastes down surface water drains may cause water pollution, which if it occurs is a strict liability offence and can lead to expensive clean-up costs and enforcement action being undertaken. Only clean, uncontaminated surface water is discharged to surface water drains. Permission to discharge to foul sewer, if required, should be obtained from the relevant sewerage undertaker. All contaminated liquids should be stored in appropriately designed containers, with secondary containment systems in place and sent for disposal or treatment.
	Hazardous waste (paints, resins, oils etc.)	Low	Medium	Medium	50%	These waste streams should be segregated from other (non-hazardous) waste streams and stored in appropriately designed and secure bunded storage areas/cupboards for subsequent identification and removal for treatment offsite at a hazardous waste facility.
General site waste	Packaging waste (plastics, wood, film, metal and cardboard	Low	Low	Medium	50%	This waste will predominantly consist of plastic sheeting, shrink-wrap, wooden pallets, metal strips (binding). Each waste stream should be segregated into colour-coded skips and removed off-site to an appropriate waste facility for recycling. Opportunities should be explored for supplier packaging take back schemes.

Activity	Anticipated Waste Stream	Anticipated Volume	Recovery Potential	Overall Priority for Recovery	Indicative Recovery Target	Management Options
	Canteen waste (comprising of food waste but also mixed waste)	Low	Medium	Medium	50-75%	This waste stream would likely comprise food waste and non-recyclable materials. Consideration should be given for providing separate bins for the collection of food waste, recyclables and non-recyclable (residual) materials. Food waste can be sent to an in-vessel composting (IVC) facility or an Anaerobic Digestion (AD) facility, whilst non-recyclable (residual) waste can be sent to an Energy-from-Waste (EfW) facility or a landfill.
	Welfare facilities waste (sewage sludge)	Medium	Low	Low	0%	Limited options to recover waste arising from on-site welfare facilities. Sewage sludge from the toilet facilities will be pumped out and sent to an appropriately permitted treatment plant. Other wastes such as paper towels etc. would be sent to an EfW facility or a landfill.
	Site office waste (paper, cardboard, plastics and non-recyclable)	Low	Medium	Medium	75%	Likely to comprise paper, cardboard, metal cans, plastic bottles and some non-recyclable material such as tissues. All recyclable materials should be sent to recycling facilities; all non-recyclable materials should be sent to an EfW facility or a landfill. Offices should be equipped with bins to segregate each waste stream for collection and future recycling off-site.

3 Waste Management

3.1 Segregation

A specific area shall be laid out and labelled to facilitate the separation of materials for potential reuse, recycling, and offtake/return. Recycling and waste bins are to be kept clean and clearly marked to avoid contamination of materials. Skips for segregation of waste currently identified are:

- Inert (e.g. concrete and rubble);
- Hazardous (e.g. contaminated land, Japanese Knotweed if identified);
- Mixed non-hazardous (non-biodegradable waste);
- Mixed non-hazardous (biodegradable waste);
- Metal (e.g. copper and iron, mixed ferrous and non-ferrous);
- Wood (e.g. fencing/hoarding, worktops, doors, frames etc);
- Waste Electronic and Electrical Equipment (WEEE) - to be handled in conjunction with measures outlined within the Waste Electronic and Electrical Equipment Regulations 2006 (as amended);
- Canteen/office/welfare waste; and
- Recyclables.

The Scheme will accord with the Waste (England and Wales) Regulations 2011, as amended which make the following provisions which came into force on 1 January 2015:

- Businesses to present metal, plastic, glass, paper and card for separate collection;
- Waste contractors to provide collection and treatment services which deliver high quality recycling; and
- A ban on any metal, plastic, glass, paper, card and food collected separately for recycling from going to incineration or landfill.

It is essential that the excavation and construction work is carried out closely with the waste management contractors, in order to determine the best techniques for managing waste and ensure a high level of recovery of materials for reuse or recycling.

Successful recycling and reuse rely upon early planning, identification of clear responsibility and provision of space within a compound for segregation and storage.

Discussions are required between the Client and Principal Contractor to identify space requirements within the compounds to accommodate skips and storage of reusable materials.

Waste management options will be supported by the identification of appropriately permitted waste treatment and recycling facilities in close proximity to the sites.

3.1.1 Colour Coding

The use of different coloured skips (or sufficiently clear labelling) to ensure that construction workers can understand where to put each type of waste will aid to reduce the level of contamination in the skips. This also increases the likelihood that a load will not be rejected once the waste stream has been sent off-site for reprocessing. In cases where the load is rejected, the likely destination will be landfill (which will increase the costs to the Scheme).

3.2 Reuse of Construction Materials

Excavation and site clearance activities generate a significant quantity of potential waste arisings. The classification of waste material from the site would be undertaken in accordance with Annex II of the EU Directive on the landfill of waste (1999/31/EC) (the Landfill Directive). Uncontaminated material, where identified, will be reused where possible within the proposed works for site levelling and fill.

If applicable, surplus inert excavated materials with some engineering strength (e.g. stone, bricks, clay, rubble, rock) could be suitable for beneficial use in land reclamation projects, if these were proceeding locally at the same time as the proposed scheme. This may require compliance with the criteria and thresholds of certain exemptions (e.g. U1 or U11 may be applicable) or permits under the Environmental Permitting Regulations 2016. The CL:AiRE Development Industry Definition of Waste Code of Practice (DoWCoP) may also be applicable for the reuse of this material. Any chosen option would need to meet current legislative requirements. The material could be reused in other schemes in the surrounding area, if one were proceeding at the same time, to avoid disposal at landfill and its associated impacts and costs but will need to meet current legislative requirements.

3.3 Waste Disposal Characterisation

Under Article 4 of the Landfill Directive, waste is classified as either inert, non-hazardous, or hazardous. Hazardous waste cannot be re-used on site under an exemption and may require additional treatment prior to disposal. The exception is contaminated soil re-used in accordance with an approved Materials Management Plan produced under the CL:AIRE DoWCoP.

Furthermore, there is a statutory requirement under the Article 6 (a) of the Landfill Directive (1999/31/EC as amended) to pre-treat any waste (including hazardous waste) prior to disposal off-site. Pre-treatment may reduce the cost of disposal by rendering the waste non-hazardous. Responsibility for the basic classification of waste rests with the Producer and Landfill Operator.

3.4 Estimating and Planning for the Reduction and Reuse of Waste

The following section details expected waste arisings from the proposed development. Table 3.1 and Table 3.2 detail those types of waste expected to arise from enabling, demolition and construction works and segregate the approximate amounts of waste into different waste streams. The overall aim is to prevent cross-contamination of waste types and to maximise reuse and recycling opportunities.

Material quantities, where provided, are intended to provide an approximate guide for efficient waste management best practice; the contractor should independently verify the quantities of waste materials likely to be produced during the works. Waste quantities specified within the SWMP are also subject to programme and design change.

It should be noted that at this stage, limited information is held regarding the Scheme and the likely construction activities. The quantities of waste material from demolition, excavation and construction activities will be determined at a later date by the demolition and/or main contractor. The information in this SWMP is based on information from other documents, publicly available data and professional judgement relating to predicted construction and operational effects.

Table 3.1: Estimation of Waste, Enabling and Demolition Works (including excavation)

Type	Materials	Forecast Estimated Quantities (m^3)	On-site Reuse/recycling (%)	Recovery (%)	Disposal (%)
Inert	Concrete	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Rubble	TBC	TBC	TBC	TBC
	Topsoil/Subsoils	TBC	TBC	TBC	TBC
	Sand and gravel (made ground)	TBC	TBC	TBC	TBC
	Boulder clay	TBC	TBC	TBC	TBC
Non-hazardous	Soils (moderate contamination- suitable for reuse onsite)	TBC	TBC	TBC	TBC
	Bricks and blocks	TBC	TBC	TBC	TBC
	Mixed waste	TBC	TBC	TBC	TBC
	Metal	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Packaging	TBC	TBC	TBC	TBC
	Cable & wiring	TBC	TBC	TBC	TBC
	Glass	TBC	TBC	TBC	TBC
	Green waste/vegetation	TBC	TBC	TBC	TBC
	Other	TBC	TBC	TBC	TBC
Hazardous	Asbestos	TBC	TBC	TBC	TBC
	Contaminated soils- unsuitable for reuse	TBC	TBC	TBC	TBC
	Other	TBC	TBC	TBC	TBC

Note: Table to be completed following detailed design stage and prior to construction commencement. This table should be duplicated for updating during construction and upon completion to record and compare the actuals vs forecasted quantities.

Table 3.2: Estimation of Waste, Construction Works

Type	Materials	Forecast Estimated Quantities (tonnes/m^3)	On-site Reuse/recycling (%)	Recovery (%)	Disposal (%)
Inert	Concrete	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Rubble	TBC	TBC	TBC	TBC
	Topsoil/Subsoils	TBC	TBC	TBC	TBC
Non-hazardous	Soils (moderate contamination- suitable for reuse onsite)	TBC	TBC	TBC	TBC
	Bricks and blocks	TBC	TBC	TBC	TBC
	Mixed waste	TBC	TBC	TBC	TBC
	Metal	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Packaging	TBC	TBC	TBC	TBC
	Cable & wiring	TBC	TBC	TBC	TBC
	Glass	TBC	TBC	TBC	TBC
	Green waste/vegetation	TBC	TBC	TBC	TBC
	Other	TBC	TBC	TBC	TBC
Hazardous	Toxic chemicals e.g. paint tins, line markers, mastic	TBC	TBC	TBC	TBC
	Contaminated soils- unsuitable for reuse	TBC	TBC	TBC	TBC
	Other	TBC	TBC	TBC	TBC

Note: Table to be completed following detailed design stage and prior to construction commencement. This table should be duplicated for updating during construction and upon completion to record and compare the actuals vs forecasted quantities

3.5 Treatment and Disposal Options

The appointed waste contractor for the site should contact the relevant treatment/transfer facilities or Environment Agency directly to determine the most appropriate waste management facility to handle the waste material being produced. Waste could either be collected from the site or transferred to a treatment or transfer facility by a registered waste carrier. Some waste would be sent for final disposal at an appropriate landfill site.

Article 4 of Landfill Directive 1999/31/EC on the landfill of waste, requires landfills to be classified into one of three categories dependent on the chemical composition of the material; these are hazardous, non-hazardous and inert. EU Waste Acceptance Criteria (WAC) are in place to control the nature of hazardous waste that can be sent to landfill. For hazardous wastes there are numerical limit values covering substances in granular wastes, monolithic wastes, and stable non-reactive hazardous wastes (SNRHW). The limit values are set out in Annex II of the Council Decision of 19th December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II to Directive 1999/31/EC.

Certain waste streams must be analysed prior to disposal to confirm whether they are inert, hazardous or non-hazardous. Then the material may require Waste Acceptance Criteria (WAC) testing prior to disposal. WAC testing is not required for all types of waste and therefore an appropriately qualified person should develop a testing regime as required prior to waste disposal, to prevent abortive work.

For excavated materials that are confirmed to be suitable for re-use within the proposed development without causing harm to human health or the environment, there are a number of reuse and recycling opportunities such as infill, bunding and landscaping or for construction or maintenance of roads, pavements, footings for gates, fences and poles.

If reuse or recycling on site is not possible due to high levels of contamination, soil treatment facilities are available around England that could be used to treat the soil. Due to the limited volume of contamination anticipated this information has not been included in this SWMP, but is available upon request should it be necessary.

Table 3.3 highlights a number of waste transfer stations, treatment facilities and other sites within 10 km of the Scheme (postcode LL29 8AR).

Table 3.3: Waste Sites – Waste Transfer Stations and Other sites

Site name	Operator	Post Code	Category*	Distance (km)**
Llanddulas Quarry Waste Treatment Centre	Hogan Waste Limited	LL22 8HP	A11: Household, Commercial & Industrial Waste Transfer Stn	3.2
Bron Y Nant Road Waste Transfer and Materials Reclamation Facility	Conwy County Borough Council	LL28 4YL	A11: Household, Commercial & Industrial Waste Transfer Stn	4.0
Worldcare Recycling	Worldcare Recycling Limited	LL31 9PN	A16: Physical Treatment Facility	8.0

Source: Natural Resources Wales, Public Registers[7], Google Maps[8]

[7] Natural Resources Wales (2020) *Find details of permitted waste sites* [online] Available at https://naturalresourceswales.gov.uk/evidence-and-data/maps/find-details-of-permitted-waste-sites/?lang=en Accessed July 2020

[8] Google (2020) *Google Maps* [online] Available at https://www.google.co.uk/maps Accessed July 2020,

Note: * These categories are based upon Natural Resource Wales definitions.

** Distance for waste facilities and landfills is a road distance measured from postcode LL29 8AR to the postcode given for the identified facility.

Table 3.4 includes operational disposal facilities within Conwy region.

Table 3.4: Waste Disposal Sites

Site name	Operator	Post Code	Category*	Distance (km)**
Llanddulas Landfill	FCC Environment	LL22 8HP	Non-hazardous landfill	5.1
Ty Mawr Farm Landfill	Wyn Griffiths and Sons	LL22 8AA	Inert Landfill	11.6

Source: Natural Resources Wales, Public Registers[9],and Google Maps[10]

Note: * These categories are based upon Environment Agency definitions.

** Distance for waste facilities and landfills is a road distance measured from postcode LL29 8AR to the postcode given for the identified facility.

3.6 Waste Controls and Handling

3.6.1 Duty of Care Compliance

Section 34 of the Environmental Protection Act 1990 (as amended) lays out a number of duties with respect to the management of waste. Waste must be managed correctly by storing it properly, only transferring it to the appropriate persons and ensuring that when it is transferred it is adequately and appropriately described to enable its safe recovery or disposal without harming the environment.

The Waste (England and Wales) Regulations 2011, as amended, explains the duties which apply to anyone who produces, keeps, imports or manages controlled waste in England and Wales.

One purpose of a SWMP is to incorporate an auditable system that identifies:

- The person responsible for removing the waste from site, and
- Keeping copies of all duty of care documentation (waste transfer notes and hazardous waste consignment notes).

This will be in accordance with the relevant Duty of Care legislation in place and other regulatory requirements.

Table 4.1 and Table 4.3 assist with the information required to meet the duty of care requirements.

Reputable waste contractors should have systems in place to ensure that all the duty of care requirements are met prior to the waste being collected. This should be checked by the site contractor prior to the appointment of waste management organisations.

[9] Natural Resources Wales (2020) *Find details of permitted waste sites* [online] Available at https://naturalresourceswales.gov.uk/evidence-and-data/maps/find-details-of-permitted-waste-sites/?lang=en Accessed July 2020

[10] Google (2020) *Google Maps* [online] Available at https://www.google.co.uk/maps Accessed July 2020,

Various information sources are available to enable the Principal Contractor to identify local waste management facilities for both recycling, recovery and disposal and check permit and waste carrier licence information to reinforce the duty of care requirements.

3.6.2 Declaration

The client and Principal Contractor will take all reasonable steps to ensure that:

All waste from the site is dealt with in accordance with the waste Duty of Care in Section 34 of the Environmental Protection Act 1990 and The Waste (England and Wales) Regulations 2011, as amended; and Materials will be handled efficiently, and waste managed appropriately.

Signatures:	Date:
Client:	
Principal Contractor:	

3.6.3 Responsibility for Waste Management

Table 3.5 identifies the primary waste streams that will arise from the activities at the site and whose responsibility it is to control and monitor the amounts of waste produced.

Table 3.5: Assigned responsibility for waste management (To be completed)

Site Activity/ Sub-contractor Work Package	Primary Waste Stream	Who is Responsible for Waste Management
Excavation and site clearance	TBC	TBC
Groundworks	TBC	TBC
Foundations, Piling	TBC	TBC
Structure	TBC	TBC
Brick & Blockwork	TBC	TBC
Mechanical Electrical	TBC	TBC
Trades- (Joinery, Painting etc)	TBC	TBC
Removal of Site Offices, Temporary Works & Final Clear Away	TBC	TBC

3.7 Waste Storage and Transportation Logistics

An area for onsite storage for excavated waste, construction materials and newly procured materials needs to be identified and appropriately secured. If waste is not to be kept on site, removal may be required on a shift by shift basis.

3.8 Site Security

Both client and Principal Contractor will take reasonable steps to ensure site security measures are in place to prevent illegal disposal of waste at the site.

4 Implementation of the SWMP

4.1 Register of Waste Carrier Licences and Permits

Table 4.1 sets out information regarding the waste management contractors, including their environmental permit, waste carriers' licences and/ or relevant exemptions that will need to be checked and verified for use on this Scheme. This table should be completed by the Principal Contractor once the details are available.

The Council Decision 2014/955/EU amending Decision 2000/532/EC on establishing a list of waste which requires that waste is described by European Waste Catalogue (EWC) codes on Transfer Notes (and Consignment Notes if waste is hazardous under the Hazardous Waste Regulations 2005, as amended) as required by the Waste Regulations 2011, as amended. The EWC categorises wastes into 20 main groups and approximately 900 codes. The EWC also identifies hazardous wastes, and these wastes are dealt with by the Hazardous Waste Regulations 2005 (as amended). These wastes should be appropriately described on Hazardous Waste Consignment Notes.

Table 4.1: Waste Description Records (to be completed by the Principal Contractor)

EWC Waste Description	EWC[11]	Origin	Waste Carrier			Permit	
			Name	Licence number	Expiry date	Name	Licence number
Concrete	17 01 01	From excavation of Made Ground known to be uncontaminated					
Bricks	17 01 02	From construction of structures					
Tiles and ceramics	17 01 03	From construction of structures					
Mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing dangerous substances	17 01 06*(M)[12]	From construction of structures					
Mixtures of concrete, bricks, tiles and ceramics other than those in 17 01 06*	17 01 07	From construction of structures					
Wood	17 02 01	From construction of structures					
Glass	17 02 02	From construction of structures					
Plastic	17 02 03	From construction of structures					
Glass, plastic and wood containing or contaminated with dangerous substances	17 02 04* (M)	From construction of structures					

[11] EWC code categorised from the Lists of Wastes pursuant to Article 1(a) of Directive 75/442/EEC on waste and Article 1 (4) of Directive 91/689/EEC on hazardous wastes. Note: EWC codes may vary depending on the actual waste types identified and removed from site.

[12] *(M) after the EWC denotes that the waste is potentially hazardous the (M) means that it is a mirror entry and the waste is only hazardous if the dangerous substance present is above threshold concentrations.

EWC Waste Description	EWC[11]	Origin	Waste Carrier	Permit
Bituminous mixtures containing coal tar	17 03 01* (M)	Excavation of Made Ground and potential historical contamination		
Bituminous mixtures other than those mentioned in 17 03 01*	17 03 02	From excavation of Made Ground known to be uncontaminated		
Coal tar and tar products	17 03 03*	From construction of highways		
Iron and steel	17 04 05	From construction of buildings		
Mixed metals	17 04 07	From construction of buildings		
Cables containing oil, coal tar and other dangerous substances	17 04 10* (M)	Installation of replacement cables, including off cuts		
Cables other than those mentioned in 17 04 10	17 04 11	Installation of replacement cables, including off cuts		
Soil and stones containing dangerous substances	17 05 03* (M)	From excavation of Made Ground known to be contaminated		
Soils and stones other than those mentioned in 17 05 03	17 05 04	From excavation of Made Ground known to be uncontaminated		
Other construction and demolition wastes (including mixed wastes) containing dangerous substances	17 09 03* (M)	From excavation of Made Ground known to be contaminated		
Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	17 09 04	Site excavation of Made Ground known to be uncontaminated and construction waste.		

EWC Waste Description	EWC[11]	Origin	Waste Carrier	Permit
Paper and card	20 01 01	Packaging materials, site office waste		
Mixed municipal waste	20 03 01	General site waste		
Waste of liquid fuels, fuel oil and diesel	13 07 01*(A)[13]	General leaks from vehicle movements, construction equipment		
Petrol	13 07 02*(A)	General leaks from vehicle movements		
Other fuels including mixtures	13 07 03*(A)	General leaks from vehicle movements		
Waste paint and varnish containing organic solvents or other dangerous substances	08 01 11*(M)	Paint wastage from road marking		
Waste paint and varnish other than those mentioned in 08 01 11	08 01 12	Paint wastage from road marking		
Waste paint or varnish remover	08 01 21*(A)	Paint wastage from road marking		
Septic Tank Waste	20 03 04	Portable toilets and welfare facilities		
Bio-degradable kitchen and canteen waste	20 01 08	Mess room wastes		
Other, as applicable				

[13] *(A) after the EWC denotes that the waste is hazardous the (A) means that it is an absolute entry and the waste is hazardous regardless of any threshold concentrations.

4.2 Training and Communication

To develop a culture of promoting best practice and increase knowledge and awareness of waste management issues at the site. The SWMP, as well as the procedures to be followed, should be given to all contractors and subcontractors at site induction and key measures reinforced in 'tool box' talks. 'Tool box' talks should be carried out every month on waste issues and all subcontractors should be expected to attend. Attendance will be recorded in the relevant training logs. It is hoped that these values can be transferred from this site to the next, promoting adoption of sustainable waste management practices on a wider scale.

4.3 Monitoring and Waste Records

The Principal Contractor should receive a waste transfer note from the waste disposal company showing the exact amount of waste materials removed from site. This sheet should also identify how much material went to landfill and how much went for recycling (Table 4.2).

All skips need to be monitored to ensure that cross-contamination of segregated skips does not occur. The 'tool box' talks should focus on how the waste management system is working and identify the extra costs associated with contamination.

The Principal Contractor should continually review the type of surplus materials being produced and change the site set up to maximise on site reuse or recycling; landfill will be the last option.

This SWMP should be included as an agenda item at the weekly construction meetings. In addition, the SWMP should be communicated to the whole team (including the client) at the monthly meetings. This should include any updates from the last version.

Table 4.2: Waste Management Records (to be updated by Principal Contractor)[14]

Date removed	Waste type	Identity of the person removing the waste	Site the waste is being taken to and whether licensed or exempt	Waste carrier and registration number*	Confirmation of delivery*	Waste management route (reuse on/offsite, recycled on/offsite, recovery, landfill, other

[14] *Evidence of waste carrier registration and waste transfer or hazardous waste consignment notes for each removal of waste are filed and cross-referenced.

4.4 SWMP Implementation Checklist

Table 4.3 is a checklist which is should be filled out by the Principal Contractor to ensure the SWMP is fully implemented from the outset of the Scheme. Further actions required to accompany the checklist should be identified in Table 4.4.

Table 4.3: Implementation Checklist (to be completed)

Checks (please tick)	Y	N
Have terms and commercial rates been agreed with the waste management contractor(s)?		
Have data reporting procedures been agreed with waste management contractor(s)?		
For offsite waste management or disposal- Are all the waste destination details correct?		
Has a waste segregation/ collection area been prepared?		
Has the waste management area been adequately sign posted?		
Has the SWMP planning meeting been set?		
Has the waste management document control/ filing system been set up?		
Have all necessary staff and contractors read and signed the SWMP?		
Have all the SWMP training/briefing requirements for staff been met?		
Have all the SWMP training/briefing requirements for contractor(s) been met?		
Have all the waste management targets been set?		
Has the SWMP been approved by the Project Manager?		

Table 4.4: Further Actions (to be updated as applicable)

Comments/ Further Actions:
1. Excavated material to be tested for contamination prior to re-use and/or disposal
2. Waste Contractor to be assigned
3. Storage areas for excavated material to be decided upon
4. Frequency of waste removal from the site to external storage areas or waste transfer station to be decided upon
5.
6.
7.

4.5 Updating the SWMP

It is recommended that the SWMP is updated as often as necessary, to record accurate information on progress and whenever changes occur on site or relating to materials, or at least every six months if there is little change during the Scheme.

Updates to the SWMP should give a current picture of how work is progressing against the waste estimates contained in the plan. Therefore, for waste that is reused or recycled on site, the SWMP should be updated to describe how much of the estimated volume or tonnage has been processed. For waste that is removed from the site, the SWMP must be updated to record the identity of the person removing the waste, the type (and quantity) of waste and the site to which it has been taken.

Whenever waste is removed from the site the Principal Contractor should record the actions in Table 4.2. Revisions to the SWMP should be recorded in Table 4.5.

Table 4.5: SWMP Revisions Record (to be updated)

Nature of revision	Date of revision	Author of revision

5 Review and Audit of SWMP

5.1 Post-Construction Review

It is important that a post construction review of the SWMP takes place, designed to identify that the SWMP has been monitored throughout the lifetime of the Scheme and then signed off at its closure (see Table 5.1).

At the end of the Scheme, it is recommended that both the Client and Principal Contractor review, revise and refine the SWMP as necessary within three months of completion to ensure compliance with relevant legislation and to identify if lessons could be learned for the next time a similar project is undertaken. This review should identify and may conclude the following:

- An explanation of any deviation from the original plan;
- A comparison of the estimated quantities of each waste type against the actual quantities generated;
- An action plan to address the lessons that have been learnt from the Scheme that could be implemented for the next Scheme; and
- An estimation of the cost savings (if any) that have been achieved through the measures undertaken to minimise, reuse, recycle or recover waste arisings rather than just sending it to landfill.

Table 5.1: Post Construction Confirmation (to be completed)

This plan has been monitored on a regular basis to ensure that work is progressing according to the plan and has been updated to record details of the actual waste management actions and waste transfers that have taken place.	
Signatures:	Date:
Client:	
Principal Contractor:	

5.2 Audit of Plan

A waste audit should be undertaken at all stages of the Scheme. This will identify the amount, nature and composition of the waste generated on site. The waste audit will examine the manner in which the waste is produced and will provide opportunity for a commentary to highlight how the management and practices inherently contribute to the production of construction and demolition waste. The measured waste quantities will be used to quantify the costs of waste management and disposal.

The audit plan should be updated as the Scheme progresses, as this will help to identify which waste streams are not achieving their anticipated recycling potential so that alternative methods to handle that waste stream can be explored for the remainder of the Scheme.

5.3 Audit of Plan – Estimated Versus Actual Quantities

Table 5.2 and Table 5.3 detail the actual enabling and construction waste streams and quantities resulting from the proposed development and how they were treated i.e. on-site/off-site recycling/reuse, final disposal etc.

Table 5.4 records the deviation between those waste quantities estimated and actual. An estimate of cost savings is also made here.

Table 5.2: Enabling/Demolition Waste (actuals) (to be completed)

Type	Materials	Actual quantities (tonnes/m^3)	On-site reuse/recycling (%)	Recovery (%)	Disposal (%)
Inert	Concrete	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Rubble	TBC	TBC	TBC	TBC
	Topsoil/Subsoils	TBC	TBC	TBC	TBC
	Sand and gravel	TBC	TBC	TBC	TBC
	Boulder clay	TBC	TBC	TBC	TBC
Non-hazardous	Soils (moderate contamination-suitable for reuse onsite)	TBC	TBC	TBC	TBC
	Bricks and blocks	TBC	TBC	TBC	TBC
	Mixed waste	TBC	TBC	TBC	TBC
	Metal	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Packaging	TBC	TBC	TBC	TBC
	Cable & wiring	TBC	TBC	TBC	TBC
	Glass	TBC	TBC	TBC	TBC
	Green waste/vegetation	TBC	TBC	TBC	TBC
	Other	TBC	TBC	TBC	TBC
Hazardous	Asbestos	TBC	TBC	TBC	TBC
	Contaminated soils- unsuitable for reuse	TBC	TBC	TBC	TBC
	Other	TBC	TBC	TBC	TBC

Table 5.3: Construction Waste (actuals) (to be completed)

Type	Materials	Actual quantities (m^3)	On-site reuse/recycling (%)	Recovery (%)	Disposal (%)
Inert	Concrete	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Rubble	TBC	TBC	TBC	TBC
	Topsoil/Subsoils	TBC	TBC	TBC	TBC
Non-hazardous	Soils (moderate contamination- suitable for reuse onsite)	TBC	TBC	TBC	TBC
	Bricks and blocks	TBC	TBC	TBC	TBC
	Screed	TBC	TBC	TBC	TBC
	Mixed waste	TBC	TBC	TBC	TBC
	Metal	TBC	TBC	TBC	TBC
	Timber	TBC	TBC	TBC	TBC
	Packaging	TBC	TBC	TBC	TBC
	Cable & wiring	TBC	TBC	TBC	TBC
	Glass	TBC	TBC	TBC	TBC
	Green waste/vegetation	TBC	TBC	TBC	TBC
	her (List, identified by type, name, EWC)	TBC	TBC	TBC	TBC
Hazardous	Toxic chemicals e.g. paint tins, line markers, mastic	TBC	TBC	TBC	TBC
	Contaminated soils- unsuitable for reuse	TBC	TBC	TBC	TBC
	Other (List, identified by type, name, EWC)	TBC	TBC	TBC	TBC

Table 5.4 records the deviation between those waste quantities estimated and actual. An estimate of cost savings is also made here.

Table 5.4: Deviations

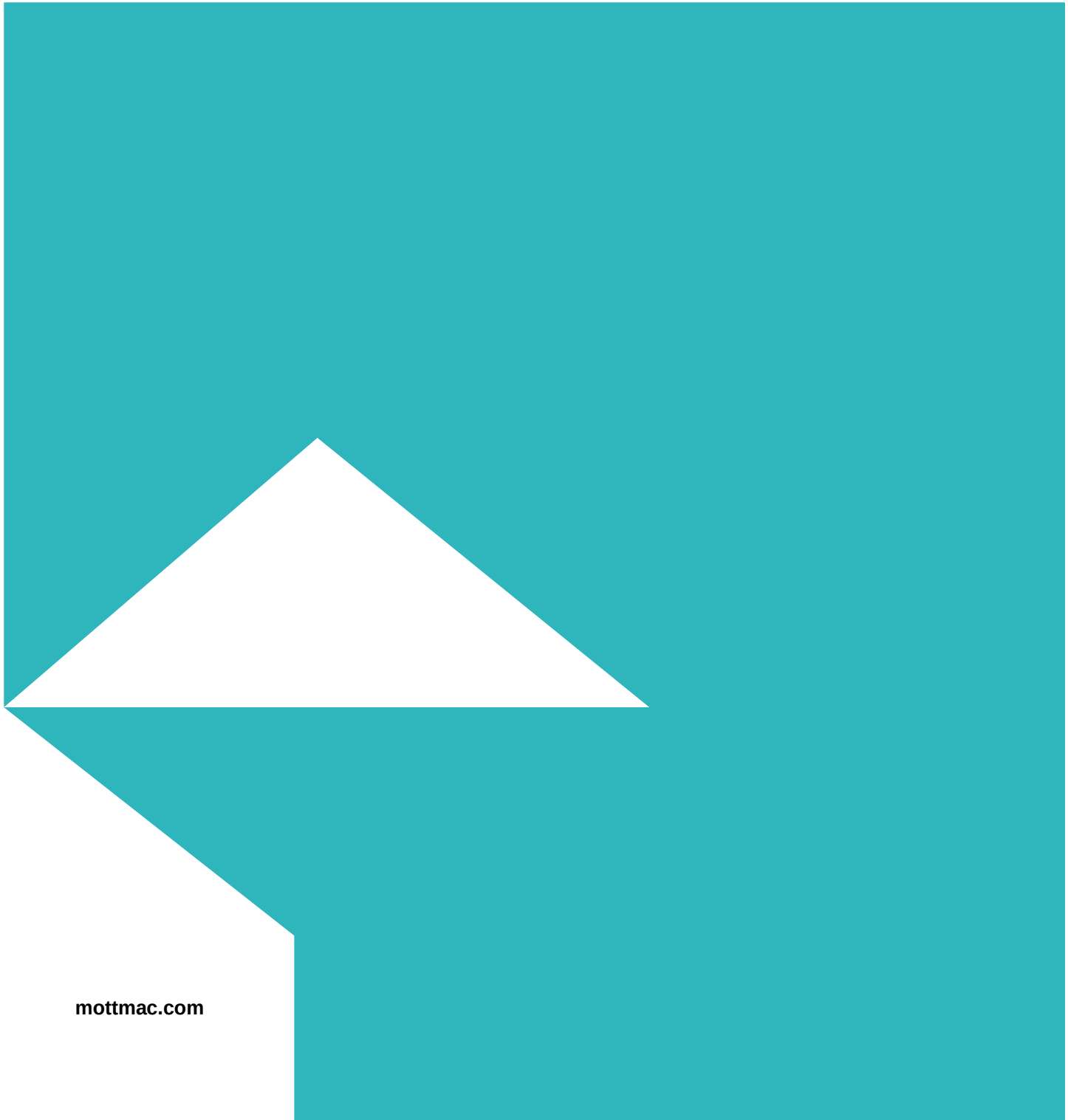
Issue	Details
[Waste forecasts- exceeded]	TBC – reasons
[Waste forecasts- not met]	TBC – reasons

5.4 Estimate of Cost Savings

[Enter]

5.5 Relevant Signatures

Principal Contractor:	[Enter]	**Date:** [Enter]
Client:	Conwy County Borough Council	**Date:** [Enter]
SWMP Author:	Shannon Stone	**Date:** 24/07/2020



A.2 Materials Management Plan

To be completed by Principal Contractor

A.3 Arboricultural Method Statement

To be completed by Principal Contractor

A.4 Construction Traffic Management Plan

To be completed by Principal Contractor

A.5 Communications Relations Strategy

To be completed by Principal Contractor

A.6 Landscape and Ecological Management Plan

Currently under preparation.

A.7 Construction Flood Risk Management Plan

To be completed by Principal Contractor

A.8 Transhipment Management Plan

To be completed by Principal Contractor (if required)

A.9 Outline Carbon Management Plan

To be updated by Principal Contractor

MOTT MACDONALD

Old Colwyn Coastal Defence and Active Travel Scheme

Carbon Management Plan

July 2020

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Old Colwyn Coastal Defence and Active Travel Scheme

Carbon Management Plan

July 2020

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
P01	July 2020	B Skinner	A Greenwood N. Spofforth	C. Williams	First Issue

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Contents

Executive summary

This Carbon Management Plan has been produced to set out the framework for managing and reducing greenhouse gas emissions for the Old Colwyn Coastal Defence and Active Travel Scheme through design and into construction. A target for the Scheme has been set to aim for a reduction of 30% from the baseline of Conceptual Design to Tender Design.

The approach to integrating low-carbon thinking during design is outlined which includes using the carbon hierarchy, challenge important aspects of the design, the implementation of topic specific workshops and how the Scheme is being assessed for the sustainability of the Scheme.

Through different stages of design, the carbon footprint of the Scheme has been estimated to allow focus on the hotspots of carbon and to track the progress of the Scheme. Footprints have been developed for the Conceptual Design and Tender Design with estimates of additional savings through Detailed Design highlighted. Following the low carbon approach through design numerous ideas have been incorporated into the design to show a reduction in carbon emissions. These ideas have resulted in a 32% saving between Conceptual Design and Tender Design meeting the reduction target set for the Scheme. Further reductions have occurred through Detailed Design along with a number of ideas to be implemented or further investigated for construction have been identified which are outlined in the plan to further reduce carbon emissions associated with the Scheme.

1 Introduction

1.1 Purpose of the Carbon Management Plan

1.1.1 This Carbon Management Plan (CMP) sets out the framework for managing and reducing project-related greenhouse gas (GHG) emissions for the Old Colwyn Coastal Defence and Active Travel Scheme (hereafter referred to as the "Scheme").

1.1.2 It also documents the key carbon reduction measures implemented within the project.

1.2 Scope of the Carbon Management Plan

1.2.1 The CMP covers the strategy that has been followed through design and will continue to be used as the design progresses. The CMP defines:

- The relevant carbon objective and targets to which the Scheme is working towards;
- Roles and responsibilities;
- Approach to integrating low-carbon thinking during design;
- Assessment approach;
- Reductions to date; and
- Further required reductions.

1.2.2 The CMP is focused upon the design stage of the Scheme, however the approach should be followed through later stages including construction. In addition, a number of ideas for implementation have been outlined within the CMP that need to be implemented or further investigated for construction.

2 Key Components of the Carbon Management Plan Approach

2.1.1 The carbon management approach has several key components which will support the delivery of low carbon solutions.

2.1.2 These are summarised in Table 2.1.

Table 2.1: Key CMP Components

Component	Theme	Section of the CMP
Strategy	Setting a strong direction for the projects in pursuit of low-carbon solutions	Section 3
People	The CMP identifies key members of the project team that can support the delivery of low-carbon solutions. This includes design, construction procurement and management teams as well as topic specialists and supply chain where relevant.	Section 4
Processes	The process of design and delivery will include carbon in multi-criteria analysis as well as targeted workshops and support throughout.	Section 5
Assessment	The carbon emissions associated with the Scheme at different stages of design will be estimated. The progress through the design and identified reductions will be recorded where possible.	Section 6 - 8

Source: Mott MacDonald 2020

2.1.3 As well as these components, there is further additional information on the assumptions and identified low carbon solutions which are captured in the Appendices of this CMP.

2.1.4 Each of the sections of this report will be updated as design progresses, and as other activities become increasingly important. Any sections no longer relevant will be moved to the Appendices.

3 Strategy

3.1 Mott MacDonald Policy

3.1.1 Mott MacDonald are committed to reducing carbon on projects by certifying its carbon management processes used on projects globally with PAS 2080: Carbon Management in Infrastructure.

3.2 Conwy County Borough Council Policy

3.2.1 The Conwy Local Development Plan was adopted in 2013[1]. Within the plan Policy DP/1 – Sustainable Development Principles references making efficient and effective use of resources, take account and address the potential impact of climate change, reduce waste production. The Natural Environment Strategic Statement states that developments must seek to limit the impact on the environment 'by minimising resource use, increasing energy efficiency and reducing carbon emissions.

3.3 Targets

3.3.1 The Scheme has set out to reduce carbon throughout the design process. To focus the reduction of carbon, a target has been set to show a reduction from Conceptual Design to the end of Tender Design.

3.3.2 The target has been set at 30% reduction from the baseline of Conceptual Design.

3.3.3 Following Tender Design the scheme has continued to reduce carbon through detailed design. Furthermore, the Scheme will continue to reduce carbon through construction however currently there are no plans to measure against a target at construction or operation stages.

[1] Conwy County Borough Council (2013). Conwy Local Development Plan 2007-2022 [online] available at: https://www.conwy.gov.uk/en/Resident/Planning-Building-Control-and-Conservation/Strategic-Planning-Policy/Adopted-Local-Development-Plan-LDP/Assets-written-proposals-maps/Conwy-Local-Development-Plan-2007-2022.pdf (last accessed June 2020)

4 Roles and Responsibilities

4.1 Key Roles

4.1.1 All members of the project teams have the potential to influence low-carbon outcomes. However, some roles have key responsibilities in leading the efforts to implement low-carbon solutions during design and delivery.

4.1.2 These are:

- Project leads – ultimate responsibility for compliance with legislation and client project commitments;
- Design managers – overall responsibility for guiding design to minimise carbon emissions as far as possible. Providing a level of challenge to make sure that focus is given to low carbon options;
- Design team – practical role in developing designs that minimise emissions and capturing and recording low-carbon options;
- Environment managers – supporting the design team to identify low-carbon solutions and providing links to other environmental disciplines to highlight co-benefits or risks;
- QS team – supporting the production of information relevant to the carbon assessment, challenging cost and productivity within their models and identifying associated low carbon opportunities;
- Procurement team – challenging suppliers to provide innovative, low carbon products and solutions;
- Pre-Construction team – minimising carbon through challenging design buildability, planning and integration of activities, optimising / challenging logistics and procurement;
- Carbon Specialists – setting the framework for considering carbon and undertaking the required quantifications. Training and informing the design managers and teams; and
- Client – setting the direction and commitments for the reduction of carbon.

4.2 Communication and Training

4.2.1 The successful implementation of this CMP depends upon there being adequate co-ordination, communication and liaison between the various parties. Any specific construction requirements for carbon reduction will be recorded within the Construction Environmental Management Plan (CEMP). In addition, the CMP will be provided as an Appendix to the CEMP

4.2.2 The appropriate project team members of the list outlined in the Section 4.1 have been provided with the following training or guidance where necessary:

- Carbon baseline and opportunities for reduction through the carbon and Design for Resource Efficiency (D4RE) workshops;
- Mott MacDonald Carbon Portal e-learning module; and
- Reference document: PAS 2080 – Carbon management in infrastructure.

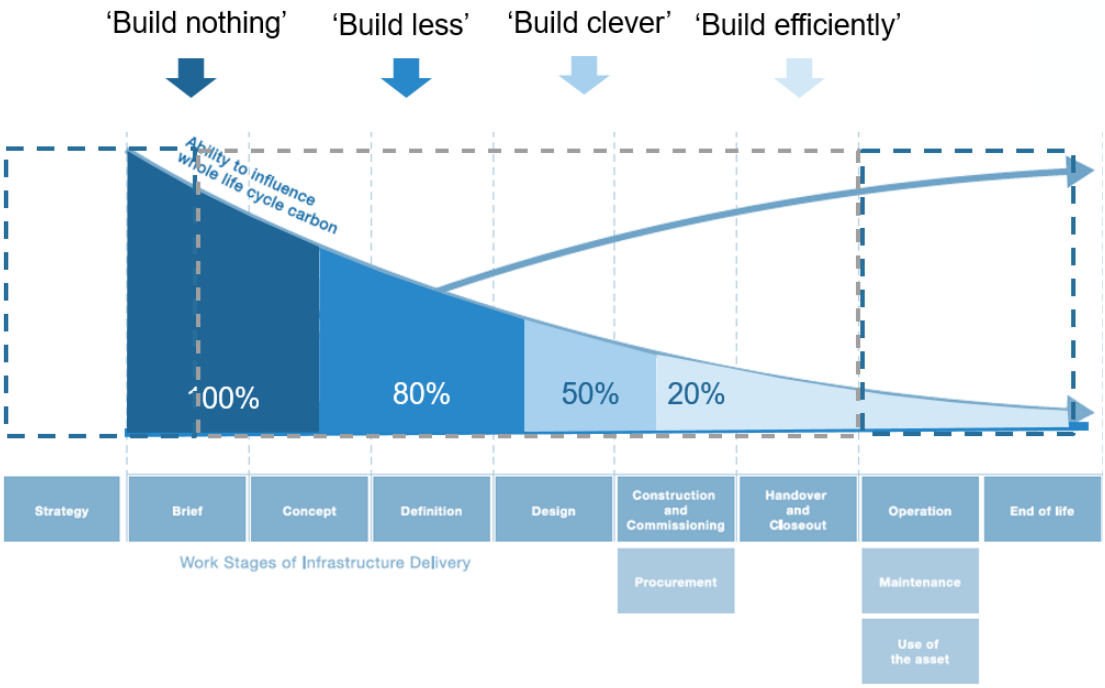
5 Approach to Integrating Low-Carbon Thinking During Design

5.1 Overall Approach

5.1.1 During the design stage, carbon has been evaluated contributing to the value engineering process with design managers being supported by the core carbon team in this process. The different design aspects have been assessed for the impact on low carbon either qualitatively or where possible quantitatively.

5.1.2 Evaluation followed the carbon hierarchy, shown in Figure 5.1, approach of identifying assets which can be designed out (build nothing), opportunities to build less, build clever and build smart.

Figure 5.1: Carbon Hierarchy Approach



5.1.3 The carbon reduction challenge focused on both reducing the amounts of primary materials required and then selecting the best materials available. In simple terms this means first trying to reduce, for example, the amount of concrete and (where compatible with other specifications) selecting the best (low-carbon) concrete available on the market.

5.2 Challenge Points

5.2.1 Key questions that prompt the discussion included the following (depending on the assets to be considered). Answers to some of these questions may not be known at any given point during the design or delivery stage:

Design focus:

- Have you considered all build nothing options? This could include ancillary items such as avoiding the need for diversions (utility / road)?
- Have you optimised material use in scheme and detailed design?
- Have you considered lowest carbon materials? In particular, any impacts from low-carbon concrete?
- Can any existing assets/infrastructure be utilised?
- Has topography and need for excavation works been considered?
- Have low-carbon soil stabilisation materials and methods been considered?
- Has optimal longevity of assets been achieved to minimise replacement vs initial capital carbon?
- Has standardisation / modularisation been considered in design to minimise cut offs and waste?
- Have you considered potential effects for re-use and/or recycling of on-site aggregates and spoil?
- Have maintenance requirements been minimised?
- Has design considered deconstruction where required to optimise recycling and reuse of components?

Construction focus:

- Have you used methods to optimise resource productivity and resource allocation to reduce construction duration and cost?
- Have you considered new construction techniques that minimise construction time, result in less temporary works, use of temporary works as permanent or reduce fuel consumption?
- Has near site assembly/manufacture been considered to minimise transport requirements?
- Have you considered alternative low carbon fuels for construction plant?
- Have you considered energy efficient site cabins and equipment?
- Have you considered optimal material logistics to reduce unnecessary transport during construction?
- Has offsite manufacture been considered to minimise waste?

5.3 Topic Specific Workshops

5.3.1 A carbon reduction or Design for Resource Efficiency (D4RE) workshop has been held with the design team. This workshop was run by the carbon management team within Mott MacDonald. This workshop served to check and challenge the design as it progresses. Members from the specific disciplines as well as other key design and delivery staff were included as part of the workshop.

5.3.2 The focus for the workshop was as follows:

- Reminder of the key drivers for carbon reduction and resource efficiency;
- Focus on the key hotspots per asset/ material type and structural solution;
- Review of any baseline reports available;
- Step through the carbon hierarchy (build nothing, build less, build clever); and

- Note specific actions and ideas to develop further.

5.3.3 Outputs from this workshop were captured within the Old Colwyn Coastal Defence and Active Travel ES Volume 2, Appendix 9.2. These have been shared with the relevant teams throughout the scheme development to monitor the opportunity implementation and impact on carbon.

5.4 CEEQUAL

5.4.1 The Scheme is being assessed under the Civil Engineering Environmental Quality Assessment and Award Scheme (CEEQUAL). A number of the questions being assessed revolve around carbon reduction including producing a carbon management approach, identifying and measuring reduction targets. This further encourages the low carbon thinking throughout design.

5.5 Reporting Progress Against the Target

5.5.1 Progress against the carbon reduction target has been tracked and reported in this CMP. The CMP is intended as a live document to be updated with the project, following carbon reduction from Conceptual Design to the end of Detailed Design. The target will be measured between Conceptual Design and the Tender Design due to the availability of the appropriate information, any further identified reduction measures through Detailed Design have been recorded in this CMP.

5.5.2 During construction, the further carbon reduction measures identified in Section 7.3 should be monitored. Progress against these measures should be tracked, with justification provided where the measures have not been implemented.

6 Assessment Approach

6.1 Activity scope

Life Cycle Stages

6.1.1 All carbon assessments have been broken down by life cycle stages (modules) in Table 6.1 consistent with the principles set out in PAS 2080. The scope of assessment included lifecycle stages A1-3, A4, A5, B2 and B6. The activities incorporated may change depending on the level of detail available in the data as the project progresses.

Table 6.1: Life Cycle Stage Activities

Life Cycle Stage	Activities Incorporated
Product stage (modules A1-A3)	The extraction, processing and manufacturing of all materials required for the permanent assets. This includes all energy and carbon emissions from manufacturing plants, primary and secondary manufacturing stages as well as any transport emission between these stages.
Construction process stage - transport to site (module A4)	The transportation of all materials required for the permanent assets and construction equipment to site from the point of production (or point of storage in the case of plant and machinery).
Construction process stage - construction and installation (module A5)	Construction site works activities including: • temporary work, ground works and landscaping; • materials storage and any energy or otherwise need to maintain necessary environmental conditions; • transport of materials and equipment on site; • installation of materials and products into the infrastructure asset; • emissions associated with site water demand; • waste management activities (transport, processing, final disposal) associated with waste arising from the construction site; and • production, transportation, and waste management of materials/products lost during works.
Boundary of use stage – (module B2)	The works activities and new materials for the maintenance, repair, replacement and refurbishment of the infrastructure during the use stage/operation of infrastructure.
Boundary of use stage – operational energy (module B6)	Represents the carbon emissions resulting from the energy used by infrastructure-integrated technical systems to enable it to deliver its service during operation. This might be to provide heating and cooling, ventilation, lighting, auxiliary energy for pumps, control and automation.

Source: PAS 2080, 2016[2]

[2] BSI (2016) PAS 2080: Carbon management in infrastructure

6.2 Temporal scope

6.2.1 The reference study period is during design, construction and operation of the project. The operational emissions are considered to be minimal and are scoped out for this project.

6.3 Activity Data

6.3.1 Activity data has been sourced from QS data used to produce bills of materials that have been available at certain points in the design process. This has been used to make sure all activities have been captured in the same way for carbon as in cost.

6.3.2 In selecting activity data, the project aimed to use that data which was the most complete, up-to-date and referenceable. During the design process, it was necessary to use interim data in order to support decision making. As far as possible this followed the same criteria however there were be cases where assumptions are required.

6.4 Emission factor data

Data quality

6.4.1 Emission factor data has been selected based on its overall applicability to the project. A number of criteria has been applied:

- Age: the most recently published data has been preferred;
- Geography: data which applies to the location of actual suppliers and/or activities has been preferred;
- Technology: data which represent the actual product/activity in question has been preferred;
- Methodology: data which follow a published methodology or product category rules has been preferred; and
- Competency: data which are produced from proficient entities has been preferred.

6.4.2 Ultimately, there are trade-offs between these criteria. The choices made by the carbon consultant have been documented in accompanying reports.

6.5 Calculations

6.5.1 The Moata Carbon Portal has been used to quantify the emissions associated with the Scheme by inputting the quantities of materials as provided. The Moata Carbon Portal contains a library of materials and activities with the associated emission factor. Items selected within the Moata Carbon Portal wherever possible contain the embodied carbon emissions and plant activities.

6.5.2 The Moata Carbon Portal does not contain information of transport of materials to site. To include this lifecycle stage, calculations have been completed in line with the Royal Institute of Chartered Surveyor (RICS) methodology assumptions on travel distances where scheme specific information is not available[3]. This can be refined as procurement progresses.

6.6 Baseline

6.6.1 Due to the availability of design information and in the interest of efficiency it has not been possible to produce a complete footprint from Conceptual Design to be used as the baseline.

[3] Royal Institute of Chartered Surveyors (2017). Whole life carbon assessment for the built environment.

6.6.2 It has been deemed appropriate for the assessment, and to measure the progress of carbon reduction, to back-calculate the approximate baseline. The D4RE workshop listed the largest reductions which occurred between conceptual design and the Tender Design and a number of these were possible to quantify. These reductions mostly involved removal of design elements and so it was deemed important to capture this 'build nothing' decision as part of the carbon management process. The calculations involved adding the quantified carbon reductions on to the Tender footprint.

6.6.3 This methodology for calculating the baseline has limitations and a number of assumptions, listed below:

- Potential omissions of increases between Conceptual Design and Tender Design that have not been recorded;
- A number of the reductions to-date have not been quantified in the latest footprint or in the baseline; this means the calculated baseline is potentially lower than the true value;
- The quantities for headlands and fishing platforms have been multiplied up by 3 to approximate the change in number and size of platforms;
- The quantities for the reductions are based upon the Tender Design footprint quantities; and
- There is potential for aspects in the Tender Design not to have been considered at Conceptual Design.

7 Carbon Assessment

7.1 Pre-tender Design Footprint

Construction

7.1.1 For the purpose of the Climate assessment within the Environmental Statement for the Scheme, the footprint was based upon the Tender Design due to the availability of information. The Tender Design was quantified by a QS to provide a bill of quantities for all the available aspects of the design.

7.1.2 The carbon assessment from has indicated that the Scheme would result in emissions of approximately 44,586tCO2e for construction lifecycle stages A1-3, A4 and A5. The breakdown of which is shown in Table 7.1 below.

Table 7.1 Emissions Split by Lifecycle Stage

Life Cycle Stage	Estimated emissions (tCO_2e)
Product stage (modules A1-A3)	37,820
Construction process stage - transport to site (module A4)	5,221
Construction process stage - construction and installation (module A5)	1,546

Source: Mott MacDonald 2020

7.1.3 The three greatest contributors, as split by category and by individual item are shown in Table 7.2.

Table 7.2 Construction Carbon Hotspots

CATEGORY	
Revetments	86%
Roads and Paving	9%
Retaining Walls	2%
INDIVIDUAL ITEM	
Supply and deliver primary armour for revetments	52%
Supply and deliver underlayer for revetments	24%
Imported regulating course to make up levels	6%

Source: Mott MacDonald 2020

Operation

7.1.4 There will be 1.2km of street lighting in the Scheme, this has been estimated at 246tCO_2e over the 50 year lifetime of the scheme (specification for the Scheme is unknown and emissions have been based on a typical installation specification and operating hours). In the absence of data to calculate the carbon emissions associated with the operation of the kiosk, considering the emissions from street lighting it is anticipated that the operational energy and carbon emissions from operation are likely to be relatively low.

7.1.5 As noted in ES Volume 1 Materials Chapter, the maintenance requirement would not include a total replacement of the Scheme. There would be a requirement to conduct visual inspections multiple times per year, these inspections would not be expected to generate significant emissions. The scheme is being designed with a 50 year lifetime and, unless significant replacement was identified through the routine inspections, the maintenance footprint is considered to be minimal.

7.2 Carbon reductions

7.2.1 Through following the approach detailed in Section 5, the design has resulted in large carbon savings from Conceptual Design to the Tender Design with further reductions identified through Detailed Design and for construction.

7.2.2 The majority of the savings that have been recorded were identified within the D4RE workshop 4th March 2020 and have been quantified where possible, shown in the Old Colwyn Coastal Defence and Active Travel Scheme ES Volume 1 Technical Appendix 9.2. The quantified reductions have either been taken into account prior to the pre-tender footprint whereas others are to be fully implemented and accounted for by the end of detailed design, as shown in Table 7.3. The quantified savings accounted for in the Tender Design footprint results in a reduction of approximately 32%.

Table 7.3 Quantified Carbon Savings from Implemented Measures

Description	D4RE Reference	Status	Carbon Saving (tCO_2e)
Implemented and accounted for in current footprint			
Reuse of existing rock armour	5	Audit of materials require	7,046
In Area 1 raise only the promenade not the road also	22	Fully implemented and accounted for in calculations	1,113
Reuse existing wave return wall within scheme design	24	Fully implemented and accounted for in calculations	100
Recycle existing asphalt as fill within scheme	34	Fully implemented and accounted for in calculations	14
Remove existing concrete promenade to be reused as fill.	N/A	Fully implemented and accounted for in calculations	179
Reduce the number of headland structures from 3 to 1	1	Fully implemented and accounted for in calculations	3,359
Use of rock armour rather than precast concrete armour	14	Fully implemented and accounted for in calculations	9,355
Reduction of fishing platforms from 3 to 1	17	Fully implemented and accounted for in calculations	53
Total			**21,220**
Implemented but not accounted for in current footprint			
Use of recycled cement replacement	10	Included within specification	238
Steepen revetments to minimise material requirements	18	Optimisation on-going, current estimate at 5% saving	1,167
Total			**1,405**

Source: Mott MacDonald 2020

7.3 Further Required Actions

7.3.1 During the design period a number of additional measures were identified to be implemented at a later stage as the Scheme progresses (with the D4RE workshop being the key stage for the identification of these measures. The quantifiable ideas are outlined in Table 7.4.

Table 7.4 Quantified Carbon Savings for Further Actions

Description	D4RE Reference	Status	Potential Carbon Saving (tCO_2e)
Reuse of fill from other site for promenade raising and revetment fill	28	Contractor responsibility	359
Use of precast concrete rather than in-situ concrete where possible	16	Contractor responsibility	1,506
Source slate waste as fill to use for raising levels	20	Contractor responsibility	98
Transport rock revetment material from Scotland or Norway by barge	4	Contractor responsibility	919-1,749
Total			**2,882-3,712**

Source: Mott MacDonald 2020

7.3.2 To continue the reduction of carbon the following measures are required to be implemented wherever possible, confirmed or further explored. The details of the ideas, the further work required and the responsible party are shown in Table 7.5. These ideas will be considered and justified if not possible to implement.

Table 7.5 Further Actions to be Implemented

Description	Further Action Required	Responsible Party	Timeframe
Recycled steel to be used for rebar where possible at a minimum of 85% recycled steel.	Contractor to implement as detailed in specification	Contractor	Through procurement
Recycled material to be used as a cement replacement. 36-85% ground granulated blast furnace slag as a suggested material.	Contractor to implement as detailed in specification	Contractor	Through procurement
Transport of rock revetment potentially to be by boat from Scotland or Norway. The further investigation should consider the distance required to move the rock from the quarry to the port also. For calculations see the following – by boat approx. 0.92 tCO^2e per km versus by road approx. 55.36 tCO^2e per km.	Further calculations required once quarry availability known.	Contractor	Through procurement

Description	Further Action Required	Responsible Party	Timeframe
During quarrying and armourstone extraction, use byproduct as underlayers, fill, aggregate or roadstone.	Contractor to implement where feasible	Contractor	Through construction
Source slate waste as fill to use for raising levels	Contractor to implement where feasible	Contractor	Through procurement
Reuse of fill from other sites for prom raising/behind revetment.	Contractor to implement where feasible once construction dates are known and other developments programme known	Contractor	Through procurement
Re-use of existing materials e.g. lighting, parking meters, ramp, benches.	CCBC to determine what is able to be reused and organise collection and storage	CCBC	Through construction

Source: Mot MacDonald 2020

7.4 Conceptual Design Baseline

7.4.1 The Conceptual Design baseline has been calculated from the Tender Design footprint with the addition of the quantified carbon reductions.

7.4.2 The carbon footprint for the Conceptual Design baseline is estimated to be 65,806tCO_2e for construction lifecycle stages A1-3, A4 and A5. The breakdown of which is shown in Table 7.6 below.

Table 7.6 Baseline Carbon Footprint

Life Cycle Stage	Estimated Emissions (tCO_2e)
Product stage (modules A1-A3)	57,678
Construction process stage - transport to site (module A4)	5,734
Construction process stage - construction and installation (module A5)	2,395

Source: Mott MacDonald 2020

7.5 Progress Through Design

7.5.1 The target was set out to reduce 30% reduction from the Conceptual Design to the Tender Design. There were a number of actions quantified for the reductions between Conceptual Design and Tender Design, as shown in Table 7.7 below. These reductions and the further quantified reductions for Detailed Design and construction, if all implemented, would result in up to a 41% saving.

Table 7.7 Carbon Footprint Through Design

Scheme Stage	Footprint (tCO_2e)	Reduction from Baseline
Conceptual Design	65,806	N/A
Pre-tender Design	44,586	32%
Detailed Design	43,400*	34%
Construction	38,688-40,518*	39-40%

Source: Mott MacDonald 2020
Note: * footprint estimated from the Tender Design footprint with the additional identified savings subtracted.

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A.10 Marine Bio-security Risk Assessment

MOTT MACDONALD

Old Colwyn Coastal Defence and Active Travel Scheme

Bio-Security Risk Assessment

July 2020

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Bio-Security Risk Assessment

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Contents

1 Introduction

1.1 Overview

This Bio Security Risk Assessment (BSRA) document has been produced in support of the Old Colwyn Coastal Defence and Active Travel Scheme (hereafter referred to as “the Scheme”).

This BSRA outlines the potential hazards relating to the introduction and spread of invasive and non-native species (INNS) on site for the Scheme. The Scheme will involve working on land, within the intertidal zone and it also may require the delivery of revetment rock by ship and barge. As a result, INNS relating to the terrestrial and marine environments have been considered.

Prior to implementing this risk assessment on site, a site briefing and a toolbox talk should be provided to all site workers regarding the importance of bio security. The required inspection, preventative and management techniques for personnel should be outlined and pest/containment identification should also be explained to ensure rapid and appropriate responses to any INNS present, (if INNS are found on site, the Ecological Clerk of Works (ECoW) should be notified and guidance should be sought with statutory agencies). An ecological walkover survey should be undertaken on site approximately 6-8 weeks prior to the construction phase commencing. This will provide an opportunity to confirm any new occurrences of INNS on site and for these to be managed suitably prior to works starting.

Formal standardised reporting to Natural Resources Wales (NRW) should be implemented on site throughout the duration of the works regarding the presence of INNS should any be discovered.

1.2 Terrestrial INNS

A Preliminary Ecological Appraisal Report has been produced for the Scheme[1], along with other subsequent assessments (both terrestrial and intertidal) for which a number of field surveys were undertaken from December 2019 to June 2020. During these surveys no invasive plant species were discovered on site. However, it is noted that INNS can be introduced into the site through poor bio-security protocols and construction practice, so a precautionary approach for the management of terrestrial INNS on site is outlined in Section 2.

1.3 Marine INNS

It should be noted that to date no site visit has been undertaken by a marine ecologist (visits were planned but these had to be cancelled due to the Covid-19 pandemic). Instead comprehensive high definition (HD) photographic evidence taken by an experiences local environmental consultant has been reviewed by a qualified marine ecologist to establish marine species present on site. It was not possible to confirm the presence/absence of marine INNS from these photographs. However, due to the potential delivery of revetment rock to the site via barge, precautionary measures to manage potential INNS within the marine environment need to be outlined.

The Marine Strategy Frame Directive (MSFD) (2008) outlines a monitoring list for INNS. These INNS listed by the MSFD are further outlined within the “Priority Monitoring and Surveillance List of Marine INNS for Wales”[2] and have been categorised into “High Risk” and “Medium Risk”

[1] Colwyn Bay Preliminary Ecological Appraisal Report (Ref: 410895-MMD-N-R-00-XX-1701), Mott MacDonald Ltd, 2020.

[2] Gov.Wales (2017). *Marine Invasive Non-Native Species Priority Monitoring and Surveillance List for Wales*. [Online] Available at: https://gov.wales/sites/default/files/publications/2018-02/invasive-aquatic-species-priority-marine-species.pdf

INNS. A “Low Risk” category also exists, but there are not INNS considered to require monitoring by the MSFD.

The “High” and “Medium” risk INNS listed by the MSFD have been reviewed and INNS from these categories that are believed to have the potential to interact with the site as a result of the delivery of revetment rock via barge have been considered for this BSRA. These species considered for this risk assessment are outlined below:

1.3.1 High Risk INNS

- Compass sea squirt (*Asterocarpa humilis*) – potential for introduction through fouling;
- Carpet sea squirt (*Didemnum vexillum*) – potential for introduction through fouling;
- Chinese mitten crab (*Eriocheir sinensis*) – potential for introduction through ballast water; and
- Red ribbon bryozoan (*Watersipora subatra*) – potential for introduction through fouling.

1.3.2 Medium Risk INNS

- Bonnemaison’s hook weed (*Bonnemaisonia hamifera*) – potential for introduction through fouling and ballast water;
- Japanese skeleton shrimp (*Caprella mutica*) – potential for introduction through fouling;
- Orange striped anemone (*Diadumene lineata*) – potential for introduction through fouling;
- Japanese wireweed (*Sargassum japonica*) – potential for introduction through fouling;
- Leathery sea squirt (*Styela clava*) – potential for introduction through fouling; and
- Wakame, Asian kelp (*Undaria pinnatifida*) – potential for introduction through fouling.

2 Bio Security Risk Assessment

The BSRA scoring methodology is presented in Appendix A

The risk assessment in **Error! Reference source not found.** outlines the potential hazards of the Scheme associated with the introduction, transfer and s pread of INNS. This risk assessment should be included within the Construction Environmental Management Plan (CEMP). As outlined above, this risk assessment is precautionary as it relies upon records of INNS within and near to the site.

Table 2.1: BSRA for the Scheme (risk is the transfer and introduction of INNS)

Hazard	Who or What Might be Affected?	Initial Assessment			Risk Control Measures	Residual Risk		
		Severity	Likelihood	Assessed Risk		Severity	Likelihood	Assessed Risk
Land Based Plant								
Machinery access	Where access points are varied and/or used on a number of occasions, the risk of pathogen transfer/introduction will increase.	4	H	UA	The number of vehicles used on site and the frequency at which they enter the intertidal area should be limited (vehicles should only enter the intertidal area on an ebb tide when there is a suitable dry area available for working). Tracking of vehicles across the intertidal zone will remain within a strict working buffer of 20m from the rock revetment (which is 30m wide, so in total a buffer of 50m from the seawall will be adhered to).	2	L	A
Use of land-based plant on the foreshore	Heavy lifting plant will be used in the intertidal zone to collect revetment rock delivered by the barges once the tide has receded. This provides the opportunity for the spread of INNS across the intertidal area.	4	M	AR	Sections of the plant that would come into direct contact with the intertidal area (track/wheels) should be thoroughly cleaned before and after use to avoid the spread of any INNS. This will also prevent potential spread from the Scheme's site area into other sites that may be used after the Scheme's construction is completed.	3	L	A

Hazard	Who or What Might be Affected?	Initial Assessment			Risk Control Measures	Residual Risk		
		Severity	Likelihood	Assessed Risk		Severity	Likelihood	Assessed Risk
Machinery origins/ previous works	Machinery travelling or having previously worked on different sites has the potential to introduce non-native or non-localised species to site.	4	H	UA	A stringent system of vehicle maintenance and cleanliness should be implemented during construction works, including frequent vehicle washing between road and beach access. A CEMP should be adhered to and available on site and NRW Pollution Prevention Guidelines should be followed.	3	M	AR
Promenade works	Material used to raise and widen the promenade may introduce alien species or spread existing species and/or pathogens on site.	3	H	AR	Existing material will be reclaimed as far as possible, therefore the risk of introduction of invasive species is considered low.	2	L	A
PPE – contractor staff, operatives and sub-contractors	PPE can collect contaminants including mud, seeds, pathogens etc. which can easily be transferred to and between sites.	4	VH	UA	All PPE especially footwear, Velcro closures, gloves, etc. should be thoroughly inspected and cleaned and inspected before arrival on site. Boot washing as well as equipment cleaning facilities (with a biocide such as Virkon) should be provided and carried out when entering and exiting site. Ideally equipment should then be allowed to dry for 48 hours before it is used elsewhere (a different site). Transfer between work areas on site should be avoided and minimised where possible.	3	M	AR
Marine Vessels / Marine Plant								
Ballast water	It is currently anticipated that the rocks required for the construction of the revetment on site may be transported by ship from Norway. There may be a requirement for these ships to take on board ballast waters from seas of different nations and to then dispose of these in	4	H	UA	All vessels and associated staff must ensure adherence to the Ballast Water Management Convention, 2017 for each vessel required for the works. This legislation outlines the requirements for each vessel to have a ballast water management plan, a ballast water record book and an international ballast water management certificate. Vessels should have a on-board ballast water treatment system, if this is not possible then ballast water should be	3	L	A

Hazard	Who or What Might be Affected?	Initial Assessment			Risk Control Measures	Residual Risk		
		Severity	Likelihood	Assessed Risk		Severity	Likelihood	Assessed Risk
	UK waters (and vice versa). This could result in the spread of INNS in the form of marine microbes, plants and animals (such as Carpet sea squirt (*Didemnum vexillum)* larvae).				exchanged mid-ocean and not near the shoreline of the site.			
Anchorage	Anchors used for the mooring of vessels pose the opportunity for bio-fouling and introduction of INNS to the site when lowered to the seabed.	3	L	A	Only the larger ships that contain the delivery of the revetment rock will be allowed to drop anchor. These ships will be moored off-site, outside of the site boundary. Barges will be held in place by tugs which are self-propelled and so these will not require anchorage within the intertidal zone. Anchors for vessels used on site should be cleaned when the opportunity arises (e.g. at port or when refuelling) to minimise cross contamination between sites. It should be noted that the anchor will provide a relatively small opportunity for cross site contamination in comparison to other hazards listed in this risk assessment.	2	L	A
Bio-fouling of revetment rock	If revetment rocks delivered on site have been reused from other projects or have spent prolonged periods of time in the marine environment, they may already be colonised to marine INNS which would then be introduced to the site.	4	M	AR	Revetment rock delivered to site should preferably be virgin material and not consist of rocks used for previous coastal defence schemes that may have spent prolonged periods of time in coastal waters. Rocks should also be clean prior to introduction into the intertidal zone on site.	2	L	A
Bio-fouling (ships, barges and tugs used	It is possible for the hulls of ships, barges and tugs used on site to be fouled by INNS such as algae,	4	M	AR	All vessels used on site should ensure they have a copy of their Bio-fouling Management Plan on board with clear information outlining efforts to reduce bio-fouling of the vessel, e.g.	4	L	AR

Hazard	Who or What Might be Affected?	Initial Assessment			Risk Control Measures	Residual Risk		
		Severity	Likelihood	Assessed Risk		Severity	Likelihood	Assessed Risk
for revetment deliveries).	barnacles, sea squirts. This presents an opportunity to introduce INNS to site and to other waters (e.g. from UK waters at Colwyn Bay to Norwegian waters where revetment rock is obtained).				through anti-fouling treatments or use of biocides.			
Bio-fouling of groynes	It should be noted that in order to install the ecological armouring units (ecological enhancements for the Scheme), sections of the existing groyne structures will be required to be removed to fit these in place. It is possible that if these sections of removed groyne are re-used on other projects, there could be a cross contamination of INNS from the Scheme area to other locations as the groyne structures could be fouled.	3	M	AR	Once removed, the sections of groyne should be disposed of suitably on land and should not be disposed of or reused within the marine environment.	3	VL	A

A. Bio-Security Risk Assessment Scoring Matrix

Table A.1: Bio-Security Risk Assessment Scoring Matrix

Biosecurity Severity or Consequence						
1 = Slight – no measurable consequence						
2 = Minor – slight impact, small scale, easily contained						
3 = Moderate – damage recoverable, moderate impact						
4 = Permanent – considerable damage, long term impacts on native flora and/or fauna						
5 = catastrophic – major damage, threat to species						
Likelihood						
VL = Improbable – unlikely to occur						
L = Remote – unlikely but possible						
M = Occasional – possible at some time						
H = Probable – likely to occur several times						
VH = Frequent – likely to occur many times						
Acceptability of assessed risks						
UA = Unacceptable (action essential)						
AR = Action required (if reasonably practical)						
A = Acceptable (manage risk)						
N = Negligible						
Assessed risk						
				Severity		
Likelihood		1	2	3	4	5
	VL	N	N	A	A	A
	L	N	A	A	AR	AR
	M	A	A	AR	AR	UA
	H	A	AR	AR	UA	UA
	VH	A	AR	UA	UA	UA

Source: Mott MacDonald, 2015

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A.11 Marine Pollution Contingency Plan

To be completed by Contractor

A.12 Surface Water Management Plan

To be completed by Contractor

A.13 Operational Flood Management Plan

To be completed by CCBC

B. Environmental Method Statements

To be completed by Principal Contractor

C. Emergency Procedures and Record of Environmental Incidents

To be completed by Principal Contractor

D. Monitoring Reports

To be completed by Principal Contractor

E. Supporting Drawings