Natural Resources Wales

Sea Defence Improvements at Portland Grounds

Environmental Statement

January 2015

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B&V project no. 109455

Client's reference no. IMWA001253

EIA Quality Mark

This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by the Institute of Environmental Management and Assessment (IEMA), through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

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Natural Resources Wales

Sea Defence Improvements at Portland Grounds

Non-Technical Summary

January 2015

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Non-Technical Summary

0.1 Introduction

This non-technical summary (NTS) describes the findings of an Environmental Impact Assessment (EIA) of the effects of the sea defence improvement works at Portland Grounds, hereafter referred to as the 'proposed scheme'. It provides a description of the existing environment, the likely environmental effects of the proposed scheme and the mitigation measures which will be implemented to avoid or reduce them. This NTS is available to view both as a standalone document, and as part of the Environmental Statement which provides a comprehensive record of the EIA.

0.2 Background

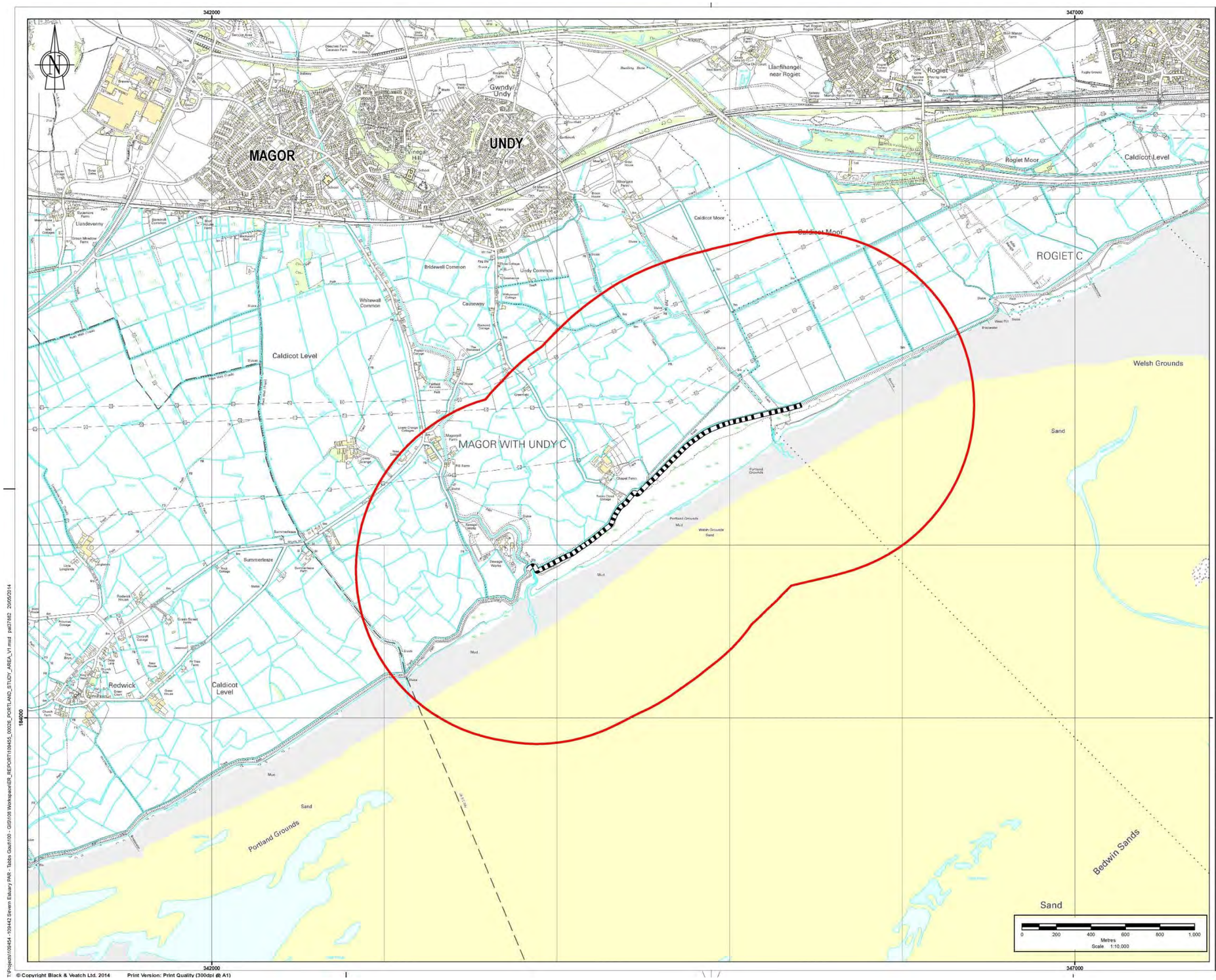
The Portland Grounds sea defence is located on the Welsh shore of the Severn Estuary in an area known as the Caldicot Levels, east of Newport and approximately four kilometres downstream of the second Severn Crossing. The Caldicot Levels form part of the wider Gwent Levels, an area of low-lying land between Cardiff and Chepstow in South Wales, which was created by the gradual enclosure and reclamation of land from the sea. The length of flood defence embankment covered by the proposed scheme is approximately 2000m between NGR ST 438,848 (to the south of Magor Sewage Treatment Works) and ST 454,858 (to the east of Collister Pill) (Figure 109455-00026).

The existing sea defences at Portland Grounds are an earth embankment, which forms part of the coastal flood defence system for the Caldicot Levels (Photo 0-1). Together these defences protect a number of communities such as Magor, Undy and Redwick. In total the area protected includes over 12,000 properties, as well as agricultural land and critical infrastructure such as the M4 motorway and the South Wales mainline railway (Photo 0-2). The draft Severn Estuary Flood Risk Management Strategy has shown that the existing crest level of the defence is low in places, only protecting the people, land and properties behind from a flood that has a 1 in 50 (2%) chance of happening each year. As a result the Portland Grounds sea defence is a weak point in the wider flood defence system for the Caldicot Levels.

By undertaking localised improvements to the defence on this frontage, in line with the preferred option of the Shoreline Management Plan, it will continue to provide (as part of the wider coastal flood defence system for the Caldicot Levels) protection to properties, land and infrastructure which would otherwise be at risk of flooding during a storm surge, or daily tidal inundation if the defences were breached.

Photo 0-1 Existing embankment at Portland Grounds (looking West)

Photo 0-2 Inland of the embankment at Portland Grounds


342000
347000
184000
MAGOR
UNDY
Gwndy/ Undy
Llanfihangel near Rogiet
Rogiet
Rogiet Moor
Caldicot Level
Caldicot Moor
ROGIET C
Welsh Grounds
Sand
Bridewell Common
Undy Common
Causeway
Whitewall Common
MAGOR WITH UNDY C
Summerleaze
Redwick
Portland Grounds
Bedwin Sands
Metres
Scale 1:10,000
Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.
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Legend:
Study Area (1km buffer area)
Location of Embankment Raising
Safety Health and Environmental Information
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following.
Construction.
SHE information included on design drawings'
Maintainence/Cleaning/Operation.
SHE information included on design drawings'
Decommissioning/Demolition
SHE information included on design drawings'
A.0 AJS KG EAS DJ 16/05/2014 FOR ISSUE
Rev Drawn Chkd Rvwd Apprvd Date Description
Designed by: AJS Date: 09/05/2014
Client
Cyfoeth Naturiol Cymru Natural Resources Wales
Client Drawing No.
Revision
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Project:
SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS
Drawing title:
STUDY AREA
Scale: 1:10,000 @ A1
Sheet size: A1
Drawing no. 109455 - 00026
Revision A.0
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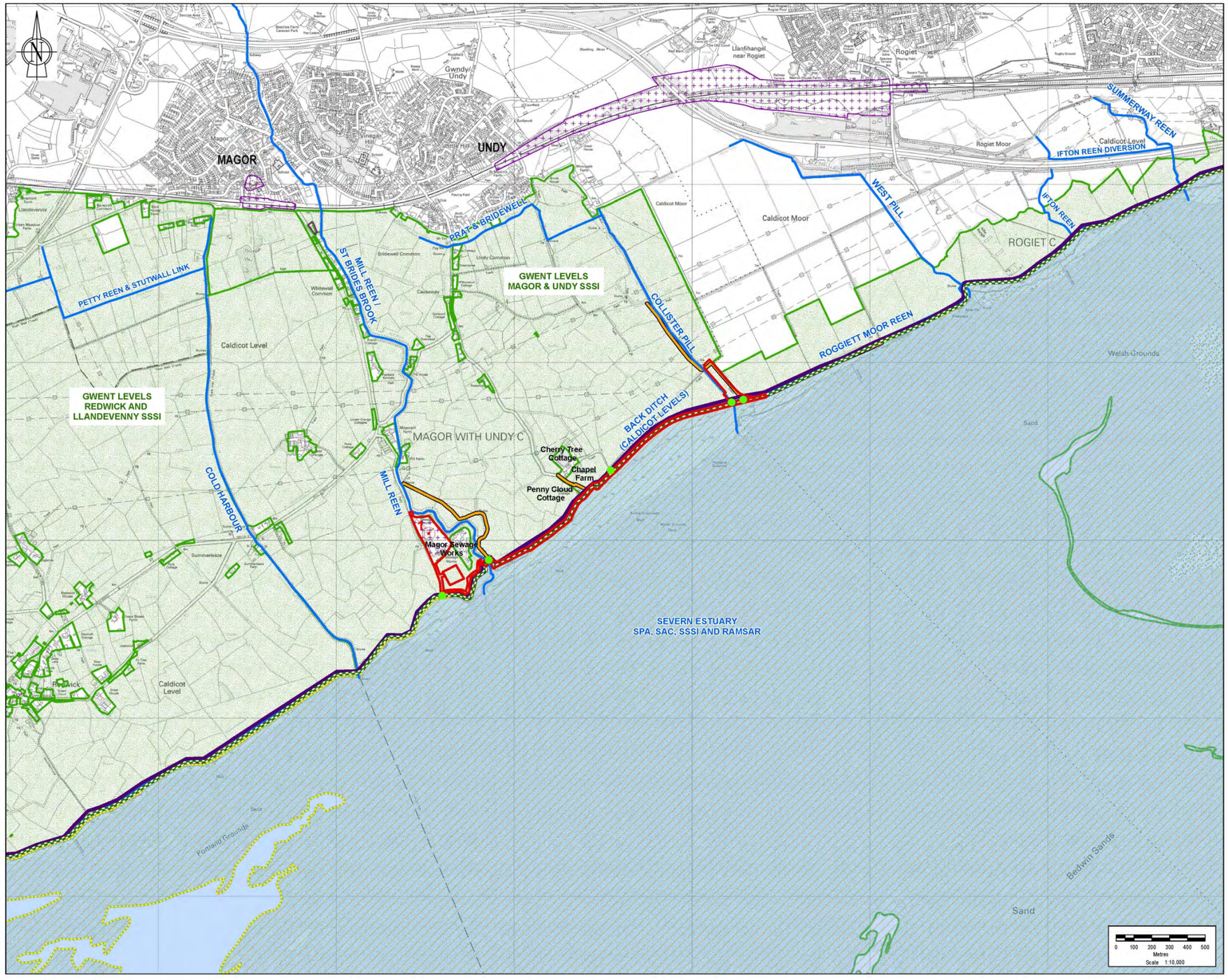

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Site Boundary
- Wales Coast Path
- Post Medieval Sea Defence
- Main Rivers
- Ramsar
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)
- Contaminated Land
- Public Right of Way to be closed
- Crossing Point over reen
- Target Note
  1. Habitat suitable for reptiles, nesting birds and badgers

Notes

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	ONV	WH	EAS	TMTP	16/05/2014	FOR ISSUE
A.0	JAP	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: Date: 08/05/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

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Project: SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title: ENVIRONMENTAL CONSTRAINTS

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455-00032 Revision A.0

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0.3 Proposed Scheme

The proposed scheme at Portland Grounds is to provide localised improvement of the defences to protect against a 1 in 1000 year event (i.e. a flood with a 0.1% chance of happening each year) similar to that of the adjacent defence. This will be achieved by raising the earth flood defence embankment at Portland Grounds by between 600mm and 900mm over a length of approximately 2,000m.

Raising the embankment at Portland Grounds involves raising the crest of the embankment without encroaching in to the Severn Estuary Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site (Natura 2000 site), an area designated for international wildlife importance. The landward side of the embankment will be raised to tie in with the raised crest, thereby effectively moving the crest in a landward direction (see Figure 0-1 below) and also steepening the gradient of the landward side of the bank. The 3m width of the crest of the embankment will be maintained, and the surface of the Wales Coast Path reinstated.

Where necessary a 600mm high retaining wall will retain the landward toe of the embankment. This will ensure that the 4m wide access track between the toe of the embankment and the reen is maintained ('reen' is a local term for water filled ditches).

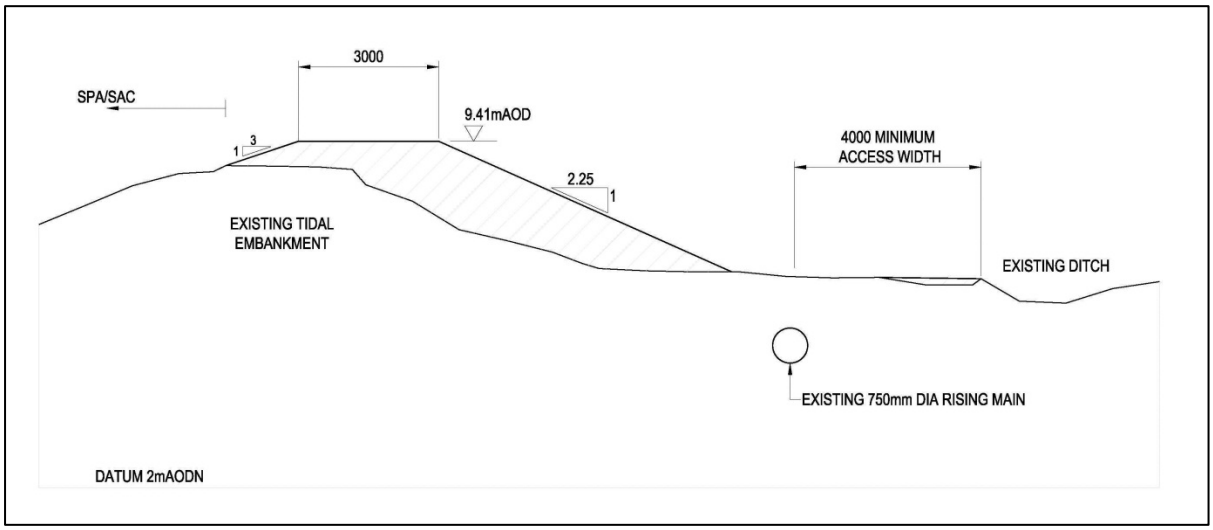

Figure 0-1 Indicative embankment cross section

In addition to embankment raising, replacement of areas of roughly placed blockstone will be undertaken at seven locations where it has previously been placed on the seaward face of the embankment to provide erosion protection. This work will involve removing the existing roughly placed blockstone on the seaward face of the embankment, investigating the cause of past slope failures and installing short sections of rock armour from the toe of the embankment to the flood defence level.

Construction of the raised embankment may be undertaken in two phases. Phase one will be constructed between April and September in 2015. It is anticipated that Phase one will be sufficient to complete all construction activities, however, if due to unforeseen circumstances this is not possible Phase two would be constructed from April 2016 for seven weeks. During Phase one there will be site compounds containing material transfer stations and welfare facilities located at both the eastern and western ends of the scheme close to Collister Pill and within/nearby Magor Sewage Treatment Works respectively (see the Environmental Constraints Plan (Figure 109455-00032)). If Phase two is required only the

eastern site compound will be used and this will remain in place between the two construction phases.

0.4 Legislative Regime

The proposed scheme constitutes permitted development under Part 15, Class A (f) of Schedule 2 of the Town and Country Planning (General Permitted Development) Order 1995 (as amended). It has been determined that the proposed scheme requires a statutory EIA under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (the 'EIA Regulations').

The Portland Grounds embankment is adjacent to the Severn Estuary Natura 2000 site. As part of the EIA, a Habitats Regulations Assessment (HRA) under the Conservation of Habitats and Species Regulations 2010 (as amended) has been undertaken to identify if any of the features of these designated sites could be adversely affected.

Natural Resources Wales's (NRW) Marine Licencing Team has confirmed that a marine licence will not be required as the proposed scheme will be undertaken above Mean High Water Springs.

An application for assent under Section 28 of the Wildlife and Countryside Act 1981 (as amended) for works within the Gwent Levels – Magor and Undy Site of Special Scientific Interest (SSSI) will be submitted to NRW Protected Sites.

0.5 Consultation

Consultation has been undertaken with a range of stakeholders including NRW specialists and external organisations.

A scoping consultation letter was sent to key technical specialists within NRW as well as to statutory and non-statutory stakeholders in June 2013. The aim of the scoping consultation letter was to seek input from key stakeholders on the baseline environment to be included in the Scoping Report. The Scoping Report was subsequently sent to the key stakeholders in December 2013; this provided a description of the proposed scheme and set out the approach for the EIA.

The main issues identified by stakeholders were:

- the potential to affect the designated Severn Estuary Natura 2000 site and the Gwent Levels – Magor and Undy SSSI;
- the need to avoid working between October and March to prevent disturbing wintering and passage birds in the Severn Estuary;
- that the working area is in close proximity to the reen network, and that detailed pollution prevention measures will need to be put in place;
- the requirement for Flood Defence Consent from NRW; and
- Glamorgan-Gwent Archaeological Trust identified a number of archaeological sensitivities within the area and highlighted the risk associated with using borrow pits.

A number of potential enhancement measures were also suggested by consultees.

The final design has been reviewed in light of these issues and they have been assessed and mitigated where required as part of the EIA (see Section 0.7 below).

0.6 Scope of the Assessment

Scoping was undertaken to identify which environmental receptors could potentially be significantly affected by the proposed scheme and therefore needed to be included in the EIA (scoped in). The receptors scoped-in are:

- Human Beings
- Soils
- Water
- Flora and Fauna
- Land Use
- Cultural Heritage and Archaeology
- Noise.

The assessment process also assisted in identifying the environmental receptors that could be scoped out of the assessment. They are:

- Air Quality
- Water Framework Directive Compliance Assessment
- Landscape and Visual Amenity
- Natural Resources
- Climate.

The assessment also considered whether the effects of the proposed scheme will act in combination with other known plans and projects to generate cumulative effects.

0.7 Significant Environmental Effects and Mitigation

The assessment considered how changes to the existing environment caused by construction and operation of the proposed scheme will affect environmental receptors. The significance of effects was assessed according to the predicted magnitude of change and the sensitivity of the receptors affected. The Environmental Constraints Plan (Figure 109455-00032) illustrates specific environmental receptors within the vicinity of Portland Grounds that have been given consideration as part of the EIA.

The assessment also considered mitigation measures that need to be implemented to prevent or reduce significant environmental effects. These measures have been included in an Environmental Action Plan (EAP) so that they are delivered pre, during and post-construction. A summary of the main potential effects and proposed mitigation is given in the following sections.

0.8 Human Beings

There are anticipated to be some short term disturbances as a result of construction activity. It will be necessary to temporarily close the Portland Grounds section of the Wales Coast Path during both phases of construction. A clearly signposted temporary diversion will be set up and safety measures put in place to protect users from construction traffic. However, there remains a residual significant adverse effect on the Wales Coast Path as the diversion is approximately 5.3km long and therefore considerably longer than the section to be closed.

Materials and equipment brought to site will result in an increase in vehicle movements on the local road network during construction. This is likely to disrupt local traffic flows and potentially damage the local road network (see also Section 0.14 Noise). In Phase one, the increase in vehicle movements are likely to affect the B4245 in Magor, Church Road and an unclassified road leading to Collister Pill Reen for the eastern site compound and the B4245,

'Whitewall' and other unclassified roads for the western site compound near Magor Sewage Treatment Works. During Phase two, only roads to the eastern site compound would be affected.

A Traffic Management Plan will be put in place which will include measures to minimise disruption and damage to the local road network. Any debris, dust or mud deposited on local roads will be cleared away by the contractor and other good practice measures will further reduce these construction related effects.

0.9 Soils

Construction activity has the potential to damage soils through the incorrect trafficking, handling and storage of subsoils and topsoils. Following the recommendations detailed within the *British Standard 3882: 2007 Specification for topsoil and requirements for use* will minimise any risk of a potential adverse effect on soils.

If the site compound is located within the Magor STW it will be placed on existing hard standing, and any excavations avoided to prevent the risk of mobilising contaminants.

0.10 Water

The proposed scheme lies within the Caldicot Levels which is an area of flat marshland intersected by a large network of drainage ditches and channels, known as reens.

There is the potential for construction activities along the foot of the sea defence embankment to affect the stability of the adjacent reen banks. Construction traffic crossing over the Back Ditch, Mill, Collister Pill and Roggiett Moor reens could result in the collapse of underlying structures due to overloading from construction vehicles.

General good practice mitigation will be implemented to avoid construction causing unnecessary pollution to the water bodies. This will include following Environment Agency Pollution Prevention Guidelines (PPG) and the formulation of a Pollution Incident Response Plan. In addition to this, NRW are monitoring the water quality of the reens prior to and throughout construction and site compounds will be located at least seven metres from any field ditch and 12 metres from any main reen. However, there remains the potential for a residual significant adverse effect on water quality from a pollution event.

Haul routes will be located to avoid encroachment onto reens and turning places will be established to minimise the reversing length of articulated vehicles. The contractor will also carry out inspections of all existing crossing points to confirm that they can withstand the anticipated construction traffic, and reinforce these crossing points if deemed necessary (Photo 0-3).

Photo 0-3 The Back Ditch reen

0.11 Flora & Fauna

The Severn Estuary is a European designated Natura 2000 site and SSSI. The estuary is designated for its large area of intertidal and subtidal habitat and fish and bird species it supports. Inland (including the existing embankment) is the Gwent Levels – Magor and Undy SSSI, designated for the unique network of reens and the rare plants and invertebrates that these support.

The Portland Grounds embankment supports semi-improved grassland whilst the fields inland are a combination of semi-improved and agricultural fields bounded by a network of reens (Photo 0-4). The Study Area also supports a number of notable/nationally rare and scarce plants, and has the potential to support reptiles, fish, nesting birds and other protected species.

Photo 0-4 The semi-improved and agricultural fields inland of the embankment and Back Ditch

The majority of the working area (including compounds and access routes) will be located outside of the Severn Estuary Natura 2000 site, and construction is scheduled to take place between April and September (with minor mobilisation and de-mobilisation works in March and October respectively). This will avoid the over-wintering bird period and the peak numbers of passage birds. In addition:

- the majority of works will be undertaken from the landward side of the defence and a fence line will be erected along the seaward side of the working area to prevent encroachment into the Severn Estuary Natura 2000 site; and
- measures will be put in place to prevent pollution events on the saltmarsh. These will include storing all equipment and materials in the site compound away from the designated sites, environmental good practice pollution prevention methods and employing methods to minimise dust emissions.

At the western end of the embankment, there may be a requirement to replace areas of roughly placed blockstone. If necessary, a 5m wide temporary access route up to 500m in length will be established in front of the seaward toe of the embankment between the STW and Penny Cloud Cottage. This is a contingency item to the works if repairs to the existing erosion protection are not able to be carried out safely from the embankment crest.

A Habitats Regulations Assessment (HRA) screening assessment has been undertaken and concluded that providing various mitigation measures are implemented, the proposed scheme is not likely to have a significant effect on the Natura 2000 site.

There is the potential for pollution incidents to occur within the Gwent Levels – Magor and Undy SSSI which may affect the diverse and rare aquatic invertebrate and plant fauna in the reens. Mitigation is proposed to reduce this risk to the interest features of the SSSI, including:

- the working area will avoid encroaching into the Back Ditch; and

any topsoil stripped from the embankment will be carefully stored and re-laid on the embankment, therefore enabling the seed bank within the topsoil to aid the re-instatement of

the embankment. Other mitigation which will be carried out to minimise the effects on plants and protected animal species include:

- sensitive vegetation management to reduce disturbance to nesting birds and reptiles;
- pre-construction surveys for notable plant species and breeding birds;
- digging up notable plants that will be lost to the scheme, growing them in a nursery and then re-sowing their seeds and plants; and
- Reasonable Avoidance Measures (RAMs) to minimise effects upon badgers.

Despite the proposed mitigation measures, use of the western site compound has the potential to result in a temporary significant residual effect upon badgers through disturbance.

0.12 Land Use

The majority of land within the Study Area, including the embankment and the site compound areas is Grade Three land under the Agricultural Land Classification (ALC) system, which is considered to be 'good' quality agricultural land. The existing sea defence embankment and the areas surrounding it are currently grazed by livestock (cattle and sheep) (Photo 0-5).

Photo 0-5 Cattle grazing the seaward side of the embankment

Phase one, Phase two and the period in-between the two construction phases will result in the temporary loss of agricultural grazing land. Close liaison with the affected farm owners and landowners, in addition to providing those affected with the appropriate compensation, will ensure that farming operations are not adversely affected by the proposed scheme.

0.13 Cultural Heritage, Archaeology & Material Assets

An archaeological desk-based assessment identified that the existing flood embankment at Portland Grounds is believed to have post-medieval origins.

Construction work is not expected to affect the historic interest of the embankment itself. Excavation is not expected to be deep enough to damage any unknown archaeology, except during the replacement of areas of roughly placed blockstone.

A programme of archaeological work set out in accordance with an archaeological written scheme of investigation will be agreed with the Local Authority's Archaeological Advisor (Glamorgan-Gwent Archaeological Trust) and implemented during construction. This is likely to include an intermittent archaeological watch brief and toolbox talks on the potential to discover unknown archaeology. Depending on the value of the find and the extent of damage to any find there is the potential for a significant adverse effect on unknown archaeology during construction.

0.14 Noise

The site is predominately rural with corresponding low noise levels. Construction is likely to create increased noise levels as a result of vehicle movements and the use of heavy plant.

There is potential for nearby residents, users of the Wales Coast Path and nearby fauna to be disturbed by construction noise. Residents of Penny Cloud Cottage are likely to be affected by machinery tracking past the property and when works are within close proximity throughout both phases of the proposed scheme.

Good construction practice will reduce noise levels, however the residual effect on Penny Cloud Cottage, Chapel Farm and Cherry Tree House is still considered to be significant during the construction periods.

0.15 Cumulative Effects

Other known developments in the area are small, localised and have mitigation measures to prevent adverse environmental effects. They are therefore not anticipated to give rise to significant effects when considered in combination with the proposed scheme.

0.16 Environmental Benefits

The main environmental benefit of improving the sea defences at Portland Grounds is the continued protection from flooding of communities, as well as agricultural land and critical infrastructure such as the South Wales mainline railway and M4 motorway.

Other environmental enhancements were proposed following consultation with NRW technical specialists and external stakeholders, however due to the sensitive nature of the Severn Estuary Natura 2000 site and the Gwent Levels – Magor and Undy SSSI the majority of suggestions were not considered to be appropriate.

0.17 Conclusion

Overall, the EIA has concluded that with appropriate mitigation and with good site management in place, that it will be possible to avoid many significant negative environmental effects resulting from the proposed scheme. The main potential for significant residual effects are as a result of the temporary closure of footpaths, disturbance to badgers, construction related noise and the potential to damage unknown archaeology. There will be a significant beneficial effect from the reduced the risk of coastal flooding to people and property, agricultural land, industrial, commercial and economic assets, and critical infrastructure.

0.18 Contact details

The main contact for the proposed scheme is:

Alex Scorey, Environmental Project Manager,
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Cardiff,
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Contents

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1 Background

1.1 Introduction

The Portland Grounds sea defence is located on the Welsh shore of the Severn Estuary in an area known as the Caldicot Levels, east of Newport, approximately four kilometres downstream of the second Severn Crossing. The Caldicot Levels form part of the wider Gwent Levels, an area of low-lying land between Cardiff and Chepstow in South Wales, which was created by the gradual enclosure and reclamation of land from the sea. The length of flood defence embankment covered by the proposed scheme is approximately 2000m between NGR ST 438 848 (to the south of Magor Sewage Treatment Works) and ST 454 858 (to the east of Collister Pill) (Drawing 109455-00026).

The existing earth embankment, which is privately owned but maintained by Natural Resources Wales (NRW), forms part of the wider coastal flood defence system for the Caldicot Levels. Together these defences protect a number of communities such as Magor, Undy and Redwick. In total the area protected includes over 12,000 properties, as well as agricultural land and critical infrastructure such as the M4 motorway and the South Wales mainline railway.

The Severn Estuary Shoreline Management Plan (SMP2) set out a strategy for sustainable coastal defence to establish objectives for the future management of the shoreline. A SMP is a large-scale assessment of the risks associated with coastal processes and helps reduce these risks to people and the developed, historic and natural environments. Coastal processes include tidal patterns, wave height, wave direction and the movement of beach and seabed materials. A SMP2 is produced in the second round of completing such plans.

Within the SMP2 the coastline at Portland Grounds falls within the Caldicot Levels Theme Area and within Policy Units CALD1 (Uskmouth Power Station Point to Sudbrook Point (north of the M4)). The SMP2 has identified the need to 'Hold the Line' (HTL) of defence at Portland Grounds for the next 100 years. In order to 'Hold the Line' at Portland Grounds the proposed scheme needs to raise the earth flood defence by between 600mm and 900mm over a length of approximately 2000m.

This Environmental Statement (ES) documents the findings of the statutory Environmental Impact Assessment (EIA) carried out to assess the likely significant effects of the proposed scheme. It has been prepared following the collection of baseline data, extensive consultation with statutory and non-statutory bodies, numerous site visits and desktop studies. The EIA has influenced the development of the proposed scheme including the working method, as well as developing mitigation that will be undertaken to ensure that any environmental effects are minimised as far as possible, whilst still achieving the scheme objectives.

This EIA has been carried out under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (hereafter referred to as 'the EIA Regulations'). It will be made available to view at Natural Resources Wales office in Tŷ Cambria, 29 Newport Road, Cardiff, CF24 0TP. Copies have been sent to statutory consultees including NRW and Cadw.

Other environmental regulations which are particularly relevant to the proposed scheme include The Conservation of Habitats and Species Regulations 2010 (as amended), the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and the Wildlife and Countryside Act 1981 (as amended); as described in Section 1.3.

1.2 The problem

The draft Severn Estuary Flood Risk Management Strategy identified that the existing crest level of the Portland Grounds sea defence is low in places, only providing a minimum Standard of Protection (SoP) against a 1 in 50 year flood event (a flood that has a 2% chance of happening each year). As a result the Portland Grounds sea defence is a weak point in the wider flood defence system for the Caldicot Levels.

By raising approximately 2,000m of the Portland Grounds sea defence, it will continue to provide (as part of the wider coastal flood defence system for the Caldicot Levels) protection to over 12,000 properties, which would otherwise be at risk of flooding during a storm surge, or daily tidal inundation if the defences were breached.

1.2.1 Aims and objectives

The primary aim of the proposed scheme at Portland Grounds is to provide localised improvement of the defences to provide protection against a 1 in 1000 year event (i.e. a flood with a 0.1% chance of happening each year), similar to that of the adjacent defence.

The objectives of the proposed scheme are to:

- reduce the risk of loss of agricultural land due to flooding / erosion;
- manage the risk of flooding to people and property;
- manage the risk of flooding to key community, recreational and amenity facilities;
- manage the risk of flooding to industrial, commercial and economic assets and activities, including tourism and agriculture;
- manage the risks of flooding and erosion to critical infrastructure;
- maintain the integrity of internationally and nationally designated nature conservation sites and the favourable condition of their features; and
- address any current or anticipated Health & Safety or public safety concerns regarding ongoing operation and maintenance.

1.3 Regulatory regime

Various legislative requirements and policy advice have informed the design and a range of consents are required to deliver the proposed scheme to achieve compliance under the Water Framework Directive (WFD), Conservation of Habitats and Species Regulations 2010 (as amended), and Wildlife and Countryside Act 1981 (as amended).

1.3.1 Planning permission

The proposed scheme constitutes permitted development under Part 15, Class A (f) of Schedule 2 of the Town and Country Planning (General Permitted Development) Order 1995 (as amended)). Class A (f) covers:

> *"Development by the [Natural Resources Wales], for the purposes of their functions, consisting of – (f) any other development in, on, over or under, their operational land, other than the provision of a building but including the extension or alteration of a building."*

The site of the existing embankment is operational land due to the fact that it is maintained by NRW, and the adjoining land on which the embankment is to be extended consists of a strip of land lying between the existing sea defence embankment and a main river which NRW also maintain. This strip of land is regularly used by NRW both to access the river and the embankment, and also to carry out operational work to the adjacent river and embankment from this strip of land. As such this strip of land (in addition to the

embankment) is ‘operational land’ and as such within the scope of Class A (f) of Part 15 of the 1995 Order.

Consequently, Monmouthshire County Council (MCC) has agreed that the proposed scheme does not require planning permission.

1.3.2 Water Framework Directive

A preliminary WFD compliance assessment has been carried out to identify the potential for the proposed scheme to inhibit the achievement of the WFD objectives for the surrounding waterbodies. Through this assessment it was concluded that there are not predicted to be any non-temporary (direct or indirect), water body scale effects upon any WFD water body arising from the proposed scheme. The proposed scheme will also not prevent the implementation of any WFD Heavily Modified Water Bodies (HMWB) mitigation measures. Therefore, the proposed scheme is unlikely to cause deterioration in WFD status or prevent the water bodies from meeting their WFD objectives in the future. Consequently, a more detailed WFD compliance assessment is not required for the proposed scheme.

1.3.3 Habitats Directive

The Severn Estuary is designated as a Natura 2000 site under the EU Habitats Directive. Natura 2000 is a network of European protected sites that include Special Protection Areas (SPA) designated under the EU Birds Directive, and Special Areas of Conservation (SAC) designated under the Habitats Directive. UK Government policy (ODPM Circular 06/2005) states that internationally important wetlands designated under the Ramsar Convention 1971 (Ramsar sites) are afforded the same protection as SPAs and SACs for the purpose of considering development proposals that may affect them. The Severn Estuary is designated as a SPA, SAC and Ramsar site.

Member states are required to take appropriate steps to avoid the deterioration of natural habitats and the habitats of species for which Natura 2000 sites have been designated. The Habitats Directive is formally transposed into Welsh law by the Conservation of Habitats and Species Regulations 2010 (as amended) (‘the Habitats Regulations’).

Under Article 6 of the Habitats Directive, and equivalent provisions in the Habitats Regulations, an ‘Appropriate Assessment’ is required where screening shows that a plan or project will give rise to a likely significant effect upon a Natura 2000 site, either alone or in combination with other plans or projects. If an Appropriate Assessment is needed, the plan or project should only be approved if the Appropriate Assessment ascertains that the plan or project will not adversely affect the integrity of the site concerned.

The ‘HTL’ policy at Portland Grounds was recommended by the SMP2, which was approved by Welsh Government in November 2014. It should be noted that effects on the qualifying interest features of the Severn Estuary Natura 2000 associated with coastal squeeze (resulting from the ‘HTL’ policy for this frontage) have been addressed and will be compensated for through the Appropriate Assessment and Imperative Reasons of Overriding Public Interest (IROPI) Statement of Case produced for the SMP2. Therefore, these effects were not considered further in the project level Habitats Regulations Assessment.

The Habitats Regulations Assessment screening concluded that the proposed scheme will not have a significant effect on the Severn Estuary Natura 2000 site, and therefore an Appropriate Assessment is not required (see Section 8.5).

1.3.4 Scoping methodology

A Scoping Report was produced to identify the key issues that needed to be addressed in the EIA, and which environmental receptors could be scoped out of the assessment (see Section 4.1.1 for more detail). Consultation with a range of stakeholders has informed the scope of the EIA. This included relevant environmental specialists within NRW and external stakeholders as shown in Section 4.1.1. The comments received on the Scoping Report are summarised in Appendix B.

1.3.5 Marine Licence

NRW's Marine Licencing Team has confirmed that a marine licence will not be required as the proposed scheme will be undertaken above Mean High Water Springs. There is a possibility that minor safety works may be required to the Magor Pill outfall, these will be discussed with the Marine Licencing Team before proceeding.

1.3.6 Environmental Impact Assessment

NRW will undertake the proposed scheme using their powers under Section 165 (2) of the Water Resources Act 1991 as amended by the Natural Resources Body for Wales (Functions) Order 2013 and other legislation, which states:

> *"The appropriate agency shall also have power, irrespective of whether the works are in connection with a main river, to maintain, improve or construct drainage works for the purpose of defence against sea water or tidal water; and that power shall be exercisable both above and below the low-water mark."*

Since the proposed scheme involves improvement to land drainage infrastructure by a land drainage body (NRW), the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 (the 'EIA Regulations') apply. Regulation 4 of the EIA Regulations requires improvement works to be screened to determine whether they may have significant effects on the environment. NRW screened the proposed scheme (as documented in the Scoping Report, Black & Veatch, 2013) and concluded that the proposed scheme was unlikely to result in significant environmental effects.

However, NRW Protected Sites team and MCC in their consultation responses both felt that significant effects on the Severn Estuary Natura 2000 site could not be ruled out, and that these issues should be addressed through an EIA. Therefore, a statutory EIA has been undertaken.

This Environmental Statement (ES) has been produced to document the statutory environmental assessment of the proposed scheme.

1.4 Structure of the report

This report is structured as follows:

Chapter 2 explains the proposed scheme development process, focussing on the alternative options considered.

Chapter 3 describes the preferred option.

Chapter 4 explains the key issues relevant to the proposed scheme including the methodology adopted for the EIA process, and the consents and approvals that are required.

Chapters 5 to 11 consider each of the key receptors that have been scoped into the EIA.

Chapter 12 considers any cumulative effects that may arise as a result of the proposed scheme as well as in-combination effects with other known plans and projects.

Chapter 13 outlines the environmental benefits that the proposed scheme will deliver.

Chapter 14 provides a summary of the EIA findings.

An Environmental Action Plan is provided in Chapter 15. This provides a record of the actions identified within this ES that are required to manage the environmental effects prior to, during, and after construction.

Chapter 16 lists the references used to compile this ES.

Chapter 17 provides a list of abbreviations which are used throughout the ES.

Chapter 18 is the glossary. This provides definitions of any key words and terms which are used in this document.

A number of appendices are included at the end of the document. These are:

Appendix A Figures and Drawings
Appendix B Consultee Comments
Appendix C Archaeological Desk Based Assessment

1.5 Contact details

The main contact for the proposed scheme is:

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2 Project development

2.1 Alternative options considered

A number of factors influenced the development of options for the proposed scheme. These included:

- Avoiding encroachment into the Severn Estuary Natura 2000 site.
- The need to maintain a four metre wide access track between the foot of the embankment and the adjacent reen system ('reen' is a local term for water filled ditches).
- Maintaining an acceptable slope gradient on the embankment to enable grass cutting (and other operations), vegetation growth and to deter poaching of the banks by livestock.
- Maintaining a minimum crest width of three metres for the Wales Coast Path (which runs along the top of the embankment) to ensure the health & safety of footpath users, and to ensure bank stability during overtopping events.
- Avoiding encroachment into, or realignment of, the reen system on the landward side of the embankment, as these support interest features of the Gwent Levels – Magor and Undy Site of Special Scientific Interest (SSSI).
- The archaeological sensitivity of the Wentlooge Levels (GGAT, 2013) which meant that borrow pits could not be used to win material for embankment raising due to the potential for effects on the archaeological resource.

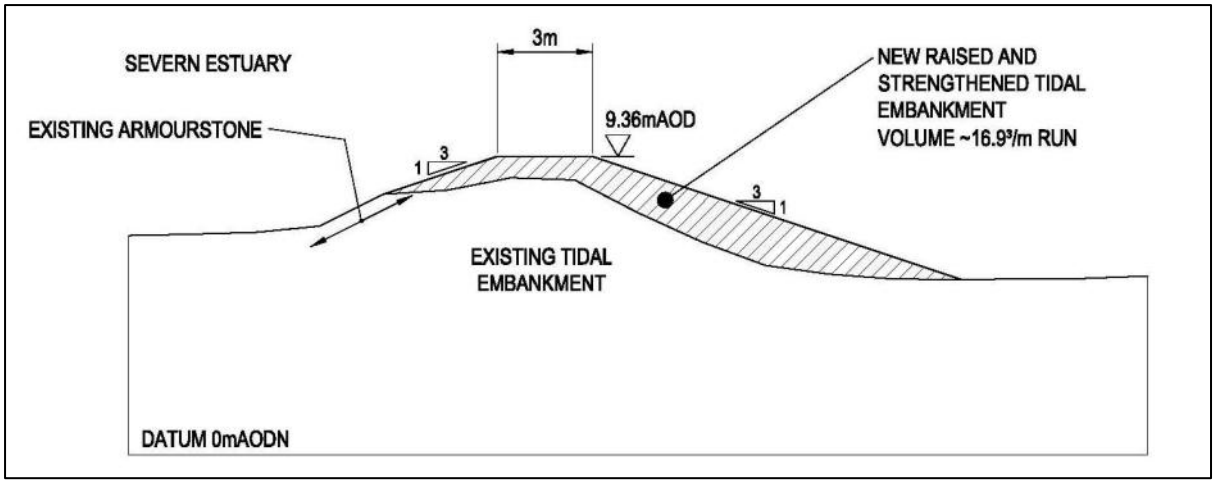
Raising the embankment by constructing it on the estuary side of the existing flood defence embankment was not considered as it does not implement the recommendations of the SMP2 to 'HTL' for the Portland Grounds frontage; rather it would advance the line. This would also result in an increase in the loss of intertidal habitat from the Severn Estuary Natura 2000 site identified in the SMP2 Habitats Regulations Assessment (HRA).

With the above constraints in mind a range of options for raising the height of the existing embankment were considered and assessed against the proposed scheme's objectives (Section 1.2.1).

The options considered as part of the appraisal process are summarised below and in Table 2.1. The reasons for discounting these options are also explained.

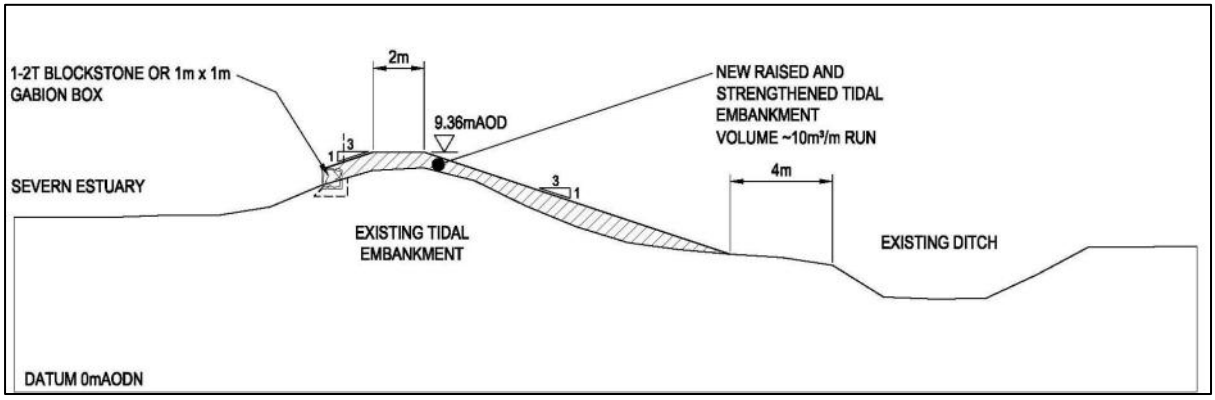
2.1.1 Design Option A

Design Option A involves raising the flood defence embankment on both sides, with the crest remaining at its current alignment, as shown below. This option was discounted primarily as a result of a request from NRW's Protected Sites team to avoid encroachment into the Severn Estuary Natura 2000 site.



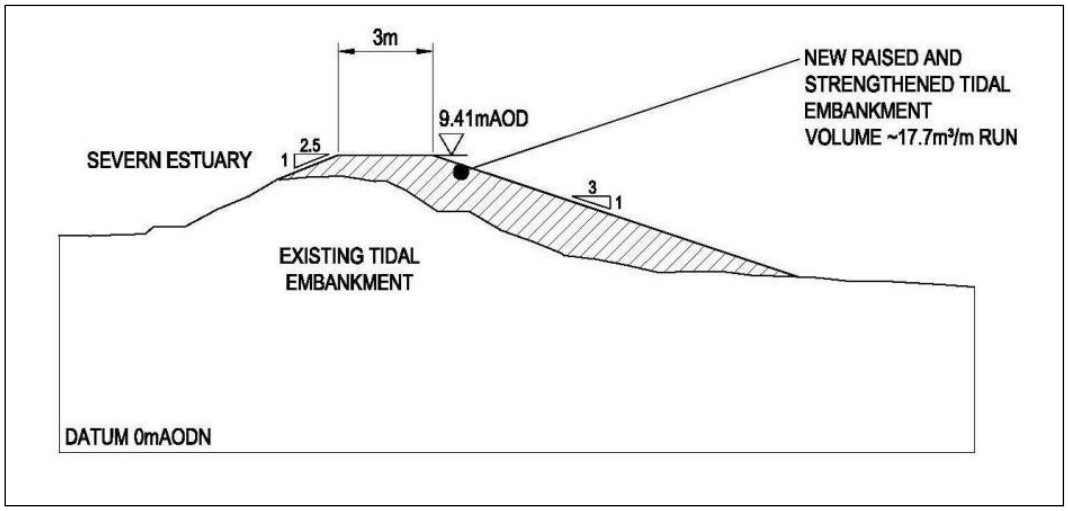
2.1.2 Design Option B

Design Option B involves raising on both sides of the flood defence embankment but with blockstone retaining the raised crest on the estuary side. This eliminates the need for an increase in footprint on the estuary side, as shown below. This option was discounted primarily as a result of a request from NRW's Protected Sites team to avoid encroachment into the Severn Estuary Natura 2000 site. It was also felt that the use of blockstone on the crest of the embankment could create a health and safety hazard to users of the Wales Coast Path (that runs along the crest of the embankment).



2.1.3 Design Option C

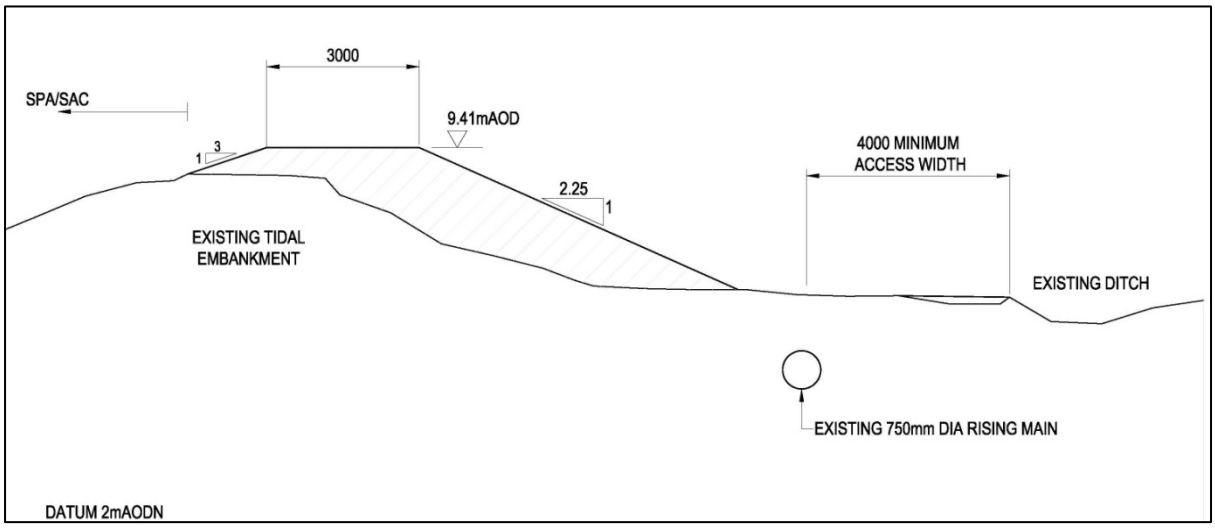
Design Option C involves raising the flood defence embankment on the landward side only, up and over the current crest. This necessitates an increase in footprint on the landward side, as shown below. This option was discounted primarily as a result of insufficient space between the toe of the existing embankment and the reen along some stretches of the embankment. This prevented extension of the embankment toe towards the reen whilst also being able to maintain a 4m wide access track.



2.1.4 Design Option C(i)

Design Option C(i) involves raising the flood defence embankment on the landward side only, up and over the current crest. This necessitates an increase in the footprint on the landward side, as shown below. However, this increase in footprint is less than that of Option C as the gradient of the slope on the landward side will be 1 in 2.25 rather than 1 in 3. The steeper slope on the landward side also removes the need for blockstone to retain the landward toe that is included in Design Option D (see Section 2.2.5).

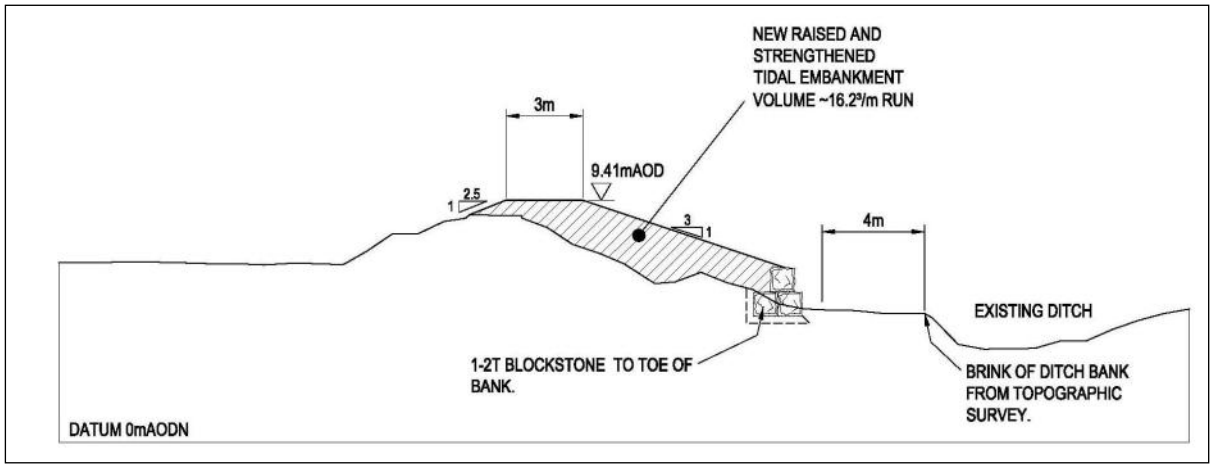
Where space between the toe of the existing embankment and the reen on the landward side of the embankment allows, Design Option C(i) offered the best technical solution to HTL of defence as recommended by SMP2 (see Section 4.4.1), whilst avoiding adverse effects on the designated features of the Severn Estuary Natura 2000 site. This option has therefore been taken forward as the preferred option for the majority of the proposed raising.



2.1.5 Design Option D

Design Option D involves raising the flood defence embankment on the landward side. Blockstone will retain the landward toe to reduce the increase in embankment footprint on the landward side where space is constrained, as shown below.

Where space between the toe of the existing embankment and the reen on the landward side of the embankment is particularly constrained, Design Option D offered the best technical solution to 'HTL' of defence as recommended by the SMP2 (see Section 4.4.1), whilst avoiding adverse effects on the designated features of the Severn Estuary Natura 2000 site. Therefore, this option in addition to Design Option C(i) has been taken forward as the preferred option, but only in those locations where space between the toe of the embankment and reen is particularly constrained.



2.1.6 Replacement of areas of roughly placed blockstone

In addition to the preferred options for the main works described above, there are also seven short sections of roughly placed blockstone located towards the western end of the scheme. These vary in length but are generally in the region of 15-20m. These sections consist of stone which has been previously tipped on to the front face of the embankment in order to repair areas of weakness within the flood defence. These sections of roughly placed blockstone have subsequently been fenced off on three sides to maintain safety to livestock and people.

As part of the wider proposed scheme it is proposed to excavate into the embankment in these areas to investigate the cause of the previous defence failure and replace it with a more ordered protection finish in order to provide a more robust defence and also allow for the existing fencing to be removed.

These works will not increase the existing footprint of the embankment; but will however require minor works to be undertaken on the front-face of the embankment.

Table 2.1 Summary of options considered for the proposed scheme

Design Option	Description	Key Positive Impacts	Key Negative Impacts
Design Option A - Raising on both sides.	Raising the embankment on both sides with the crest remaining at the current alignment. Works to front face of the embankment.	**This option implements the recommendations of the SMP2 to 'HTL' for the Portland Grounds frontage.** Remedial works to the front face of the embankment will reduce the risk of livestock injury.	Encroachment onto the Severn Estuary Natura 2000 site which may have a detrimental effect on the interest features of the site and some notable plant species. Temporary construction disturbance to local residents, traffic, protected birds, reptiles, Gwent Levels SSSI habitat and the Wales Coast Path. Topsoil stripping of the flood defence embankment has the potential to disturb a site of known archaeological interest (the post-medieval sea defence).
Design Option B - Blockstone retaining raised crest on estuary side.	Raising the embankment on both sides but with blockstone retaining the raised crest on the estuary side. This eliminates the need for an increase in footprint on the estuary side. Works to front face of the embankment.	**This option implements the recommendations of the SMP2 to 'HTL' for the Portland Grounds frontage.** Less encroachment into the Severn Estuary Natura 2000 site resulting in a lesser effect on the Natura 2000 site. Remedial works to the front face of the embankment will reduce the risk of livestock injury.	Same as for Design Option A.
Design Option C - Raising on landward side only.	Raising the embankment on the landward side only, up and over the current crest, necessitating an increase in footprint on the landward side. Works to front face of the embankment.	**This option implements the recommendations of the SMP2 to 'HTL' for the Portland Grounds frontage.** No encroachment into the Severn Estuary Natura 2000 site resulting in no significant effect on the Natura 2000 site. Remedial works to the front face of the embankment will reduce the risk of livestock injury.	Temporary construction disturbance to local residents, traffic, protected birds, reptiles, Gwent Levels SSSI habitat and the Wales Coast Path. Topsoil stripping of the flood defence embankment has the potential to disturb a site of known archaeological interest (the post-medieval sea defence).
Design Option C(i) – Raising on landward side only,1:2.25 slope gradient	Raising the embankment on the landward side only, up and over the current crest, necessitating an increase in footprint on the landward side. Differing from Design Option C due to steeper slope gradient and less of an increase in footprint on landward side Works to front face of the embankment.	**This option implements the recommendations of the SMP2 to 'HTL' for the Portland Grounds frontage.** No encroachment into the Severn Estuary Natura 2000 site resulting in no significant effect on the Natura 2000 site. Less encroachment onto the access track on the landward side than Design Option C. The steeper slope removes the need for blockstone at the landward toe (included in Design Option D) which reduces the risk of injury to grazing livestock (a concern of the landowner). No encroachment into the Severn Estuary Natura 2000 site resulting in no significant effect on the Natura 2000 site. Remedial works to the front face of the embankment will reduce the risk of livestock injury.	Same as for Design Option C.

Design Option	Description	Key Positive Impacts	Key Negative Impacts
Design Option D - Raising on landward side with blockstone retaining landward toe.	Raising the embankment on the landward side with blockstone retaining the landward toe to reduce the increase in embankment footprint on the landward side where space is constrained. Works to front face of the embankment.	**This option implements the recommendations of the SMP2 to 'HTL' for the Portland Grounds frontage.** No encroachment into the Severn Estuary Natura 2000 site resulting in no significant effect on the Natura 2000 site. Remedial works to the front face of the embankment will reduce the risk of livestock injury.	Temporary construction disturbance to local residents, traffic, protected birds, reptiles, Gwent Levels SSSI habitat and the Wales Coast Path. Excavation to install blockwork at the landward toe of the flood defence embankment and topsoil stripping has the potential to disturb unknown buried archaeology, and a site of known archaeological interest (the post-medieval sea defence).

3 The preferred option

3.1 Description of the proposal

The preferred option for the proposed scheme involves raising the crest of the embankment by between 600mm and 900mm (depending on existing crest height) without encroaching in to the Severn Estuary Natura 2000 site, except in localised areas where roughly placed blockstone requires investigation and remediation (see Drawing 109455-00033). The landward side of the embankment will be raised to tie in with the raised crest, thereby effectively moving the crest in a landward direction (see Figure 3-1 below) and also steepening the gradient of the landward side of the bank. The 3m width of the crest of the embankment will be maintained, and the surface of the Wales Coast Path reinstated.

Where necessary a 600mm high retaining wall built from 'Redi-Rock' (or similar) will retain the landward toe of the embankment. This will ensure that the 4m wide access track between the toe of the embankment and the reen is maintained.

Where Redi-Rock (or similar) is built the design will incorporate a 1 in 10 crossfall to raise the seaward side of the access track behind the wall, using a mix of embankment fill/ topsoil and scour protection material. This will reduce the drop created by the wall by between 0-300mm and help improve the drainage of the track. This will be required for sections totalling a length of approximately 800m (see detail on drawing 109455-00009.

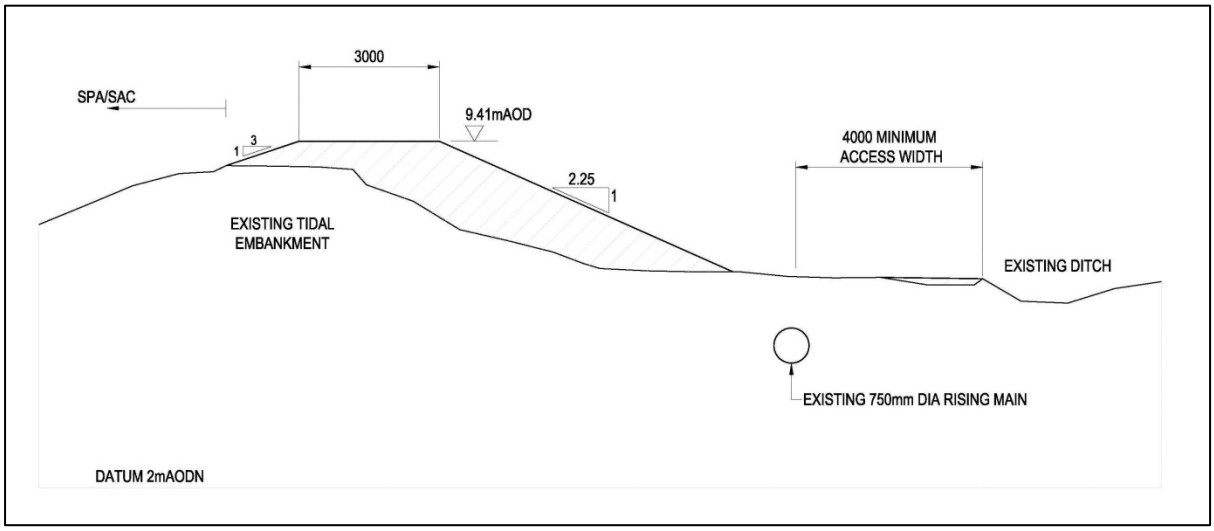


Figure 3-1 Indicative embankment cross section (sections where Redi-Rock (or similar) wall is not required)

Construction works are scheduled to be carried out between April and September 2015 in order to avoid adverse effects to over-wintering birds. If it is not possible to complete all works by the end of September 2015, then a second phase of works will be carried out between April and September 2016.

For Phase 1, mobilisation and demobilisation will take place in March and October 2015.

The programme for Phase 1 is:

- Mobilisation: 4 weeks (4th March to 31st March, with on-site work commencing from 18th March)
- Construction: 26 weeks (1st April to 30th September)

- Demobilisation (only consisting of work within the site compounds and behind the embankment): 2 weeks (1st October to 15th October).

If Phase 2 is needed, then construction work will recommence in April 2016 and is likely to take a maximum of 7 weeks to complete, plus an additional two weeks for demobilisation. No construction work will take place between October 2015 and March 2016 inclusive.

3.2 Method of construction

3.2.1 Site set-up

There will be a requirement for two site compounds containing material transfer stations and welfare facilities. The easternmost of these will be located inland of Collister Pill. At the west of the scheme a compound will either be located within the Dwr Cymru Welsh Water (DCWW) Magor Sewage Treatment Works (STW) or in a field to the south of this location (Drawing 109455-00003).

If Phase two is required there will only be one site compound containing material transfer stations and welfare facilities; this will be the easternmost compound inland of Collister Pill. It will remain in place through the winter period 2015-16 when no construction is taking place.

To set up the site compounds the topsoil will be stripped and stored in stockpiles around the perimeter of the site compound for re-use on completion of construction. Terram (or similar) will be placed on the areas required as offices, car parking, for storage of Redi-Rock (or similar), and for turning. On top of the Terram, 200mm of Type 1 aggregate will be laid and compacted. The material transfer station will remain uncovered by Terram/aggregate for the storing of the embankment fill material (clay) which will be reloaded onto articulated dumper trucks.

Access to the site compounds and the working area will vary depending on which site compounds are being used and which section of the embankment is being raised. See Section 4.3 for more details.

The route from the site compound to the embankments will be inspected during mobilisation and haul roads made of hard-core installed where necessary.

Imported fill material will be off loaded from road lorries within the site compound and reloaded to articulated 25 tonne dump trucks.

Existing services will be plotted on the ground and protection measures put in place to protect these where appropriate. Protection measures will be taken for the existing foul water rising main as required by DCWW.

3.2.2 Haul routes and vehicle numbers

The exact source of the fill material that will be used to raise the embankment is still uncertain. As a result there is some uncertainty regarding the route that construction traffic will use to access the site. However, it is highly likely that construction vehicles will utilise the shortest route from the nearest main road (the A4810). Construction traffic is most likely to use the B4245 through Magor, Church Road and the unclassified road leading to Collister Pill Reen to access the eastern site compound. To access the western site compound construction traffic is most likely to use ‘Whitewall’ (undesignated road) and the access track from this to the Magor STW (Drawing 109455-00027).

If Phase two of construction is necessary, only one access route to the Collister Pill compound will be utilised (the same access as described above for Phase one of construction).

Types and anticipated numbers of vehicle movements are provided in Chapter 5 Human Beings.

The route of the haul roads for transporting fill material from the site compound to the embankment will be located to avoid encroaching too close to the reen and will run within the footprint of the widened embankment.

Topsoil will be stripped from the lower part of the existing embankment to provide the haul road footprint and transported to the compound.

Turning places will be established by each work section to minimise the reversing length of the articulated dump trucks. The turning places will necessitate a topsoil strip of the embankment side to give sufficient room for the trucks to turn.

Where work is required to the roughly placed blockstone, access to the foreshore will only be necessary as a contingency measure if it becomes apparent that work cannot be carried out safely from the top of the embankment. If required, access to these areas will be via an existing access point located approximately 250m east of the DCWW STW and a 5m wide temporary access track established seaward of the embankment.

3.2.3 Embankment improvement works

The proposed scheme has been timed to avoid the winter season when typically the highest tides occur. The contractor will be included in advance NRW warnings of tidal surges.

The embankment improvement during Phase one works will involve two working gangs each progressing along 100m sections utilising a 25 tonne 360°excavator. The works will commence from an existing access track approximately halfway along the embankment and work in opposite directions towards each of the construction compounds. If close to the end of Phase one it becomes apparent that Phase two will be required and that one half of the embankment is closer to completion than the other, that half will be prioritised for completion in order to reduce the construction area and necessary tracking during Phase two.

Topsoil will be stripped off the first 100m section and transported back to the compound for storage. Imported fill will be transported from a site compound in 25 tonne articulated dumpers, then laid and compacted to raise the embankment. The landward side of the embankment will be ‘benched’ to receive and compact the fill in level layers.

Once the filling operation is completed the embankment will be graded to its final profile by an excavator sited on the crest, and surplus material will be removed by tracked dumper for use on the next section.

Upon completion of raising the first 100m section of the embankment, the second 100m section will be topsoil stripped and topsoil transported by 6 tonne tracked dumper (facing the first section to avoid turning) along the crest to the first section.

Topsoil will be spread along the landward side of the first section of raised embankment by a second 20 tonne 360°excavator. The landward face will be graded by the excavator sitting on the crest and sufficient topsoil left on the crest edge for dressing into the footpath once constructed.

The above method will then be repeated in 100m sections all the way along the 2000m stretch of embankment to be raised, with the topsoil from the next section being used to complete the previous section.

3.2.4 Seaward face stone protection and footpath construction

Once work on the topsoil is complete to the landward face of the first section a separate team will commence the stone protection works (where required) utilising the same 20 tonne 360° excavator sited on top of the crest.

The stone will be delivered from the compound and tipped at the toe of the landward face. Working from the start of the first section progressing towards the second section, the excavator will pass the stone to a gang working on the seaward face to position it.

Working in 5 metre sections, the edges of the footpath will be installed, and the stone protection laid to this. The topsoil will be laid, and then the footpath material laid and compacted. Once complete the subsequent 5 metre section will commence.

Works will progress behind the embankment raising operation in both directions for the length of the embankment.

3.2.5 Embankment improvements – Redi-Rock (or similar) retaining wall

Once the stone protection and footpath team have completed the first section a Redi-Rock walling team will be mobilised.

Work to install the Redi-Rock (or similar) wall will take place from the bottom of the embankment using a second 20 tonne excavator (sited between the reen and the line of the wall) which will be used to lift the Redi-Rock (or similar) units.

The fill will be trimmed back on the landward side toe to existing ground level to accommodate the Redi-Rock (or similar) wall. The face of this trimming will be battered to provide a stable and safe workplace for the Redi-Rock (or similar) team.

The Redi-Rock (or similar) foundation will be excavated for the first section and the wall foundation stone laid and compacted. Once the wall is constructed for the first section length it will be backfilled and compacted in layers with fill material. Topsoil will be placed to fill the gap between that previously laid and the top of the Redi-Rock (or similar) wall.

3.2.6 Replacement of areas of roughly placed blockstone

In addition to embankment raising, work will be carried out to replace areas of roughly placed blockstone on the seaward face of the embankment (see Drawing 109455-00033).

Where needed, the investigation phase of these works will take place before activities to raise the embankment. Works to reinstate the improved erosion protection will be carried out in conjunction with embankment raising works. The working methods will be as follows:

i) Embankment investigations

- The existing roughly placed blockstone on the front face will be removed under supervision of a geotechnical engineer.
- Additional excavation of the front face of the flood embankment will be carried out under instruction of a geotechnical engineer to investigate the cause of previous front face slope failures whilst ensuring measures are in place to maintain the function of the embankment as a flood defence at all times.
- Excavation will be carried out using machinery placed on the crest of the embankment whenever it is safe to do so.

- Excavated material will be loaded into dumper trucks for removal from the working area; no excavated material will be placed on the foreshore.

ii) New erosion protection

- The excavated area will be backfilled with suitable material and profiled to form the space for the stone blocks.
- To prepare the base for the stone blocks, a geotextile membrane will be placed on the surface of the excavation; rammed earth will be installed at the toe of the embankment; and a crushed stone bedding layer will be placed on top of the geotextile.
- 1 tonne stone rocks will be lifted in place, ensuring that there are at least 3 points of contact with adjacent rocks.
- Placing the rocks will be coordinated with raising the embankment to ensure the stability of the embankment is maintained at all times and allow safe working. This may require alternate working between placing front face protection and raising the embankment.
- Rammed earth will be placed to form the connection between the top-most rocks and the crest of the raised embankment.
- The voids between rocks will be filled with soil and hydro-seeded to provide a safe surface for livestock.
- The new rock armour, including excavations to toe-in the rocks, will not extend beyond the current bank toe.
- All works will be carried out using machinery placed on the crest of the embankment whenever it is safe to do so.

The works will be carried out from the crest of the embankment wherever possible. However, it may not be possible to carry out all the work safely from the crest of the bank. Under these circumstances temporary access would be needed along the seaward side of the embankment within the Natura 2000 site. Ground protection would be used to limit the potential to damage saltmarsh. The footprint of the completed repairs will not extend beyond the existing embankment toe meaning there will be no permanent loss of saltmarsh.

3.3 Periodic maintenance works

The embankment will be visually inspected every six months by NRW Operations team to check its structural integrity. Further structural inspections will be undertaken if visual inspections identify any potential defects that require further assessment. These will involve operatives accessing the bank via the access track by vehicle. Inspections will be undertaken on foot.

Periodically the grass on the embankment will require cutting. This will be undertaken by the NRW Operations team using a combination of a mower, and a tractor with a flail. Grass cutting will occur approximately once a year.

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4 Key issues and methodology

4.1 The Environmental Impact Assessment

The basis for the Environmental Impact Assessment (EIA) legislation in England and Wales is the European Union (EU) Directive 85/337/ECC (as amended) and codified by EU Directive 2011/92/EU. This directive is translated into UK law through various EIA Regulations. Those relevant to the proposed scheme are the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999 which requires improvement works to be screened, to determine whether they may have significant effects on the environment and hence require a statutory EIA to be undertaken. NRW Protected Sites team and MCC advised that significant effects on the Severn Estuary Natura 2000 site could not be ruled out and therefore a statutory EIA has been undertaken (see Section 1.3.6).

4.1.1 Scoping consultation

As part of the EIA process, NRW carried out a scoping consultation exercise to identify the key issues that needed to be addressed in the EIA. A Scoping Letter was sent at the beginning of project appraisal to obtain relevant baseline information and identify potential constraints. Following this a Scoping Report (Black & Veatch, 2013b) was produced and distributed to technical specialists and other interested parties, including relevant government and non-government organisations. Internal NRW specialists and external stakeholders consulted on the Scoping Report included those listed in Table 4.1 below.

Table 4.1 Consultees of the proposed scheme

	Consultees
Internal NRW consultees	Environmental Management Operations Delivery Protected Sites Groundwater and Contaminated Land Fisheries and Biodiversity Planning Liaison Development and Flood Risk Landscape Hydromorphology Recreation and Access Flood & Coastal Risk Management / Asset Systems Management Newport Wetlands Centre
External stakeholders	Gwent & Glamorgan Archaeological Trust (GGAT) Cadw RSPB Gwent Wildlife Trust The Wildlife Trust of South and West Wales

	Consultees
	Caldicot and Wentlooge Levels Internal Drainage Board Glamorgan Bird Club Gwent Ornithological Society Gwent Bat Group Monmouthshire County Council Dŵr Cymru Welsh Water (DCWW) Bumblebee Conservation Trust

The results of this consultation exercise informed the design of the proposed scheme; helped identify the possible effects of the proposed scheme which are likely to arise, and helped formulate appropriate mitigation measures to reduce these effects. It also helped identify environmental opportunities that could be incorporated into the proposed scheme where appropriate and economically viable. A summary of the consultation responses received and how they have informed the design of the proposed scheme and the EIA is provided in Appendix B.

In summary the following receptors were identified as having the potential to be significantly affected prior to mitigation:

- Human Beings (including Traffic and Transport);
- Soils;
- Water;
- Flora and Fauna;
- Land Use;
- Cultural Heritage and Archaeology; and
- Noise.

The scoping consultation process also assisted in identifying the environmental receptors that could be scoped out of the assessment. These are:

- Air quality; the proposed scheme will not significantly alter existing air quality. There is likely to be a minor, temporary, localised deterioration in air quality during construction from vehicle emissions and dust, which will be managed through best practice construction methods.
- Landscape & Visual Amenity; the proposed scheme will not significantly alter the existing landscape character due to the minor modifications to the existing embankment, or alter the visual amenity of the identified receptors. The greatest visual effect will be during construction; however this will only be a temporary effect;
- WFD compliance assessment; the preliminary WFD compliance assessment has identified that the preferred option will be compliant, and therefore further assessment is not required.
- Natural Resources; the proposed scheme will not affect any waste or mineral sites within the Study Area.

Further consideration during detailed design and as part of the EIA also identified that it was possible to scope out ‘Climate’ as well as ‘Geology and hydrogeology’, since there is no mechanism by which the finalised design of the proposed scheme could affect the climate or climate change, geology and hydrogeology. Future sea level rise as a result of climate change has been factored into the design height of the embankment as required by Government guidance.

A Health Impact Assessment will not be included as the short term construction works are small scale and localised in their extent. Potential health and safety risks to users of the Wales Coast Path long distance walking route, and local residents and the potential risks associated with construction traffic will be considered in the Human Beings chapter. Disturbance to birds and other wildlife will be considered in the Flora and Fauna chapter.

For those receptors that have been 'scoped out' of the assessment, good practice environmental mitigation measures will be adopted and are included within the Environmental Action Plan (Chapter 15).

Chapters 5 to 11 describe the relevant information for each environmental receptor included in the assessment (the planning and policy context is described in Section 4.4). Each chapter presents a description of the baseline conditions, an assessment of effects, potential mitigation measures and residual effects.

NRW will continue to engage with stakeholders during the detailed design stage to update them on the proposed scheme.

4.2 Environmental Impact Assessment methodology

The aim of an EIA is to determine the likely significant effects of a scheme, to assess their effect upon environmental receptors and identify appropriate mitigation measures. 'Receptors' are the environmental resources likely to be affected by the proposed scheme. These include for example 'flora and fauna' or 'human beings'.

The ES provides a record of the process (including the influence that the EIA has had on the design process) and documents the findings as to whether the proposal is likely to cause any significant environmental effects. The EIA also ensures that the proposed scheme is designed with potential environmental effects in mind, so that project decisions are made in the light of any potential effects. This includes the level of that significance, the magnitude and other characteristics of the potential changes that are expected to affect the receptor's sensitivity to these changes. The value attributed to the receptor and the effects of these changes is also taken into account.

In order to assess the potential effects of the proposed scheme and to design mitigation methods where appropriate, the baseline, or existing environmental conditions for each environmental topic, has been established within the Study Area. Information has been obtained through desk-based research, discussions with internal specialists and external consultees and through site-based survey work.

4.2.1 Assessing the sensitivity or value of receptors

For each receptor either the value, importance, or sensitivity (whichever is relevant to the environmental topic) is assessed. Table 4.2 describes the general criteria used to define the level of sensitivity or value.

Table 4.2 General criteria for classifying the value or sensitivity of environmental baseline

Value	Criteria
High	Highly sensitive sites can include sites that are designated to be of national or international importance, legally protected species or large numbers of people. Generally highly sensitive sites are those of high quality / in good condition or highly regarded by people.
Moderate	Sites of moderate sensitivity can include sites of regional or local interest or importance, or a small number of people. Generally moderately sensitive sites are in moderate condition or locally regarded in value or quality. It includes 'red list' or rare species.
Low	Sites of low sensitivity are unlikely to be designated. They are unlikely to be considered of value by either the local population or stakeholders.

4.2.2 Characterisation of effects and assessment of magnitude

The assessment will consider the following sources of effect:

- **Direct:** for example the loss of a buried heritage asset to the footprint of the proposed scheme;
- **Indirect:** for example changes in ground conditions around a buried heritage asset due to change in water levels during flood conditions. These effects take into account the inter-relationships between environmental receptors and topics; and
- **Combined (intra-project):** the total effect on a receptor that will be exposed to multiple changes as a result of the proposed scheme; for example, a population of a particular species may be affected by a reduction in breeding habitat, reduction in feeding habitat, and increased exposure to disturbance. These effects take into account the total effect on a receptor due to changes to the environment at all project sites and changes to other, inter-related, receptors or topics.

The magnitude of change is based on the level of disruption the proposed scheme may cause. The magnitude of change is classified as high, medium, low, very low or no change. Table 4.3 describes some of the criteria used to define the magnitude of change.

Table 4.3 Criteria for classifying the magnitude of change

Magnitude of change	General criteria
High	>75% of area or receptor affected. Residential noise receptor less than 50m from the works. Impact affects widespread area and large section of water feature. Medium to long-term disturbance / pollution of water feature. Large scale impact on land use, generally permanent; key elements and characteristics of existing agricultural environment are completely lost. Might mean that an agricultural business becomes unviable.
Medium	25 to 75% of area or receptor affected. Impact affects medium area/section of water feature. Residential noise receptor 50-99m from the works. Short-term disturbance / pollution incident. Moderate scale impact on land use, permanent or temporary; key elements and characteristics of existing agricultural environment are partially lost.
Low	42 to 25% of area or receptor affected.

Magnitude of change	General criteria
	Residential noise receptor 100-200m from the works. Duration of impact / pollution incident very short. Small scale impact on land use, permanent or temporary; only minor loss or alteration of key elements and characteristics of existing agricultural environment.
Very low	>0, but <5% of area or receptor affected. Residential noise receptor over 200m from the works. Impact affecting very localised area of water feature. No impacts on key elements or characteristics of the baseline agricultural environment are considered likely.
No change	No change.

The likely effects on receptors as a result of activities or environmental changes arising due to the proposed scheme are identified and characterised with reference to the nature (adverse or beneficial) and type of the effect (e.g. whether it is direct or indirect, secondary, cumulative, short or long-term, permanent or temporary, reversible or irreversible). Table 4.4 provides definitions of permanent and temporary effects.

Table 4.4 Determining duration of effect

Nature of Change	Duration	Definition/Description
Temporary	Short-term	Effect continues during construction and up to 1 year following construction.
	Medium-term	Effect continues 1-5 years following construction.
	Long-term	Effect continues 5-10 years following construction.
Permanent		Due to the subjectivity of human perception of timeframes, those effects that continue for greater than 10 years following construction can be defined as permanent.

4.2.3 Evaluating the significance of the predicted effects

The significance of each environmental effect is assessed based on the value and/or sensitivity of the receptor and magnitude of change using the matrix set out in Table 4.5. Each effect is classified as either; none, negligible, minor, moderate or major. For the purposes of this EIA, significant effects are classified as those identified as moderate or major (those shaded blue in Table 4.5), whether adverse or beneficial. The predicted effects are initially assessed without the implementation of any mitigation. Mitigation measures are then proposed to address any adverse effects identified and the effects of the proposed scheme incorporating the proposed measures are then assessed (residual effects).

Table 4.5 Criteria for classifying the significance of potential environmental effect

Magnitude of Change	Sensitivity / Importance of Receptor		
	High	Moderate	**Low**
High	Major	Major	Moderate
Medium	Major	Moderate	Minor
Low	Moderate	Minor	None
Very low	Minor	Minor	None
No change	None	None	None

4.2.4 Mitigation, management and monitoring

Where adverse effects have been predicted, measures to avoid, reduce or compensate for these are identified and described in each chapter. This focuses, in particular, on those adverse effects identified as moderate or major. Measures to comply with legislation or policy are also described. Specific mitigation measures identified as part of the EIA process are included in the Environmental Action Plan (EAP) in Chapter 15. The EAP is a tool by which the environmental effects identified in this ES will be managed. It includes details of the objectives and associated actions for the proposed scheme before, during and after construction. It identifies who is responsible for ensuring the actions are carried out and details any monitoring requirements to assess the effectiveness of the actions.

4.2.5 Residual effects

The significance of residual effects remaining after the implementation of mitigation is assessed using the same methodology as the assessment of pre-mitigation effects.

4.3 Uncertainties and assumptions

The certainty with which effects on the environment can be predicted and evaluated is dependent on the data that is available and the knowledge about how different receptors respond to changes in the environment.

A number of uncertainties remain with regard to the proposed scheme:

- the construction programme: works will be undertaken in one season during summer 2015 (April-September inclusive) if possible, with an allowance for on-site mobilisation/ demobilisation either side of this. If, however, works extend beyond this period, works will cease during winter and re-commence the following April to avoid adverse effects to over-wintering birds;
- the exact location of the section/s that will be raised in 2016 if not all works are completed in 2015;

- the source of the fill material that will be used to raise the embankment (and as a result the likely route that construction traffic will take to site); and
- the exact access routes to the site compounds that construction traffic will use.

For the purposes of this ES the following assumptions have been made:

- Programme: construction will be undertaken between April and September (inclusive) in 2015 if possible. If incomplete after this period, works will cease and recommence in April 2016:
    - Mobilisation – 4 weeks (4th March – 31st March); the latter two weeks of this period will consist of on-site work
    - Construction – 26 weeks (1st April – 30th September)
    - De-mobilisation – 2 weeks (1st October – 15th October)
- Amount and location of raising:
    - All work is programmed for Phase one in 2015, with two working groups working from the middle of the embankment to the eastern and western compounds. If works over-run it is possible that any section of the embankment could be raised in 2016. A maximum of 25% of work will be undertaken in 2016.
- Site compound locations (Drawing 109455-00003):
    - both compound areas will be used in 2015;
    - if works extend in to 2016 only the eastern site compound will be used; and
    - the western site compound will be located either within the Magor STW; or in the field to the south of the STW (the field to the south of the STW is preferred due to the presence of badgers).
- Access:
    - access will be from both the east and the west of the embankment in 2015. If works extend in to 2016 it will only be via the east;
    - it is assumed that 100% of vehicles will be used in Phase one (see Chapter 5: Human Beings), however, as there is the possibility for up to 25% of works to be undertaken during 2016, subsequently up to 25% of total vehicle numbers may be required during this period;
    - the temporary diversion of the Wales Coast Path will be removed and access fully restored in the period between Phase one and Phase two of construction; and
    - haul routes and the easternmost Phase one site compound will be left in-situ between Phase one and Phase two of construction.
- Method of construction:
    - working hours are to be Monday to Friday 07:00 to 19:00 and Saturday from 07:00 to 13:00. No work is to be carried out on Sundays or Bank Holidays. Local residents will be consulted about any extension to these hours. Any extension will approved by the NRW Project Manager;
    - work during Phase two of construction in 2016 will be approximately half the efficiency of work in Phase one in 2015 (as only one compound location/haul route will be utilised (see 'site compound locations;' above); and
    - seeding of the section of embankment raised will occur at the end of Phase one or Phase two, and these areas will remain fenced until the following May. Fencing will be such to allow use of Wales Coast Path after construction and between phases one and two of construction.

The routes that construction traffic will take will be affected by the source of the fill material and the location of the site compound. The most likely routes (the shortest from the nearest main road) to the different site compound locations have been identified (Drawing 109455-00027) and the assessment of the effect arising from traffic movement has been made on this basis. Vehicle numbers have been estimated (see Chapter 5 Human Beings) according

to the length of embankment raising that will take place and the site compound locations that will be used. A small amount of car sharing by site operatives has been assumed (see Chapter 5 Human Beings).

Where it has been necessary to make assumptions, the 'worst-case' assumption (in terms of potential for effects on the environment) has been made in an attempt to ensure that any deviation from the assumptions during construction should result in less significant effects on the environment.

4.4 Planning context

Planning Policy Wales (PPW) and other statutory and non-statutory guidance documents have informed the design of the proposed scheme. This section examines planning policies that are relevant to the proposed scheme.

4.4.1 Flood Risk Management Strategy

In 2011 the Environment Agency completed the draft Severn Estuary Flood Risk Management Strategy (SEFRMS) (Environment Agency, 2011) which covers the area bounded geographically by the Gloucester Weirs at the upstream extent, and Lavernock Point (on the Welsh side) and Hinkley Point (on the English side) at the downstream extent.

Portland Grounds is referred to as Chapel Farm in the Strategy and is within the Caldicot Levels flood cell (FC2-0). The preferred option for the defences at Portland Grounds in the short term (before 2030) is indicated in the Strategy as localised improvement of the defences to provide protection against a 1 in 1000yr event, similar to that of the adjacent defence (i.e. 0.1% chance of happening each year). In the longer term (2030 – 2110), the preferred option is wider significant raising of defence levels, along with more extensive foreshore management (including polders and rock armouring) and resizing of outfalls.

The preferred policy covering this section of coastline within the draft SEFRMS is to 'HTL' for the next 100 years.

4.4.2 Planning Policy Wales

The Planning Policy Wales (Edition 7, July 2014) contains policy guidance of relevance to the proposed scheme including:

- the requirement for sustainable development, by enhancing the economic, social and environmental well-being of people and communities with a focus on the consequence of climate change;
- objectives and issues for conserving natural heritage and the coast which should be taken into account in development plans, including the protection and management of internationally designated sites; and
- maximising environmental protection for people, natural and cultural resources, property and infrastructure and to manage and prevent environmental pollution.

The proposed scheme reflects the core planning principles of the PPW. It will provide resilience to the effects of climate change, which is central to the economic, social and environmental aspects of sustainable development.

4.4.3 NERC biodiversity duty

Wales' biodiversity duty is set out in the Natural Environment and Rural Communities Act 2006 (NERC). Section 40(1) of NERC places a duty on every public authority to "have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity".

Section 42 of NERC lists species and habitats of principal importance in Wales. The list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40 NERC "to have regard" to the conservation of biodiversity in all their activities.

4.4.4 Statutory Development Plans

The proposed scheme falls within the administrative boundary of MCC, therefore the local plan for the council will be relevant to the proposed scheme at Portland Grounds.

Monmouthshire County Council Local Development Plan

On 27th February 2014, MCC formally adopted the Monmouthshire Local Development Plan (LDP) which covers the period 2011-2021. This plan has now become part of the development plan for the county, replacing the Monmouthshire Unitary Development Plan. The LDP aims to help achieve sustainable development by setting out a framework for the development and use of land and for the protection of the environment. It consists of details of the spatial strategy and strategic policies which have been developed to implement the plan's objectives in addition to more specific development management and site allocation policies. The proposed flood defence works do not lie in an area covered by any site allocation policies.

The following strategic and development management policies are considered potentially relevant to the proposed scheme:

- Policy S13: Landscape, Green Infrastructure and the Natural Environment
- Policy S17: Place Making and Design
- Policy CRF3: Safeguarding Existing Recreational Facilities and Public Open Space
- Policy SD2: Sustainable Construction and Energy Efficiency
- Policy SD3: Flood Risk
- Policy LC5: Protection and Enhancement of Landscape Character
- Policy NE1: Nature Conservation and Development
- Policy EP1: Amenity and Environmental Protection
- Policy EP2: Protection of Water Sources and the Water Environment
- Policy EP3: Lighting
- Policy W1: Waste Reduction
- Policy MV3: Public Rights of Way
- Policy DES1: General Design Considerations

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5 Human beings

This chapter focuses on the potential effect of the proposed scheme upon the local human population, recreation and amenities and traffic and transport within the Study Area (Drawing 109455-00026). These effects have been assessed following the general EIA methodology described in Chapter 4.

Scoped-in receptors and potential effects

The receptors and potential effects related to this 'Human Beings' chapter that have been scoped-in to the EIA are listed in Table 5.1.

Table 5.1 Receptors and potential effects scoped-in to the Population chapter

Scoped-in receptor	Scoped-in potential effect
Public Rights of Way	The potential for restricted access (closure/diversion) to the Wales Coast Path affecting recreational users' enjoyment of the PRoW.
Traffic and Transport	The use of minor roads for construction related traffic.

The chapter cross-references where appropriate Chapter 11, where noise has the potential to affect human beings.

5.1 Existing environment

5.1.1 Public Rights of Way

The Wales Coast Path is a long distance walking route and a designated Public Right of Way (PRoW) that runs along the crest of the existing flood defence embankment within the Study Area (Drawing 109455-00027). The Wales Coast Path provides a continuous walking route around the whole of Wales, providing people with close access to the coastline. In addition to walking opportunities, the Wales Coast Path along the Portland Grounds embankment provides tourists with views across the Severn Estuary and facilitates bird watching of wildfowl and waders within the estuary.

The Caldicot Moor lies within the north east of the Study Area and is a popular bird watching location. There are multiple additional PRoWs within the Study Area (372/46, 372/48, 372/51, 372/53, 372/56, 372/58 and 378/13B), some of which connect the Wales Coast Path to the wider PRoW network. There are no cycle routes (Sustrans, 2013) or other known tourism and recreation facilities within the Study Area.

5.1.2 Traffic and transport

There are a number of minor roads within the Study Area including 'Pill Street', 'Whitewall', Church Road, 'The Causeway' and some unnamed and unclassified roads which link the farms and houses to the B4245. The Whitewall road also connects to the A4810 to the north (Drawing 109455-00027).

5.2 Likely significant effects

5.2.1 Construction effects

The following potential construction effects on the human population within the Study Area have been identified. An assessment of significance is given prior to mitigation.

5.2.1.1 Public Rights of Way

As the Wales Coast Path is a long distance walking route it is considered to be of regional importance; and of **moderate sensitivity** for the purposes of this assessment.

The Wales Coast Path on the Portland Grounds embankment will require temporary closure during construction for a maximum of 26 weeks from April to September inclusive in 2015 and for a maximum of 7 weeks from April 2016 if works cannot be completed in a single season. The stretch of the Wales Coast Path will be temporarily closed for both construction periods only and this is therefore a **short term** effect. Between the two phases of work, the footpath will be re-opened to the public.

As the closure will restrict users of the Wales Coast Paths ability to complete the entire long distance walking route, the magnitude of change arising from the construction works is considered to be high.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **major adverse, short term effect** on the Wales Coast Path in the area before mitigation.

As a receptor, the footpaths within the Study Area are considered to be of local importance; and of **low** sensitivity for the purposes of this assessment.

Footpaths 372/56, 372/53, 372/48 and 378/13B (Drawing 109455-00027) will require temporary closure throughout the construction period but will be re-opened between Phases one and two if necessary. This is considered to be a **short term effect.**

As the closure will affect over half of the footpaths within the Study Area, the magnitude of change arising from the construction works is considered to be **medium**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **minor adverse, short term effect** on the footpaths in the area.

5.2.1.2 Traffic and transport

As a receptor, the local road network is classified as being of **moderate sensitivity** to the proposed scheme.

Phase one

During Phase one construction traffic will travel to both the eastern and western site compounds. Construction traffic is most likely to use the B4245 through Magor, Church Road and the unclassified road leading to Collister Pill Reen to access the eastern site compound. The western compound area is likely to be accessed via Whitewall and the access rack from this to the Magor STW (Drawing 109455-00027).

Types and anticipated numbers of vehicle movements (single journeys) for Phase one and Phase two are provided in Table 5.2. Approximately 5,366 lorry/large plant movements are predicted to be required through the 30 week mobilisation, construction and demobilisation period for the transportation of materials and equipment. This equates to approximately 30

lorry movements per working day (i.e. excluding Sundays). Additionally, it is expected that there will be approximately 48 car/van movements per day for the transportation of workers, split between the two site compounds.

The increased number of vehicle movements on the local road network and an increase in heavy vehicle movements will result in disruption to local traffic flows. This disruption will last throughout mobilisation, work on the embankment and demobilisation (30 weeks); it is therefore a **temporary, short term effect**.

The local road network consists of small secondary and unclassified roads prior to reaching the B4245 junction with the A4810, although there is no baseline traffic data for these local roads for comparison, it is reasonable to assume that the magnitude of change will be greater on the smaller local roads than on the main A4810. Due to the requirement for heavy vehicle movements on the rural roads and the potential interface with local traffic it is anticipated the magnitude of change will be **medium**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **moderate adverse, short term effect.**

Phase two

It is assumed that during Phase two of construction only the eastern compound area and access routes will be used. Construction traffic is most likely to use the B4245, Church Road and the unclassified road leading to Collister Pill Reen to access the eastern site compound (Drawing 109455-00027).

Types and anticipated numbers of vehicle movements for Phase two are provided in Table 5.2. Approximately 1,349 lorry/large plant movements are predicted to be required through the 11 week construction period for the transportation of materials and equipment. This equates to approximately 21 lorry movements per day. Additionally, it is expected that there will be the requirement for approximately 48 car/van movements per day, travelling to and from the eastern site compound.

The increased number of vehicle movements on the local road network and an increase in heavy vehicle movements will result in disruption to local traffic flows. This disruption will last throughout mobilisation, work on the embankment and demobilisation; it is therefore a **temporary, short term effect**.

As for Phase one it is reasonable to assume that the magnitude of change will be greater on the smaller local roads than on the main A4810. Due to the requirement for heavy vehicle movements on the rural roads and the potential interface with local traffic it is anticipated the magnitude of change will be **medium**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **moderate adverse, short term effect.**

Table 5.2 Types and anticipated number of vehicle movements (single journeys) required during construction[1]

Types of transport and reasons for use	2015			2016		
	Mobilisation (2 weeks)	Work on embankment (26 weeks)	Demobilisation (2 weeks)	Mobilisation (2 weeks)	Work on embankment (7 weeks)	Demobilisation (2 weeks)
Transporting workers (car/van movements)	**8,640**			**3,168**		
Site setup/removal	120	-	60	0	-	60
Transporting clay / Redi-rock foundation material (using 8 wheeler / 20 tonne vehicle)	-	4,140	-	-	1,035	-
Transporting of Redi-rock (using 8 wheeler / 20 tonne vehicle)	-	100	-	-	25	-
Transporting stone facing (using 8 wheeler / 20 tonne vehicle)	-	570	-	-	143	-
Disposal of material from roughly placed blockwork improvements	-	30	-	-	8	-
Transporting plant and equipment.	36	-	36	11	-	11
Transport of fuel	-	104	-	-	14	-
Transport of sewage from site		104			14	
Transport of welfare equipment (consumables, personal protection equipment (PPE) etc.)	10	52	4	10	14	4
Total lorry loads (excluding transport of workers)	**166**	**5,100**	**100**	**21**	**1,253**	**75**
	5,366			**1,349**		

[1] Numbers reflect that 100% of proposed works are undertaken in Phase one with the scenario that a maximum of 25% of works are undertaken during Phase two. Phase two would not be required if works are completed during Phase one (see Chapter 3 for further information). Likewise, if Phase two is required up to 25% less traffic numbers would actually occur in Phase one.

Phase one and two

Throughout construction the increased volume of traffic could potentially damage the local road network and result in debris being spread on local roads. Depending on the scale of damage caused the magnitude of change could range from **low to high**. In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **minor to major adverse, short term effect** on the condition of the local road network prior to mitigation.

5.2.2 Operational effects

There are no operational effects of the proposed scheme on human beings in the area.

5.3 Mitigation

The following mitigation measures will be followed to minimise the risk of adversely affecting PRoWs:

- the temporary closure of the Wales Coast Path and other PRoWs will be agreed with MCC. A temporary 5.3km diversion has been developed in consultation with MCC as shown on Drawing 109455-00013. The temporary diversion will be approximately 5.3km (2.3km longer than the section to be closed) and clearly signposted;
- two temporary pedestrian footbridges and an access gate at the western end will be put in place to enable users access to and from the temporary diversion;
- where necessary the temporary diversion and construction traffic will be segregated;
- where the users of the diverted PRoW need to cross construction access routes, designated crossing points will be established and appropriate signage installed to warn construction and other traffic of the crossing point;
- the PRoW will be temporarily re-opened between the two phases of construction (if necessary) and formally re-opened as soon as possible following completion of the works.

The following mitigation measures will be followed to minimise the risk of adversely affecting traffic and transport:

- A Traffic Management Plan (TMP) will be put in place. This will detail construction vehicle access routes, timings of deliveries and contingency measures for emergency access, to ensure minimal disruption to the local road network and community. These will include:
    - bulk deliveries will only arrive during construction hours;
    - warning signs will be placed on local roads (in locations to be agreed with MCC);
    - measures to avoid and manage mud on the public highway, including monitoring vehicles, road sweeping and other dust suppression methods will be employed where necessary;
    - measures to minimise vehicle movements where possible;
    - management of the interface between users of the Wales Coast Path diversion and construction vehicles;
    - deliveries to the site will be controlled to avoid queuing; and
    - limiting vehicle speeds where required.
- Pre and post construction surveys of local roads along the route that construction traffic is expected to use will be undertaken to assess any damage to the local road network.

5.4 Summary of effects

Significant adverse effects of the proposed scheme are temporary and associated with the temporary closure of the Wales Coast Path, and increased traffic and heavy vehicle movements affecting local traffic flows during construction. The implementation of mitigation measures will reduce the residual effects that result from construction. No residual significant effects are envisaged after mitigation.

Table 5.4 provides a summary of the effects on PRoW and traffic and transport within the Study Area, proposed mitigation measures and the residual effects.

Table 5.2 Potential effects of the proposed scheme on PRoW and traffic and transport

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction effects						
Temporary closure of Wales Coast Path at Portland Grounds.	Moderate	High	**Major adverse, short term**	See 'PRoW' mitigation measures in Section 5.3. The Wales Coast Path will be temporarily closed and a diversion will be set up to avoid the embankment and site compound. The path will be re-opened between phases.	Medium	**Moderate adverse, short term**
Temporary closure of footpaths within Study Area.	Low	Medium	**Minor adverse, short term**	See 'PRoW' mitigation measures in Section 5.3. The footpaths will be temporarily closed and a diversion will be set up to avoid the embankment and site compound.	Very low	**Minor adverse, short term**
Increased traffic and instance of heavy vehicle movements on local road network from construction plant and materials during Phase one and two.	Moderate	Medium	**Moderate adverse, short term**	See 'Traffic and Transport' mitigation measures in Section 5.3. A TMP will be put in place and will detail construction access routes, timings of deliveries and to ensure minimal disruption to the local road network and community.	Low	**Minor adverse, short term**
Damage to the local road network from increased traffic volumes.	Moderate	High to low	**Major to minor adverse, short term**	See 'Traffic and Transport' mitigation measures in Section 5.3. The TMP will include measures to manage and avoid mud on the local road network and limit vehicle speeds.	Low to very low	**Minor adverse, short term**

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6 Soils

This chapter focuses on the potential effect of the proposed scheme upon soils within the Study Area (Drawing 109455-00030). These effects have been assessed following the general EIA methodology described in Chapter 4

Scoped-in receptors and potential effects

The receptors and potential effects related to this 'Soils' chapter that were scoped-in to the EIA in the Scoping Report (Black & Veatch, 2013b) are listed in Table 6.1.

Table 6.1 Receptors and potential effects scoped-in to the soils chapter

Scoped-in receptor	Scoped-in potential effect
Contaminated Land	An area of potentially contaminated land within the Magor STW has been identified as a site compound location. Work activities within this area have the potential to mobilise contaminants.
Soils	Pollution of soils from construction activities (i.e. run-off, spillages).
	Damage to soils from the incorrect trafficking, handling and storage of subsoil and topsoil.

The chapter cross-references where appropriate to others within this ES, such as Chapter 9, where the effect on soils has the potential to affect agricultural land use.

6.1 Existing environment

6.1.1 Soils

A study has been undertaken of the ground conditions along and in the immediate vicinity of the Portland Grounds embankment (White Young Green Environmental, 2013). The ground conditions of the embankment are comprised of topsoil and made ground overlying estuarine alluvium (clay and peat). The topsoil was primarily made up of fibrous, brown, silt and clay topsoil. The made ground contained re-worked alluvium in the form of brown (mottled grey and orange) slightly silty clay. The underlying estuarine alluvium consisted of grey and blue grey, silty clay.

6.1.2 Contaminated land

There is a site of potentially contaminated land at the Magor Sewage Treatment Works (STW) to the west of the Study Area (see Drawing 109455-00030). There are no other sites of known, or potentially contaminated, land within the Study Area. During the ground investigation of the embankment and surrounding area no evidence of contamination was observed (White Young Green Environmental, 2013).

6.2 Likely significant effects

6.2.1 Construction effects

The soils along the embankment and within the site compounds support Grade 3, good quality agricultural land and as such are of **moderate** sensitivity (See Chapter 9 for further details). Construction activities and the set up and operation of the compounds have the potential to pollute soils. This could result from the movement of construction plant and

materials; run-off from the site; storage of fuels, oils and other substances within the site compound; and from accidental spillages. This could affect the agricultural function of the soils but any effect is likely to be localised. Therefore the magnitude of change of polluting these soils through construction activities is assessed to be **low** and therefore there will be a **minor adverse**, medium term significance of effect.

The area of potentially contaminated land within Magor STW may contain historic sludge or screenings from the STW processes and as such this land is of **moderate** sensitivity. The magnitude of change of potentially mobilising contaminants is assessed to be **low** due to the fact that the site compound is a temporary structure that will not alter the existing ground conditions, resulting in a **minor adverse,** medium term significance of effect.

The incorrect storage, handling and trafficking of soils could lead to damage to the macrostructure of the soil affecting the success of the reinstatement of the working areas back to agricultural land. Compaction by heavy machinery can also damage the macrostructure of soil. The waterlogged nature of some areas makes them particularly prone to compaction and structural damage, as slippage of machinery on the wet ground has a very damaging effect on the soil structure. This could affect the agricultural function of the soils but any effect is likely to be localised. Therefore, the magnitude of change for damaging soil structure through construction activities is assessed to be **low.** This could result in a **minor adverse, long term**, effect on soils in the Study Area.

6.2.2 Operational effects

There are no anticipated operational effects of the proposed scheme on soils within the Study Area.

6.3 Mitigation

The following mitigation will be implemented to minimise the risk of mobilising contaminants within the Magor STW site compound area:

- no boring, digging, excavation or similar operations will be undertaken within the Magor STW site compound area; and
- all working areas within the site compound at Magor STW will be located on existing concrete slabs which were formerly utilised as sludge drying beds, but are now clean and disused.

The following mitigation measures will be followed to minimise the risk of polluting soils within the Study Area:

- Adhere to the mitigation measures laid out in Chapter 7 and the recommendations contained within the following Environment Agency Pollution Prevention Guidelines:
  - PPG 1 General Guide to the Prevention of Pollution;
  - PPG 6 Working at Construction and Demolition Sites;
  - PPG 7 Refuelling Facilities;
  - PPG 21 Incident Response Planning;
  - PPG 22 Dealing with Spills; and
  - PPG26 Drums and intermediate bulk containers.
- All waste generated by the project will be managed, stored and disposed of in accordance with the Site Waste Management Plan (SWMP). Waste will be stored in segregated waste skips and bins prior to disposal within the site compound. Disposal will take place under the Duty of Care system and be recorded in the SWMP.

The following mitigation measures, in accordance with *British Standard 3882: 2007 Specification for topsoil and requirements for use* will be followed to avoid adversely affecting soils within the Study Area:

- topsoil shall not be handled or trafficked during, or shortly after, heavy precipitation; in a waterlogged condition; when the ground is frozen or covered by snow; and when there are pools of water on the ground surface. Topsoil spreading, levelling and loosening will not be carried out during or immediately after heavy rain;
- when stockpiling topsoil, heaps should be tipped loosely, the surface firmed and shaped to shed water;
- stockpiles of topsoil should be as long, narrow and shallow as possible (as an adequate oxygen supply is unlikely to penetrate more than 1m from the stockpile surface);
- stockpiles should be kept clear of injurious or pernicious weeds and sharps, plastics and other non-soil forming materials;
- topsoil should be spread over loosened subsoil (it is particularly important that the subsoil is not over compacted. This should ensure that plant roots can extend into it and excess water can drain away through it);
- subsoils should not be trafficked by heavy machinery prior to the application of topsoil. Where trafficking is unavoidable, it should be kept to a minimum;
- vehicle access routes along the embankment will be clearly delineated to minimise trafficking of soils; and
- the plant species selected for reseeding the embankment will promote the development of soil structure and drainage.

6.4 Summary of effects

Table 6.2 provides a summary of the effects on soils within the Study Area, proposed mitigation measures and the residual effects. No residual significant effects are envisaged after mitigation.

Table 6.2 Summary of effects on soils

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction Effects						
Potential mobilisation of contaminants within the Magor STW.	Moderate	Low	**Minor adverse, medium term, effect**	No boring, digging, excavation or similar operations will be undertaken within the site compound area. All working areas within the site compound at Magor STW will be located on existing concrete slabs which were formerly utilised as sludge drying beds, but are now clean and disused.	No change	**None**
Pollution of soils from general construction activities.	Moderate	Low	**Minor adverse, medium term, effect**	Adhere to the mitigation measures laid out in Sections 6.3 and 7.3 and comply with the recommendations of the Environment Agency PPGs.	Very Low	**Minor adverse, medium term, effect**
Deterioration of the quality of agricultural soil from the incorrect storage, handling and trafficking of subsoils and topsoils.	Moderate	Low	**Minor adverse, long term, effect**	Soil to be handled in accordance with *British Standard 3882: 2007 Specification for topsoil and requirements for use*. Vehicle access routes along the embankment will be clearly delineated to minimise trafficking of soils. The plant species selected for reseeding the embankment should promote the development of soil structure and drainage.	Very Low	**Minor adverse, long term, effect**

7 Surface Water Bodies

This chapter focuses on the potential effect of the proposed scheme upon surface water bodies within the Study Area (Drawing 109455-00028). The effects have been assessed following the general EIA methodology described in Chapter 4.

Scoped-in receptors and potential effects

The receptors and potential effects related to this 'Surface Water Bodies' chapter that have been scoped-in to the EIA are listed in Table 7.1.

Table 7.1 Receptors and potential effects scoped-in to the water chapter

Scoped-in receptor	Scoped-in potential effect
Surface water bodies	Risk of deterioration in water quality of the following reens: Back Ditch (Caldicot Levels) (hereafter referred to as 'Back Ditch'), Roggiett Moor, Mill and Collister Pill through construction activities.
	Encroachment onto the banks and collapse of underlying structures into the Back Ditch, Roggiett Moor, Mill and Collister Pill resulting in blockages to water flow.

Other chapters where water quality effects have the potential to affect additional receptors are listed below in Table 7.2.

Table 7.2 Effects of changes in water environment considered in other chapters

Receptor	Chapter
Nationally important scarce plants and invertebrates (interest features of the Gwent Levels – Magor & Undy SSSI)	Flora & Fauna (Chapter 8)
Otters, great crested newts, fish and eels	Flora & Fauna (Chapter 8)

7.1 Existing environment

The Study Area lies within the Caldicot Levels. The Caldicot Levels are an area of flat marshland intersected by a large network of drainage ditches and channels known as reens, which bring water into the area from the higher ground to the north, as well as from rainfall. The whole of the Caldicot Levels lie below high tide level, and are protected from tidal inundation by the existing sea defences bordering the Severn Estuary (Caldicot & Wentlooge Levels IDB, 2013). The reen system provides a vital land drainage function, removing excess water from the Levels and draining this to the sea so that the land can be farmed (Caldicot & Wentlooge Levels IDB, 2013).

Within the Study Area there are five reens which are designated as main rivers; Cold Harbour, Mill, Back Ditch, Collister Pill and Roggiett Moor. There are six other reens present within the Study Area which are not designated as main rivers; Whitewall, Chapel, Petty, Norton, Green Wall and Sea Wall (see Drawing 109455-00028). The following reens (from left to right on Drawing 109455-00028) flow in a southerly direction towards the Severn

Estuary: Coldharbour, Mill, Chapel, Norton, Green Wall, Sea Wall and Collister Pill. Whitewall reen intersects Cold Harbour reen to the west of the Study Area and Petty reen transverses the land between Chapel reen and Collister Pill reen to the east of the Study Area. Immediately adjacent to the landward toe of the embankment flows the Back Ditch reen, which becomes Roggiett Moor reen east of Collister Pill.

Photo 7-1: Back Ditch reen behind the sea defences at Portland Grounds

7.2 Likely significant effects

7.2.1 Construction effects

Due to the location of the site compounds, access routes and works to the landward toe of the sea defence embankment the following reens have been identified as potentially being affected by the proposed scheme: Mill, Back Ditch, Collister Pill and Roggiett Moor. The remaining reens will not be affected by the proposed scheme and have been scoped out of further assessment. There are also a number of field drains which border site compound areas, and these drains are also an important feature of the Caldicot Levels drainage network. The following potential construction effects on the effected reens and field drains within the Study Area have been identified. An assessment of significance is given prior to mitigation.

7.2.1.1 Pollution events

The potentially affected reens and field drains are rich in plant species and communities, many of which are rare or absent in other Levels systems, and the reens also support features of the Magor & Undy SSSI. As such they are assessed to be of a receptor of **high** sensitivity to changes in water chemistry and flow conditions. The construction works along the landward toe of the embankment and the use of the site compounds have the potential to affect the surface water quality of the reens and field drains through pollution from

construction activities. Pollution of these reens could result from: the movement of construction plant and materials; run-off from the site; storage of fuels, oils and other substances in the site compound; and accidental spillages, all of which has the potential to adversely affect these surface water bodies. Depending upon the scale of the pollution event the magnitude of change is in the range of **very low to high** with the potential to create a **minor to major adverse**, **medium-term** effect on surface water bodies and water quality

7.2.1.2 Encroachment of construction activities and collapse of underlying structures into reens

During both Phase one and Phase two construction works, the linear tracking of plant and equipment along the landward toe of the embankment has the potential to encroach upon the banks of the Back Ditch and Roggiett Moor reens. This may affect the structural integrity of their banks, potentially leading to their collapse. The magnitude of change from this effect is assessed to be **low** due to the likely small and localised nature of any bank collapse.

There are also a number of places where construction traffic needs to traverse over field crossings and culverts which overlie reens and drains; this has the potential to result in the collapse of the underlying structures due to overloading from construction vehicles. The use of the preferred eastern compound requires construction vehicles to cross over Collister Pill and Roggiett Moor reens. The use of the preferred western compound requires crossing a field drain to the west of the compound and Mill reen. All crossing points are marked on Drawing 109455-00028. As described in Section 7.2.1.1 the sensitivity of the potentially affected reens and field drains is assessed to be **high**. The magnitude of change from this effect is assessed to be **low** due to the small and localised nature of the crossing points.

Overall, physical effects on the reens have the potential to result in a **moderate adverse, medium term effect.**

7.2.2 Operational effects

No operational effects of the proposed scheme on the surface water bodies in the Study Area are anticipated. Grass cutting and general maintenance of the embankment will be no different from existing maintenance operations.

7.3 Mitigation

The following mitigation measures will be followed to minimise the risk of pollution adversely affecting surface water bodies and water quality:

- generic guidelines provided by the CIRIA publications, '*Environmental Good Practice On Site' (2005*) and '*Coastal & Marine Environmental Site Guide*' (2003) will be followed;
- Environment Agency PPGs will be followed during construction (refer to Section 6.4);
- during construction, care will be taken to ensure that equipment and fuel storage facilities are protected by secure fences and locked where possible to prevent accidental spillages as a result of vandalism;
- secure fencing of will be erected around the site compound and the compound will be manned by a 24 hour security guard to prevent pollution as a result of spillages resulting from vandalism or theft of materials, plant and equipment;
- drip trays will be used underneath standing plant;
- any drip tray with a mixture of water and contaminant will be emptied into a 25l plastic container using a funnel. The container will be disposed of at the end of the scheme or when full;
- emergency spill kits and trained personnel will be available;

- all vehicles will carry emergency spill kits;
- bulk fuel will be stored in a double bunded tank inside the site compound. The tank will be covered to prevent rainwater build up in the bund. Filling hose and nozzle will be kept within the bunded area and locked when not in use. Diesel and petrol in clearly marked suitable containers will be stored in bunded areas inside the secure storage container;
- stockpiles of clay will be managed to shed rainwater and avoid run off to watercourses;
- all mechanical plant that is hydraulically operated in whole or in part and is to be used close to watercourses will be run using approved biodegradable oil;
- stockpiles of clay will be managed to shed rainwater and avoid run-off to watercourses;
- silt build up will be minimised by maintenance of the haul roads. Should weather conditions dictate during the summer months, a low level bund will be constructed to prevent run off entering the reens;
- method statements and a Pollution Incident Response Plan (PIRP) will be prepared by the contractor to minimise the risk of polluting the adjacent water bodies. Method statements will be agreed with NRW Environmental Management, Fisheries and Protected Sites teams prior to construction commencing;
- tide levels will be obtained and the proposed scheme commenced to avoid Spring high tides;
- the Back Ditch and Mill reens have been subjected to three months of water quality monitoring in Spring 2014 to establish their baseline water quality condition (water quality monitoring locations shown on Drawing 109455-00028). Water quality will then be monitored throughout construction to ensure that there are no adverse effects on water quality;
- an Environmental Clerk of Works will audit the construction works to ensure pollution control measures and method statements are adhered to; and
- the site compounds will be least 7m from any field ditch and 12m from any main reen.

The following mitigation measures will be followed to minimise the risk of destabilising reen banks and to minimise the risk of blockage reens resulting from the collapse of the field crossings and culverts which overlie them due to overloading by construction traffic:

- the route of the haul roads for fill material will be located to avoid encroaching on the Back Ditch reen and will run within the footprint of the widened embankment;
- topsoil will be stripped from the lower part of the embankment first to provide the haul road footprint;
- turning places will be established to minimise the reversing length of the articulated dump trucks by stripping topsoil from the side of the embankment to allow sufficient turning room for vehicles; and
- contractor to carry out inspections on all crossing points to confirm that they can withstand the anticipated construction traffic. The crossing points will be reinforced if deemed necessary depending on the outcome of the inspections.

7.4 Summary of effects

Adverse effects of the proposed scheme are temporary and associated with the risk of pollution and structural damage to the reens within the Study Area during Phases one and two of construction. The implementation of mitigation measures will ensure no significant residual effects as a result of construction upon the structural integrity of any reens or field drains. After the implementation of mitigation there remains the potential for a **moderate adverse medium term effect** from a pollution event.

Following construction of the proposed scheme there will be no operational effect of the reinstated embankment on any surface water bodies within the Study Area. The existing grass mowing and maintenance regime will continue.

Table 7.2 provides a summary of the effects on the surface water bodies within the Study Area, proposed mitigation measures and the residual effects.

Table 7.2 Summary of effects on water

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction Effects						
Phase one and Phase two - Construction works along the landward toe of the embankment and the use of the site compounds have the potential to affect the surface water quality of the reens and field ditches though pollution from construction activities.	High	Very Low to High	Minor to Major adverse, medium term	Adherence to best practice pollution prevention guidelines at all times. A PIRP and Method Statements will be produced and agreed with NRW. NRW have undertaken monitoring of water quality of the Back Ditch and Mill reen prior to construction to establish a baseline. Water quality will subsequently be monitored throughout construction and works will cease if a marked decrease in water quality is observed. The site compounds will be at least 7m from any field ditch and 12m from any main reen. An Environmental Clerk of Works will audit the construction works to ensure pollution control measures and method statements are adhered to.	Very Low to Low	**Minor to Moderate adverse, medium term**
Phase one and Phase two - Damage to the structural integrity of the	High	Low	Moderate	The route of the haul roads for the granular fill material will be located to avoid encroaching upon the reens and	Very Low or No Change	**Minor adverse, medium**

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
banks of the Back Ditch and Roggient Moor reen; and blockage of the Back Ditch, Collister Pill, Mill and Roggiett Moor reens from the collapse of the field crossings and culverts which overlie them due to overloading by construction traffic				will run within the footprint of the widened embankment. Topsoil will be stripped from the lower part of the existing embankment to provide the haul road footprint. Turning places will be established to minimise the reversing length of the articulated dump trucks. Contractor to carry out inspections on all crossing points to confirm that they can withstand the anticipated construction traffic. The crossing points will be reinforced if deemed necessary depending on the outcome of the inspections.		**term to No change**

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8 Flora & Fauna

This chapter focuses on the potential effect of the proposed scheme upon flora and fauna within the Study Area shown in Appendix A (Drawing 109455-00026). Where effects have been identified as only relating to either Phase one or two of the proposed scheme they have been separately assessed.

Scoped-in receptors and potential effects

The receptors and potential effects related to this 'Flora and Fauna' chapter that have been scoped-in to the EIA are listed in Table 8.1.

Table 8.1 Receptors and potential effects scoped-in to the flora and fauna chapter

Scoped-in receptor	Scoped-in potential effects
Severn Estuary Natura 2000 Sites (Ramsar Site, SPA and SAC) and SSSI	Potential for adverse effects on the interest features of the Severn Estuary Natura 2000 site.
Gwent Levels - Magor & Undy SSSI	Potential for adverse effects on the interest features of the Gwent Levels – Magor & Undy SSSI.
Protected species	Potential for adverse effects on protected species (reptiles, otters, great crested newts, fish, eels and nesting birds).
Notable / nationally rare or scarce plants and invertebrates	Potential for direct and indirect effects on notable species within the reens and on the embankment.

The chapter cross-references where appropriate to others within this ER, such as Chapter 7, where water quality effects have the potential to affect flora and fauna within the reen system, and Chapter 11 where noise from construction activities has the potential to affect overwintering, passage and breeding birds (see Table 8.2).

Table 8.2 Effects on flora and fauna considered in other chapters

Receptor	Chapter
Nationally protected sites (Gwent Levels – Magor & Undy SSSI)	Water (Chapter 7)
Protected species	Noise (Chapter 11)
Notable / nationally rare or scarce plants and invertebrates	Water (Chapter 7)

8.1 Assessment methodology

8.1.1 Assessment of impact significance

The assessment of ecological effects has been undertaken with reference to the Chartered Institute of Ecology and Environmental Management Guidelines for Ecological Impact Assessment in the UK (CIEEM, 2006).

The IEEM guidelines note that the sensitivity of the receptor takes into account the following factors:

- the sensitivity and biodiversity value of the receiving habitat, for example in terms of its relative extent, fragility (including its ability to recover) and rarity;
- the nature and significance of any nature conservation designations that apply to the receiving site/habitat; and
- the presence and sensitivity of any scarce, rare, protected or otherwise notable species of flora or fauna.

The levels of sensitivity adopted in this assessment are provided in Table 8.3. Where a species or habitat may be protected or designated, but is relatively common in the local area the sensitivity may be reduced. Where necessary this is discussed in the relevant section(s) of the assessment.

Table 8.3 Sensitivity of ecological receptors

Receptor	High	Moderate	Low
Designated sites/habitats	International or national designation	Regional or local designation S42 NERC	No designation
Floral and faunal species	Legally protected	Red list or rare species S42 NERC	No listing

8.1.2 Characterisation of effects and assessment of magnitude

The magnitude of change considers factors such as the extent and integrity of the affected area, and the duration of potentially damaging effects (CIEEM, 2006). The levels of change adopted in this assessment are provided in Table 8.4) below.

Table 8.4 Magnitude of change

Receptor	High	Moderate	Low	Very low
Extent	75-100% of area or receptor affected	25-75% of area or receptor affected	5-25% of area or receptor affected	0- <5% of area or receptor affected
Integrity	Adverse effect on site integrity, in terms of coherence of ecological structure or function	Adverse effect on a site's ecological objectives	Neither integrity nor ecological objectives of site compromised, negligible adverse effects	No observable change

8.2 Existing environment

In order to determine up to date baseline conditions on the flora and fauna within the Study Area, the following studies have been undertaken:

- Extended Phase 1 Habitat Survey (Black & Veatch 2013)
- Otter survey undertaken by Black & Veatch in March 2014
- Botanical (Phase 2) survey (Cheshire Ecology, 2014) in March 2014

- Desk based study and consultation with NRW, Monmouthshire County Council technical specialists, the RSPB, Gwent Wildlife Trust, Gwent Ornithological Society and the Bumblebee Conservation Trust.

Biological records have also been obtained from:

- South East Wales Biodiversity Records Centre (SEWBReC);
- NBN Gateway (www.nbn.org.uk);
- MAGIC GIS database (www.magic.gov.uk);
- the Environment Agency Website (www.environment-agency.gov.uk/homeandleisure/37793.aspx);
- aerial photography;
- review of Ordnance Survey (OS) maps; and
- Severn Notable Plants Survey (Woodman 2010 - 2012).

8.2.1 Statutorily designated sites

The locations of the internationally and nationally protected sites are shown in Drawing 109455-00029. The Severn Estuary Natura 2000 site and SSSI border the existing sea defence embankment on its seaward side. The embankment and the majority of the rest of the Study Area are located within the Gwent Levels – Magor and Undy SSSI. The interest features of the statutorily designated sites are provided in Table 8.5.

Photo 8-1 View of the seaward side of the embankment at Portland Grounds

Table 8.5 Statutory Designated Sites within 1km of the proposed scheme

Designated Site Name	Distance from the proposed scheme	Reasons for notification and integral value
Severn Estuary SAC	Adjacent on the seaward side of the embankment	Supports internationally important Annex I habitats: • sandbanks which are slightly covered by sea water all the time; • estuaries; • mudflats and sandflats not covered by seawater at low tide; • reefs; • salicornia and other annuals colonising mud and sand; • spartina swards; • Atlantic salt meadows; and • embryonic shifting dunes Internationally important populations of Annex II species: • sea lamprey; • river lamprey; • Allis shad; and • Twaite shad
Severn Estuary SPA	Adjacent on the seaward side of the embankment	Internationally important populations of regularly occurring Annex 1 species: • wintering populations of Bewick's swan, gadwell, greater white-fronted goose, dunlin, common shelduck, common redshank; and • on passage populations of ringed plover. An internationally important assemblage of waterfowl: • Curlew, pintail, redshank, shelduck.
Severn Estuary Ramsar site	Adjacent on the seaward side of the embankment	Internationally important habitats: • sandbanks which are slightly covered by sea water all the time; • estuaries; • mudflats and sandflats not covered by sea water at low tide; and • Atlantic salt meadows. The unusual estuarine communities, reduced diversity and high productivity.

Designated Site Name	Distance from the proposed scheme	Reasons for notification and integral value
		Supports and provides a run for migratory fish between sea and river estuary, including the following species: salmon, sea trout, sea lamprey, river lamprey, allis shad, twaite shad and eel. It is also of importance for migratory birds during spring and autumn. Internationally important assemblage of over 70,000 waterfowl (5 year peak mean 1998/99-2002/03). Winter populations of tundra swan, greater white-fronted goose, common shelduck, gadwall, dunlin and common redshank.
Severn Estuary SSSI	Adjacent on the seaward side of the embankment	The Severn Estuary is designated due to a number of unique features, including saltmarsh, plants, invertebrates, fish, birds and marine habitats, as well as the functioning of the estuary itself. The estuarine fauna includes: internationally important populations of waterfowl; invertebrate populations of considerable interest; and large populations of migratory fish, including the nationally rare and endangered allis shad.
Gwent Levels – Magor and Undy SSSI	Within	The Gwent Levels: Magor and Undy SSSI has three special features; • the ditch habitat of the drainage system; • the range of scarce plants; and • the invertebrates it supports. The Magor and Undy SSSI supports a total of 43 nationally rare and notable invertebrate species such as the soldier fly, the snail killing fly and the water beetle. This area also supports a number of rare and notable aquatic plant species.

8.2.2 Habitats

The main embankment supports semi-improved and improved grassland. The majority of the agricultural fields in the Study Area are improved grassland. Most field boundaries are

formed by hedgerows, some with trees. The Back Ditch runs parallel to the embankment on the landward side and connects to the wider reen network. The wider landscape is agricultural. To the seaward side of the embankment is the Severn Estuary with areas of saltmarsh and intertidal habitat along the foreshore.

Photo 8-2 View of the landward side of the Portland Grounds embankment.

8.2.3 Notable / nationally rare or scarce plants

The reens, embankment and saltmarsh within the Study Area support a number of notable/nationally rare or scarce plant species as reflected by their respective designations as part of the Gwent Levels – Magor and Undy and Severn Estuary SSSIs. Table 8.6 lists those notable/nationally rare or scarce plant species that have been recorded within 1km of the working area.

Table 8.6 Notable/nationally rare or scarce plant species within 1km of the working area

Species name	Legal protection and conservation status
Blue water speedwell	Locally important species(1)
Bulbous foxtail	Notable species(2)
Common sea-lavender	Locally important species(1)
Corn parsley	Notable species(2)
Fennel pondweed	Locally important species(1)
Horned pondweed	Locally important species(1)
Knotted hedge parsley	Notable species(2)

Species name	Legal protection and conservation status
Long-bracted sedge	Notable species(2)
Sea wormwood	Notable species(2)
Slender hare's-ear	S42 NERC, RD1, RD2
Strawberry clover	Notable species(2)
Weeping alkali grass	Notable species(2)
Purple glasswort	Notable species(2)

(1) As identified by local specialist in the SEWBReC area
(2) As defined by Woodman (2010-2012)
S42 - NERC Act Section 42 Species (Priority Species in Wales)
RD1 - Red Data Book Species (based on International Union for Conservation of Nature (IUCN) criteria)
RD2 - Red Data Book Species (not based on IUCN criteria)

The botanical (Phase 2) survey (Cheshire Ecology, 2014) aimed to determine the presence/absence and location of any notable/nationally rare or scarce plant species within the working area. The survey identified:

- corn parsley was found at several locations growing in longer, more established, permanent grassland on the seaward side of the embankment;
- fennel pondweed has been recorded within the reens near the site;
- reflexed saltmarsh grass was found in multiple locations on the embankment and in the saltmarsh;
- sea wormwood was found growing amongst rocks beside Magor Pill;
- knotted hedge parsley was found at several locations; mainly growing on the seaward side of the embankment. A large number of plants were also found on the embankment near Chapel Farm; and
- there are a number of marshy areas near the reens, which could support blue water speedwell.

No specimens of slender hare's-ear were found during the survey.

8.2.4 Protected species

8.2.4.1 Reptiles

The extended Phase 1 Habitat Survey (Black & Veatch 2013) identified that suitable habitats for reptiles were present (Drawing 109455-50001). The landward semi-improved grassland areas on the western side of the embankment were long at the time of the survey and offered potential cover and basking sites on the embankment slopes. Although the habitat surrounding the rubble pile in the middle of the proposed scheme (Target Note 3 in Drawing 109455-50001) was not suitable at the time of survey, if the surrounding grazed areas were left to grow, the suitability of the grassland for reptiles would increase. The rubble pile (see Photo 8.3) could be used as a hibernation site. The tall ruderal/rough grassland within the potential western site compound in Magor STW (Target Note 1 in Drawing 109455-50001) also offers suitable habitat for reptiles.

Photo 8-3 Rubble pile potentially suitable for reptiles.

8.2.4.2 Badgers

There are field signs of badgers within the potential western site compound at the Magor STW.

8.2.4.3 Otters

The desk study did not identify any records of otters in the area. An otter survey was carried out in March 2014 of the working area (the existing embankment, access routes and site compounds) and within a 70m buffer of the working area. The survey did not identify any field signs of otters or holts.

8.2.4.4 Great crested newts

The reen network is considered potential suitable habitat for amphibians (Black & Veatch 2013). The hedgerows, rough grassland and marginal vegetation also potentially provide habitat for amphibians during the terrestrial phase of their life cycle. However, there is some likely saline intrusion into the reens closest to the embankments which would make them less suitable.

There are no records of great crested newts (GCN) within the Study Area. Random net sampling of reens surrounding the working areas carried out by Black & Veatch ecologists in March 2014 found no evidence of GCN, other species of newts or frogspawn, suggesting that the habitat is sub-optimal for amphibians.

NRW Protected Sites team have therefore agreed that GCN are likely absent from the Study Area and further surveys are not required. Consequently GCN are not considered further in this ES.

8.2.4.5 Fish

There is potential for fish and eels to be present throughout the reen system.

8.2.4.6 Nesting birds

Other than those species protected by international designations the Study Area also provides a range of suitable habitat with the potential to support nesting birds; in particular the dense areas of hedgerow and longer vegetation adjacent to the reens and the tall ruderal/rough grassland within the alternative western site compound.

8.2.4.7 Other notable species

A population of water voles was released on the Gwent Levels in 2012 and is being monitored by the Gwent Wildlife Trust. The Gwent Wildlife Trust has advised that it is highly unlikely that this water vole population has extended to within the Study Area and therefore this species has not been discussed further.

Although dormice may be present in the wider area, due to the low species diversity, poor connectivity and the defunct nature of the hedgerows in the survey area, these are not considered suitable for supporting dormice.

The shrill carder bee is a species of principle importance in Wales as it is included in NERC Section 42. The Bumblebee Conservation Trust and NRW's Terrestrial Habitat Ecosystem Group have both confirmed that they are present within the Study Area.

The shrill carder bee generally nests in areas of tussocky/long vegetation. The western site compound and the vegetation around the reens offers suitable habitat for nesting shrill carder bee. As the vegetation on the embankment is kept short it is unlikely to offer suitable nesting habitat for the shrill carder bee.

8.3 Likely significant effects

8.3.1 Construction effects

8.3.1.1 Internationally designated sites

A summary of the Habitats Regulation Assessment is provided in Section 8.5, and assesses the construction effects on the Severn Estuary Natura 2000 site.

8.3.1.2 Nationally designated sites

As a receptor, all nationally designated sites, such as SSSI's are classified as being of **high** sensitivity.

There is the potential for pollution incidents to occur within the Gwent Levels – Magor and Undy SSSI which may indirectly affect the interest features of the designated site (the diverse and rare aquatic invertebrate and plant fauna). Pollution events may occur as a result of movement of construction plant and materials; run-off from the site; storage of fuels, oils and other substances in the site compound; and accidental spillages. Depending on the nature and magnitude of the pollution event, the magnitude of change could range from **low to high**.

In accordance with the recognised methodology for classifying significance levels, the effect of potential pollution incidents within the SSSI is assessed as being **moderate to major adverse and short term** on the Gwent Levels – Magor and Undy SSSI.

There is also the potential for increased surface run-off into the reens as a result of the works. At present, water that accumulates on the access track slowly drains into the adjacent reen as the existing cross-fall ranges between a 1-in-10 and 1-in-40 gradient. The proposed works would create a consistent gradient on the cross-fall of 1-in-10 which will increase the rate of surface water flows and potentially alter drainage pathways locally. The works will not alter the total amount or quality of water that runs off the track into the reen, therefore the magnitude of effect is considered **very low**. In accordance with the recognised methodology for classifying significance levels, the effect of increased surface run-off into the reens within the SSSI is assessed as being **minor adverse and short term.**

Impacts on the Severn Estuary SSSI are as described in Section 8.5.

8.3.1.3 Notable/nationally rare or scarce plants

As a receptor, the plant species identified on the embankment during the botanical survey are notably rare species or plants listed in S42 NERC and therefore considered to be of **moderate** sensitivity.

The construction method for raising the embankment includes removing, temporarily storing and then replacing the topsoil. This may damage or kill notable, nationally rare and scarce plants that are located on the stretch of the embankment that is to be raised and those nearby. This has the potential to temporarily reduce the population of these plants and can therefore be considered a **temporary, medium term** effect.

Removal of the topsoil from the Portland Grounds embankment is likely to only remove a small proportion of the plants along the entire embankment. The seedbank will also be retained within the topsoil, which will be stored and reused on the embankment, therefore the integrity of the embankment will not be adversely affected and the magnitude of change could be considered to be **low**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being **minor adverse and medium term** on the notable/nationally rare or scarce plants.

8.3.1.4 Reptiles

Reptile species likely to be present at this site have a degree of legal protection (against intentional killing, injuring and trade only) and are listed under S42 SERC but are widespread, and therefore are classified as being of **moderate** sensitivity.

General plant movement has the potential to kill or injure reptile species through the destruction of foraging and basking areas. In addition, clearance of tall ruderal/rough grassland within the potential western site compound at Magor STW (Drawing 109455-00003) has the potential to disturb reptile populations. Approximately 1ha of potentially suitable reptile habitat will be affected, therefore the magnitude of change is considered to be **medium**.

In accordance with the recognise methodology for classifying significance levels, the effect is assessed as being **moderate adverse and short term**.

8.3.1.5 Badgers

As a receptor, badgers are classified as being of **moderate** sensitivity as while protected they are generally widespread and their protection is aimed at preventing persecution.

Use of the western site compound during Phase one risks potentially disturbing any badger setts in the area and potentially killing or injuring badgers. Furthermore, there is the potential

risk that badgers may dig into any temporary stockpiles of topsoil stored within the either of the proposed western site compounds, and be killed or injured when material is taken from the stockpiles. Therefore, the magnitude of change is considered to be **high**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being **major adverse and medium term** on the local badger population.

8.3.1.6 Fish

As a receptor, fish and eels are classified as being of **moderate** sensitivity.

As with the nationally designated SSSI, there is potential for pollution incidents (as discussed in this section and Chapter 7) to adversely affect the water quality within the reen system, which in turn could indirectly injure or kill fish. As only a small proportion of suitable fish habitat has the potential to be affected by any pollution incidents the magnitude of change is considered to be **low.**

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being **minor adverse and short term**.

8.3.1.7 Nesting birds

Other than those which are interest features of the internationally designated sites, the Study Area is likely to be of local value for nesting birds and therefore as a receptor, nesting birds are classified as being of **moderate** sensitivity.

There is potential for construction works to disturb nesting birds through visual disturbance from machinery and workers on the embankment and the site compounds. There will be a requirement for some vegetation clearance, in particular for use of the western site compound and grass clearance to allow topsoil stripping on the embankment itself. This risks disturbing, killing or injuring nesting birds

As a moderate proportion of nesting birds could be disturbed and there will be an adverse effect on the sites ecological objectives the magnitude of change on nesting birds is considered to be **medium**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being **moderate adverse and short term** on nesting birds within the Study Area.

8.3.1.8 Other notable species

As a receptor, the shrill carder bee is classified as being of **moderate** sensitivity. Any disturbance will only occur during construction and can therefore be considered a **temporary, short term** effect.

During set up of the western site compound during Phase one, any clearance of tussocky/long vegetation has the potential to kill shrill carder bees by destroying their nests and removing suitable habitat. There will be no vegetation clearance (trees, hedgerows and scrub) near the reens, other than the grass clearance to allow topsoil stripping on the embankment itself. The grass is considered to be ideal foraging habitat (but unsuitable nesting habitat as the vegetation is generally kept short). As only a small proportion of suitable shrill carder bee habitat will be affected, the magnitude of change is considered to be **low**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being **minor adverse and short term** on the shrill carder bee.

8.3.2 Operational effects

There is the potential for temporary and brief disturbance to flora and fauna from grass-cutting during regular maintenance. However, grass-cutting will be infrequent, temporary, of brief duration and similar to that already undertaken on the existing embankment. Therefore, this presents no change to the current baseline situation and it is therefore considered unlikely that grass-cutting activities will have an adverse effect on the flora and fauna within the Study Area.

8.4 Mitigation

The following mitigation measures will be followed to minimise the risk of adversely affecting the internationally designated sites and Severn Estuary SSSI:

- all work, including the site compound and access routes will be located outside of the designated sites where possible, and no equipment will be stored on the estuary side of the embankment (Drawing 109455-00003) in order to minimise any potential effects on the interest features of the sites. Working from the foreshore will only be required for blockstone remedial works if it becomes apparent that the proposed working method from the top of the embankment is unfeasible;
- a fence line will be erected, with mobile kickboard along the seaward side of the working area to prevent encroachment into the designated sites. The works will be undertaken during daylight hours and as such floodlights will not be required;
- good construction practice to prevent pollution (see Section 6.4); and
- good construction practice to prevent noise disturbance (see Chapter 11) and temporary reductions in air quality.

Mitigation measures outlined in Chapter 7 will be followed to minimise the risk of adversely affecting the reen network, the plants, invertebrates and fish (including eels) they support.

The following mitigation measures will be followed to minimise the risk of adversely affecting populations of the rare plants on the embankment:

- the knotted hedge parsley, corn parsley and sea wormwood will be dug up before construction commences. These plants will be grown in a nursery until they have flowered and set seed. The seed will then be scattered in suitable locations on the reinstated embankment. An additional survey will be undertaken before construction commences to check for the presence of slender hare's-ear. If it is identified on the embankment every attempt will be made to collect the seed or remove the plants from the site before work commences. The seed will be scattered in suitable locations on the restated embankment and plants re-planted on the embankment. This usually occurs between July and September. This will be carried out again before Phase two commences; and
- any seed mixes used to re-vegetate the embankment will be agreed with NRW Protected Sites team with the potential to include seed mixes from a local Gwent Wildlife Trust reserve.

The following mitigation measures will be followed to minimise the risk of adversely affecting reptiles:

- there are only likely to be localised effects on reptiles within the footprint of the working area (access track and embankment). Therefore, suitable habitat for reptiles such as long grass on the embankment will be made unsuitable for the species prior to construction. The grass on the embankment can be strimmed in a two-staged approach in this area to allow reptiles to vacate the area as long as there is also suitable adjacent habitat for any reptiles to flee to (this was present at the time of

survey). This will be carried out in the reptile active period (March-October), weather permitting;
- if the western site compound at Magor STW is utilised (Phase one):
    - The site compound will only use the 'drying bed' area and the existing access road into the STW. The areas of tall ruderal/long grass will not be used and the vegetation will not be cleared; and
    - A suitably qualified ecologist will be present to supervise the removal of the stored topsoil.

The following mitigation measures will be followed to minimise the risk of adversely affecting badgers:

- The western site compound will only use the 'drying bed' area and the existing access road into the STW. The tall ruderal/long grass will not be utilised and any badger setts will be left in situ with a 20m buffer to avoid disturbance.
- Reasonable avoidance measures (RAMs) for badgers will be followed when the western site compound is utilised. These will include:
    - checking for signs of digs on a daily basis; and
    - storage of harmful chemicals/materials in areas where badgers cannot access them.

The following mitigation measures will be followed to minimise the risk of adversely affecting nesting birds:

- wherever possible any vegetation to be removed as part of the proposed scheme will be made unsuitable for nesting outside of the nesting bird season (March to September inclusive). However, some birds such as the wood pigeon nest year-round and therefore care will be taken outside of this season to avoid disturbance;
- if it is not possible to undertake vegetation clearance outside of the nesting bird season, a breeding bird survey will be carried out by a suitably qualified ecologist prior to the habitat clearance; and
- if the western site compound is sited in the Magor STW; the site compound will only use the 'drying bed' area and the existing access road into the STW. The areas of tall ruderal/ long grass will not be used and the vegetation will not be cleared.

The following mitigation measures will be followed to minimise the risk of adversely affecting shrill carder bees:

- wherever possible any areas of dense vegetation to be removed as part of the proposed scheme will be strimmed between April and July to discourage shrill carder bees from nesting in the area; and
- the embankment will be re-vegetated using an appropriate seed mix, approved by NRW Protected Site team, to re-instate for the loss of foraging habitat during the construction period.

8.5 Habitats Regulations Assessment

A Habitats Regulations Assessment (HRA) of possible significant effects on the Severn Estuary Natura 2000 site has been undertaken (NRW, 2015) and is summarised below.

The HRA identified the following potential effects during construction:
- disturbance to over-wintering and passage birds:
    - noise disturbance from construction activities;
    - visual disturbance from machinery and workers;
    - depletion of air quality resulting from machinery and vehicle emissions; and

    - potential for encroachment onto the Severn Estuary Natura 2000 site for temporary access during replacement of areas of roughly placed blockstone.
- disturbance to nesting birds (lesser black-backed gulls):
    - noise disturbance from construction activities;
    - visual disturbance from machinery and workers;
    - depletion of air quality resulting from machinery and vehicle emissions; and
    - potential damage to nests from construction activities.

Construction works are scheduled to take place between April and September in 2015 if incomplete, Phase 2 works will re-commence in April 2016 (see Chapter 3). The timing of construction has been determined through liaison with NRW Protected Sites team in order to avoid the over-wintering bird period (October 1st to March 31st inclusive) and thereby avoid disturbance to over-wintering birds. By scheduling construction from May to September we are also avoiding disturbance to the peak numbers of passage birds.

The lesser black-backed gull is a potential future interest feature of the Severn Estuary Ramsar site (under Criterion 6). However, the location of breeding colonies of this species are known to be located on the western bank of the River Usk just north of the A48, and at the Llanwern steelworks; both of which are several kilometres away from the site of the proposed scheme (JNCC, 2014) and therefore breeding birds and their nests will not be affected by the proposed scheme.

The following mitigation measures will be followed to protect saltmarsh habitats during replacement of areas of roughly placed blockstone:

- Works on the foreshore will be avoided wherever possible; works on the saltmarsh will only be carried out as a very last resort if there is no other safe way of carrying out the work.
- Excavated material will not be placed on the saltmarsh, but on/behind the embankment.
- There will be no storage of materials on the foreshore.
- There will be no excavation / disturbance of the saltmarsh to construct the toe of the new erosion protection; excavation of the toe will be undertaken within the existing embankment footprint.

If it is not possible to carry out all works from the crest of the embankment, then construction access along the seawards side of the defences would be needed for up to 500m between the STW and Penny Cloud Cottage. For the westernmost 150m (covering three repair locations; see Drawing 109455-00033) the embankment is fronted by a band of semi-improved grassland and in this area there would be no need to encroach onto saltmarsh. The easternmost 50m of the potential access route (covering repair location 7) would also be across an area of grassland.

For the central 300m of the potential route, the saltmarsh extends close to the toe of the flood embankment. If access is needed on the foreshore, the following measures will be followed to protect the saltmarsh:

- As much work as possible will still be carried out from the crest of the embankment.
- Access to the foreshore will be via an existing access point from the crest of the embankment adjacent to the third repair location from the west (see Drawing 109455-00033). This access point leads to semi-improved grassland and means that no machinery will need to track across saltmarsh to access repair locations 1 to 3.
- The access route will be a maximum 5m wide where it crosses saltmarsh.
- A detailed survey of the extent and condition of saltmarsh along the access route will be carried out prior to the access route being established, to inform the exact location

of the route; the most suitable protective matting; and, to give a better understanding of the extent of saltmarsh potentially affected.

- If necessary for safe working, a turning area will be established within the area of semi improved grassland.
- A fence line, with mobile kickboard, will be erected along the seaward edge of the access route and turning area under the supervision of the Environmental Clerk of Works prior to any vehicle access being allowed onto the foreshore. This is to prevent physical encroachment or construction debris from entering into the saltmarsh.
- Protective matting will be laid out along the access route and turning area.
- Only low ground-pressure vehicles will be permitted access onto the foreshore.
- A spill kit will be kept within the area of semi-improved grassland at all times when works are taking place on the foreshore.

With these measures, the maximum area of saltmarsh affected would be 0.15ha (5m x 300m); this represents less than 0.03% of the Atlantic saltmeadows in the Severn Estuary (based on data in the Severn Estuary/ Môr Hafren Natura 2000 Data Form Produced by JNCC. 07/09/11. The mitigation measures also minimise the risk of long term damage to habitats that are tracked over by vehicles.

In conclusion, the noise and visual disturbance during construction has been timed to avoid the over-wintering period and the peak passage period, and will not take place within the vicinity of the breeding colonies of the lesser black-backed gull. Therefore, it is considered that the noise and visual disturbance generated during construction, as described, will not have a significant adverse effect upon bird behaviour and / or their health. A number of mitigation measures have been developed to minimise noise, dust and emissions and the potential risk of a pollution event as part of the HRA to avoid significant effects on the Severn Estuary Natura 2000 site as a result of construction. If access to the foreshore is needed to carry out erosion protection repairs, then application of the mitigation measures outlined above will limit the spatial extent of saltmarsh affected. The use of protective matting and appropriate machinery will minimise the level of any temporary damage to the saltmarsh. The HRA therefore concluded that the proposed scheme is not likely to have a significant effect on the Severn Estuary Natura 2000 site.

In relation to the generalised EIA methodology for assessing the effect of the proposed scheme on the Severn Estuary Natura 2000 site, as receptors, the internationally designated sites are classified as being of **high** sensitivity. As a consequence of the mitigation measures already in place the magnitude of change on the internationally designated sites is considered to be **very low and short-term**. Therefore, in accordance with the recognised methodology for classifying significance levels, the proposed scheme is assessed as having a **minor (non-significant) short-term** effect on the Severn Estuary Natura 2000 Site**.**

8.6 Summary of effects

Adverse effects of the proposed scheme are temporary and associated with the disturbance of habitats that have the potential to support protected species with the implementation of mitigation measures no significant residual effects are anticipated.

Table 8.7 provides a summary of the effects on the flora and fauna, proposed mitigation measures and residual effects.

Table 8.7 Potential effects of the proposed scheme on flora and fauna

Effects	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction effects						
Statutorily designated sites						
Severn Estuary Natura 2000 site and Severn Estuary SSSI: Potential disturbance to over wintering and passage birds. Potential damage to saltmarsh due if access on foreshore required for erosion protection works.	High	Very low	**Minor adverse, short-term**	See 'Internationally Designated Sites' mitigation in Section 8.4 and 'Habitats Regulations Assessment' (Section 8.5). All work will be located outside of the designated sites wherever safe and a fence will be erected along the seaward side of the working area to prevent encroachment. Good construction practice will be used to prevent pollution. Access on foreshore will only be used as last resort. Access width will be minimised, low ground- pressure vehicles used and ground protection agreed with NRW Protected Sites.	Very low	**Minor adverse, short-term** (i.e. not a significant effect. The HRA confirms the scheme will not have a likely significant effect in terms of the Habitats Regulations)
Gwent Levels – Magor and Undy SSSI: Potential for pollution of the reen system.	High	Low to High	**Moderate to major adverse, short term**	See 'Nationally Designated Sites' mitigation in Section 8.4 and Section 7.4. The working area will avoid encroachment into the reen network and all material will be stored a minimum of 10m away from the reens.	Very low to low	**Minor adverse, short term**
Removal of notably rare or scarce species of plants listed in S42 NERC due to removal of topsoil	Moderate	Low	**Minor adverse, medium term**	See 'Notable/Nationally Rare or Scarce Plants' mitigation in Section 8.4. Some species will be dug up before construction commences and replanted	Very low	**Minor adverse, medium term**

Effects	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
on the embankment.				or the seed will be scattered on the reinstated embankment. Any slender hare's-ear identified on the embankment at a later stage will need to be preserved by collecting its seeds or digging it up before construction. Any seed mixes used to re-vegetated the embankment will be agreed with NRW.		
Protected species						
Reptiles Potential to kill, injure or disturb reptiles, particularly through the use of the western site compound during Phase one.	Moderate	Medium	**Moderate adverse, short term**	See 'Reptile' mitigation in Section 8.4. Higher risk habitat will be avoided and other vegetation managed to minimise the risk of harm to reptiles.	Low	**Minor adverse, short term**
Badgers Potential to kill or injure badgers through use of the western site compound (proposed for use during Phase one).	High	High	**Major adverse, permanent**	See 'Badger' mitigation in Section 8.4. The badger sett will be avoided and a 20m buffer will be established to avoid disturbance. RAMs will be developed to further limit the effect on badgers.	Low	**Moderate adverse, short term**
Potential for any pollution incidents to injure or kill fish.	Moderate	Low	**Minor adverse, short term.**	Mitigation measures already outlined in this section, regarding the protection of the reen network, Section 7.3 and Section 8.4 will minimise the risk of adversely affecting fish.	Low	**Minor adverse, short term**

Effects	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Nesting birds Potential visual disturbance to nesting birds from machinery and workers on the embankment and the western compound (during Phase one). Removal of vegetation for topsoil strip along embankment.	Moderate	Medium	**Moderate adverse, short term**	See 'Birds' mitigation in Section 8.4. The site compound will be located on the 'drying bed' area and no vegetation will be removed. Vegetation will be removed prior to nesting season or surveys carried out to ensure no nests would be disturbed.	Low	**Minor adverse, short term**
Shrill carder bee	Moderate	Low	**Minor adverse, short term**	See 'shrill carder bee' mitigation in Section 8.4. Vegetation clearance will take place between April and July to discourage shrill carder bees from nesting in the area.	Very low	**Minor adverse, short term**
Operational effects						
Statutorily designated sites						
Gwent Levels – Magor and Undy SSSI: **Potential for increased surface run-off into the reens as a result of increased cross-fall.**	High	Very Low	**Minor adverse, permanent**	None required.	Very low	**Minor adverse, permanent**

9 Land Use

This chapter addresses the potential effect of the proposed scheme upon land use within the Study Area (Drawing 109455-00030). These effects have been assessed following the general EIA methodology described in Chapter 4.

Scoped-in receptors and potential effects

The receptors and potential effects related to this land use chapter that have been scoped-in to the EIA are listed in Table 9.1.

Table 9.1 Receptors and potential impacts scoped-in to the land use chapter

Scoped-in receptor	Scoped-in potential effect
Agricultural land	Temporary loss of grazing land along the embankment and within the site compound during construction.

The potential effects of the proposed scheme on land use also have associated implications on soils which are discussed in detail in Chapter 6.

9.1 Existing environment

The Study Area to the landward side of the existing sea defences is predominantly rural, with agriculture being the most common land use, along with some residential and agricultural buildings. The seaward side of the sea defences consists of tidal flats and includes areas of saltmarsh and other intertidal habitat along the foreshore.

The majority of land within the Study Area, including the embankment and the area immediately landward of it, is Agricultural Land Classification (ALC) Grade three land (Drawing 109455-00030). The ALC provides a method for assessing the quality of farmland to enable informed decisions to be made about its future use within the planning system (Defra, 1988). Grades one and two are considered ‘’excellent’ and ‘very good’ quality agricultural land respectively, and Grade three and four are considered to be ‘good’ and ‘poor’ quality agricultural land respectively by policy guidance (Defra, 1988). The existing sea defence embankment and the areas surrounding it are currently grazed by livestock (cattle and sheep). There are approximately half a dozen, 15-20m in length, fenced off areas behind the embankment at Portland Grounds. Grazing of the saltmarsh in front of the embankment occurs in the areas the stock proof fencing is not present (see Photo 9-1).

Photo 9-1: Sheep grazing the land seaward of the sea defence embankment at Portland Grounds

9.2 Likely significant effects

9.2.1 Construction effects

Agricultural land on the embankment and within the preferred eastern and western site compounds are ALC Grade 3, which is considered 'good' agricultural land (Defra, 1988). As such this receptor is considered to be of **moderate** sensitivity.

The use of the fields containing the eastern and western site compounds will temporarily restrict their use as agricultural grazing land (note: the potential compound area at the Magor STW is not utilised as agricultural grazing land). The embankment is also grazed and access to this will be restricted throughout construction (see Chapter 3 for details of the construction period dates and durations). After the completion of construction, the embankment will be re-seeded and fenced off for a growing season (approximately one year), to allow vegetation to establish along its length, in the absence of grazing pressure. The eastern site compound used during Phase one will remain in situ between the two phases and re-used during Phase two. The western site compound will be demobilised at the end of Phase one and will not be required during Phase two.

The temporary agricultural land take resulting from the proposed scheme for each Phase, depending on which site compound is utilised is listed in Table 9.2. Due to the temporary nature, and the relatively small amount of agricultural land take required by the proposed scheme the magnitude of change is assessed to be **low**. During Phase one there will be a **minor adverse medium term effect** as the land take will continue in-between Phase one and Phase two**.** During Phase two there will be a **minor adverse, short term effect.**

Table 9.2: Temporary agricultural land take during each phase of the works according to which site compound is used

	Phase one		Phase two
	Compound Scenario A (Eastern Compound + Western Compound in Magor STW)	**Compound Scenario B (Eastern Compound + Western compound in field south of Magor STW)**	**Eastern compound only**
Area of agricultural land temporarily lost from works to the sea defence embankment (ha)	2.6	2.6	2.6*
Total temporary loss of agricultural land from site compound footprint (ha)	1.7**	2.8	1.7
Total temporary loss of agricultural land (embankment works + compound footprint) (ha)	**4.3**	**5.4**	**4.3**

* Maximum of 25% of total embankment works will be undertaken in Phase two. Works information, including exact working area extents are currently unknown. However, much of the embankment is likely to remain closed between Phases one and two while grass re-establishes. Therefore worst case assumed.

** Potential western compound area within STW is an area of existing hard-standing and will therefore result in no loss of agricultural land.

9.2.2 Operational effects

No operational effects of the proposed scheme on land use are anticipated. Grass cutting and general maintenance of the embankment will be no different from existing maintenance operations. If safe to do so following the erosion protection works, the fencing around the roughly placed blockstone locations may be removed.

9.3 Mitigation

The following mitigation measures will be implemented to minimise the risk of the proposed scheme adversely affecting land use:

- to ensure that vegetation recolonises the working areas following construction the quality and structure of the topsoil and subsoil needs to be maintained. The recommendations of the *British Standard 3882:2007: Specification for topsoil and requirements for use* will be applied. See Section 6.3 for a full description of the mitigation measures that will be implemented;

- appropriate remuneration will be paid to all landowners affected by the proposed scheme in accordance with Section 177 and Schedule 21 of the Water Resources Act 1991;
- consultation with landowners will ensure that there is no temporary fragmentation of the farm holding, no adverse effect on access to farm buildings, other fields or on farm security and no disruption to water supply or drainage. The works will therefore not disrupt the management or continued viable operation of the farms affected by the works; and
- a photographic record will be made of the working area (embankment, access routes and the site compound areas) prior to construction to ensure that they are reinstated to pre-construction conditions.

9.4 Summary of effects

The adverse effects of the proposed scheme are temporary and associated with the potential effect on agricultural production from the temporary loss of grazing land during Phase one, Phase two and the year between the two phases. The implementation of mitigation measures and reinstatement of all working areas following construction will ensure that there are no significant residual effects on land use. Table 9.3 provides a summary of the effects of the proposed scheme on land use.

Table 9.3 Summary of effects on land use

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction Effects						
Temporary loss of between 4.3ha and 5.4ha of agricultural grazing land under Phase one.	Moderate	Low	Minor adverse, medium term	Appropriate remuneration will be paid to the landowners for the rental of the site compound areas. Close liaison with the landowner to ensure that there will be no fragmentation of the farm holding, no effect on access to farm buildings, other fields, or on farm security and no severance to water supply or drainage as a result of construction. The works will not disrupt the management or continued viable operation of landowner's farm. A photographic record will be made of the working area (embankment, access routes and the site compound areas) prior to construction to ensure that it is reinstated to pre-construction conditions.	Low	Minor adverse, medium term
Temporary loss of 4.3ha of agricultural grazing land under Phase two.	Moderate	Low	Minor adverse, short term	As above.	Very Low	Minor adverse, short term

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10 Cultural heritage and archaeology

This chapter focuses on the potential effect of the proposed scheme upon archaeology and cultural heritage within the Study Area (Drawing 109455-00031). These effects have been assessed following the general EIA methodology described in Chapter 4.

Scoped-in receptors and potential effects

The receptors and potential effects related to this 'Cultural heritage and archaeology' chapter that have been scoped-in to the EIA are listed in Table 10-1.

Table 10-1 Receptors and potential effects scoped-in to the cultural heritage and archaeology chapter

Scoped-in receptor	Scoped-in potential effect
Known archaeological sites and cultural heritage	Potential for effects on cultural heritage features.
	Risk of degrading the archaeological interest associated with the existing flood defence embankment.
Previously undiscovered archaeology or heritage sites	Potential for encountering previously unknown sites through any ground intrusion works.

10.1 Existing environment

An archaeological Desk-Based Assessment (DBA) (Appendix C) and site walkover was undertaken by Glamorgan-Gwent Archaeological Trust Ltd (GGAT) in February 2013. This assessment reviewed existing information about the archaeological resource of the embankment, and the wider Study Area. Information was obtained from the regional Historic Environment Record (HER) and National Monument Record. Cartographic and documentary sources were studied, along with relevant published information and current Listed Building, Scheduled Monuments and registered landscapes information was obtained from Cadw. No archaeological fieldwork has been undertaken within the Study Area.

The aims of the desk-based assessment were to:

- assess the importance and rarity of individual sites;
- determine the condition of individual sites;
- assess the group association between sites within the landscape and identify any group associations; and
- assess the effect on the archaeological resource of the proposed scheme.

The Gwent Levels have been designated an Outstanding Historic Landscape, which represents the largest and most significant example in Wales of a 'hand-crafted' landscape (Drawing 109455-00031). The Levels are entirely the work of man, having been repeatedly inundated and reclaimed from the sea from the Roman period onwards. The area has distinctive patterns of settlement, enclosure and drainage systems belonging to successive periods of use, and a proven and possible quite vast potential for extensive, well-preserved, buried, waterlogged, archaeological and palaeo-environmental deposits surviving from earlier landscapes (GGAT, 2013).

The DBA identified a total of 79 sites of known archaeological interest, including the existing flood defence embankment itself, the origins of which are believed to be post-medieval.

Collister Pill, Magor Pill and earthworks at Chapel Farm (which are situated on the landward side of the Back Ditch (Caldicot Levels) (Drawing 109455-00031) were also identified as of being of archaeological interest. The proposed scheme does not include any construction work within the vicinity of these archaeological interests and therefore will not be affected by the scheme. The DBA also noted that recent work has shown that this historic landscape is rich not only in surviving earthworks and field patterns, but is also important due to the buried remains in both the intertidal zone and inland of the sea wall.

There are two Listed Buildings, 30m from the proposed access route to the eastern site compound; 'The Vicarage' on Newport Road in Magor and 'Moorgate Cottage' on Church Road in Magor (Drawing 109455-00031). There is one Scheduled Monument within the Study Area and this is the 'Relict Sea Wall alongside Collister Pill Reen', south east of Undy, 150m from the proposed access route and over 600m from the eastern site compound. Additionally there is a Scheduled Monument within 50m of the proposed access route to the eastern site compound, 'Medieval Moated Site 400m North of Undy Church' (Drawing 109455-00031).

Zetica (2013) identified that there is a moderate risk of encountering unexploded ordnance (UXO) within the Study Area. Moderate-risk regions are those that show a bomb density of between 11 and 50 bombs per 1000 acres and that may contain potential World War II targets. However, the proposed scheme involves limited excavation for topsoil stripping only and so the risk of encountering UXO is considered to be low. As a result, consultation with the Construction Design and Management (CDM) Coordinator has identified that no further UXO studies are required.

10.2 Likely significant effects

10.2.1 Construction effects

The following potential effects during construction upon the cultural heritage and archaeology within the Study Area have been identified. An assessment of significance is given prior to mitigation. As any damage to a site of archaeological or cultural interest cannot be reversed any effect is considered to be **permanent,** unless otherwise stated.

10.2.1.1 Sites of known archaeological interest

GGAT have identified the existing flood defence embankment as being of regional importance, therefore, as a receptor, it is considered to be of **moderate** sensitivity.

The proposed scheme includes the temporary removal and storage of topsoil from the flood defence embankment, raising the embankment using imported clay, excavation at the landward toe to construct the retaining wall and replacement of areas of roughly placed blockstone. This has the potential to damage the archaeological interest of the existing flood defence embankment. The post-medieval interest of the embankment is likely to be buried within the core of the existing embankment therefore only the replacement of areas of roughly placed blockstone have the potential to cause disturbance, whereas the topsoil removal will only disturb a small layer from the embankments surface. The top surface of the embankment is likely to have been disturbed in the past by previous maintenance and grazing of the area. Furthermore, excavation associated with the retaining wall will take place on the existing access track (see Figure 3.1), away from the core of the existing embankment.

Consequently, the temporary removal and storage of topsoil from the flood defence embankment, raising the embankment using imported clay and excavation at the landward toe to construct the retaining wall is not expected to affect the post-medieval core that forms the archaeological interest of the embankment, therefore the magnitude of change is

considered to be **very low**. The magnitude of change related to the replacement of areas of roughly placed blockstone is considered to be **low.**

In accordance with the recognised methodology for classifying significance levels, the effect on the archaeological interest of the existing flood defence embankment is assessed as being a **minor adverse, permanent effect**

10.2.1.2 Listed buildings

GGAT have categorised Listed Buildings to be of at least regional importance, therefore in the context of this ES, as receptors, both Moorgate Cottage and The Vicarage are considered to be of **moderate** sensitivity.

There will be a requirement for construction traffic to pass by both Listed Buildings to access the eastern site compound. Both buildings are approximately 30m from the road. Both buildings are far enough away from the road to be affected by vibrations from passing construction traffic. Therefore, there will be **no change** to these receptors as a result of the proposed scheme, and **no effect** as a result.

10.2.1.3 Unknown buried archaeology or heritage site

As a receptor, unknown buried archaeology has the potential to be of national or international importance and is therefore classified to be of **high sensitivity**. There is the potential to uncover and subsequently damage previously unknown buried archaeology during topsoil stripping. This a particular risk to the sections of embankment which require a 'Redi-Rock' wall (or similar) on the landward side (see Drawing 109455-00003). In these locations there will be excavation of the existing access track, where excavation will be most substantial, to enable part of the 'Redi-Rock' wall to be buried and to lay foundations. Replacement of areas of roughly placed blockstone also have the potential to uncover and damage previously unknown archaeology. Setup of the site compound and access tracks will also potentially be placed on top of buried remains known to exist inland of the flood defence. However, setup of site compounds and access routes only requires topsoil stripping and the DBA explains that the buried remains are protected by deep alluvial deposits. Therefore, it is not expected that these remains will be affected by the proposed scheme.

Depending on the value of the find and the extent of damage to any find, the magnitude of change could range from **very low to high**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as having a **minor to major adverse, permanent effect** on unknown buried archaeology. However, this would provide the opportunity to add to the historic environment records of the area.

Buried remains in the intertidal zone will not be affected as no construction work will take place on the seaward side of the embankment.

10.2.2 Operational effects

There are no operational effects of the proposed scheme on the cultural heritage, archaeology and material assets of the Study Area.

10.3 Mitigation

The following mitigation measures will be followed to minimise the risk of adversely affecting the existing flood defence embankment (site of known archaeological interest) and any unknown buried archaeology:

- a programme of archaeological work set out in accordance with an archaeological written scheme of investigation will be agreed with the Local Authority Archaeological Advisor (GGAT), and implemented during construction works. Specific mitigation measures will be likely to include:
    - intermittent archaeological watching brief during ground breaking operations, in particular close to erosion protection works close to the roughly placed blockstone;
    - the watching brief will consider the potential for disturbance of the archaeological resource and include contingencies for the provision of sufficient time and resources for the archaeological investigation to be undertaken and a report containing the results to be produced;
    - toolbox talks will include the potential to discover unknown buried archaeology and will inform the contractor of what to look out for during excavation work; and
    - any finds will be reported to the Local Authority Archaeological Advisor (GGAT), and work in that area will be stopped whilst the find is investigated by an archaeologist. Any fossils, antiquities, structures, remains or other objects of geological or archaeological interest or value will be reported to the coroner in accordance with the Treasure Act 1996.

10.4 Summary of effects

Adverse effects of the proposed scheme are permanent with regards to uncovering unknown buried archaeology. The implementation of mitigation measures will reduce the residual effects that result from construction. However, the residual adverse effect from the potential for uncovering unknown buried archaeology (depending on the value of the archaeology) is still considered to be significant, although any find would contribute to the archaeology knowledge of the area.

Table 10.2 provides a summary of the effects on the cultural heritage, archaeology and material assets within the Study Area, proposed mitigation measures and the residual effects.

Table 10.2 Potential effects of the proposed scheme on archaeology and cultural heritage

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction effects						
Damage to the archaeolo**gical interest of the existing flood defence embankment from works relating to the temporary removal and storage of topsoil from the flood defence embankment, raising the embankment using imported clay, excavation at the landward toe to construct the retaining wall** and **excavating into the core of the embankment for replacement of areas of roughly placed blockstone**.	Moderate	Very low	**Minor adverse, permanent**	There will be no borrow pits locally; all fill material will be imported. A programme of archaeological work set out in accordance with an archaeological written scheme of investigation will be agreed with the Local Authority Archaeological Advisor (GGAT), and implemented during construction works.	No change	**Minor adverse, permanent**
Potential damage to Listed Buildings from passing construction traffic.	Moderate	No change	**None**	None.	No change	**None**
Uncover and subsequently damage previously unknown	High	High to very low	**Major to minor adverse, permanent**	A programme of archaeological work set out in accordance with an archaeological written scheme of investigation will be	Low to very low	**Moderate to minor adverse, permanent**

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
buried archaeology.				agreed with the Local Authority Archaeological Advisor (GGAT), and implemented during construction works.		

11 Noise

This chapter focuses on the potential noise effects of the proposed scheme within the Study Area (Drawing 109455-00026). These effects have been assessed following the general EIA methodology described in Chapter 4.

Where effects have been identified as only relating to either Phase one or two of the proposed scheme they have been separately assessed.

Scoped-in receptors and potential effects

The receptors and potential effects related to this 'Noise' chapter that have been scoped-in to the EIA are listed in Table 11.1.

Table 11.1 Receptors and potential effects scoped-in to the noise chapter

Scoped-in receptor	Scoped-in potential effect
Human beings	Machinery/vehicle movements associated with the proposed scheme could result in temporarily increased levels of noise, disturbing noise sensitive receptors including people using the Wales Coast Path, other PRoW, nearby residents of Penny Cloud Cottage, Cherry Tree House and Chapel Farm and operatives of Magor STW.
	Vehicle movements associated with the proposed scheme could result in temporarily increased levels of noise, disturbing residents near to the proposed access routes and site compounds.
Fauna	Increased levels of noise could disturb birds associated with the Severn Estuary SPA and other fauna (noise effects on SPA birds are assessed within the HRA screening – see Chapter 8).

11.1 Existing environment

The site is predominantly rural, with corresponding low noise levels. The main sources of noise are the M4, the South Wales mainline railway, intermittent traffic noise from the minor roads and Magor STW and farming activity (tractors etc), and birdsong.

The proposed scheme area is quite remote. However, residents of Penny Cloud Cottages are approximately 30m from the embankment at its closest point. Residents of Chapel Farm and Cherry Tree House are over 150m from the embankment and over 600m from the site compounds.

The Wales Coast Path that runs along the crest of the embankment is regularly used by walkers. The western site compound will be located between 150-300m from the embankment, depending on which option is preferred. The eastern site compound is located in the field immediately adjacent to the proposed working area. Construction traffic is expected to pass through Magor and Undy.

Noise sensitive receptors include the recreational users of the embankment, the residents of the three properties, operatives of the STW, the residents of Magor and Undy and the birds associated with the adjacent Severn Estuary Natura 2000 site, and other fauna (such as reptiles and nesting birds).

11.2 Likely significant effects

11.2.1 Construction effects

The following potential effects during construction on the noise levels within the Study Area have been identified. An assessment of significance is given prior to mitigation.

11.2.1.1 Human beings

The construction site is likely to create increased noise levels from vehicle movements and the use of heavy plant. Typical plant that will be used on site is likely to include; 25 tonne dumper trucks, 20 tonne lorries, 25 tonne excavators, compactors and rolling plant.

Local residents

Due to the sparsely populated and rural nature of the site, local residents as a receptor are considered to be of a **moderate sensitivity** to the proposed scheme.

As the three properties identified are near the middle section of the embankment it is assumed that effects will be greater during Phase one of construction. Whilst there may be a requirement for some tracking along this section of embankment during Phase two, this is anticipated to be a lesser effect in comparison. Therefore, for the purpose of this assessment it is considered that Phase one will produce greater effects and is therefore the basis of further assessment.

The magnitude of change on local residents has been assessed separately according to their distance from the working area and site compound.

Penny Cloud Cottage's property boundary is adjacent to the embankment and the residence is approximately 30m from the working area; therefore it has the potential to be disturbed by construction works on the embankment. As construction works will take place in 100m sections, noise generated from the proposed scheme will not affect the residents of Penny Cloud Cottage throughout the entire construction period, only when within close proximity and when machinery passes it to access other sections. Depending on whether the noise is coming from works on the 100m stretch of embankment directly adjacent to the property or from machinery tracking past the magnitude of change on residents of Penny Cloud Cottage will range from **high to low** respectively**.** Given the distance from either of the proposed compound locations, noise generated from construction traffic, vehicle movements and unloading/loading material around the compounds is considered to give rise to negligible additional noise disturbance to this property. In accordance with the recognised methodology for classifying significance levels, the effect on Penny Cloud Cottage is assessed as being a **major to minor adverse, short term effect**.

As Chapel Farm and Cherry Tree House are within 200m of the embankment there is potential that they will be disturbed by construction works on the embankment. Given the distance from either of the proposed compound locations, noise generated from construction traffic, vehicle movements and unloading/loading material around the compounds is considered to give rise to negligible additional noise disturbance to these properties.

Depending on whether the noise is coming from works on the 100m stretch of embankment directly adjacent to the property or from passing machinery the magnitude of change on residents of Chapel Farm and Cherry Tree House will range from **high to low** respectively**.** In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **major to minor adverse, short term effect** on Chapel Farm and Cherry Tree House.

Residents of Magor and Undy

As a receptor, residents of Magor and Undy are considered to be of a **moderate sensitivity** to the proposed scheme and will be affected during both phases.

There is potential that noise generated from vehicle movements along the routes proposed to access the site compounds will disturb residents living adjacent to the routes. Although there is no baseline traffic data for these local roads for comparison it is reasonable to assume that the increased volume of heavy good vehicles will generate additional noise. The disturbance will continue throughout the entire construction period. Therefore, the magnitude of change is considered to be **low** as only residents adjacent to the proposed access routes will be disturbed.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **minor adverse, short term effect**.

Users of the Wales Coast Path

Users of the Wales Coast Path as a receptor are considered to be of a **moderate sensitivity** to the proposed scheme. Users of the Wales Coast Path will be temporarily diverted during construction (Drawing 109455-00027) and will not pass nearby to the Portland Grounds embankment. Users will only be disturbed by noise generated from construction and vehicle movements whilst on footpath 372/58 at the western end of the embankment; and only when the western site compound is utilised in Phase one. Therefore any disturbance from construction will be for short periods of time, and the magnitude of change is considered to be **low**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **minor adverse, short term effect** on users of the Wales Coast Path.

Operatives of the Magor STW

Due to existing noise generated by the operational Magor STW, operatives of the STW as a receptor are considered to be of **moderate sensitivity** to the proposed scheme.

Both the preferred and alternative western site compounds are less than 50m from Magor STW operatives. There is potential that noise generated from construction traffic, vehicle movements around the site and unloading/loading material may cause a disturbance. Work on the embankment will only cause a potential disturbance when carried out at the western end. As operatives of the STW are likely to be disturbed throughout Phase one of the proposed scheme the magnitude of change is considered to be **medium**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **moderate adverse, short term effect** on operatives of Magor STW.

11.2.1.2 Fauna

As a receptor, all species (such as reptiles, fish and nesting birds) which do not relate to the nationally or internationally designated sites are considered to be of **moderate** sensitivity to the proposed scheme.

There is potential for the increased noise levels to disturb fauna within the Study Area. As with human beings the noise disturbance is not expected to be constant and furthermore, as with other construction effects discussed in Section 8.3.1, any noise disturbance will only affect a small proportion of suitable habitat and therefore the magnitude of change is considered to be **low**.

In accordance with the recognised methodology for classifying significance levels, the effect is assessed as being a **minor adverse, short term effect** on other fauna.

11.2.2 Operational effects

There is the potential for temporary and brief disturbance from grass-cutting during regular maintenance. However, grass-cutting will be infrequent, temporary, of brief duration and similar to that already undertaken on the existing embankment. Therefore, this presents no change to the current baseline situation and it is therefore considered unlikely that noise generated from grass-cutting activities will have an adverse effect on the local residents, users of the Welsh Coast Path or fauna within the Study Area.

11.3 Mitigation

The following mitigation measures will be followed to minimise the effects of increased noise levels, including following the TMP (see Section 5.3) and British Standard guidelines BS5228:2009 – *Code of practice for noise and vibration control on construction and open sites:*

- local residents will be consulted in advance on any requirements for out of hours work;
- deliveries will only be made during working hours (between 7.30am and 6pm);
- haul roads will be well maintained to reduce noise from vehicle movements;
- plant used during construction will be suitably sized for the works to limit noise and vibration;
- plant will be of a good modern standard and maintained to ensure unnecessary vibration or noise from exhaust systems or loose panels is eliminated;
- any stationary plant (e.g. generators and compressors) will be positioned as far as practically possible away from residential properties and screened to reduce noise emissions;
- all plant will be shut down when not in use to eliminate any unnecessary noise;
- where possible, quieter electrically powered plant will be used as opposed to diesel or petrol-driven equipment;
- turning places will be created along the embankment to minimise the need for reversing and thereby avoid long periods of reversing alarms;
- more efficient exhaust sound reduction equipment on earth moving plant will be considered if required;
- unnecessary revving of engines will be avoided and equipment will be switched off when not required;
- internal haul routes will be kept well maintained;
- rubber linings in, for example, chutes and dumpers will be used to reduce impact noise;
- drop height of materials will be minimised; and
- plant and vehicles will start up sequentially rather than all together.

11.4 Summary of effects

Adverse effects of the proposed scheme are temporary and associated with the increased noise levels from construction plant and machinery on noise sensitive receptors. The implementation of mitigation measures will reduce the residual effects that result from construction related noise disturbance. However, the residual effects from noise disturbances to Penny Cloud Cottage, Chapel Farm and Cherry Tree House remain significant but during the construction periods only.

Table 11.2 provides a summary of the effects from increased noise levels within the Study Area, proposed mitigation measures and the residual effects.

Table 11.2 Potential effects of noise as a result of the proposed scheme

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
Construction effects						
Human beings						
Potential noise disturbance to residents of Penny Cloud Cottage.	Moderate	High to low	**Major to minor adverse, short term**	See mitigation measures in Section 11.3 Good construction practice will be used to reduce noise, including; • Turning places will be created along the embankment to minimise the use of reversing alarms. • Stationary plant will be positioned away from residential properties and screened.	Medium to very low	**Moderate to minor adverse, short term**
Potential noise disturbance to residents of Chapel Farm and Cherry Tree House.	Moderate	High to low	**Major to minor adverse, short term**	See mitigation measures in Section 11.3. Good construction practice will be used to reduce noise, including; • Deliveries will only be made during working hours. • Haul roads will be well maintained to reduce noise from vehicle movements.	Medium to very low	**Moderate adverse, short term**
Potential disturbance to residents of Magor and Undy.	Moderate	Low	**Minor adverse, short term**	See mitigation measures in Section 11.3 and those detailed above.	Low	**Minor adverse, short term**
Potential noise disturbance to users of the Wales Coast Path.	Moderate	Low	**Minor adverse, short term**	See mitigation measures in Section 11.3 and those detailed above.	Low	**Minor adverse, short term**
Potential disturbance to	Moderate	Medium	**Moderate**	See mitigation measures in Section 11.3	Low	**Minor**

Effect	Sensitivity of receptors	Magnitude of change before mitigation	Significance and duration before mitigation	Mitigation	Magnitude of change after mitigation	Residual effect
operatives of the Magor STW.			**adverse, short term**	and those detailed above.		**adverse, short term**
Fauna						
Potential noise disturbance to protected species within the Study Area.	Moderate	Low	**Minor adverse, short term**	See mitigation measures in Section 11.3 and those detailed above.	Low	**Minor adverse, short term**

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12 Cumulative effects

12.1 Introduction

Projects are not planned, built, operated and decommissioned in isolation, but within regional, national and international processes of change which include other projects, plans and policies. IEMA guidelines (2011) recommend that an EIA should assess the effects of a development cumulatively with other planned developments, where there are likely to be significant environmental effects. Cumulative effects arise, for instance, where several developments each have insignificant effects, but together have a significant effect; or where several individual effects of the plan (e.g. noise, dust and visual) have a combined effect.

12.2 Other known plans or projects

12.2.1 Embankment raising at Tabb's Gout, NRW

NRW also propose to undertake similar embankment raising along a stretch of existing embankment at Tabb's Gout, which is located to the east of Cardiff on the Wentlooge Levels between NGR ST 248 787 and ST 254 791. Construction at Tabb's Gout is programmed for April to September 2015.

Construction at Tabb's Gout has also been timed to avoid noise and visual disturbance to over-wintering birds and the peak passage period. Operation of the proposed scheme at Tabb's Gout will also only involve infrequent grass-cutting as at Portland Grounds, which follows the current maintenance activities, therefore there will not be any in-combination effects on the interest features of the Severn Estuary Natura 2000 site. There will be no permanent habitat loss as a result of the works at Tabb's Gout.

The works at Tabb's Gout are approximately 20km away from Portland Grounds. Construction traffic routes will therefore not overlap on either local or main roads. However, due to construction at Tabb's Gout coinciding with Phase one construction at Portland Grounds, the Wales Coast Path will be affected at both locations at the same time. The effect of these schemes on the Wales Coast Path will be managed at both locations by providing a temporary footpath diversion. In addition, the temporary diversion of the Wales Coast Path at Portland Grounds will be reopened between Phase one and Phase two of construction. Simultaneous diversion of the Wales Coast Path (a receptor of **moderate** sensitivity) at both Tabb's Gout and Portland Grounds will only affect long distance walkers for a period of approximately four months, and is therefore considered to remain a **moderate adverse, short term** effect.

12.2.2 Cold Harbour to Mill Reen - Wave return wall repairs, NRW

Immediately to the west of the length of proposed raising at Portland Grounds between ST431 218 and ST438 368 NRW plans to fill a number of voids in the wave return wall with concrete, either by hand or using a single concrete machine to pipe the concrete in. Access to the sea doors and inlets along the Caldicott between Cold Harbour Pill and Mill Reen also need improvements (e.g. new handrails/ access steps etc.) which upon completion will improve the operation safety of the workforce. It is anticipated that these works will take approximately one month or less, will take place in April 2015 thereby avoiding the overwintering bird period and construction will not take place upon the adjacent saltmarsh. Otter surveys are also being undertaken in advance of the proposed works to ensure that any otters present in the area will not be affected by the proposed works.

Construction traffic associated with repairs to the wave return wall will utilise the same local roads and access route to the embankment (the road to Magor STW) as those that will be

used to raise the sea defences at Portland Grounds. However, the traffic volume generated by the wave return wall repairs is likely to be only two vehicles per day, due to the small scale of the work. Construction traffic associated with the wave return wall repairs will be using the western access route in April 2015 coinciding with access during the Phase one works at Portland Grounds. Given the local road network is classified as being of **moderate sensitivity** these works will only have a **low** magnitude of effect resulting in a **minor adverse short-term effect** on traffic during the short time period that the two construction programmes overlap.

12.3 Summary

The main cumulative effect with other plans and projects that has been identified is due to the simultaneous diversion of the Wales Coast Path at both Tabb's Gout and Portland Grounds. However, this will be mitigated by the provision of a temporary diversion route at both locations and is considered to be a **moderate adverse, short-term** effect. Mitigation measures are to be implemented on all of the known projects, which will further reduce the potential for cumulative effects.

Wave return wall repairs between Cold Harbour and Mill Reen may overlap with the Portland Grounds construction period, and similar access routes to the site are likely to be utilised. However, this will only be for a short duration and will only result in low additional traffic numbers and no significant cumulative effects.

13 Environmental benefits and enhancements

The proposed scheme results in environmental benefits due to continued flood protection.

13.1 Environmental benefits

The main environmental benefit of the proposed scheme is the continued flood protection (as part of the wider coastal flood defence system for the Caldicot Levels) of communities such as Magor, Undy and Redwick. In total the area protected includes over 12,000 properties, as well as agricultural land and critical infrastructure such as the South Wales mainline railway and the M4 motorway, which would otherwise be at risk of flooding during a storm surge, or daily tidal inundation if the defences were breached.

13.2 Other enhancements considered

NRW has a statutory duty to protect and enhance the environment. Following consultation with NRW technical specialists and external stakeholders (see Section 4.1.1) potential environmental enhancements were suggested that could be incorporated into the design of the proposed scheme. Due to the ecological and archaeological sensitivity of the Study Area, none of these could be taken forward; reasons for not incorporating each enhancement are included in Appendix B – Consultee Comments. Suggested enhancements included:

- NRW's Recreation and Access officer suggested that the surface of the Wales Coast Path could be upgraded;
- NRW's Landscape Architect suggested hedgerow planting to fill existing gaps in order to provide ecological habitat and better define existing field boundaries;
- NRW's Landscape Architect also suggested seeding the banks of the raised embankment to improve their floristic diversity;
- NRW's Landscape Architect suggested providing a seating area along the Wales Coast Path on the embankment;
- Gwent Wildlife Trust suggested that there may be potential to win material that could be used to raise the embankment from their Solutia Reserve;
- Gwent Ornithological Society suggested that there may be an opportunity for habitat creation of shallow pools within the Study Area;
- Gwent Ornithological Society subsequently suggested the construction of a shingle ridge on the foreshore of the embankment to support roosting waders; and
- NRW Protected Sites team suggested that some ditch clearance within the reens could be beneficial.

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14 Summary

The Severn Estuary Shoreline Management Plan (SMP2) has identified the need to implement a 'Hold the Line' (HTL) policy at Portland Grounds. By undertaking localised raising of between 600mm and 900mm along an approximately 2000m stretch of the defence on this frontage, it will continue to provide (as part of the wider coastal flood defence system for the Caldicot Levels) protection to over 12,000 properties, as well as agricultural land and critical infrastructure such as the M4 motorway and the South Wales mainline railway.

A statutory EIA was undertaken for the proposed scheme. This ES documents the results of the EIA.

Other environmental regulations that relate to the site and scheme include the Conservation of Habitats and Species Regulations (2010), the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and the Wildlife and Countryside Act 1981 (as amended).

A Habitats Regulations screening assessment concluded that the proposed scheme is not likely to have a significant effect on the Severn Estuary SPA, SAC and Ramsar site.

There is anticipated to be some short term disturbance as a result of construction activity. It will be necessary to temporarily close the Portland Grounds section of the Wales Coast Path during both phases of construction. A clearly signposted temporary diversion will be set up and safety measures will be put in place to protect users from construction traffic. However, the residual effect on the Wales Coast Path is still considered to be significant.

Materials and equipment brought to site will result in an increase in vehicle movements on the local road network during both phases of construction. This is likely to disrupt local traffic flows and potentially damage the local road network. A Traffic Management Plan will be put in place which will include measures to minimise disruption and damage to the local road network. Any debris, dust or mud deposited on local roads will be cleared away by the contractor and other good practice measures will further reduce construction related effects.

Construction activity in both phases has the potential to damage soils through incorrect trafficking, handling and storage of topsoils and subsoils. Following the recommendations detailed within the *British Standard 3882: 2007 Specification for topsoil and requirements for use* will minimise any risk of a potential adverse effect on soils.

The risk of mobilising contaminants as a result of siting the site compound within the Magor STW will be mitigated by locating all working areas on existing hard standing, and not boring, digging, or excavating within the site compound area.

NRW are monitoring the water quality of the reens prior to and throughout construction, and general good practice mitigation will be implemented to avoid construction causing unnecessary pollution to the reens. Measures will also be put in place to ensure that construction works do not encroach upon the Back Ditch and Roggiett Moor reens. The contractor will also carry out inspections of all crossing points to confirm that they can withstand the anticipated construction traffic, and reinforce these if deemed necessary. However, there remains the potential for a residual significant adverse effect on water quality from a pollution event.

A preliminary WFD assessment concluded that the proposed scheme will not cause deterioration of the adjacent or nearby water bodies or prevent future measures required to achieve the overall objectives.

The majority of the working area will be located outside of the Severn Estuary Natura 2000 site and Severn Estuary SSSI, and construction is scheduled to take place between April and September. This will avoid the over-wintering bird period and the peak numbers of passage birds, therefore preventing disturbance of the interest features of the site. There may be a requirement for a temporary access for replacement of areas of roughly placed blockstone; however this will only be for short periods at a small number of distinct locations when investigation work is required.

There is the potential for pollution incidents to occur within the Gwent Levels – Magor and Undy SSSI which may affect the interest features of the designated site (the diverse and rare aquatic invertebrate and plant fauna in the reens). Mitigation is proposed to reduce this risk including avoiding encroachment of the working area onto the reen. An application for Assent under Section 28 of the Wildlife and Countryside Act 1981 (as amended) for works within the Gwent Levels SSSI will be submitted to NRW Protected Sites.

Other mitigation to minimise the potential for effects on plants and protected species is proposed, for example, pre-construction surveys for notable plant species and breeding birds. However, there remains the potential for a significant adverse effect on badgers from use of the alternative western site compound.

There will be a temporary loss of agricultural grazing land during both phases of construction, and for the period in-between when the eastern site compound and access route is left in place. Close liaison with the affected farm owners and landowners, in addition to providing those affected with the appropriate compensation, will ensure that farming operations are not adversely affected by the proposed scheme.

A potentially significant effect of uncovering and damaging unknown archaeology in the working area and through establishing the site compound was identified. Construction also has the risk of affecting the historic interest of the embankment itself through excavation. A programme of archaeological work set out in accordance with an archaeological written scheme of investigation will be agreed with the Local Authorities Archaeological Advisor (GGAT) and implemented during construction. This is likely to include an intermittent archaeological watching brief and toolbox talks on the potential to discover unknown archaeology. However, depending on the value of the find and the extent of damage to any find, there is the potential for a significant adverse effect on unknown archaeology during construction.

There is potential for nearby residents, users of the Wales Coast Path and nearby fauna to be disturbed by construction noise. Residents of Penny Cloud Cottages are likely to be affected by machinery tracking past the property and when works are within close proximity throughout both phases of construction. Good construction practice will reduce noise levels, however the residual effect on Penny Cloud Cottage, Chapel Farm and Cherry Tree House is still considered to be significant.

Other known developments within the local area are small and localised and not anticipated to give rise to additional significant effects when considered in combination with the proposed scheme.

An Environmental Action Plan (EAP) has been developed and is included in Chapter 15. This summarises the actions required to implement the proposed scheme in accordance with the ES. The EAP also details the roles and responsibilities of those involved.

Overall, the EIA has concluded that with appropriate mitigation and with good site management in place, that it will be possible to avoid most significant negative environmental effects resulting from the proposed scheme during construction. There will be a significant beneficial effect on the risk of coastal flooding to people and property,

agricultural land, industrial, commercial and economic assets, and critical infrastructure on completion.

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15 Environmental Action Plan

The Environmental Action Plan (EAP) and supporting Constraints Plan (Drawing 109455-00032) summarise the actions required to implement the proposed scheme in accordance with this ES. It sets out specific objectives and targets which define the ways in which the NRW and its partners intend for the ES and its findings to be addressed during each phase of the proposed scheme (i.e. pre-construction, during construction and post-construction). It also details the roles and responsibilities of those involved in the proposed scheme.

Where an action specifically relates to Phase one the text is in blue (there are no actions that relate only to Phase two).

The EAP will form part of the contract documents for the appointed contractor and will be regularly updated throughout the delivery phase. The objectives and actions will be monitored and audited either by the NRW Project Manager, Environmental Assessment Unit or by the Environmental Clerk of Works (ECW) to ensure that the required mitigation measures are being carried out.

Generic actions are omitted from the EAP as these will be included in the contractor's Method Statement (Team Van Ord, 2014a) and Environmental Management Plan (Team Van Ord, 2014b) but will include the following:

Avoid pollution from the proposed scheme: Method statements and a PIRP will be produced by the contractor prior to the construction which will adhere to Environment Agency Pollution Prevention Guidelines. All method statements will be approved by NRW Environmental Management and Protected Sites teams. All method statements will include good practice measures and the requirement for all mechanical plant to use biodegradable oil.

Establish a baseline in order to ensure that the site is left in as good or better condition than before the construction works began: The Contractor will carry out a pre-start photographic survey of all work areas.

Maintain a tidy site: The Contractor will ensure the site is kept clean and tidy throughout the construction. All materials will be stored in skips and clearly labelled. On completion of construction, all waste is to be removed from site and all temporary works are to be removed and the areas reinstated to as good a condition as pre-construction.

Pollution prevention incidents: Prior to construction, the Contractor will produce method statements and a PIRP to ensure pollution to water bodies is avoided. Method statements to include good practice measures and the requirement for all mechanical plant to be used within 15m of watercourses to be run off an approved biodegradable oil as hydraulic oil. Method statements will be agreed with NRW Environmental Management and Protected Sites teams. The PIRP and method statements will be adhered to throughout construction, and monitored by the ECW.

Produce a SWMP: A plan will be produced by the contractor prior to construction to record the waste types and quantities which will be produced during the course of construction. The plan will include management actions including re-use, re-cycling, recovery and disposal, and a declaration that waste will be managed appropriately and according to the Duty of Care. The SWMP will be complied with throughout the construction to ensure waste is segregated, re-used, recycled and disposed of appropriately. Regular audits are to be undertaken and corrective actions followed. Following construction, all waste will be removed from site in accordance with the SWMP and the Duty of Care.

Minimise carbon footprint: The project team will update the carbon calculator throughout the proposed scheme and identify options to reduce the carbon footprint during the design.

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
Pre-construction						
Human beings						
A1.1	**Minimise disruption to the local road network.**	Contractor to produce a TMP. Specific measures to be included are: • bulk deliveries will only arrive during construction hours; • warning signs will be placed on local roads (in locations to the agreed with Monmouthshire County Council); • measures to avoid and manage mud on the public highway, including monitoring vehicles, road sweeping and other dust suppression methods will be employed where necessary; • measures to minimise vehicle movements; • management of the interface between users of the Wales Coast Path diversion and construction vehicles; • deliveries to the site will be controlled to avoid queuing; and • construction vehicle speeds will be reduced.	*Contractor*			
A1.2	**To communicate information about the proposed scheme.**	Inform the local community (especially the local residents) of the proposed scheme objectives and programme of works and provide contact name and number.	*NRW*			
		Inform adjacent and local landowners/tenants (including residents of Penny Cloud Cottage, Cherry Tree House and Chapel Farm) of the nature and	*NRW*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		duration of construction and provide contact name and number.				
A1.3	**Minimise disturbance to users of the Wales Coast Path and footpaths.**	Agree a suitable footpath diversion with Monmouthshire County Council's Right of Way Officers and landowners.	*NRW*	*Give drawing reference*	Route agreed and documented in Environmental Statement	
		• Apply for Temporary Footpath Closure and advertise footpath closure and diversion routes in advance of construction and erect signage on site; • temporary pedestrian footbridges and an access gate at the western end will be put in place to enable users access to and from the temporary diversion; and • where the users of the diverted PRoW need to cross construction access routes, designated crossing points will be established and appropriate signage installed to warn construction and other traffic of the crossing point.	*Contractor*			
A1.4	**To prevent damage to the local road network.**	Undertake a pre-condition survey of local roads along the route that construction traffic will follow to site.	*Contractor*			
Soils						
A2.1	**Minimise damage to subsoils and topsoils from the incorrect storage, handling and trafficking of soils.**	Construction vehicle access routes along the embankment will be clearly delineated to minimise trafficking of soils.	*Contractor*	*British Standard 3882:2007: Specification for topsoil and requirements for use will be applied.*		
Surface water bodies						

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
A3.1	**To maintain water quality of the reens.**	Monitor water quality of the reens for three months prior to construction to establish baseline water quality.	*NRW*		NRW have undertaken three months of water quality monitoring surveys to establish a baseline. Parameters monitored include: • ammonia • biological oxygen demand • chloride • chemical oxygen demand • nitrogen • nitrite • phosphate • suspended solids • salinity.	
A3.2	**To prevent encroachment onto the Back Ditch (Collister Pill) at the foot of the landward side of the embankment.**	Locate the haul road along the access track to avoid encroaching on to the Back Ditch and Roggiett Moor reen.	*Contractor*			
A3.3	**To minimise the risk of blockage of the reens resulting from the collapse of the field crossings and culverts which overlie them due to overloading by construction traffic.**	Carry out inspections of all crossing points to confirm that they can withstand the anticipated construction traffic.	*Contractor*			
		Reinforce crossing points if deemed necessary depending on the outcome of the inspections.	*Contractor*			
Flora and fauna						
A4.1	**To avoid effects on the Gwent Levels - Magor and Undy SSSI.**	Obtain SSSI Assent from NRW Protected Sites.	*NRW*			
A4.2	**To minimise the risk of adversely affecting the rare plants along the embankment.**	The knotted hedge parsley, corn parsley and sea wormwood should be dug up before construction commences. These plants should be grown in a nursery until they have flowered and set seed.	*ECW*			
		Agree any seed mixes to be used to re-vegetate the embankment with NRW Protected sites.	*NRW*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		An additional survey will be undertaken 1 to 2 weeks before construction commences to check for the presence of slender hare's-ear. If identified on the embankment the seed should be collected or plant dug up before construction commences. This plant should be grown in a nursery until they have flowered and set seed.	*ECW*			
A4.3	**To minimise the risk of adversely affecting the reen network and the plants and invertebrates they support.**	Storage of materials should be a minimum of 12m away from the reens. See also A3.2.	*Contractor*			
A4.4	**To prevent the killing and injury of reptiles and amphibians.**	Habitat to be made unsuitable for reptiles. Grass should be strimmed in a two-staged approach at the western end of the landward side of the embankment to allow reptiles to vacate the area as long as there is also suitable adjacent habitat for any reptiles to flee to. This must be carried out in the reptile active period (March-October).	*Contractor*			
		The risk of encountering amphibians (including GCN) and reptiles will be included in the site induction which will include procedures to be followed if encountered.	*Contractor & ECW*			
A4.5	**To prevent killing or injury of breeding birds (including destruction of nests or eggs).**	Where possible undertake vegetation clearance outside bird nesting season (March – September). Pre-construction breeding bird checks to be carried out by ECW (including areas used for access) if vegetation clearance required in nesting season.	*Contractor (Ecologist)*			
		If nests found exclusion zone to be set up until young have	*Contractor (Ecologist)*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		fledged (size as directed by Ecologist). If clear, flail vegetation immediately to prevent return.				
A4.6	**To prevent killing or injury to shrill carder bees.**	Any areas of tussocky/long vegetation to be removed as part of the proposed scheme should be cut back between April and July to discourage shrill carder bee from nesting in the area.	*Contractor*			
A4.7	**To avoid effects on other protected species.**	Undertake pre-construction surveys for otters.	*Consultant (Ecologist)*			
		Toolbox talk and information board on the potential for work to disturb protected species.	*ECW*			
Land use						
A5.1	**To maintain landowner access to the site.**	Communicate with landowners to ensure that the construction works cause minimal disruption to normal farming operations.	*NRW*			
A5.2	**To minimise deterioration agricultural land quality.**	A pre-construction photographic record should be made of all working areas and the site compound to ensure that they are reinstated to pre-construction conditions.	*Contractor*			
Cultural heritage and archaeology						
A6.1	**To minimise the risk of adversely affecting the existing flood defence embankment and unknown archaeology.**	Toolbox talk to cover the potential for work to reveal unknown archaeology and to inform the contractor what to look out for during excavation works.	*ECW*			
		Agree a method for an archaeological watching brief. Ensure a suitably qualified archaeologist is appointed, provided with the construction programme and present to observe any excavations within the area.	*NRW*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
Noise						
A7.1	**To minimise noise disturbance to the local residents and users of the Wales Coast Path.**	• Working hours to be agreed with the Local Planning Authority (LPA); and • haul roads will be designed to minimise the need for reversing.	*Contractor*			
During Construction						
Human beings						
B1.1	**Ensure safety of pedestrians using the diverted Wales Coast Path.**	Maintain segregation of footpath users and construction traffic for duration of construction.	*Contractor*			
B1.2	**To minimise disruption to the local road network.**	Contractor to adhere to the measures set out in the TMP.	*Contractor*			
Soils						
B2.1	**Minimise damage to topsoils and subsoils from incorrect storage, handling and trafficking of soils.**	• Topsoil shall not be handled or trafficked during, or shortly after, heavy precipitation; in a waterlogged condition; when the ground is frozen or covered by snow; and when there are pools of water on the ground surface. Topsoil spreading, levelling and loosening should not be carried out during or immediately after heavy rain. Soils generally gain strength and become more resistant to damage as they lose moisture; they shall thus be handled only in the appropriate conditions of weather and soil moisture, and with suitable machinery; • when stockpiling topsoil, heaps should be tipped	*Contractor*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		loosely; the surface firmed and shaped to shed water; • stockpiles of topsoil should be as long, narrow and shallow as possible (as an adequate oxygen supply is unlikely to penetrate more than 1m from the stockpile surface); • keep stockpiles clear of injurious or pernicious weeds and sharps, plastics and other non-soil forming materials; • topsoil should be spread over loosened subsoil (it is particularly important that the subsoil is not over compacted. This should ensure that plant roots can extend into it and excess water can drain away through it); and • trafficking of soils should be kept to a minimum.				
B2.2	**To minimise the risk of polluting soils.**	See actions in Section B3.1				
B2.3	**To minimise risk of mobilising contaminants within the Magor STW.**	• No boring, digging or similar operations will be undertaken within the Magor STW; and • all working areas within the potential site compound at Magor STW will be located on areas of existing hardstanding.	*Contractor*			
Surface water bodies						
B3.1	**To maintain the water quality of the reens.**	• Ensure that equipment and fuel storage facilities are protected by secure fences and locked where possible to prevent accidental spillages as a result of vandalism; • drip trays to be used underneath standing equipment; • any drip tray with a mixture of	*Contractor*	'Environmental Good Practice On Site' (2005). 'Coastal & Marine Environmental Site Guide' (2003). PPG 1 General Guide to the Prevention of Pollution.		

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		water and contaminant will be emptied into a 25l plastic container using a funnel. The container will be disposed of at the end of construction or when full; • emergency spill kits and trained personnel will be available; • all vehicles, including fuel bowsers, will carry emergency spill kits; • bulk fuel will be stored in a double bunded tank inside the compound. The tank will be covered to prevent rainwater build up in the bund. Filling hose and nozzle will be kept within the bunded area and locked when not in use. Diesel and petrol in clearly marked suitable containers will be stored in bunded areas inside the secure storage container. There should be no refuelling outside of the site compound. All re-fuelling to be done over hardstanding; • stockpiles of clay will be managed to shed rainwater and avoid run off to watercourses; • all stockpiles should be sealed to contain runoff; • all mechanical plant that is hydraulically operated in whole or in part and is to be used close to watercourses will be run using approved biodegradable oil; • silt build up will be minimised by maintenance of the haul roads. Should weather conditions dictate during the summer months a low level		PPG 5 Works and Maintenance in and near Water. PPG 6 Working at Construction and Demolition Sites. PPG 7 Refuelling Facilities. PPG 21 Pollution Incident Response Planning. PPG 22 Dealing with Spills. PPG26 Drums and Intermediate Bulk Containers		

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		bund will be constructed along the side of the Back Ditch and Roggiett Moor reen to prevent run off from entering; • tide levels will be obtained and construction works commenced to avoid Spring high tides; • water quality of the reens will be monitored throughout construction to ensure that there are no adverse effects on water quality; and • site compounds will be at least 7m from any field ditch and 12m from any main reen.				
B3.2	**To prevent encroachment onto the Back Ditch and Roggiett Moor reen the foot of the landward side of the embankment.**	• The route of the haul roads for the embankment material will be located to avoid encroaching on the reen and will run within the footprint of the widened embankment; • topsoil will be stripped from the lower part of the embankment first to provide the haul road footprint; and • turning places will be established to minimise the reversing length of the articulated dump trucks by stripping topsoil from the side of the embankment to allow sufficient turning room for vehicles.	*Contractor*			
Flora & fauna						
B4.1	**Minimise effects on the Severn Estuary SPA, SAC, Ramsar and SSSI.**	• No construction work 1st October to 31st March (except for mobilisation and de-mobilisation); • all work except those required for erosion protection (see below), including the site compound and access routes	*Contractor*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		will be located outside of the designated European sites, and no equipment will be stored on the estuary side of the embankment; • a fence line will be erected along the seaward side of the working area to prevent encroachment into the designated sites. A mobile kickboard will be positioned at the base of the fence to prevent any loose debris from encroaching into the designated site; • works will be undertaken during daylight hours only. • no re-fuelling of machinery/vehicles on site, all re-fuelling to be done in the site compound and at least 15m away from ditches and water run-off points; • biodegradable oils to be used in all machinery/vehicles; • tide levels will be obtained and construction times to avoid Spring high tides; and • during construction, detailed weather reports will be obtained prior to starting on site at the beginning of each day to reduce the potential of being on site if a storm surge were to occur.				
		Where encroachment is required onto the Severn Estuary Natura 2000 site for erosion protection works, the following measures will be implemented: • Access to the foreshore will only be permitted if it is not possible for works to be carried out from the	*Contractor*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		embankment crest. • Access to be via existing access point. • No tracking over saltmarsh to access repair locations 1-3. • Defined access route a maximum of 5m wide across saltmarsh to access remaining repair locations. • Exact location of route and most suitable protective matting to be agreed with NRW Protected Sites in advance. • Fenceline, with mobile kickboard, to be erected along seaward edge of access route. • Only low ground pressure vehicles permitted on the foreshore. • Spill kits to be available at all times on designated site				
B4.2	**To prevent the destruction of notable / nationally rare of scarce plants and invertebrates.**	Any topsoil stripped from the embankment will be carefully stored (see B2.1 detailing how topsoil will be managed) and re-laid on the embankment, therefore enabling the seed bank within the topsoil to regenerate.	*Contractor*			
		Any plants dug up and grown in a nursery within the site compound will be cared for during construction.	*ECW*			
B4.3	**To prevent the killing and injury of reptiles and amphibians.**	If the western site compound in Magor STW is utilised; the areas of tall ruderal/long grass will not be used and vegetation will not be cleared.	*Contractor*			
		A suitably qualified ecologist must be present to supervise the removal of the stored topsoil.	*Contractor (Ecologist)*			
B4.4	**To prevent killing to injury to badgers.**	If the western site compound within Magor STW is utilised; the	*Contractor*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		areas of tall ruderal/long grass will not be used and vegetation will not be cleared.				
		Reasonable Avoidance Measures (RAMs) will be applied when the western site compound is utilised, these will include: • checking for signs of digs on a daily basis; and • store harmful chemicals / materials in areas where badgers cannot access them.	*Contractor*			
B4.5	**To prevent killing or injury of breeding birds (including destruction of nests or eggs).**	If nests are found during construction they will be protected with construction buffer zones until the young have fledged.	*Contractor*			
		If the Magor STW western site compound area is utilised the areas of tall ruderal/long grass will not be used and the vegetation will not be cleared.	*Contractor*			
B4.6	**To prevent killing and injury of GCN.**	If a GCN is found at any point during construction, works will cease in the area and the ECW will be contacted for advice.	*Contractor*			
B4.7	**To prevent the spread of invasive species.**	Biosecurity measures will be employed as required to ensure that no invasive species such as Japanese knotweed are imported to the site.	*Contractor*			
Land use						
B5.1	**To minimise deterioration in agricultural land quality.**	Maintain the quality of subsoils and topsoils within all working areas by following the mitigation measures outlined in B2.1.	*Contractor*	*British Standard 3882:2007: Specification for topsoil and requirements for use*		
Cultural heritage and archaeology						
B6.1	**To minimise the risk of adversely affecting unknown archaeology.**	Intermittent archaeological watching brief should be implemented during ground	*NRW*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		breaking operations. Any finds will be reported to the Local Authority Archaeological Advisor (GGAT), and work in that area will be stopped whilst the find is investigated by an archaeologist. Any fossils, antiquities, structures, remains or other objects of geological or archaeological interest or value will be reported to the coroner in accordance with the Treasure Act 1996.				
Noise						
B7.1	**To minimise noise disturbance to the local residents and users of the Wales Coast Path.**	• Working hours will be restricted to the hours of 7am-7pm on weekdays and 7am-1pm on Saturdays. There will be no working on Sundays or Bank Holidays. Local residents will be consulted in advance on any requirements for out of hours work; • deliveries will only be made during working hours; • haul roads will be well maintained to reduce noise from vehicle movements; plant used during construction will be suitably sized for the works to limit noise and vibration; • plant will be of a good modern standard and maintained to ensure unnecessary vibration or noise from exhaust systems or loose panels is eliminated; • any stationary plant (e.g. generators and compressors) will be positioned as far as practically possible away from residential properties and screened to reduce noise	*Contractor*	*British Standard guidelines BS5228:2009 – Code of practice for noise and vibration control on construction and open sites*		

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		emissions; • all plant will be shut down when not in use to eliminate any unnecessary noise; • where possible, quieter electrically powered plant will be used as opposed to diesel or petrol-driven equipment; • turning places will be created along the embankment to minimise the need for reversing and thereby avoid long periods of reversing alarms; • consider the need to fit more efficient exhaust sound reduction equipment on earth moving plant; • avoid unnecessary revving of engines and switch off equipment when not required; • keep internal haul routes well maintained and avoid steep gradients; • use rubber linings in, for example, chutes and dumpers to reduce impact noise; • minimise drop height of materials; and • start-up plant and vehicles sequentially rather than all together.				
Air Quality						
B8.1	**To minimise the effect on air quality to the local residents , users of the Wales Coast Path and the surrounding saltmarsh**	• Bowser to be available at the site compound for dust suppression of haul roads; • working areas will be kept neat and tidy; • cleaning of access roads will be done by road brush; • road going vehicles will be restricted to running on hard surfaces;	*Contractor*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		• vehicle speeds will be limited; • wheel cleaning facilities will be available (hose pipe, brush) and if required a jet wash will be employed; • vehicles travelling off site will be observed by the site Foreman to check for mud/debris on the road; • access routes will be maintained on site to ensure that there is no mud nuisance on the highway; • control measures will be in place for disposal of rubbish; • materials will be stockpiled out of the wind, or wind breaks provided; • machinery/vehicles to be well maintained, regularly serviced and comply with MOT emissions standards; • deliveries to site will be controlled to avoid queuing; and • engines will be switched off when not in use.				
Post construction						
Human beings						
C1.1	**To keep public informed of work progress.**	Notify the public once construction is complete and when the Wales Coast Path is accessible to public.	*NRW*			
C1.2	**To reopen the Wales Coast Path and other footpaths.**	Reopen the Wales Coast Path and other footpaths, removing all closure adverts and diversion signs.	*Contractor*			
C1.3	**To ensure no damage to the local road network, including access route.**	Carry out post-construction survey and compare to pre-construction condition survey undertaken (see clause A1.4).	*Contractor*			

Ref. No.	Objective	Action	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		Undertake any repairs as necessary.				
C1.4	**To minimise disruption to the local road network.**	Remove all construction related signage from the local road network.	*Contractor*			
Soils						
C2.1	**To minimise damage to the restored embankment.**	The restored embankment should not be trafficked by plant. Where trafficking is unavoidable, it should be kept to a minimum.	*Contractor*			
Land use						
C3.1	**To reinstate site compound all other working areas.**	Access routes and site compound areas to be subject to post-construction inspection (against pre-construction survey details) to ensure that reinstatement has been carried out to an acceptable level.	*Contractor*			
Flora and fauna						
C4.1	**Re-vegetate the embankment.**	Sow seed mix agreed with NRW Protected Sites team on raised embankment.	*NRW (ECW)*			
		Sow seeds collected from the rare plants dug up and grown in a nursery.	*NRW (ECW)*			
C4.2	**Maintenance of the embankment.**	Regular grass-cutting, similar to that already undertaken on the existing embankment will take place in late September at the earliest.	*NRW Operations*			

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17 List of abbreviations

TERM	DEFINITION
ALC	Agricultural Land Classification
CDM	Construction Design and Management
DBA	Desk Based Assessment
DCWW	Dŵr Cymru Welsh Water
Defra	Department for Environment, Food and Rural Affairs
EAP	Environmental Action Plan
EC	European Commission
ECW	Environmental Clerk of Works
EEC	European Economic Community
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
GCN	Great Crested Newts
GGAT	Glamorgan-Gwent Archaeological Trust
HER	Historic Environment Records
HMWB	Heavily Modified Water Bodies
HRA	Habitats Regulation Assessment
HTL	Hold The Line
IDB	Internal Drainage Board
IEMA	Institute of Environmental Management and Assessment
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LPA	Local Planning Authority
MCC	Monmouthshire County Council
NERC	Natural Environment and Rural Communities Act
NRW	Natural Resources Wales
NTS	Non-Technical Summary
OS	Ordnance Survey
PIRP	Pollution Incident Response Plan
PPE	Personal Protection Equipment
PPG	Pollution Prevention Guidelines
PPW	Planning Policy Wales
PRoW	Public Right of Way
RAMs	Reasonable avoidance measures
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SMP	Shoreline Management Plan
SoP	Standard of Protection
SPA	Special Protection Area

TERM	DEFINITION
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWMP	Site Waste Management Plan
TMP	Traffic Management Plan
UDP	Unitary Development Plan
UXO	Unexploded Ordnance
WFD	Water Framework Directive

18 Glossary

TERM	DEFINITION
Agricultural Land classification (ALC)	A series of six grades classifying soil in terms of its suitability for agriculture, from 1 (excellent) to 5 (very poor).
Appropriate Assessment	See Habitats Regulations Assessment.
Baseline data	Data collected to determine the 'baseline' or 'existing' conditions.
Biodiversity	Genetically determined variability amongst living organisms, including the variability within species, between species, and of ecosystems.
Climate Change	Refers to long term trends in weather patterns at large geographic and temporal scales.
Coastal Squeeze	The process, by which coastal habitats and natural features are progressively lost or drowned, caught between coastal defences and rising sea levels.
Cumulative Impacts	The combined effects of several projects within an area, which individually are not significant, but together amount to a significant effect.
De-mobilisation	The completion and removal of the physical and manpower resources from a construction site at the completion of contract.
Department for Environment, Food and Rural Affairs (Defra)	The government department responsible for flood management policy in England.
Environment	Where environmental issues are referred to, this term is used to encompass landscape/natural beauty, flora, fauna, geological or geomorphological features and buildings, sites and objects of archaeological, architectural or historical interest.
Environmental Action Plan (EAP)	A standalone report or section within another environmental impact assessment document which ensures that constraints, objectives and targets set in the main Environmental Report/Statement are actually carried out on the ground. Actions are separated into those to be carried out before, during and after construction.
Environmental Assessment	A systematic study which identifies and predicts the effects on the bio-geophysical, social and economic environment of a proposed scheme.
Environmental Clerk of Works	An individual responsible for undertaking legislation and compliance monitoring during construction by auditing the EAP on a regular basis. Also responsible for the provision of environmental advice.
Flood Cell	A discrete area subject to flooding from failure of defences at a specific point or length.
Flood defence	A structure (or system of structures) that reduces flooding from rivers or the sea.
Flooding	Refers to inundation by water whether this is caused by breaches, overtopping of banks or defences, or by inadequate or slow drainage of rainfall or underlying ground water levels.
Floodplain	Areas of river valley floors or coastal plains which are inundated during times of flood, including areas protected by flood defences.
General Permitted Development Order (GPDO)	The Town and Country Planning (General Permitted Development) Order 1995 sets out what may be built without needing planning permission. Part 15 applies specifically to the Environment Agency.
Geology	The study of the Earth's history, structure and composition.

TERM	DEFINITION
Geomorphology	The study of landforms, including their origin and evolution, and the processes that shape them.
Groundwater	Water contained in the void spaces in pervious rocks and also within soil.
Habitat	A place where an organism lives; a type of environment inhabited by a particular species and/or communities; often characterised by dominant plant forms, physical characters, or a combination of these.
Habitats Directive	EC Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna. Implemented (with the Birds Directive (79/409/EEC)) in the UK as the Conservation (Natural habitats and wild flora and fauna) Regulations (1994). This establishes a system of protection of certain flora, fauna and habitats considered to be of International or European conservation importance. Sites are designated as SACs, SPAs and/or Ramsar sites. Any developments in or close to these designated areas are subject to the Habitat Regulations for approval of English Nature. Together these sites are referred to as the Natura 2000 network.
Habitats Regulations Assessment (HRA)	The Conservations of Habitats and Species Regulations 2010 impose a duty on operating authorities to maintain the integrity of Natura 2000 complexes. Under these regulations, if there are assessed to be likely significant effects, there is a requirement to undertake an Appropriate Assessment to assess the effects of implementing the project upon the conservation objectives of the designated sites, in order to determine whether it is likely to result in an adverse effect upon the integrity of the sites.
Health impact assessment	"A combination of procedures, methods and tools by which a policy, programme or project may be judged as its potential effects on the health of a population, and the distribution of those effects within a population." World Health Organisation.
Hydrogeology	Branch of geology concerned with water within the earth's crust.
Hydrology	The study of water and its dynamics.
Invertebrates	Animals without a backbone e.g. insects, worms and spiders.
Land Drainage Regulations	The Environmental Impact Assessment (Land Drainage Improvement Works) Regulations (SI 1999 No. 1783) apply to improvement works to land drainage infrastructure undertaken by land drainage bodies, including the Environment Agency. Such works are permitted development and therefore not subject to the Town and Country Planning EIA requirements.
Magnitude	A combination of the nature, size, extent and duration of an effect.
Main River	Designated under the Water Resources Act 1991 by the Ministry of Agriculture, Fisheries and Food (now the Department for Food and Rural Affairs). Formal consent is required for all activities that interfere with the bed or banks of the river or obstruct the flow.
Mitigation	The measures, including any process, activity or design to avoid, reduce or remedy or compensate for adverse landscape and visual effects of a development proposed scheme.
Mobilisation	Preparatory activities carried out by the contractor before works commence on the ground.
Natura 2000 site	A network of marine and terrestrial areas of international importance designed to conserve natural habitats and species of plants and animals that are rare, endangered or vulnerable protected under EU law. Natura 2000 sites consist of SACs (protected sites based on the

TERM	DEFINITION
	Habitats Directive) and SPAs (protected sites based on the Birds Directive).
Ordnance Datum (OD)	Land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum.' Contours on Ordnance Survey maps of the UK show heights in metres above Ordnance Datum.
Phase 1 Habitat Survey	The Phase 1 habitat classification and associated field survey technique provides a relatively rapid system of recording semi-natural vegetation and other wildlife habitats. Each habitat type/feature is defined by way of a brief description and is allocated a specific name, an alpha-numeric code, and unique mapping colour. The system has been widely used and continues to act as the standard 'phase 1' technique for habitat survey across the UK.
Pills	Small inlets from the sea.
Plan	A purposeful, forward looking strategy or design, often with co-ordinated priorities, options and measures, that elaborates and implements policy e.g. Shoreline Management Plans
Polders	An area of low-lying land that has been reclaimed from a body of water and is protected by dikes.
Policy	A general course of action or proposed overall direction that an organisation is, or will be, pursuing and which guides ongoing decision making.
Ramsar Site	Internationally important wetland identified for conservation under the Ramsar convention (1971).
Receptor	Any component of the natural or man-made environment that is potentially affected by an impact from a development
Redi-Rock	Dry laid concrete blocks that have the look of natural stone and assemble like giant concrete Lego™.
Reen	A type of drainage ditch, the primary purpose of which is to hold water in the winter months during periods when sea doors (gouts) are unable to discharge water due to the tide being locked. A secondary function is to hold water in the summer months to help stop adjacent grounds from drying out. This is in the interests of nature conservation, agriculture, aesthetics and the structural stability of the ground.
Royal Society for the Protection of Birds (RSPB)	A national charity that seeks to protect birds and wildlife and tackle problems that threaten the environment.
Scoping	Determines all of a proposal's possible effects to address those that are potentially significant.
Screening	Focuses on proposals with potential significant adverse environmental effects or with effects not fully known to eliminate those proposals.
Sensitivity	Gives regard to the quality, relative abundances and level of statutory protection of the receptor.
Site of Special Scientific Interest (SSSI)	An area of land of special interest by reason of its flora, fauna, geology or physiographical features notified under Section 28 of the Wildlife and Countryside Act 1981.
Special Area Conservation (SAC)	Special Area of Conservation as designated under the European Union Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.
Surface Water	General term used to describe all the water features such as rivers,

TERM	DEFINITION
	streams, springs, ponds and lakes.
Sustainable Development	'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' (WCED, 1987).
Terram	Permeable geotextile membrane used to separate the stone road surface from the soil underneath.
Water Framework Directive (WFD)	The WFD stipulates that all water bodies should aim to meet good status by a set timeframe. This refers to the overall status of the water body, which is defined differently for surface and groundwater bodies. For natural surface waters, good status is a composite of ecological status and chemical status, and the aim is to achieve 'Good Ecological Status' (GES). Surface waters that are completely man-made, or have been altered from natural characteristics for a specific purpose (or 'use') are classed as either Heavily Modified Water Bodies (HMWB) or Artificial Water Bodies (AWB), and the aim for HMWB and AWB is to achieve 'Good Ecological Potential' (GEP).
Wetlands	Areas where the water table is either seasonally or permanently high. They naturally occur in river valleys where drainage is impeded either by topography or soil structure and they can be entirely natural or man-made. Wetlands may be used for agriculture, forestry or amenity purposes that can tolerate intermittent high water tables. An area could be both a washland and a wetland; these are not mutually exclusive terms.

APPENDICES

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APPENDIX A – FIGURES AND DRAWINGS

343500

344000

185000

184500

PREFERRED POINT OF ACCESS. TRACK IN POOR CONDITION AND WILL REQUIRE GRADING PRIOR TO CONSTRUCTION TRAFFIC

PROPOSED CLOSURE OF PUBLIC HIGHWAY

ALTERNATIVE WESTERN LOCATION FOR WELFARE AND TRANSFER COMPOUND.

DCWW SEWAGE TREATMENT WORKS (STW)

DCWW DN600 RISING MAIN

TRIAL PIT

DEFENCE TO BE MAINTAINED DURING OUT OF WORK HOURS

CULVERT

SURVEY STATION (9.629 mAOD)

DN300

PREFERRED WESTERN WELFARE AND TRANSFER COMPOUND.

PRoW DIVERSION TO BE IMPLEMENTED. SEE DRAWING 00013 FOR DETAILS

DCWW MANHOLE COVER ON EMBANKMENT CREST

DN700

300MM DIAMETER OVERFLOW

CS1

CS1a

CS2

CS2a

CS3

LONGITUDINAL SECTION

Caldicot Level

Sewage Works

Tanks

Drain

Path (um)

Sluice

Mill Reen

Main River

Sloping masonry

Marsh

Mud

Portland Gro

ROCK ARMOUR TYPE 1

BLOCKSTONE WITH LIMITED DEGREE OF INTERLOCK WITH SOME SMALLER UNITS (+/- 300MM) PLACED LOOSELY IN THE TOP LAYER. LARGER UNITS ARE AROUND 750MM. ALSO INCLUDES AREAS OF ROUGHLY PLACED BLOCKSTONE WITH ROCKS AROUND 500MM IN SIZE ALTHOUGH SIGNIFICANT QUANITITES OF SMALLER ROCK ARE ALSO EVIDENT. (SEE TECHNICAL NOTE: 'EROSION PROTECTION' FOR MORE DETAILS)

0 25 50 75 100 125

Metres

Scale 1:1,500

Safety Health and Environmental Information
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:
Construction. S.1 - THE WALES COAST PATH RUNS ALONG THE TOP OF THE DEFENCE EMBANKMENT. THE FOOTPATH IS TO BE TEMPORARILY CLOSED AND DIVERTED. TO BE AGREED WITH RIGHTS OF WAY OFFICER. S.2 - AREA ESTUARY SIDE OF DEFENCE EMBANKMENT USED FOR PRIVATE SHOOTING. S.3 - RISK OF FLOODING FROM ESTUARY STORM SURGE EVENTS OR DUE TO HIGH RAINFALL EVENTS. - EMBANKMENT AND AREAS EITHER SIDE USED FOR GRAZING CATTLE. S.4 - LOW RISK OF UNEXPLODED ORDNANCE BUT WHICH COULD LEAD TO A FATALITY. S.5 - WORKING NEAR A SAC/SPA DESIGNATED CONSERVATION AREA IN THE ESTUARY. S.6 - WORKING WITHIN A SSSI DESIGNATED AREA
Maintainence/Cleaning/Operation. - SAFE GRASS CUTTING METHODS WILL NEED TO BE CHOSEN CONSIDERING MAXIMUM GRADIENTS ON BANK. - SLOPE GRADIENT DICTATED DUE TO LACK OF SPACE
Decommissioning/Demolition - AS PER CONSTRUCTION. - CATSCAN OR TRIAL HOLES TO LOCATE OUTFALL PIPES REQUIRED.
FURTHER CONSIDERATIONS - LOCATION OF COMPOUND AND TRANSFER AREAS AND ACCESS ROUTES TO BE CONFIRMED. - STOCK PROOF FENCING MAY BE REQUIRED TO PROTECT SEEDED AREAS WHILST ESTABLISHING.

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Site Boundary
- Proposed Top of Embankment
- Redi-Rock required
- Access Routes
  - Preferred
  - Emergency
- Compound/Storage Area
  - Preferred Option
  - Alternative Option
- Ordnance Survey Background
  - Building
  - Mean High Water
- Rock Armour
  - Type 1
  - Type 2
  - Type 3
  - Type 4
  - Type 5
- PRoW Routes
  - Wales Coast Path
- Designations & Landuse
  - Ramsar, SPA & SAC
  - Site of Special Scientific Interest (SSSI)
  - Contaminated Land
- DCWW Assets
  - Manhole
  - AV
  - Rising Main
  - Combined Sewer
- Other
  - Survey Station/Trig Pillar
  - Trial Pit
  - Overhead Electric Cable

Notes

1. ENCROACHMENT INTO THE SPA/SAC SITE SHOULD BE AVOIDED BY SITE PERSONNEL. NO MACHINERY IS PERMITTED BEYOND THE ESTUARY SIDE OF THE EXISTING EMBANKMENT CREST, EXCEPT WHEN WORKING ON BLOCKSTONE REPLACEMENT WORKS
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3. LOCATION OF COMPOUND, TRANSFER AREAS AND ACCESS ROUTES ARE UNDER DISCUSSION WITH LANDOWNERS AT TIME OF TENDER.
4. ACCESS ROUTES WILL REQUIRE RESURFACING ON COMPLETION OF WORKS.
5. THE DRAINAGE DITCH AT THE BACK OF THE DEFENCE IS DESIGNATED AS MAIN RIVER AND WILL REQUIRE FLOOD DEFENCE CONSENT FOR WORKS IN ITS VICINITY.
6. FRONT FACE OF THE NEW SLOPE TO MATCH THE EXISTING SLOPE FACING. TOP LEVEL OF EXISTING FACING TO BE REMOVED AS REQUIRED TO ALLOW FOR SUFFICIENT TIE IN AND INTERLOCK BETWEEN NEW AND EXISTING FACING.
7. NO WORKS SEAWARD OF THE EXISTING ESTUARY CREST LINE OF THE EMBANKMENT, EXCEPT WHEN WORKING ON BLOCKSTONE REPLACEMENT WORKS

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
H	AJS	PH	ES	TPMP	28/01/2015	FOR EIA
G	ONV	RPT	HDJ	TPMP	15/12/2014	FOR TENDER
F	ONV	DW	TPMP	TPMP	16/10/2014	AMENDMENTS FOLLOWING TQ'S ON ROCK ARMOUR
E	JP	DW	TPMP	TPMP	10/04/2014	FOR TENDER
D	ONV	DW	TPMP	TPMP	07/01/2014	ISSUED FOR PAR

Designed by: ONV Date: 26/09/2013

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

GENERAL ARRANGEMENT

SHEET 1 OF 3

Scale: 1:1,500 @ A1 Sheet size: A1

Drawing no. 109455-00003-1 Revision H

P:\109454 -109442 Severn Estuary PAR - Tables Govt\100 - GIS\108 Workspace\PAR Drawings\109455-00003.mxd sse18302 02/02/2015

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185500

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TRIAL PIT

CHAPEL FARM

ACCESS TRACK OVER EMBANKMENT TO BE RAISED TO PROVIDE REQUIRED FLOOD DEFENCE LEVEL WHILST MAINTAINING ACCESS FOR LANDOWNER

DEFENCE TO BE MAINTAINED DURING OUT OF WORK HOURS

ACCESS FOR EMERGENCY VEHICLES ONLY. ALL CONSTRUCTION TRAFFIC PROHIBITED.

CS9

CS8

CS7

CS6

CS5

CS4

CS3

LENGTH OF DEFENCE TO BE RAISED

SALTMARSH

Chapel Reen

Chapel Farm

Cherry Tree House

Penny Cloud Cottage

140m

Caldicot Level

Portland Grounds

Mud

Sand

Mean High Water

Drain

Track

Marsh

ROCK ARMOUR TYPE 5
ROCK PLACED IN THE EMBANKMENT SLOPE FRONTING THE FARM IN ROUGH FORMATION COVERING THE LOWER PART OF THE EMBANKMENT. (SEE TECHNICAL NOTE: 'EROSION PROTECTION' FOR MORE DETAILS)

ROCK ARMOUR TYPE 4
BLOCKWORK REVETMENT FOR FIRST 70M FOLLOWED BY ANOTHER 70M SECTION OF LARGER ROCK SET INTO THE EMBANKMENT (SEE TECHNICAL NOTE: EROSION PROTECTION FOR MORE DETAILS)

ROCK ARMOUR TYPE 3
INFILLED REVETMENT WITH LARGER ROCKS (~700MM) SET INTO THE EMBANKMENT AND SOIL BETWEEN THE ROCKS VEGETATED BY GRASS. (SEE TECHNICAL NOTE: 'EROSION PROTECTION' FOR MORE DETAILS)

DCWW DN600 RISING MAIN

ROCK ARMOUR TYPE 2
PLACED REVETMENT WITH BLOCKS OF VARYING SIZES BETWEEN ~300 TO 400MM INTERLOCKED WITH EACH OTHER. PROTECTS BOTTOM PART OF SLOPE ONLY (SEE TECHNICAL NOTE: 'EROSION PROTECTION' FOR MORE DETAILS)

0 25 50 75 100 125
Metres
Scale 1:1,500

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  - Emergency
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  - Alternative Option
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  - Type 2
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  - Manhole
  - AV
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  - Combined Sewer
- Other
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  - Trial Pit
  - Overhead Electric Cable

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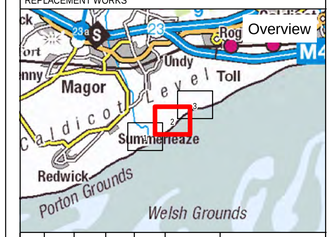

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Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

GENERAL ARRANGEMENT

SHEET 2 OF 3

Scale: 1:1,500 @ A1 Sheet size: A1

Drawing no. 109455-00003-2 | Revision H

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345000

345500

186000

185500

PERFERRED ACCESS VIA LANDOWNER'S HARD TRACK FROM PUBLIC ROAD TO THIS POINT (1.4KM). ASSUME WILL NEED REGRADING TO CURRENT CONDITION, OR BETTER ON COMPLETION.

PREFERRED EASTERN LOCATION FOR WELFARE AND TRANSFER COMPOUND

ACCESS TRACK OVER EMBANKMENT TO BE RAISED

PRoW DIVERSION TO BE IMPLEMENTED

CONTRACTOR TO CONFIRM CULVERTED WATERCOURSE (COLLISTER PILL) CAN WITHSTAND CONSTRUCTION TRAFFIC

INSTALL AND MAINTAIN GATED ACCESS THROUGH EXISTING FENCELINE

DEFENCE TO BE MAINTAINED DURING OUT OF WORK HOURS

OUTFALL OF COLLISTER PILL

LONGITUDINAL SECTION

K OVER EMBANKMENT
TO PROVIDE REQUIRED
CE LEVEL WHILST
ACCESS FOR

Petty Reen
Sluice
DN600
ETL
Roggiett Moor Reen
Drain
Caldicot Level
Track
CS13
CS12
CS11a
CS11
CS10a
CS10
CS9
CS8
CS7
Marsh
Shingle
Mean High Water
Sluice Pill
Collister Pill
Mud
Portland Grounds
Stopping masonry
Building
ED Bdy

0 25 50 75 100 125
Metres
Scale 1:1,500

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Maintainence/Cleaning/Operation.

- SAFE GRASS CUTTING METHODS WILL NEED TO BE CHOSEN CONSIDERING MAXIMUM GRADIENTS ON BANK.
- SLOPE GRADIENT DICTATED DUE TO LACK OF SPACE

Decommissioning/Demolition

- AS PER CONSTRUCTION.
- CATSCAN OR TRIAL HOLES TO LOCATE OUTFALL PIPES REQUIRED.

FURTHER CONSIDERATIONS

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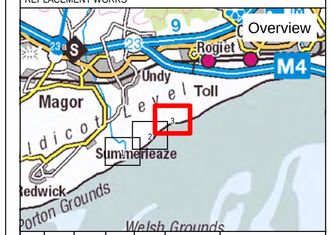
4. ACCESS ROUTES WILL REQUIRE RESURFACING ON COMPLETION OF WORKS.
5. THE DRAINAGE DITCH AT THE BACK OF THE DEFENCE IS DESIGNATED AS MAIN RIVER AND WILL REQUIRE FLOOD DEFENCE CONSENT FOR WORKS IN ITS VICINITY.
6. FRONT FACE OF THE NEW SLOPE TO MATCH THE EXISTING SLOPE FACING. TOP LEVEL OF EXISTING FACING TO BE REMOVED AS REQUIRED TO ALLOW FOR SUFFICIENT TIE IN AND INTERLOCK BETWEEN NEW AND EXISTING FACING.
7. NO WORKS SEAWARD OF THE EXISTING ESTUARY CREST LINE OF THE EMBANKMENT, EXCEPT WHEN WORKING ON BLOCKSTONE REPLACEMENT WORKS



Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
H	AJS	PH	ES	TPMP	28/01/2015	FOR EIA
G	ONV	RPT	HDJ	TPMP	15/12/2014	FOR TENDER
F	ONV	DW	TPMP	TPMP	16/10/2014	AMENDMENTS FOLLOWING TQ'S ON ROCK ARMOUR
E	JP	DW	TPMP	TPMP	10/04/2014	FOR TENDER
D	ONV	DW	TPMP	TPMP	07/01/2014	ISSUED FOR PAR

Designed by: ONV Date: 26/09/2013

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

GENERAL ARRANGEMENT

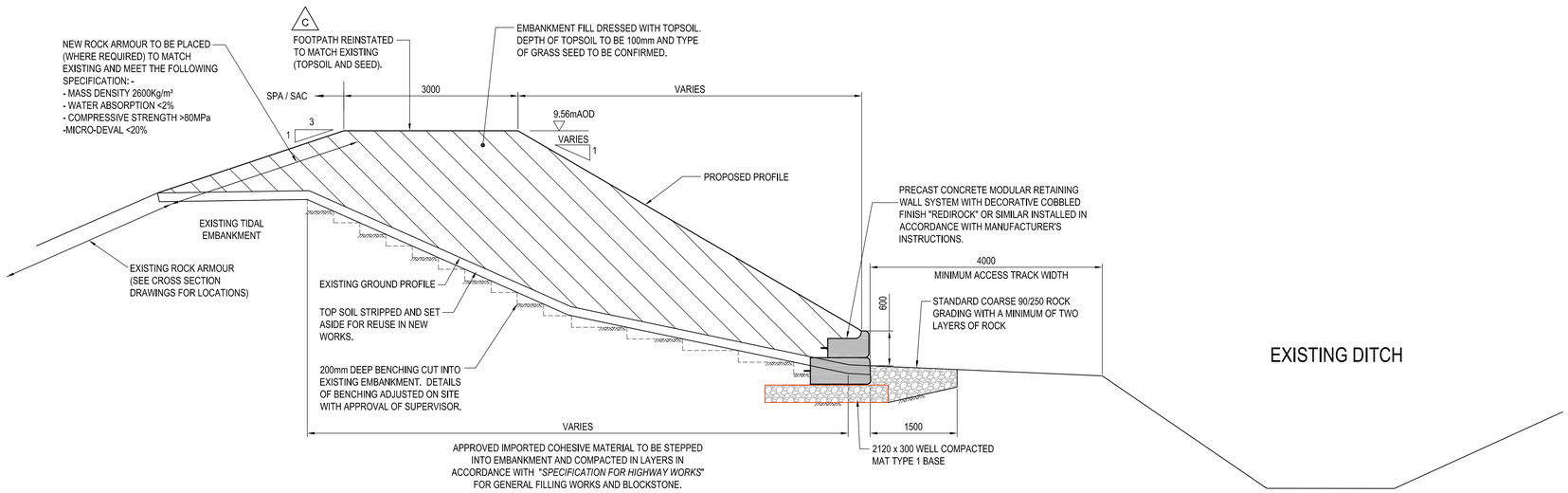
SHEET 3 OF 3

Scale: 1:1,500 @ A1 Sheet size: A1

Drawing no. 109455-00003-3 Revision H

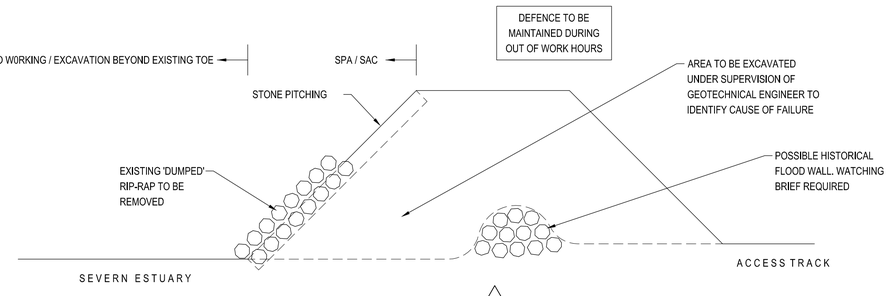
 Print Version: Print Quality (300dpi @ A1)

P:\109454 - 109442 Severn Estuary PAR - Tabbs Gout\100 - GIS\108 Workspace\PAR Drawings\109455-00003.mxd steJ8302 02/02/2015



TYPICAL DETAIL OF BENCHING, BLOCKSTONE TOE AND SCOUR PROTECTION

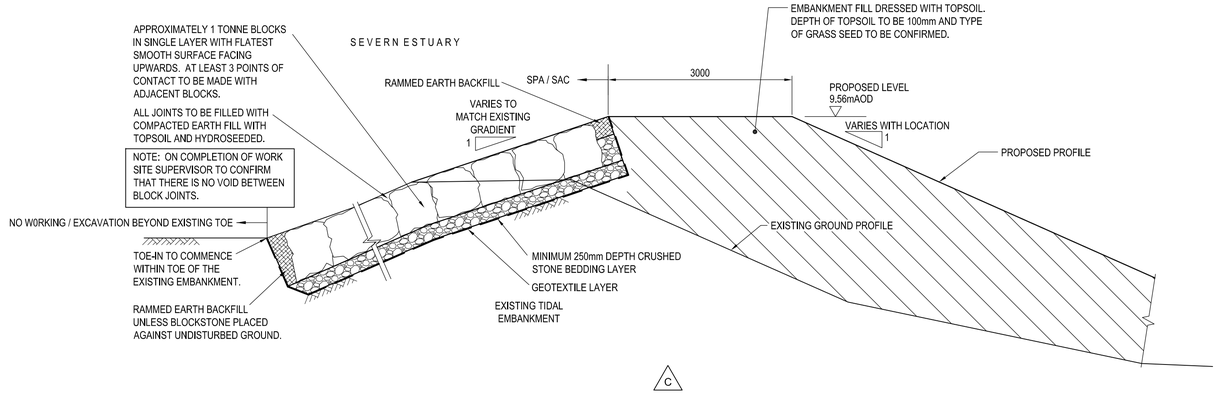
SCALE 1:50



C

TYPICAL SECTION SHOWING EXISTING EMBANKMENT AT LOCATIONS WHERE RIP-RAP PLACED IN 2011

NTS



C

TYPICAL SECTION SHOWING PROPOSED EMBANKMENT AT LOCATIONS WHERE EMBANKMENT TO BE REINSTATED

SCALE 1:50

1m 0m 1m 2m 3m

Scale 1:50

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
2. ALL LEVELS ARE IN METRES REFERRED TO ORDNANCE DATUM (NEWLYN).
3. EXISTING GROUND PROFILE IS GENERATED FROM LiDAR DATA, EXCEPT FOR THE LANDWARD TOE OF EMBANKMENT AND BACK DITCH BRINK LOCATION AND LEVEL WHICH WAS OBTAINED BY TOPOGRAPHIC SURVEY.
4. FINISHED GRADIENT OF EMBANKMENT WILL VARY.
5. IT IS POSSIBLE THAT THE EXISTING FOOTPATH SURFACE MAY BE IMPROVED PRIOR TO CONSTRUCTION OF NEW WORKS.
6. ENCROACHMENT INTO THE SPA/SAC SITE SHOULD BE AVOIDED WHERE POSSIBLE BY SITE PERSONNEL. NO MACHINERY IS PERMITTED BEYOND THE ESTUARY SIDE OF THE EXISTING EMBANKMENT CREST UNLESS NECESSARY FOR REASONS OF HEALTH & SAFETY.
7. SEE NOTES ON GENERAL ARRANGEMENT DRAWING No.109454-00003.
8. FRONT FACE OF THE NEW SLOPE TO MATCH EXISTING SLOPE FACING. TOP LEVEL OF EXISTING FACING TO BE REMOVED AS REQUIRED TO ALLOW SUFFICIENT TIE-IN AND INTERLOCK BETWEEN NEW AND EXISTING FACING.
9. COMBINED WELSH WATER SEWER NOT SHOWN AS DEPTH AND LOCATION UNCERTAIN.
10. HAT - HIGHEST ASTRONOMICAL TIDE.
    MHWS - MEAN HIGHWATER SPRINGS.
    F.D.L. - FLOOD DEFENCE LEVEL.
11. INTEGRATION BETWEEN EXISTING EMBANKMENT SURFACE & NEW MATERIAL TO BE BENCHED AS PER STANDARD DETAIL.
12. FINISHED LEVELS INCLUDE A 150mm ALLOWANCE FOR SETTLEMENT.

Safety Health and Environmental information
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:
Construction.
S.1 - THE WALES COAST PATH RUNS ALONG THE TOP OF THE DEFENCE EMBANKMENT. THE FOOTPATH IS TO BE TEMPORARILY CLOSED AND DIVERTED. TO BE AGREED WITH RIGHTS OF WAY OFFICER. S.2 - AREA ESTUARY SIDE OF DEFENCE EMBANKMENT USED FOR PRIVATE SHOOTING. S.3 - RISK OF FLOODING FROM ESTUARY STORM SURGE EVENTS OR DUE TO HIGH RAINFALL EVENTS. S.4 - LOW RISK OF UNEXPLODED ORDNANCE BUT WHICH COULD LEAD TO A FATALITY. S.5 - WORKING NEAR SAC/SPA DESIGNATED CONSERVATION AREA IN THE ESTUARY.
Maintenance/Cleaning/Operation.
- SAFE GRASS CUTTING METHODS WILL NEED TO BE CHOSEN CONSIDERING MAXIMUM GRADIENTS ON BANK. SLOPE GRADIENT DICTATED DUE TO LACK OF SPACE.
Decommissioning/Demolition.
- AS FOR CONSTRUCTION. - CATSCAN OR TRIAL HOLES TO LOCATE OUTFALL PIPES REQUIRED.

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
C	ILC	RPT	HDJ	TPMP	11.JAN.15	F/PATH DETAIL OMITTED; SECTION HANDED; REINSTATEMENT SECTION APPENDED; NOTE REMOVED
B	SPJ	RPT	HDJ	TPMP	17.DEC.14	FOR TENDER
A	RM	DW	HDJ	TPMP	11.APR.14	FOR TENDER

Designed by: Date:

Client

Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155

Project

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

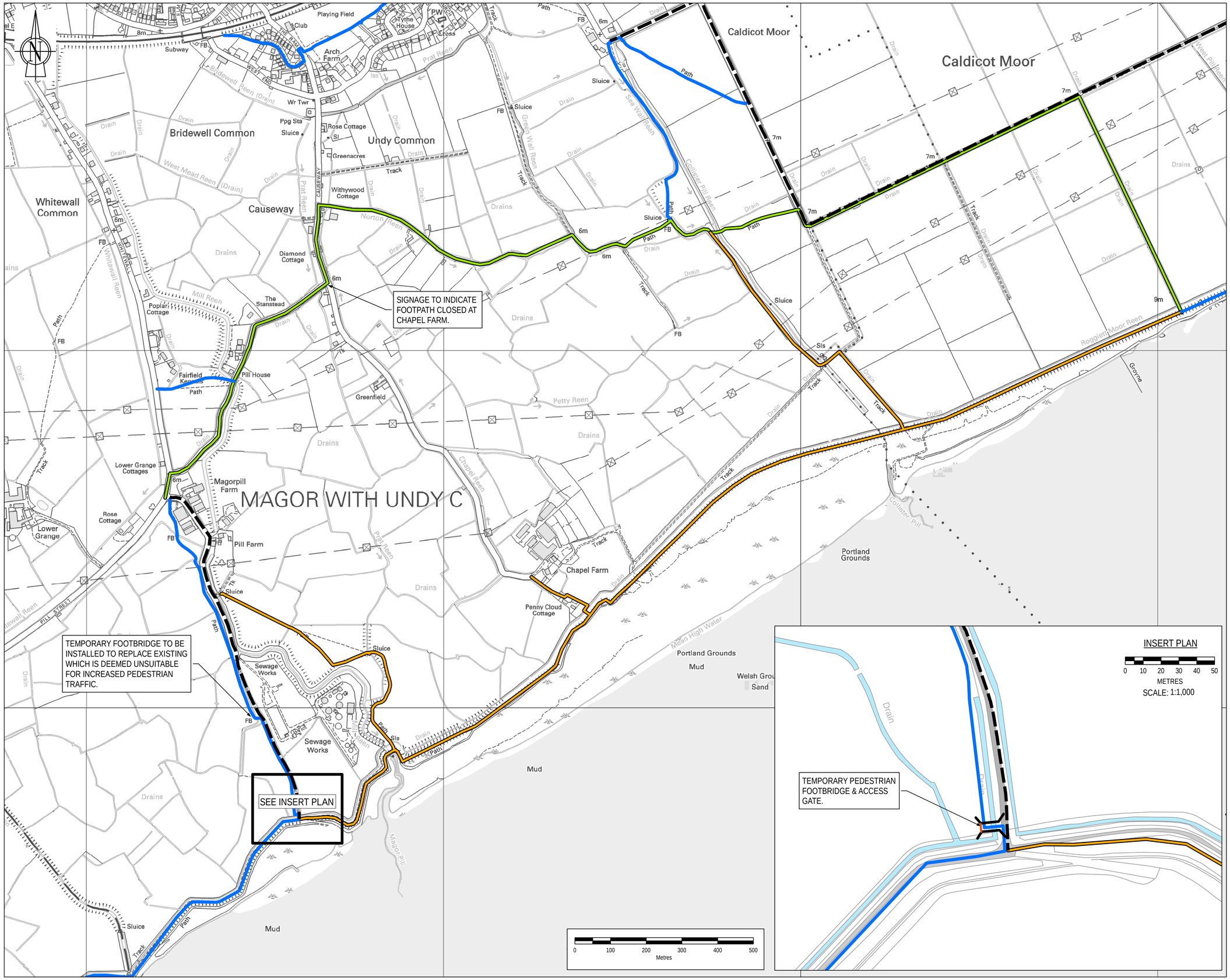
Drawing title

TYPICAL DETAILS OF EMBANKMENT BENCHING AND BLOCKSTONE

C

Drawing scale: 1:20 1:50 Sheet size: A1

Drawing no. 109455 – 00009 | Revision C



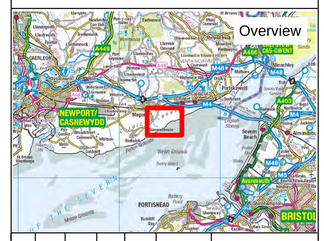
Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

Existing routes and options

- Alternative Routes
- Public Footpaths
- Public Path to be closed
- Public Restricted Byways

Notes



Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	JP	DW	HDJ	TPMP	11/04/2014	FOR TENDER
A.0	ONV	DW	TPMP	TPMP	04/02/2014	DRAFT ISSUE

Designed by: ONV Date: 21/01/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No.

Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

FOOTPATH DIVERSION PLAN

Scale: 1:5,000 @ A1

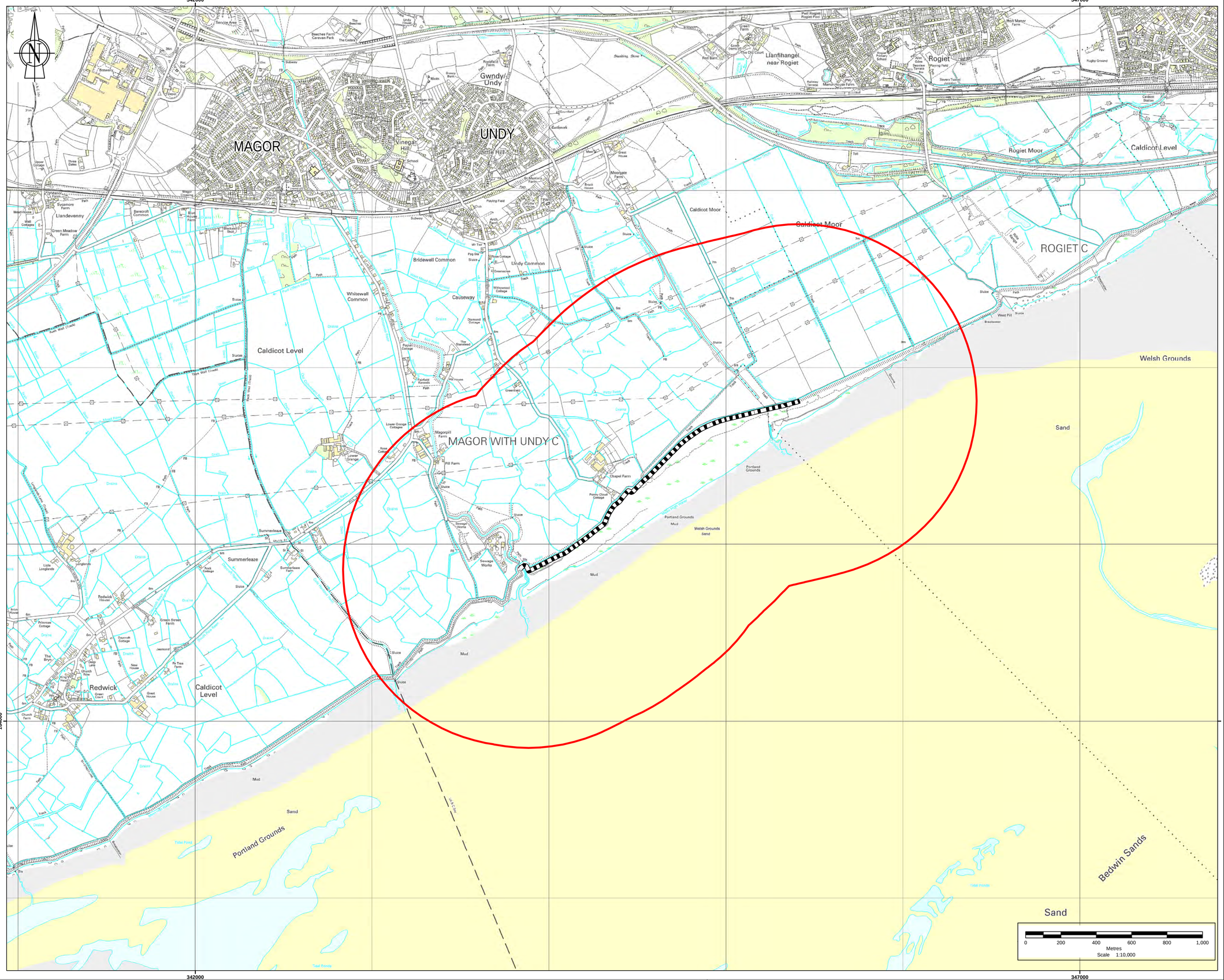
Sheet size: A1

Drawing no. 109455-00013

Revision B.0

Print Version: Print Quality (300dpi @ A1)

T:\Projects\109454 -109442 Severn Estuary PAR - Tabbs Gurt\100 - GIS\108 Workspace\PAR Drawings\109455-00013.mxd pal37882 11/04/2014



Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Study Area (1km buffer area)
- Location of Embankment Raising

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	ONV	JME	EAS	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
A.0	AJS	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: AJS Date: 09/05/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:
SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:
STUDY AREA

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455 - 00026 Revision B.0

P:\109454 -109442 Severn Estuary PAR - Tabbs Gout\100 - GIS\108 Workspace\ER_REPORT\109455_00026_PORTLAND_STUDY_AREA_V1.mxd ver38533 26/01/2015 AC

342000

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M4

A4810

B4245

Church Road

MAGOR

UNDY

Gwndy

Llanfihangel near Rogiet

Rogiet

Rogiet Moor

Caldicot Level

The Ramp

Whitewall

Bridewell Common

Undy Common

The Causeway

Whitewall Common

Caldicot Moor

ROGIET C

372/46

372/47

372/48

372/49

372/50

372/51

372/60

378/14

378/18

Wales Coast Path

Welsh Grounds

Sand

Cherry Tree Cottage

Chapel Farm

MAGOR WITH UNDY C

372/58

372/59

372/56

372/53

Penny Cloud Cottage

Magor Sewage Treatment Works

Redwick

Caldicot Level

Portland Grounds

Bedwin Sands

Mud

0 200 400 600 800 1,000

Metres

Scale 1:10,000

Print Version: Print Quality (300dpi @ A1)

P:\109454 - 109442 Severn Estuary PAR - Tasks Go\st100 - GIS\108 Workspace\ER_REPORT\109455_00027_PORTLAND_HUMAN_BEINGS.mxd ves38533 26/01/2015

AC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Study Area (1km buffer area)
- Anticipated Construction Traffic Route
- Wales Coast Path Public Right of Way
- Public Right of Way
- Extent of Embankment Raising

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
C.0	ONV	JME	EAS	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
B.0	ONV	WH	EAS	TPMP	15/01/2015	FOR ISSUE
A.0	JAP	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: AJS Date: 08/05/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No.

Revision

BLACK & VEATCH
Building a world of difference.

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

HUMAN BEINGS

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455 - 00027

Revision C.0

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PRAT & BRIDEWELL

SEA WALL REEN

GREEN WALL REEN

NORTON REEN

COLLISTER PILL

WEST PILL

SUMMERWAY REEN

IFTON REEN DIVERSION

IFTON REEN

ROGGIETT MOOR REEN

PETTY REEN & STUTWALL LINK

ST BRIDES BROOK / MILL REEN

PETTY REEN

CHAPEL REEN

COLD HARBOUR

WHITEWALL REEN

MILL REEN

BACK DITCH (CALDICOT LEVELS)

Gwndy/ Undy

Llanfihangel near Rogiet

Rogiet

Magor

Vinegar Hill

Little Hill

Llandevenny

Bridewell Common

Undy Common

Whitewall Common

Causeway

Caldicot Moor

Rogiet Moor

Caldicot Level

MAGOR WITH UNDY C

ROGIET C

Welsh Grounds

Sand

Mud

Portland Grounds

Redwick

Caldicot Level

Summerleaze

Bedwin Sands

Tidal Pools

Tidal Road

Tidal Fence

0 200 400 600 800 1,000

Metres

Scale 1:10,000

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Study Area (1km buffer area)
- Location of Embankment Raising
- Main Rivers
- Other Watercourses
- Water Quality Monitoring Points
- Crossing Point over reen

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	AJS	JME	EAS	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
A.0	AJS	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: AJS Date: 09/05/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

SURFACE WATER BODIES AND GROUND WATER

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455 - 00028 Revision B.0

 Print Version: Print Quality (300dpi @ A1)

P:\109454 - 109442 Severn Estuary PAR - Tabbs Gout\100 - GIS\108 Workspace\ER_REPORT\109455_00028_PORTLAND_WATER_SUPPLY_V1.mxd vee38533 26/01/2015 AC

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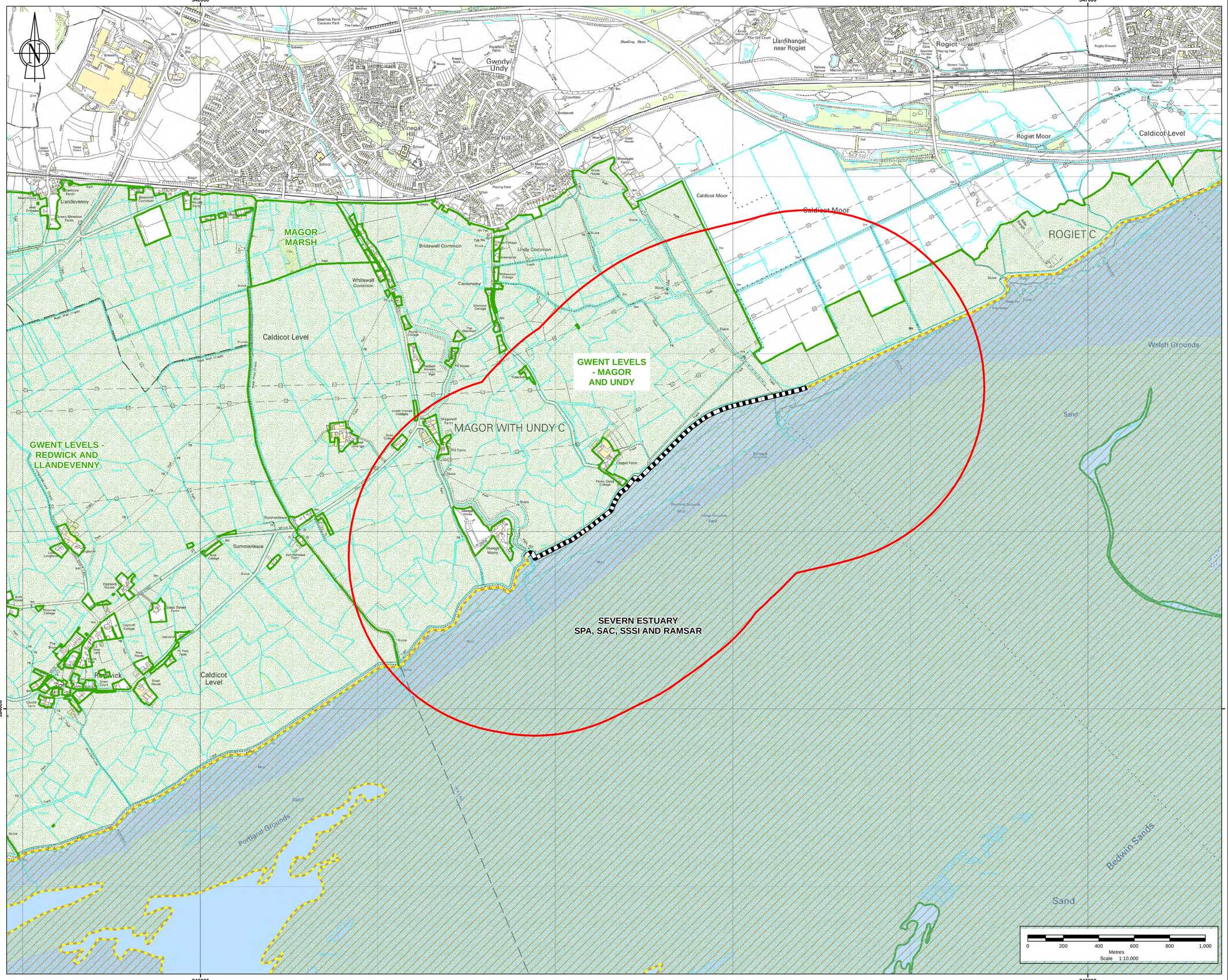

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Study Area (1km buffer area)
- Location of Embankment Raising
- Ramsar
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	AJS	JME	EAS	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
A.0	AJS	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: AJS Date: 09/05/2014

Client: Cyfoeth Naturiol Cymru / Natural Resources Wales

Client Drawing No. | Revision

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Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

INTERNATIONAL AND NATIONAL NATURE CONSERVATION DESIGNATIONS

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455 - 00029 Revision B.0

 Print Version: Print Quality (300dpi @ A1)

P:\109454 - 109442 Severn Estuary PAR - Tasbs Gout100 - GIS\108 Workspace\ER_REPORT\109455_00029_PORTLAND_DESIGNATIONS_V1.mxd ver.38533 29/01/2015

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LAND OFF DANCING HILL

Railway land

Cemetery or Graveyard

Railway land

Unknown Filled Ground

Caldicot Moor

Caldicot Level

Caldicot Level

Summerleaze Smithy

Summerleaze Pet Crematorium

Magor Sewage Treatment Works

Caldicot Level

Welsh Grounds

Sand

Portland Grounds

Bedwin Sands

Sand

MAGOR WITH UNDY C

ROGIET C

Llanfihangel near Rogiet

Rogiet

Gwndy/ Undy

Undy

Magor

Landevenny

Redwick

Summerleaze

Caldicot Moor

Rogiet Moor

Bridewell Common

Whitewall Common

Undy Common

Causeway

Portland Grounds Mud

Welsh Grounds Sand

Mud

Tidal Pools

0 200 400 600 800 1,000

Metres

Scale 1:10,000

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Study Area (1km buffer area)
- Location of Embankment Raising
- Contaminated Land
- Potentially Contaminated Land
- Historic Landfill Site

Agricultural Land Classification

- Grade 1
- Grade 2
- Grade 3
- Grade 4
- Grade 5
- Non Agricultural
- Urban

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	AJS	JME	EAS	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
A.0	AJS	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: AJS Date: 09/05/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

AGRICULTURE AND LAND USE

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455 - 00030 | Revision B.0

 Print Version: Print Quality (300dpi @ A1)

P:\109454 - 109442 Severn Estuary PAR - Tabbs Go\a100 - GIS\108 Workspace\ER_REPORT\109455_00030_PORTLAND_LANDUSE_V1.mxd ver38533 26/01/2015 AC

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347000

184000

VILLAGE W Y'S CHURCH WILCRICK HILL CAMP

The Vicarage Listed Building

STANDING STONE 252M SOUTH OF BENCROFT LANE

ST. MICHAEL'S CHURCHYARD CROSS, LANFIHANGEL ROGIET

MEDIEVAL MOATED SITE 400M N OF UNDY CHURCH

Moorgate Cottage Listed Building

ST. MARY'S CHURCHYARD CROSSES, MAGOR

MEDIEVAL BUILDING ADJOINING MAGOR CHURCHYARD

UNDY CHURCHYARD CROSS

RELICT SEAWALL ALONGSIDE COLLISTER PILL REEN

GWENT LEVELS HISTORIC LANDSCAPE

GWENT LEVELS HISTORIC LANDSCAPE

GWENT LEVELS HISTORIC LANDSCAPE

Chapel Farm Earthworks Site of Archaeological Interest

Collister Pill Site of Archaeological Interest

Magor Pill Site of Archaeological Interest

MAGOR WITH UNDY C

ROGIET C

Caldicot Level

Caldicot Moor

Rogiet Moor

Welsh Grounds

Sand

Mud

Portland Grounds

Bedwin Sands

Tidal Ponds

Redwick

Caldicot Level

Summerleaze

Magor

Undy

Rogiet

Llanfihangel near Rogiet

Bridewall Common

Undy Common

Whitewall Common

Causeway

Vinegar Hill

Gwndy/ Undy

Llandevenny

Scale 1:10,000

0 200 400 600 800 1,000 Metres

Print Version: Print Quality (300dpi @ A1)

P:\109454 -109442 Severn Estuary PAR - Tables Gsu\100 - GIS\108 Workspace\ER_REPORT\109455_00031_PORTLAND_HISTORIC_V1.mxd ves38533 26/01/2015 AC

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Study Area
- Listed Building
- Scheduled Monument
- Historic Landscape Area
- Post Medieval Sea Defence Site of Known Archaeological Interest
- Extent of Embankment Raising

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B.0	ONV	JME	EAS	TPMP	26/01/2015	FOR ISSUE
A.0	AJS	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: AJS Date: 09/05/2014

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

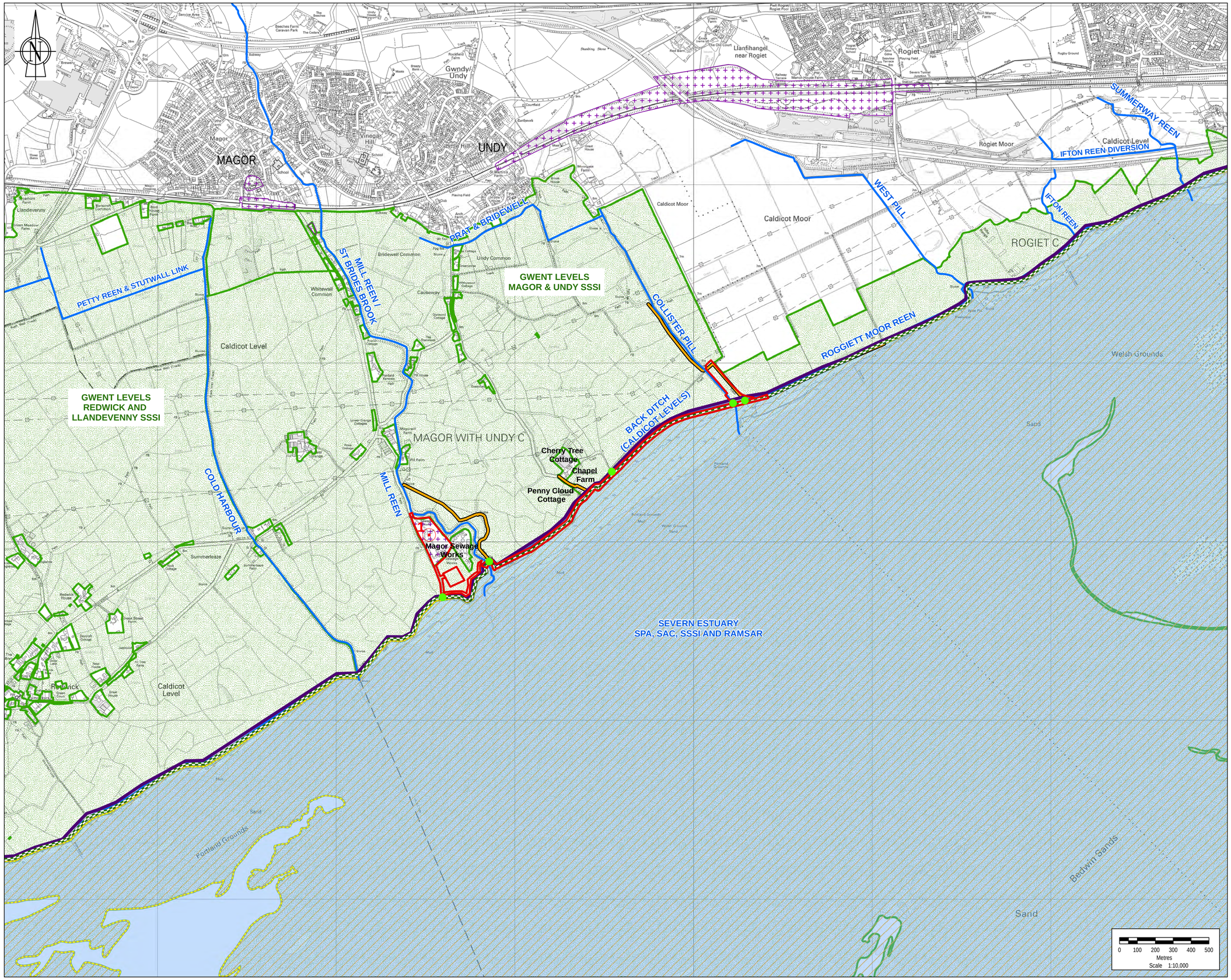
SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

HISTORIC ENVIRONMENT

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455 - 00031 Revision B.0



Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Site Boundary
- Wales Coast Path
- Post Medieval Sea Defence
- Main Rivers
- Ramsar
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Site of Special Scientific Interest (SSSI)
- Contaminated Land
- Public Right of Way to be closed
- Crossing Point over reen
- Target Note
  1. Habitat suitable for reptiles, nesting birds and badgers

Rev	Drawn	Chkd	Rwwd	Apprvd	Date	Description
C.0	ONV	JME	EAS	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
B.0	ONV	WH	EAS	TPMP	16/05/2014	FOR ISSUE
A.0	JAP	KQ	EAS	DJ	16/05/2014	FOR ISSUE

Designed by: Date: 08/05/2014

Client

Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

Black & Veatch Limited
Registered Office
Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:

ENVIRONMENTAL CONSTRAINTS

Scale: 1:10,000 @ A1 Sheet size: A1

Drawing no. 109455-00032 Revision C.0

P:\109454 - 109442 Severn Estuary PAR - Tabbs Gout\100 - GIS\108 Workspace\ER_REPORT\109455_00032_PORTLAND_ENV_CONSTRAINTS.mxd vxe38533 26/01/2015

 Print Version: Print Quality (300dpi @ A1)

344000

185000

APPROXIMATE LOCATION OF ROUGHLY PLACED BLOCKSTONE

APPROXIMATE LOCATION OF EXISTING ACCESS POINT TO FORESHORE

APPROXIMATE LOCATION OF ROUGHLY PLACED BLOCKSTONE

Drain

Drain

Drain

Drain

Drain

Sluice

Sluice

Sluice

Mill Reen

Path (um)

Path (um)

Path (um)

Caldicot Level

Sloping masonry

Sloping masonry

MLW

MLW

Mean H

R WITH UNDY C

1

2

3

4

5

6

7

0 25 50 75 100
Metres

SITE BOUNDARY OVERVIEW

EXTENT OF MAIN VIEW

Greenfield

Petty Reen

Chapel Farm

Penny Cloud Cottage

Sewage Works

Portland Grounds

Mud

Welsh Grounds

Sand

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Site Boundary (See inset map)
- Potential working area on foreshore
- Approximate location of roughly placed blockstone
- Existing Embankment Base
- Existing Top of Embankment

Phase 1 Habitat Survey

- B2.2 Semi-improved Grassland
- B4 Improved Grassland
- B6 - Poor Semi-improved Grassland
- G1 Open Water
- H2.6 Dense Continuous Saltmarsh
- 3 Roughly placed blockstone location reference

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
B	ONV	AJB	ES	TPMP	26/01/2015	FIRST ISSUE
A	ONV	JME	ES	TPMP	20/01/2015	FIRST ISSUE

Designed by: ONV Date: 12/01/2015

Client

Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No.

Revision

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Grosvenor House, 69 London Road, Redhill, Surrey, RH1 1LQ, United Kingdom
Tel: +44(0)1737 774155 E-mail: bvl@bv.com

Project:

SEA DEFENCES AT PORTLAND GROUNDS

Drawing title:

APPROXIMATE LOCATION OF WORKS TO REPLACE ROUGHLY PLACED BLOCKSTONE

Scale: 1:1,000 @ A1 Sheet size: A1

Drawing no. 109455-00033

Revision B

P:\109454 -109442 Severn Estuary PAR - Tabbs Gout\100 - GIS\108 Workspace\ER_REPORT\109455-00033.mxd ver38533 26/01/2015

 Print Version: Print Quality (300dpi @ A1)

343000 343500 344000 344500 345000 345500

186000 185500 185000 184500

Causeway
Diamond Cottage
The Stanstead
Poplar Cottage
Fairfield Kennels
Pill House
Greenfield
Lower Grange Cottages
Magorpill Farm
Rose Cottage
Pill Farm
Penny Cloud Cottage
Chapel Farm
Portland Grounds
Sewage Works
MAGOR WITH UNDY C
Norton Reen
Mill Reen
Petty Reen
Chapel Reen
Priar Reen
Magor Pill
Collister Pill
Drains
Path
Track
Sluice
FB
6m
7m
Sls
Mean High Water
Mud
Welsh Grounds
Sand

0 100 200 300 400 500
Metres
Scale 1:4,000

Print Version: Print Quality (300dpi @ A1)

P:\109454 -109442 Severn Estuary PAR - Tabs Govt\100 - GIS\108 Workspace\Habitats\109455_50001_Portland_PH1S_v2a1.mxd ste18392 30/01/2015

Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.

Legend:

- Survey Area
- A2.1 Dense Scrub
- B2.2 Semi-improved Grassland
- B4 Improved Grassland
- B5 Marshy Grassland
- B6 - Poor Semi-improved Grassland
- C3.1 Tall Ruderal
- G1 Open Water
- H2.6 Dense Continuous Saltmarsh
- G2 Running Water
- J2.1.2 Hedgerow (Species-poor)
- J2.3.2 Hedgerow with Trees (Species-poor)
- J2.4 Fence
- Target note
  1. Habitat suitable for repltiles
  2. Potential for otters
  3. Rubble pile
  4. Potential for nesting birds throughout vegetation
  5. Potential for over-wintering birds on saltmarsh
  6. Dense bullrush
  7. Stand of common reed
  8. Hardstanding

NOTE: This map has been distributed as a layered pdf. Layer selection for printing is at the discretion of Natural Resources Wales.

Safety Health and Environmental Information
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:
Construction.
Maintainence/Cleaning/Operation.
Decommissioning/Demolition

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
E.0	ONV	JME	ES	TPMP	26/01/2015	CLIENT COMMENTS ADDRESSED
D.0	MM	KQ	KQ	ES	09/05/2014	CLIENT COMMENTS ADDRESSED
C.1	MM	KQ	KQ	ES	09/05/2014	CLIENT COMMENTS ADDRESSED
B.0	AJS	AR	KQ	ES	11/04/2014	ISSUED FOR COMMENT

Designed by: ONV Date: 26/09/2013

Client: Cyfoeth Naturiol Cymru Natural Resources Wales

Client Drawing No. | Revision

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Project:
SEA DEFENCE IMPROVEMENTS AT PORTLAND GROUNDS

Drawing title:
PHASE 1 HABITAT SURVEY

Scale: 1:4,000 @ A1 Sheet size: A1

Drawing no. 109455-50001 Revision A

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APPENDIX B – CONSULTEE COMMENTS

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Consultee	Date	Outcome of Consultation	Action
Internal NRW consultees			
Protected Sites (PS) team	28/11/2013	NRW Protected Sites (PS) expressed concern that the Strategy is not yet 'signed off', and that as a result the required compensatory habitat is not yet identified and agreed. NRW PS also had a number of other comments and areas of concern: • the compound site should be at least 7m from any field ditch and 12m from any main reen, if this is not possible alternative protection measures should be put in place to protect the features of interest of the SSSI; • corn parsley & knotted hedge are present on the flood defence; • semi – improved grassland is not common in the area and has the potential to support the shrill carder bee, which is a qualifying feature of the Gwent levels: Magor & Undy SSSI (Protected Sites disagree with the scoping report that states that semi-improved grassland is common in the area); • providing all works are undertaken from the landward side of the defence and measures are in place to prevent accidental spillages etc. the works are unlikely to have an adverse effect on the saltmarsh; • would welcome the opportunity to be involved in the reinstatement of the embankment, e.g. removing some turves in the known location of identified rare species and reinstating them on the new bank. Preference would be for a plain seed mix, rather than introduce species within a seed mix; • NRW PS sites have questioned whether cutting marginal vegetation adjacent to reens is necessary to discourage reptile	The SMP2 (and the 'Imperative Reasons of Overriding Public Interest' case) was approved in November 2014 so the proposed scheme can now proceed. Compound location will be specified in accordance with this within the Contractor's EMP and Method Statement. Survey of notable species on the bank has been undertaken and the results used to inform reinstatement. Cutting of marginal vegetation adjacent to reens will not be required. All works will be undertaken from landward side of bank to avoid effects on saltmarsh. NRW PS has been consulted on development of bank reinstatement including the intention to translocate specimens of the notable species detailed in Chapter 8, care for these in a nursery area during construction, harvest seed from them and reinstate the seeds onto the raised embankment post-construction. In addition, NRW PS will be consulted on

Consultee	Date	Outcome of Consultation	Action
		use. Especially as flowering ruderal species are used by the Shrill Carder Bee; • require further justification as to why a survey for otter resting places is not to be carried out other than just pre-construction; • emphasised the importance of the 3 months of water quality monitoring, before and during construction; • concerned about proximity of 'make up access area' to the reen at cross section B-B. Protected Sites emphasised the need for the impacts of this aspect of the design to be fully assessed; • require more details on the pollution prevention measures and a contingency plan for action to be taken in the event of a breach in water quality levels or pollution incident; • emphasised the requirement for production of an Environmental Management Plan before assent for the works can be provided; • agreed with the recommendation that a GCN survey is not required; • highlighted the importance that the Wales Coast Path surface must be reinstated to the same width as existing and it must not encroach on semi-improved grassland; • we disagree with the suggestion of NRW Landscape Architect for hedgerow planting, as this would conflict with the management aims of the Gwent Levels SSSI; and • suggested that a potential enhancement could be ditch clearance works. In response to the draft HRA NRW PS advised that:	the composition of the 'plain' seed mix that will be used to vegetate the raised embankment. If possible, seed harvested from a Local Wildlife Trust reserve may also be used to supplement the 'plain' seed mix. Surveys for otter resting places were undertaken in March 2014 and did not find any evidence of their presence. Baseline and during construction water quality monitoring of the reens commenced in Jan 2014. Pollution prevention measures will be detailed in the ES, EAP and Contractors EMP which will be sent to NRW PS for review prior to construction. Wales Coast Path will be reinstated to existing width as per discussions with Council. The hedgerow planting enhancement measure will not be taken forward. It is not felt that ditch clearance will be an appropriate enhancement measure given the environmental sensitivity of the reens as an interest feature of the Gwent Levels – Magor and Undy SSSI.

Consultee	Date	Outcome of Consultation	Action
	9/12/13	• concern that the Strategy is not yet 'signed off', and that as a result the required compensatory habitat is not yet identified and agreed. Notwithstanding the above, in principle it should be possible to avoid adverse effects on the Severn Estuary SAC, SPA and Ramsar provided: • work is timed to avoid the overwintering bird period of 1 March to 31 October; • all works are undertaken from the landward side of the defence; • there is no trafficking of vehicles, or other works, on the salt marsh; and • steps are in place to prevent accidental spillages etc onto the saltmarsh.	The SMP2 (and the 'Imperative Reasons of Overriding Public Interest' case) was approved in November 2014 so the proposed scheme can now proceed. All of these measures have been taken into consideration in the design of the proposed scheme; have been included within the HRA and also in the Contractor's Method Statement and EMP.
Environmental Management	19/11/2013	Comments from Environmental Management regarding Appendix D – Environmental good practice measures to be employed on site: • due to the proximity of the reen network to the land works, and the height the works will be in relation to the reen at completion, inclusion of 'PPG 5 Works In and Near Water', needs to be incorporated; • it would be best to review the need for silt fencing and/or traps to be in place along the bank of the reen, or available for immediate deployment should bad weather be predicated; • the use of heavy machinery will need to be reviewed if there are prolonged periods of wet weather, and the use of the access track reviewed so potential effects on the reen from run off, and continued use of heavy machinery along the track way is minimised; and	Works will be undertaken in accordance with all relevant PPG. Contractor's Method Statement and EMP will take into consideration working in close proximity to the reens, and storage of materials.

Consultee	Date	Outcome of Consultation	Action
		• if the soil is to be stored in the yard, appropriate bunding will need to be in place to mitigate potential run-off into field drains and reen.	
Groundwater and Contaminated Land	17/06/2013	Suggests that if there are plans to import materials to the site – a materials management plan is likely to be required.	Contractor to follow "Definition of Waste: Development Industry Code of Practice (DoWCoP)" in importing material. A materials management plan to be produced if required.
Fisheries and Biodiversity	19/06/2013 14/11/2013	• Concerned about the risk of damage/direct loss to species in/alongside the back ditch, especially at pinch points; • has suggested considering managed retreat and habitat creation as part of this scheme; • concerned about the risk of soil etc from the newly constructed defence being undermined / washed out during tide events and being deposited on the saltmarsh; and • concerned about effects on utilities, in particular the sewer pipeline that runs along the Portland Grounds site.	Managed Retreat is not SMP2 recommended policy for this frontage. A notable plant survey of the bank was undertaken and used to inform reinstatement in discussions with NRW PS. This has been considered in the design of the embankment. As part of site set-up the contractor will plot all existing services on the ground, and put in place protection measures as agreed with DCWW.
Planning Liaison	03/07/2013	Consult the relevant Local Planning Authorities.	Monmouthshire County Council has all been consulted regarding the proposed scheme.
Development & Flood Risk	20/06/2013	Confirmed that the proposed works will require prior formal flood defence consent of NRW.	Flood defence consents (temporary and permanent) will be obtained prior to construction.
Landscape	18/06/2013	• Agrees that a full Landscape and Visual Assessment is not	Landscape & Visual Impact

Consultee	Date	Outcome of Consultation	Action
Architect		needed; • however, highlighted the importance of continuing to review the potential effects on landscape; • would like the major hedgerows and any significant hedgerow trees mapped to ensure they will not be affected by the proposed scheme; • suggested that the option to locally steepen the bank is likely to have the least effect on the landscape; • concerned that air quality has been scoped out as dust could be an issue for the proposed scheme; and • there may be potential for enhancing/restoring the existing landscape by: o hedgerow planting where there are currently gaps; o increasing the floristic diversity of the embankment; and o installing of seating along the Wales Coast Path where the embankment is wide enough.	Assessment was scoped out of the EIA. The landscape effect of the proposed scheme was considered throughout detailed design in consultation with NRW's Landscape Architect. No hedgerows or trees will be affected as a result of the proposed scheme. Air quality will be dealt with through Pollution Prevention Guidelines and best practice construction methods detailed in the EAP. The proposed enhancements cannot be taken forward because hedgerow planting conflicts with the management aims for the Gwent Levels – Magor & Undy SSSI, increasing the floristic diversity may conflict with the existing plant species and seating on the Wales Coast Path was not assessed as part of the HRA for the construction of the Wales Coast Path.
Water Framework Directive (Hydromorphology)	19/06/2013	NRW – Water Framework Directive provided the following response to the scoping report: "*WFD compliance should be considered for potential impacts the waterbody, and adjacent waterbodies. If the schemes "screen out" then a file note to this effect is required. If they screen in then an assessment*	A preliminary WFD screening compliance assessment was undertaken and concluded that the proposed scheme was compliant. Therefore, no further WFD assessment was required.

Consultee	Date	Outcome of Consultation	Action
		should be completed to appropriate scope and depth."	
Recreation and Access	04/07/2013	Monmouthshire County Council has been considering some improvements to the Wales Coast Path in the area, but didn't include this section. Opportunity to see if any improvements to the Wales Coast Path could be included in the proposed scheme.	It was proposed to upgrade the surface of the path using the specification that Newport City Council Rights of Way Department has used to improve the surface of the Wales Coast Path within their jurisdiction. However, the landowner has expressed concern about the suitability of the proposed surface materials for livestock, and so this enhancement measure cannot be taken forward.
Flood and Coastal Risk Management /Asset Systems Management		Flood and Coastal Risk Management were consulted by the project team throughout development of the proposed scheme.	
Terrestrial Ecosystem Group	15/08/2013	The population of shrill carder bee on the Gwent Levels is one of the most important in the UK. The Terrestrial Ecosystem group has suggested reinstating the bank with species suitable to the shrill carder bee.	This enhancement measure will not be taken forward due to preference for a plain seed mix expressed by NRW PS.
External consultees			
NRW - Newport Wetland Centre Reserve Manager	17/06/2013	The Newport Wetland Centre Reserve Manager provided some factual information on birds in the area: • Avoid working from October to March to prevent disturbing the wintering birds in the Severn Estuary; • there is a possibility that ground nesting birds like skylark,	Working in wintering bird period will be avoided (October – March). Risk of disturbing ground nesting birds is unlikely along embankment as is disturbed regularly by walkers; however storage locations for soil and

Consultee	Date	Outcome of Consultation	Action
		redshank and lapwing may be nesting in the vicinity so a survey may be necessary if the work is carried out between March and Mid July; and • presuming that the banks will need to be re-seeded. This could be an opportunity to include species that would be useful to shrill carder bees in the grass seed mix, like tufted vetch and red cover.	compounds will be checked prior to construction for nesting birds. This enhancement measure will not be taken forward due to preference for a plain seed mix expressed by NRW PS.
Gwent and Glamorgan Archaeological Trust	12/07/2013 13/12/2013	• further consultation with GGAT is required following the final construction plans to provide detailed mitigation measures; • following the desk-based assessment GGAT have confirmed that Assessment of the Significance of Impacts of Development on Historic Landscape (ASIDOHL) is not required; and • an archaeological watching brief should be undertaken on both pre-development works and any groundworks for the proposed scheme.	An archaeological watching brief will be undertaken for intrusive ground works.
Cadw	09/07/2013	Confirmed Cadw had no comments to make on the proposed scheme.	Noted.
RSPB	19/07/2013	RSPB expressed the opinion that: • a HRA will be required to assess the effects on the SAC and SPA sites. Protected species such as otter, badger and species of reptiles should be considered; • the proposed scheme must comply with Invasive Non Native Species (INNS) bio-security guidelines to avoid the spread of invasive non-native species from imported materials, vehicles and associated equipment; and • there may be potential for some biodiversity enhancement within or beyond the footprint of the proposed schemes. Such as the potential for habitat creation on nearby sites managed for wildlife.	A Habitats Regulations Assessment (HRA) has been undertaken. An extended Phase 1 Habitat Survey has been undertaken, which identified specific survey requirements for protected species. Surveys for otter, badger and breeding birds have been/will be undertaken prior to construction. Reasonable Avoidance Measures for reptiles have been included see Chapter 8 Flora & Fauna.

Consultee	Date	Outcome of Consultation	Action
			Best practice construction methods will be employed to manage the biosecurity risk.
Gwent Wildlife Trust	15/07/2013	Suggested enhancement opportunities: • the proposed scheme may be able to reduce the disturbance of birds on the estuary from the silhouette of walkers on the skyline on top of the wall. A stepped profile could be considered, with the path on the land-ward side, retaining a view for walkers, but reducing their silhouette and therefore minimising disturbance for birds on the Estuary. Other comments included: • concerned about the potential long-term effects on drainage in the surrounding areas, and temporary effects from drainage, pollution and silt movement during construction, and would therefore seek appropriate measures to be put in place; • the current wall has developed some botanical interest including cowslips on the north facing side of the wall. There would clearly be benefits in assessing this interest and ensuring some actions are included to mitigate this; • opportunities for partnership working could arise in relation to the material extraction site and its potential uses post extraction. In particular this site may present the opportunity to create wildlife habitats and subsequently be managed as a nature reserve; • it should be noted that Gwent Levels SSSI are part of a NERC Section 42 habitat, floodplain grazing marsh, so the whole habitat must be taken into account; and	The embankment will be maintained by NRW Operations and has therefore been designed with their maintenance requirements in mind. Material extraction from the Solutia Reserve was explored with the Gwent Wildlife Trust but they did not feel that sufficient material could be provided. SSSI Assent will be required from NRW PS and will be applied for. Noted.

Consultee	Date	Outcome of Consultation	Action
	16/12/13	• do not think that sufficient material could be extracted from Solutia Reserve to be of use as fill material for raising the embankments.	
Caldicot and Wentlooge Levels Internal Drainage Board (CWLIBD)	17/06/2013	CWLIDB questioned whether it was possible to provide an increased embankment height by widening the embankment into the foreshore on the estuary side. They also provided information on historic design levels at the site. They also provided information on historic design levels at the site.	The project team have provided information on both the proposed scheme and the Sea Defence Improvements at Tabb's Gout projects to the CWLIDB and have met with them on two occasions (the last being on 10th March 2013). The project team confirmed that widening the embankment on the foreshore on the estuary side was not possible due to the presence of the Severn Estuary Natura 2000 site and designated habitats.
Gwent Ornithological Society	03/07/2013	The saltmarsh at Portland Grounds supports an important high tide wader/wildfowl roost (usually just the Newport side of Collister Pill) and any works should try to avoid the period over high tide to minimise any disturbance.	Working within overwintering bird period will be avoided. Checks for nesting birds within the working area will be undertaken prior to construction. If found, no works will be undertaken within the vicinity until chicks have fledged.
Monmouthshire County Council	1/8/13	The section of the proposed works will directly affect footpaths 372/52; 372/54 and restricted byway 372/53 and also the Wales Coast Path. The proposed works look likely to require temporary closure and an alternative route put in place.	Footpath diversions and closures have been developed in consultation with MCC Rights of Way officer. MCC were consulted on the Wales

Consultee	Date	Outcome of Consultation	Action
		Design details to include: widths, surfacing, access points, gradients etc should be developed in consultation with MCC.	Coast Path reinstatement, it was agreed that this should follow the specification that Newport County Council have used to upgrade the Wales Coast Path surface in other locations. However, due to landowner objection upgrading of the Wales Coast Path surface cannot be undertaken as an enhancement on this scheme.
	17/01/14	Screening Opinion: "*The Planning Authority concurs with the advice received from NRW* [Protected Sites team] *and having taken into account all advice received and having had regard to the selection criteria in Schedule 3 of the 1999* [EIA] *Regulations and the advice contained in WO Circular 11/99 on establishing whether EIA is required, it is this Authority's opinion that on the basis of the information provided so far it has not been demonstrated that the proposed development will not be likely to have significant effects on the environment by virtue of factors such as its nature, size and location. For the reasons given above, this Authority is of the opinion that the proposed development* ***is 'EIA development'****."* Permitted development: "*We agree that the proposal constitutes 'permitted development' under Part 15 of the Town & Country Planning (General Permitted Development) Oder 1995 (as amended) being a development by the [*NRW*] for the purposes of their functions, consisting of…(b) development in, on or under any watercourse or land drainage works and required in connection with the improvement, maintenance or repair of that*	Noted. It was subsequently agreed (in correspondence dated 29/1/14 and 5/2/14) that a statutory EIA will be undertaken under the Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999.

Consultee	Date	Outcome of Consultation	Action
		watercourse or those works."	
Dŵr Cymru Welsh Water (DCWW)	04/07/2013 and 16/12/2013	The DCWW Nash to Chepstow foul water rising main runs underneath the proposed working area, and connects to Magor STW.	DCWW were consulted throughout detailed design and protection measures for their assets will be put in place prior to construction commencing.
Bumblebee Conservation Trust.	19/08/2013	Noted the following points: • if vegetation (including tussocky grass) is cleared between May and September there is a risk to nesting bees, including shrill carder bees; and • suggests reseeding the embankment with species ideal for shrill carder bees e.g. Common knapweed (Centaurea nigra), Red clover (Trifolium pratense), Red Bartsia (Odontites vernus), Bird's-foot trefoil (Lotus corniculatus or pendunculatus), Narrow leaved everlasting pea (Lathyrus sylvestris), Meadow vetchling (Lathyrus pratensis), Tufted vetch (Vicia cracca) and Bush vetch (Vicia sepium).	Potential for effects on the shrill carder bee has been considered as part of the EIA. See Chapter 8 Flora & Fauna. This enhancement measure will not be taken forward due to preference for a plain seed mix expressed by NRW PS.

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APPENDIX C – ARCHAEOLOGICAL DESK BASED ASSESSMENT

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Portland Grounds, Caldicot, Monmouthshire

Archaeological desk-based assessment

November 2013

A report for Natural Resources Wales
By Johnny Crawford Bsc MA
and Charlotte Halford BA PG Cert

GGAT report no. 2013/011
Project no.P1598
National Grid Reference:
ST 44397 85254

The Glamorgan-Gwent Archaeological Trust Ltd
Heathfield House Heathfield Swansea SA1 6EL

Contents Page

Figures

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Summary

Natural Resources Wales is proposing to increase the height of a length of sea defence on the Gwent Levels, between Magor Pill and Collister Pill (centred on NGR ST 44397 85254), in the vicinity of Chapel Farm, Monmouthshire. As part of this project, the Glamorgan Gwent Archaeological Trust (Projects Division) has been commissioned to undertake an assessment of the effect on the archaeological resource of the proposed development. The assessment reviewed information held by the regional Historic Environment Record (HER) and the National Monuments Record (NMR), as well as cartographic and documentary sources. Aerial photographs were examined and a site visit conducted.

A total of 97 sites of known archaeological interest were identified within the study area. Nine new sites were identified within the development area as part of the study. The proposed development area lies within the Historic Landscape Character Areas of Redwick (HLCA06) and Caldicot Moor (HLCA011), which form part of the Outstanding Historic Landscape Area of the Gwent Levels (*HLW(Gt)2). The study area is generally characterised by regular and irregular fields, traversed by drainage ditches known as reens and containing small inlets from the sea known as Pills and a scattering of Post-medieval settlement that probably has an earlier medieval origin.*

A total of 29 sites have been identified within the development area, of which nine sites will be potentially be affected by the development. Four sites have been assessed as being subject to a 'major' effect. These are the earthworks at Chapel Farm (05310g), the existing sea wall (506698) and both Collister Pill (08889g) and Magor Pill (08902g). The remaining five sites Chapeltump (00458g/309436), Chapeltump infield (05258g), the possible manor house (00459g) and the Second World War Pillbox (04292g/270305) and the drainage channel west of Collister Pill (05583g) have been assessed as being subject to a 'minor' effect. The nine new sites (boundary stones PG001-9) have been assessed as having no effect.

Previous investigations both within the study area and also the wider locality demonstrate the nature and extent of the archaeological resource. It is recommended that an archaeological watching brief is affected for any ground intrusion work in the development area, including foundation excavations, service provisions and landscaping work. The suggested recommendations will ensure that any potential remains associated with gleyed clays or peat deposits will also be recorded. Contingency plans should also be drawn up to allow for an appropriate response in the event of the discovery of significant archaeological remains during construction work. It is also recommended that the initial ground investigation work should be carried out (under archaeological supervision) well in advance of the main construction programme to avoid undue delay should significant archaeological deposits be discovered.

The development area is located within a Registered Historic Landscape, the Gwent Levels (HLW(Gt)2) and under normal circumstances an ASIDOHL2 assessment would be required. However, the regional archaeological advisor to the Local Planning Authority has determined that I n this instance an ASIDOHL2 assessment is not required.

All archaeological work should be carried out to the standards laid down by the Institute for Archaeologists.

Acknowledgements

The project was managed by Richard Lewis BA MIfA (Head of Projects). The report was researched and prepared by Johnny Crawford BSc MA PIfA (Senior Project Archaeologist) and amendments by Charlotte Halford BA, PG Cert (Project Archaeologist) GGAT Projects. The illustrations were prepared by Paul Jones (Senior Illustrator of GGAT Projects). The author

would like to thank Vivien Davies (CRAPW), Lisa Fiddes (Cadw), Penny Icke (RCAHMW) and the staff of the Gwent Record Office.

Copyright notice

Abbreviations and glossary

CRAPW:	Central Register of Air Photography for Wales
GGAT:	Glamorgan Gwent Archaeological Trust
Gm	A Scheduled Ancient Monument (SAM) in Glamorgan
Gout	A non-returning sluice gate often found at the mouth of Pills in the region. Known to have been in use since at least the medieval period. Allows freshwater to drain from the land whilst preventing a backflow of salt water from the sea.
Grips	Small gullies which run parallel to each other through agricultural land. Grips are the primary conveyers of water on the levels, channelling water to the greater network of ditches.
GWR:	Great Western Railway (e.g. ID 01229.0w)
HER:	Historic Environment Record (curated by GGAT Curatorial)
HLCA	Historic Landscape Character Area.
HLW:	Registered Historic Landscapes of Wales
LB:	Listed Building
LPA:	Local Planning Authority
NGR:	National Grid Reference
NMR:	National Monuments Record (curated by RCAHMW)
NMW	A find held by the National Museum of Wales
NPRN:	National Primary Record Number (in NMR)
OS Map	Ordnance Survey Map
PRN:	Primary Record Number (in HER - indicated by a letter suffix, in this case ‘g’)
Ramsar	The Convention on Wetlands of International Importance.
RCAHMW:	Royal Commission on the Ancient and Historical Monuments of Wales
SAC	Special Area of Conservation.
SPA	Special Protection Area.
SSSI:	Site of Special Scientific Interest
Reen	A type of drainage ditch. The primary purpose is to hold water in the winter months, during periods when the sea doors (gouts) are unable to discharge water due to being tide locked (Approximately 4.5 hours in every tide cycle). A secondary function is to hold water in the summer months to help stop adjacent ground from drying out. This is in the interests of nature conservation, agriculture, aesthetics and the structural stability of the ground. When referring to nearby sites of archaeological interest, the approximate distance between the development area, the direction from which it is

located and the site of interest with its PRN/NPRN are displayed as: (0km to the southwest; 00000g)

Period definitions

Period	*Dates*	*Suggested scope note*
Prehistoric		All periods up to the invasion of Britain by the Romans in 43AD. This period is a broader term for Pleistocene, Palaeolithic, Mesolithic, Neolithic, Bronze Age and Iron Age.
Pleistocene		The period that covers the span of the Palaeolithic periods (Lower, Middle, Early Upper, Late Upper and Final) that were commonly known as the Old Stone Age.
Palaeolithic	225000 - 10000BC	The 'Old Stone Age' from the earliest appearance of man in the British Isles to the end of the last Ice Age around 8,500 years BC.
Mesolithic	10000 - 4400BC	The 'Middle Stone Age' from the end of the last Ice Age around 8,500 years BC ago to the introduction of farming in the British Isles around 4,000 years BC.
Neolithic	4400 - 2300BC	The 'New Stone Age' from the introduction of farming in the British Isles to the introduction of metal technology in the Bronze Age around 2,200 years BC.
Bronze Age	2300 - 700BC	From the introduction of bronze working technology around 2,200 years BC to the beginning of iron working technology around 700 years BC.
Iron Age	701BC - 43AD	From the introduction of iron working technology around 700 years BC to the invasion of Britain by Rome in 43AD.
Roman	44 - 410AD	From the invasion of Britain by the Romans in 43AD to its abandonment by the legions in 410AD.
Early-medieval	411 - 1066AD	From the abandonment of Britain by the Roman legions in 410AD to the Norman invasion of Britain.
Medieval	1067 - 1485AD	From the Norman invasion of Britain to the coronation of Henry VII and the start of the Tudor dynasty.
Post-medieval	1486 - 1900AD	From the start of the Tudor dynasty to the death of Queen Victoria.
Modern	1901AD - present	From the death of Queen Victoria to the present.

1. Introduction

1.1 Planning history

Natural Resources Wales is proposing to increase the height of a length of sea defence on the Gwent Levels, between Magor Pill and Collister Pill, in the vicinity of Chapel Farm, Monmouthshire. This project would involve raising the current height of the sea wall up by 0.6m, along a length of approximately 1.5km, with the possibility of excavating up to 1m.

The Glamorgan-Gwent Archaeological Trust, Projects Division (GGAT Projects) have undertaken an assessment of the effect on the archaeological resource of the proposed development. The assessment reviewed information held by the regional Historic Environment Record (HER) and the National Monuments Record (NMR), as well as cartographic and documentary sources. Aerial photographs were examined and a site visit conducted.

1.2 Specification and methodology for study

The assessment comprises a review of existing information about the archaeological resource of an area of approximately 9.6 km^2 situated in Magor and Undy parishes. The study area is centred on NGR ST 44397 85254 and is outlined in blue in Figure 1. The development area is situated within the Gwent Levels Historic Landscape (HLW(GT)2). The assessment conforms to the Institute for Archaeologists' *Standards in British Archaeology: Archaeological desk-based assessments* (1994, amended 1999, 2001 and 2008).

Information recorded on the regional Historic Environment Record (HER) and National Monuments Record (NMR) was assessed. Cartographic and documentary sources were studied, along with relevant published information. Current Listed Building data and information on Scheduled Ancient Monuments and registered landscapes was obtained from Cadw. Collections of aerial photographs held by the Central Register of Air Photography for Wales (CRAPW) were examined and additional information requested from the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW). A site visit was made on the 7th February 2013.

Detailed advice on archaeology in the planning process is contained in *Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology*. Works affecting an ancient monument and its setting are protected through implementation of the *Ancient Monument and Archaeological Areas Act 1979*. Detailed advice on Environmental Impact Assessment is contained within *Welsh Office Circular 11/99 Environmental Impact Assessment*, which forms part of the wider *Archaeology Planning Policy Wales (PPW)*. This document sets out the land use planning policies of the Welsh Assembly Government. *Planning Policy Wales* is supplemented by a series of TANs, and together with the Welsh Office Circulars comprise the *National Planning Policy*.

The *Ancient Monument and Archaeological Areas Act 1979* sets out a presumption in favour of preservation *in-situ* concerning sites and monuments of national importance (scheduled), and there exists in the current *Planning Policy Wales (Chapter 6)* a presumption in favour of preservation *in-situ* of all types of archaeological sites and monuments.

1.3 Assessment criteria

The archaeological sites within the study area are categorised in accordance with the only available criteria that are nationally agreed; these values are set out in the Department of Transport/Welsh Office/Scottish Office *Design Manual for Roads and Bridges* paragraph 3.4 Vol. 11 Section 3 Part 2 (Cultural Heritage).

- Category A: national importance
- Category B: regional importance
- Category C: local importance
- Category D: low importance
- To these an additional category has been added
- Category U: unknown

The assessment of the importance of individual sites is essentially a subjective exercise based upon the experience of the project team. The importance of certain sites will be implied by their status within the statutory framework. Scheduled Ancient Monuments will always be of national importance; Listed Buildings will be of at least regional importance. Values assigned to other sites are given both in relation to their individual importance and to their context within the wider landscape.

The **condition** of individual sites and the general overall condition of surviving remains has bearing on the value of the sites themselves and on the value that they impart within a wider landscape context. The condition of sites is recorded following the system used by the GGAT HER, using the following criteria:

- Intact: the site is intact
- Near intact: the site is nearly intact
- Damaged: the site has been moderately damaged
- Near destroyed: the site has nearly been destroyed
- Destroyed: the site has been destroyed
- Restored: the site has been restored
- Moved: the site has been moved (usually finds)
- Not known: the condition of the site is not known

For the purposes of desk-based assessments, **rarity** is assessed at regional level only. The following criteria are used:

- High: very few sites of this type are known
- Medium: the site is not unusual, but cannot be considered common
- Low: the site is quite common

Group association is where a connection between sites within the landscape can be demonstrated. These will usually be of the same period, but may include groups where the presence of an earlier site or sites has led to the formation of a later complex, or where an

earlier site or sites can be shown to have acquired importance as part of a later complex. The criteria are as follows:

- High: the site forms part of an interconnected complex occupying a clearly definable landscape where little or no fragmentation has occurred
- Medium: the site is part of an interconnected complex, which is either limited in scope or badly fragmented
- Low: there are few or no other sites, which are associated

Historical association is where there is a link between the site and known historical or cultural persons or events. Prehistoric sites, which are by definition before historical evidence, cannot have any contemporary historical association, but they may acquire later associations. For the Roman and Early-medieval periods, where survival of historical evidence is poor and patchy, any contemporary documentation at all will be important. Two classifications are given for historical association, one reflecting the certainty of the identification, and the other its importance. Only sites with certain or possible association can be assessed for importance, and historical association can only increase the importance of a site; the absence of it will never decrease its importance.

Historical association- identification

- Certain
- Possible
- Unknown

Historical association- importance

- High
- Medium
- Low

The assignment of values to identified interests requires consideration of the reliability and accuracy of the source data, ranging from fully-recorded features seen in open excavation to antiquarian comments on finds of note from a poorly-defined location. The **confidence** with which the values have been assigned is noted, using the following criteria:

- High: existing information is reliable and detailed
- Medium: existing information is apparently reliable but limited in detail
- Low: existing information is too limited to allow its reliability to be assessed

The **effect** of the proposal on the archaeological resource has been assessed using the following criteria:

- Severe: total loss
- Major: significant loss, likely to result in a reduction of value of the surviving site
- Minor: loss unlikely to result in a reduction of value of the surviving site
- None: no identifiable effect
- Beneficial: development will protect, preserve or enhance the site better than if the development did not occur

2. Background

2.1 Location

The proposed development (centred on ST 44397 85254) is located on the coast of the Severn Estuary, 1.8km south of the village of Undy in Monmouthshire and 18.5km east of Newport. The proposed area straddles the two parishes of Magor and Undy, with Magor Pill forming the boundary between the two.

The Gwent Levels are a landscape of extraordinarily diverse environmental and archaeological potential. Although they are an important wetland resource in their own right, archaeologically the area contains a variety of landscapes of different dates, and nowhere else is it possible to make the period distinctions so easily. Having been reclaimed from the sea at various times during the historic period, the present land surface is a supreme example of a 'hand-crafted' landscape, artificially created and entirely man-made, preserving clear evidence of distinctive patterns of settlement, enclosure and drainage systems. However, because of recurrent phases of inundation and alluviation, there is also a proven, and quite possibly vast, potential for extensive, buried, waterlogged, archaeological and environmental deposits belonging to the earlier landscapes, which extend beyond the seawalls and banks into the intertidal mudflats. The Levels are therefore a uniquely rich archaeological and historical resource in Wales, and certainly of international importance and significance (Cadw/CCW/ICOMOS 1998). Wetland sites such as those on the Levels provide ideal conditions which favour the preservation of material culture, such as organic materials like wood, textiles, hides and basketry as well as pollen, insect, plant and micro-organism remains (Rippon 1996).

2.2 Topography

The proposed development area is located on the coast, 1.8km south of the village of Undy in Monmouthshire and falls within the two parishes of Magor and Undy. The majority of the land is flat and low lying, comprising numerous regular and irregular fields defined by hedgerow boundaries, with an earth and occasional stone and concrete sea wall separating the inland area from the saltmarsh and foreshore. As the land behind the sea wall is lower than the highest tides, it is poorly drained and consequently a large number of drainage channels, known as reens, traverse the area; many of the fields are traversed by parallel drainage channels known as grips. Some of these drainage features are historic and have helped to define the communities *e.g.* Magor Pill forms the parish boundary between Magor and Undy. Occupation consists of a series of farmsteads nearer the coast with a denser concentration of settlement (the villages of Magor and Undy) on the dryer, rising ground to the north. One farmstead, Chapel Farm is located near the centre of the development area. The majority of fields appear to be used as pasture but the larger and more regular fields in the east of the study area, are arable.

2.3 Geology

The proposed development is located on the Caldicot Level, which has accumulated during the post-glacial period (Holocene) and is largely composed of estuarine alluvium deposited through sea-level rise. These soils are of the 'Wentlooge Series' (renamed 'Newchurch 2 Series' by the Soil Survey 1983) and generally consist of brown-grey, moderately friable, silty clays, becoming more grey in colour and heavier in texture with depth (Rippon 1996). The Wentlooge Formation can be divided into Upper, Middle (a peat layer) and Lower Formations. Artefacts and structures dating to the Bronze Age are associated with the Middle Formation (Bell and Newmann 1996). The Upper Formation was laid down from the Iron Age through to

the Post-medieval period. The published geological map and recent geological mapping covering the development area (GS Sheet 249, published 1969) show a geological layer of undifferentiated Triassic Rocks consisting of Keuper Marl (Mercia Mudstone), siltstone and sandstone of Triassic age. Alluvium clay, silt and sand also form part of the Caldicot Levels (Soil Mechanics 2009, BGS 2011a and BGS 2011b).

2.4 Walkover survey

A walkover survey was conducted on 7th February 2013. The area was photographed and some sites previously identified from a search of the regional Historic Environment Record (HER) and National Monuments Record (NMR) were visited in order to assess their current condition. It should be noted however that access was restricted to the top of the sea wall as the majority of the study area, including the foreshore, is in private ownership.

A sample of photographs taken illustrating the current condition of the archaeological interests and the site in general can be seen in Appendix II. No new sites were identified during the course of the walkover survey; however nine new sites (boundary stones PG001-9) were identified during map regression.

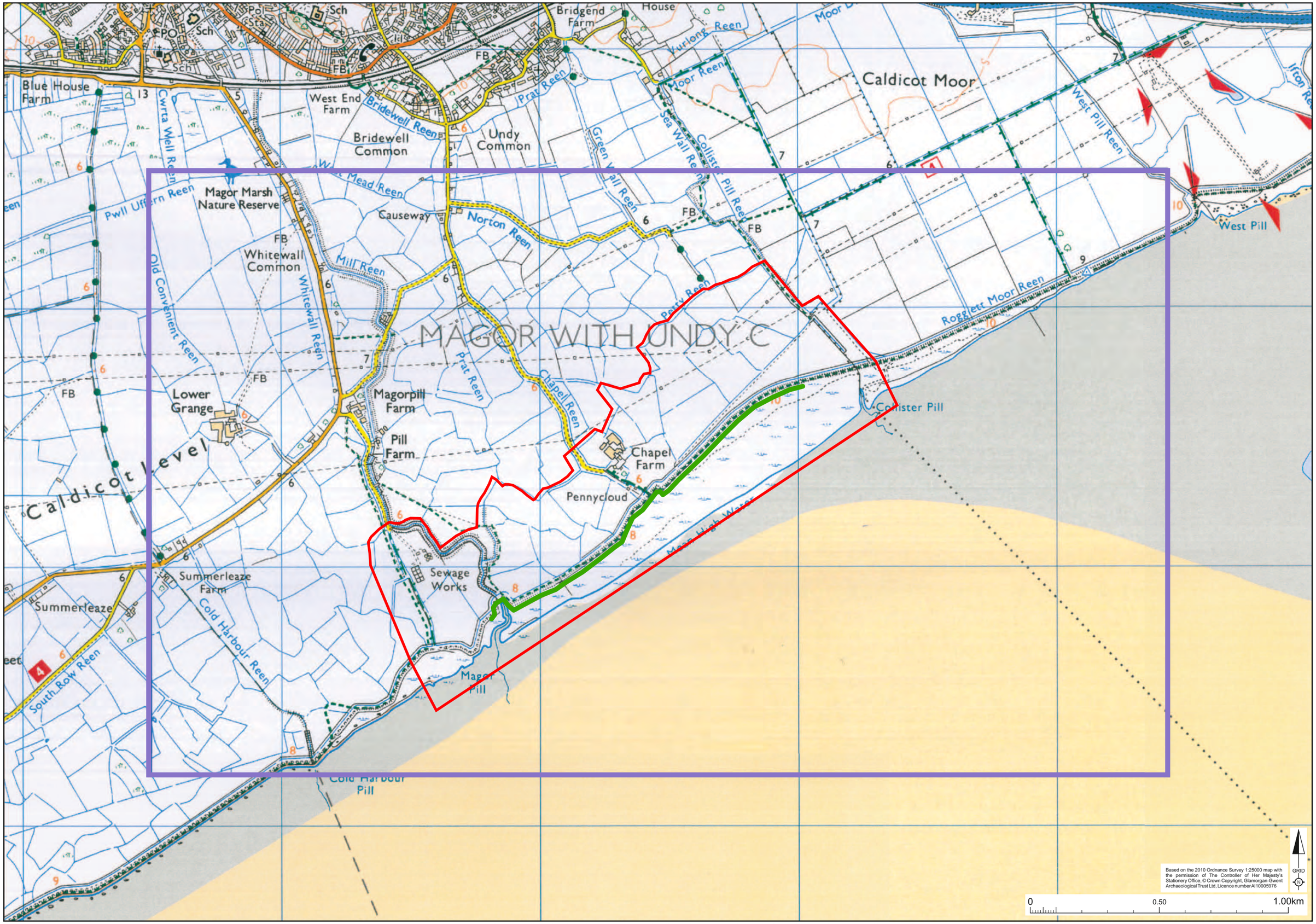

Figure 1. Study area (blue), development area (red) and proposed area of works on the sea wall (green)

2.5 General historical and archaeological background

Prehistoric (up to AD43)

The earliest evidence for human occupation in southeast Wales comprises finds of animal and human bone and artefacts from the Upper Palaeolithic, which began some 200,000 years ago during a warm phase of the Pleistocene. Three hand axes and two Levallois flakes of the Pleistocene were recovered from the gravels of the Severn at Sudbrook during the construction of the Second Severn crossing and allude to the presence of Neanderthals (Aldhouse-Green 2004 and Lewis 2007).

The last ice age to affect Wales is known as the Younger Dryas Stadial and occurred sometime between 11,000 BC to 10,000 BC (Walker 2004). As the ice retreated northwards, southeast Wales began a warm period called the Holocene where arctic tundra gave way to open scrub and then woodland. The warming climate and consequent retreating ice caps meant a sea level rise during the Mesolithic (10,000 BC to 4000 BC) and the Severn Valley, a mixture of open grassland and woodland up until this point, began to flood. By the late Mesolithic (5000 BC) period this flooding had reached similar sea levels to those of today, and along the coast at Goldcliff, Mesolithic forests can been found eroding out on the foreshore. This landscape was inhabited as footprints have been found at Uskmouth (04885g, 07592g and 09356g) and hunter gather settlements or seasonal occupation sites have been found along the foreshore. These sites are often contiguous with the submerged forests, and tend to yield a variety of flint tools, animal bones and gathered flora (seed and pollen residues) (Lewis 2007).

The Neolithic period (4000 BC to 2000 BC) is usually seen to represent a new and dynamic era in human history, very different from the one that prevailed for the last half a million years. The domestication of plants and animals represents a vast social upheaval in the way people interacted and understood the world around them. Several flint flakes of the Bronze Age (2000 BC to 700 BC) have been discovered within the present study area (07598g) and the Wentlooge and Caldicot Levels have produced an enormous quantity of intertidal material from the period including cattle hoofprints, roundhouses and post-settings, flint, bone, discreet pottery scatters, timber fish traps and temporary shelters. In the late Bronze Age, southeast Wales became the centre for a thriving local industry producing socketed axes, which were the standard tool of the period (Lewis 2007). To the west a Bronze Age occupation site, consisting of probable roundhouses and associated material culture, has been identified eroding out of the peat shelf at Rumney Great Wharf (02891s).

Settlement continued on the Levels in the Iron Age (700 BC to AD 43) with several square wicker-walled Iron Age houses on the foreshore at Goldcliff, and initial theories suggested that these were specialist buildings possibly relating to a cattle economy (Lewis 2007). However, another group of three wicker-wall square buildings was discovered in the alluvium at Magor suggesting that this type of unusual Iron Age building was more widespread that initially thought (Newman 2000).

Roman AD44 – 410

Monmouthshire was, by the 1st century AD, occupied by a tribe known to the Romans as the Silures (Howell 2009). The Roman advance into Wales met with fierce opposition from the Silures, who continued to harry Roman forces until military gains around the Usk enabled the Romans to establish a legionary fortress in the frontier zone on the east bank of the river c. AD 55 (Manning 2004). Legio II Augusta was transferred into the area from Gloucester and they constructed a new legionary fortress at Caerleon, some 12 km downstream of Usk. The major routes must have been supplemented by minor roads, although so far no details of this system are known. Riverine transport, especially on the Wye and Usk, was also very important in the

Roman period, particularly for the movement of heavy bulky material (*ibid*.). The initial Roman presence of southeast Wales was centred on the large legionary fortress at Caerleon located around 4.8km north of Newport. There is no evidence for a fort in Newport area, although it is likely that some military activity occurred in the area. Caerwent was built as a civilian political centre for the Silures in an attempt to implant Roman values within the local populace and the town remained of some significance for into the Early-medieval period (*ibid*.).

Two significant Roman roads are known in the Newport area along with a plethora of smaller metalled roads, such as those around Bulmore and Christchurch. The main road was the east-west route connecting Gloucester to Carmarthen, principally following the line of the present A48. A possible road has been identified running south from this road to Magor Pill (Rippon 1996). A road linking Caerleon to the site of the former fortress of Usk and then proceeding north to Abergavenny following the eastern bank of the River Usk was also built. A Roman boat and quay excavated at Barland's Farm (04703g) south of Llandavenny illustrates the type of vessels and local harbours used in the period (Lewis 2007).

The Levels were known to have been drained during the Roman period and their presence is attested by coins (eg. 00163g, 00230g and 00235g) (Boon 1980) and pottery found within an apparently deliberately drained and protected landscape, thought to have provided pasture for cavalry horses. Evaluation by Allen and Fulford (1986) found that a rectilinear drainage system that pre-dated the sea wall ran from the Wentlooge Level to the foreshore and that there were a series of ditches sealed by the 'Wentlooge palaeosol'. These ditches correspond with the suggestion of Roman occupation, reflected in the banks, gullies, ditches, Palaeochannels and agricultural features. Subsequent excavation in 1992 (Fulford *et al* 1994) considered the Wentlooge palaeosol, seen on the foreshore, corresponded to the present ground surface landward of the sea wall and that this surface represented a relict Romano-British ground surface. An alternative view of the foreshore is that the early ditch system may be a local drainage system, associated with farmstead-type occupation and that the Wentlooge palaeosol and the later ditches (aligned on the reens behind the sea wall) are in fact of early Post-medieval date (Locock 1998). Marvell (Nayling and McGrail 2004) presents a convincing argument for a probable buried Roman landscape landward of the sea wall and thus a later medieval or Post-medieval date is postulated for the majority of the extant landward ditches. Whether the Roman effort to drain and manage the landscape extended eastwards to the current study area is unclear. The number of Roman potsherds and the presence of the Barlands Farm boat however, strongly suggest that the Caldicot Levels were subject to a similar regime.

Early-medieval (411 to 1066)

Tradition states that the first settlement in the Newport area was founded by St. Gwynllwg, who 'was led by a vision in the sixth century to the top of Stow Hill, which dominates the site of the borough of Newport geographically, and there he established his residence and place of prayer and meditation' (Griffiths 1978). During this time, the Usk formed the eastern border of the kingdom of Glywysing (later to be renamed Morgannwg), which stretched as far west as the River Towy. This kingdom was sub-divided into seven cantrefs (units of local government) the eastern-most, being known as Gwynllwg. The sanctuary founded by St Gwynllwg eventually developed into the medieval parish church of St. Woolos (00166g).

The later medieval *Vitae Cadoci* (Life of St Cadoc) refers to a settlement of merchants at the mouth of the Usk during the 11th century AD although there are doubts about the authenticity of this document. However, the most likely area for such a settlement is the land between the Rivers Usk and Ebbw called the Level of Mendlegief, a Norse place name, and the site of the discovery of part of a wooden boat, which has been dated to the mid-10th century.

It is assumed that the major elements of the Roman road system continued in use during this period. Remains of settlement continuing into the late 6th early 7th century in Caerleon have been found, and evidence for Christian activity in this period is more visible with a number of churches bearing dedications to Celtic saints, indicating early foundation (although some of these dedications reflect 19th century romantic additions). Other early churches can be identified by their circular or oval churchyards (Evans 2004). There is a lack, however, of early Christian monuments in the area. It is thought that the Levels were inundated by the sea or at best marshland at this time. This may be supported by the complete lack of churches dedicated to Celtic Saints on the Levels (Lewis 2007).

Medieval (1067 to 1485)

The Norman Conquest heralded a period of political and social upheaval in southeast Wales; the impact of the Normans after 1067 was probably greater in the Monmouthshire area than in any other part of Wales. By the early 12th century, the newly-conquered kingdom of Gwent had been divided into five lordships, Abergavenny, Caerleon, Monmouth, Netherwent (comprising Chepstow and Usk) later subdivided into smaller landholding units (Crouch 2003). The death of King Henry I in 1135 was followed by a period of civil strife in England and the March, between the supporters of King Stephen and the Empress Matilda, daughter of Henry I, who claimed the throne. The Welsh appear to have taken the opportunity presented by the dynastic conflict in England to recover their former lands in South Wales and the March. The political situation on the Welsh March remained extremely volatile throughout the 12th and 13th centuries, with a continuing threat of raids and more serious incursions by the Welsh, a well-known example being the attack on Abergavenny and Dingestow Castles by Hywel ap Iorwerth, lord of Caerleon, in 1182 (*Ibid.*).

The arrival of the Normans rapidly altered the political divisions of Newport area and this led to changes in the settlement pattern. The main Roman east-west road was obviously still in use and it was along this route that the initial Norman attacks were made. Norman progress was initially rapid, William the Conqueror made a "pilgrimage" to St David's in AD 1081. How much military action took place on this journey is unknown, but the Gwent seaboard and Caerleon were in Norman hands by AD 1085. Morgannwg was probably also under Norman control by this date, given the presence of a mint in Newport (Lewis 2007).

The Norman invasion led to the establishment of their manorial system into the Newport area. Two areas do not appear to have had this system forced on them, these being the upland areas to the north and west of Newport and the eastern bank of the Usk surrounding Liswerry. New buildings, normally retaining their existing churchyards but often being re-dedicated to Latin Saints, replaced the existing Celtic churches. New churches were, however, built for the new settlements and these were always dedicated to Latin Saints. The Norman Lords gave a considerable amount of their newly conquered lands to the church. The only monastery to be built in the area was the Benedictine priory at Goldcliff. The land was donated by William de Chandos to the Monastery of Bec in France. They established the priory in AD 1113 as a subordinate house to Bec. It appears that de Chandos gave the priory a mixture of moorland and marsh on the Caldicot Level, presumably the Levels were partly free draining at this time. The monks then started a major reclamation scheme by excavating the major reens on the Level, the largest being Monks Ditch taking water from the Llanwern area to the sea. Their work appears to have been very successful and by AD 1271 it was the richest Benedictine priory in Wales. However, its status as a subservient priory to a French monastery was to change this position during the later medieval period due to the extended wars with France. A combination of wars with France and changes in sea level drastically affected the monastery. In AD 1295 there were

25 monks in the Priory; by 1297 this had fallen to fifteen due to great poverty. This poverty had partly been caused by renewed hostilities with France; being subservient to a French monastery the Priory was taken into the hands of the King, who appears to have extracted considerable revenue from its lands. However at the same time land appears to have been being lost to a rise in sea level. In 1324 it is recorded that the sea had submerged a large part of its lands, and it is assumed that the sea banks, which are still extant on the Levels, date from this period as attempts were made to stabilise the situation. It is possibly this inundation that was responsible for the loss of the harbour at Abergwaitha (00446g) from the record.

The Welsh Lords of Caerleon also presented a considerable amount of land to the church. Documentary records mention an abbey or priory of Caerleon; however, these references probably refer to the Cistercian monastery founded by at Llantarnam, which was inside the Lordship of Caerleon. Llantarnam possessed a grange (monastic estate) at Pwl-Pan, with most of its land on the Caldicot Level. Land on the Levels was also given to Glastonbury Abbey and a small priory subservient to Glastonbury was established at Malpas (Lewis 2007).

Post-medieval (1486 to 1900)

The dissolution of the Monasteries 1533-6 led to large areas being initially placed in the hands of the Crown and then made available to be sold. In AD 1536, Henry VIII combined the Lordships of Abergavenny, Caerleon, Chepstow, Monmouth, Newport and Usk together to form the new County of Monmouthshire, including Magor and Undy, with its county town at Monmouth. This administrative re-organisation led to the affairs being determined by the residential gentry rather than nobles living outside the area. These changes led to new families owning land in the area and slowly combining the small medieval manors into large estates. (Lewis 2007).

The towns of Newport and Caerleon continued in their roles as market centres and trade slowly began to expand especially in shipping; although they remained minor ports, chiefly used for the transhipment of goods across the Severn to and from the major port at Bristol. The majority of goods were transported in land by pack horse, although the River Usk was navigable as far as Newbridge on Usk. Both towns remained very small and in AD 1791, Newport only had a population of 750. The opening of the Monmouthshire Canal in 1798 saw the rapid expansion of Newport as a port. The Canal enabled heavy goods such as coal and iron to be moved easily, and at Newport to be loaded onto sea going vessels (Lewis 2007). The Levels however, remained largely un-touched by the industrialisation and expansion of South Wales.

2.6 General Historical and Archaeological Background of the Gwent Levels

The Gwent Levels have been designated an Outstanding Historic Landscape (HLW (Gt) 2), which represents the largest and most significant example in Wales of a ‘hand-crafted’ landscape. The Levels are entirely the work of humans, having been recurrently inundated and reclaimed from the sea from the Roman period onwards. The area has distinctive patterns of settlement, enclosure and drainage systems belonging to successive periods of use, and a proven and possibly vast potential for extensive, well-preserved, buried, waterlogged, archaeological and palaeoenvironmental deposits surviving from earlier landscapes (Cadw and ICOMOS 1998, Lewis 2007).

The Gwent Levels extend from Cardiff to Chepstow. They are divided into three parts by the Rivers Ebbw and Usk. The eastern area is known as the Caldicot Level, the area between the two rivers is the Level of Mendlegief, whilst the western area is the Wentlooge Level. Humans have exploited the Gwent Levels for at least 6000 years. The area has been at times covered by the sea, salt marsh and dry land depending on fluctuation in sea-level. Human exploitation has

therefore depended on the extant conditions. Continual clearance for both arable and pasture is indicated, possibly reflective of summer and spring pasture, abandoned in the winter. Networks of no fewer than twelve Iron Age brushwood trackways enabling the mud to be crossed were found at Goldcliff (Aldhouse-Green 2004). The present landscape represents human efforts to drain the saltmarshes and to hold back later raises in sea-level. The intricate pattern of large ditches (called reens) and the interconnecting smaller channels (called grips) are the result of massive human effort carried out since Roman times. The present sea wall, without which the sea would submerge the present landscape, is probably a late medieval feature, constructed to deal with a rise in the Sea-Level at that period. Recent work has shown that this historic landscape is rich not only in surviving earthworks and field patterns, but equally important in the buried remains in both the intertidal zone and inland of the sea wall. Over most of the Level, prehistoric and Roman landscapes are sealed and protected by later alluvium, which even modern archaeological methods have difficulty in locating by conventional methods due to the depth of the alluvium. This protective blanket of alluvium, and the resulting waterlogged conditions, has allowed the excellent preservation of archaeological deposits and rare organic material, of which the Roman boat from Barlands Farm, Magor is a prime example (Nayling and McGrail 2004). The Level combines both an extant relict surface landscape and a buried landscape of international importance (Lewis 2007).

In 1607, the worst flood recorded in the British Isles, speculated to be a tsunami, devastated the Bristol Channel and Severn Estuary, from North Devon, Somerset, Gloucestershire and along the South Wales coast from Monmouthshire to Carmarthenshire. Accounts of the flooding of Norfolk are commissioned by Edward White in 1607, noting that the flood destroyed 'many thousands of men, women and children, overthrowing and bearing downe whole townes and villages, and drowning infinite numbers of sheepe and other cattle'. 'Lamentable newes of Monmouthshire in Wales. Losse of many men, women and children, and the submersion of xxvi parishes in January last' is recorded in an account of the flood commissioned by William Welby, 1607 (Plate 1, Mason 1885). William Jones of Usk heralds the flood as 'Gods warning to his people of England' (Park 1809). Poems written by John Stradling in 1606 depict the Herculean labour required to complete the Aberthaw sea wall in five months, and in 1607 another of his poems describes how the sea wall was subsequently 'overcome and wholly torn apart' by the floods (Stradling 1607). There is no evidence detailing exactly how the two parishes of Magor and Undy were affected, but it is certain that they would have been devastated by this natural disaster; in an adjoining parish, the height the water rose to is marked on the tower of Redwick church, and stands nearly to the height of the door. Similarly, there is a plaque on the side of Goldcliff church marking the rise of the waters.

2.7 Specific historical and archaeological background

The information held regarding the archaeological resource within the study area is detailed and highlights the significance of this part of the Gwent Levels. The record is dominated by findspots from along the shoreline, which is to be expected given the location and nature of the area. The majority of information derives from last twenty years of the 20th century when extensive research was carried out on the Gwent Levels prior to designation as a significant historic landscape.

There is ample evidence of occupation and human activity along the foreshore between Cold Harbour Pill, Magor Pill and Collister Pill. Three circular houses dating to the Bronze Age have been identified at Chapeltump (03979g) with evidence that some form of occupation continued into the Iron Age, with the discovery of a structure consisting of a 10m diameter ring of wooden posts and an inner ring with a central post (02529g). A human femur discovered at

Chapeltump has been dated to approximately 1400 B.C. but has tentatively been suggested as having been brought to the Late Bronze Age/Early Iron Age site from an earlier burial, perhaps as a way of legitimising ancestral rights to exploit the area (Locock *et al.* 2000, 33-34, Wilkinson 2000 34).

Prehistoric activity has been recorded near Cold Harbour Pill in the form of pottery, animal bone and charcoal (02530g). Remains of several Bronze Age trackways made of brushwood and wooden stakes have been located within the development area, including the so called Upton Trackway (03980.0g) south of Magor Pill, a trackway just west of Cold Harbour Pill (04328g) and another fragmentary trackway located near Collister Pill (05772g). These trackways are thought to have been constructed to aid crossing the muddy parts of the foreshore, probably to provide access to fish traps. Evidence for the human utilisation of the environment comes from wooden fish traps located near Cold Harbour (08992g) and a RAMSAR designated Iron Age basket fish trap in Redwick (05754g). More ephemeral evidence for occupation has come from the discovery of footprints in prehistoric deposits located on the foreshore; these include the footprints of an adult male and a child dated to the Mesolithic (05758g), and the footprints of a dog or wolf located crossing a palaeochannel (05757g). Despite the relative abundance of evidence for occupation, it is believed that the Levels were occupied only seasonally, with most people migrating inland during the winter (Hamilton 2004, 107).

Numerous sherds of pottery have been discovered along the shoreline that suggests a Roman presence within the proposed development area. These appear to be focused east of Cold Harbour Pill (00445g) which has been suggested as the site of a settlement in the 2nd Century; Rippon believes that Magor Pill is the most likely site for the settlement and that the finds from Cold Harbour have arrived there, together with medieval finds, through natural depositional processes. Further east, a Roman coin hoard dating to the 4th Century was found on Caldicot Moor (00485g). Magor Pill is one of three sites on the Caldicot Level to be strongly associated with Roman occupation, the others being the mouth of the Usk and Goldcliff Point (Rippon 1996). Rippon suggests that the Magor site appears to be extensive and complex, with hundreds of sherds of pottery, leather and wooden items and a heavy cast bronze sheet being found in 1950 in the relatively recent saltmarsh (*ibid.).* However, no evidence for structures has been found. Behind the sea wall, sherds of Roman pottery were found in the vicinity of Magor Sewage works in the 1930s (04730g) and 1966 (03995g). Supporting evidence for a settlement at Magor Pill is provided by a possible Roman road running south from the Caerwent-Caerleon road to the Roman site at Magor Pill (*ibid*). Other Roman material has come from the intertidal zone at Chapel Farm (06155g).

The development area falls within the boundaries of the lordship of Caerwent and Caldicot (Crouch) Llebenydd to the west, Chepstow to the east and north, (Caerwent appears as an isolated area within the Chepstow lordship)

Undy appears to have been in control of the dynasty of Morgan ab Owain, who had captured parts of the area from the Normans in 1136 and remained within the Welsh dynasty of Caerleon until 1236, when a local knight, Sir William de St Maur, was co-opted to aid Earl Gilbert de Clare of Hertford, in an unsuccessful legal battle to oust Morgan ap Hywel, the current Welsh overlord of Llebenydd and Edlogan, from the manor of Undy (Crouch 2008). Welsh suzerainty existed up to at least 1248 when Morgan died childless and the manor was probably acquired by Maredudd ap Gruffudd (*Ibid*.).

Magor was an important demesne manor, worked for profit, in the lordship of Netherwent or Chepstow in the late 12th century. When William Marshall died in 1245, the manor of Magor

(with subsidiary units of Redwick, Pill and Porton) was retained by the Crown (Henry III). Actual boundaries between the manors are somewhat confused; as it appears they were divided and sub-divided by the Crown as a means of controlling inheritances (Courtney 2009).

In 1495, Magor, Undy and Redwick formed part of the Lordship of the Crown, with the newly crowned king Henry VII making his uncle, Jasper Tudor, Duke of Bedford and lord of Newport, Abergavenny, Caldicot and Magor (Griffiths *et al* 2008). By this time, more people of Welsh decent formed part of the landowning, office-holding and religious elites; these people were less likely to live in separate communities and the region around Magor and Undy, under the Crown, would probably have been a much more ordered place to live (*ibid*.) and has remained essentially unchanged, in historical terms, since the early Post-medieval period.

The possible Roman settlement at Magor Pill has been suggested as the site of the later Medieval harbour of Abergwaitha (08902g/00446g) which was extant in 1295 but subsequently abandoned or destroyed by a natural disaster in the early 14th century (Rippon 1996). Medieval pottery sherds have been located in and around Magor Pill (07977g, 07623g) and Cold Harbour (00445g). More tangible evidence within the study area of medieval occupation behind the sea wall is derived from a number of buildings, none of which are extant. Lower Grange and Moor Grange Chapel are the sites of a probable medieval manor complex (00456g/45143, 00457g, 08381g) associated with the parish of Redwick. The name 'grange' generally denotes association with monastic land and this complex is believed to be a subsidiary of Tintern Abbey (Evans 2003). This complex may be similar in nature to the one supposedly on the site of the extant Chapel Farm complex. There are three sites associated with Chapel Farm that have a medieval origin, these being a lost manor house (00459g), the eponymous chapel (00458g/309436) which is also now lost and a distinctive sub circular field boundary located west of Chapel Farm (05258g) and truncated to the south by the modern coastline. This enclosure has been described by Rippon as a medieval infield (1996). In south west Wales, sub-circular field enclosures are often believed to be associated with the sites of early churches and given its association with a chapel, the site is believed by some to be the site of Merthyr Geryn (GGAT HER) an early pre-Norman conquest Church although there is currently insufficient evidence to support this (Evans 1997, 2004, Roberts and Evans pers. con. 2013). Rippon believes that the enclosure is too large to be directly associated with an ecclesiastical site and that it is more likely to be a medieval agricultural infield.

Welsh medieval arable fields in Monmouthshire appear likely to have been small and grouped around isolated farmsteads and hamlets, probably with open pasture beyond (Courtney 2009). The Welsh medieval legal practice of gavelkind (the division of inherited land equally between sons) may well have contributed to the small size of arable holdings, creating a landscape that was divided and sub divided. The fields around Caldicot, Undy and Magor were the last in Monmouthshire to be enclosed by Act of Parliament in the mid-19th century, the large size of the communities and the lack of a coherent lordship combining to delay actual enclosure (*ibid*.). It is this pattern that can be seen in the Tithe maps and First Edition OS map. It is therefore possible that the two different field patterns observed between the west (small and distinctly irregular enclosures) and east (larger generally more regular enclosures) of the study area is a product of two different traditions and legal systems *i.e.* the English and the Welsh and that the late parliamentary enclosure of the eastern Anglicised part of the landscape has emphasised the differences.

Other medieval activity within the study area has been discovered in the form of a boat (the Magor Pill boat) (04777g) that was exposed by a storm in 1994, approximately 500m south of the present sea wall.

In the Post-medieval period, there is no evidence of the great flood of 1607 within the development area but it is likely that there is a horizon of alluvial material that marks this event. It may be possible that the flood was responsible for the disappearance of the manor and chapel complex at Chapel Farm; certainly Chapel Farm appears to develop as an agricultural complex in the Post-medieval period, although the Tithe map of Magor does not show the extensive range of buildings that are seen on the First Edition OS map of 1880 and it is therefore likely that this development is essentially 19th century in origin. There is little significant change in the field patterns but such as there is discussed in the map regression section below.

The most obvious local change to the development area came in the 1930s with the construction of a sewerage works on the site of the modern Brewery Sewerage plant. A coastal observation Pillbox was constructed within the proposed development area during the Second World War (04292g/270305); its location gives it an excellent view along the north and south of the foreshore.

The current sea wall within the west of the development area dates largely to the 1960's as evidenced by the concrete wave return wall and the fact that the sea wall partly overlays some of the foundation of the wartime Pillbox, but the line of the defence in the west almost certainly follows the course of a pre-existing sea defence. In the east of the development area, the line of the sea defences has moved south in the Post-medieval period to encompass the triangular field immediately west of Collister Pill and which appears to have been re-claimed in the 20th century.

Previous Investigations

Over most of the Gwent Levels, the Prehistoric and Roman deposits are sealed by post-Roman alluvium making identification of such features virtually impossible without excavation and therefore very vulnerable to loss (Rippon 1996). The majority of information concerning archaeological features and finds comes either through development work or as a result of erosional activity by the sea.

A survey of the Severn Levels was carried out in the 1980's by GGAT that highlighted the significance of the intertidal landscape within the Caldicot Levels (Locock 1998a). As part of the survey, rescue work was carried out on two, interconnected Bronze Age trackways at Cold Harbour Pill, immediately south west of the proposed development area (04328g) and the so called Upton Trackway south of Magor Pill (03980.0g). Evidence for wooden posts and stone gritted prehistoric pottery was recovered near Magor Pill (07978g) and has continued to be recovered from the same area over the years.

The wetland zone of the Gwent Levels lies below the elevation attained by the highest spring tides and as a result, permanent settlement would be impossible without protection from sea defences (Parry 1990). The antiquity of the sea defences on the levels has been debated for some time and whilst there is ample evidence for early land reclamation and defence, the current pattern of sea defences date to the late medieval period or later (*ibid*.).

A detailed analysis of the Gwent Levels was carried out by Stephen Rippon for the Gwent Levels Historic Landscape Survey, which defined types of landscape and settlement history. This study is the seminal work on the Gwent Levels and much of our knowledge of its past is distilled in the report. As mentioned previously, this study supported theories that although the Levels had been drained by the Romans followed by a period where the sea walls collapsed (though elements survive in the Wentlooge Level), the landscape is primarily a recent creation including medieval drainage and a sea wall constructed before AD 1113 (Rippon 1996).

A section of the peat shelf eroded from foreshore in front of Chapel Farm in the development area in the 1980's revealing a series of Late Bronze Age and Iron Age features including a trackway, a roundhouse and dense find scatters of pottery. The post-excavation report concluded that during these periods, the siting of the settlement near Chapel Farm resulted from good access to intertidal resources such as fish, clay and possibly salt, providing a significant additional economic contribution to the subsistence of the population whose main settlement was presumably further inland (Locock 2000).

The Magor Pill boat was a well preserved medieval sailing boat that was exposed by a storm in 1994. It measured 7m by 3m, being clinker built and held together with both iron nails and wooden treenails. The boat had been carrying a cargo of iron ore when she sank and whilst the location is outside the study area, its presence close to the possible harbour of Abergwaitha is relevant as more vessels could potentially be found in the vicinity.

The remains of a second vessel (Magor Pill II) were recorded in 1995 some 75m north of Magor Pill I (Nayling 1996). Although quite fragmentary, it was concluded that this oak built vessel was likely to date to the 16th or 17th centuries but was probably not in its original position, having been exposed and possibly deposited near the Pill as a result of natural processes.

A geophysical survey was carried out in 1999/2000 of the area immediately west and north of the Brewery Sewerage works, with the aim of identifying anomalies of archaeological significance (Barker and Mercer 2000). The survey discovered anomalies regarded as archaeologically significant in all the areas surveyed but the interpretation of these features was not possible from these results; a proposed programme of trenching to identify the anomalies does not appear to have taken place.

Archaeological watching briefs were carried out on groundworks at the Brewery Sewerage plant in 2004 (Tuck) and 2011 (Crawford). No archaeologically significant finds or features were observed during either watching brief, with most of the ground being made up since the initial construction in the area in the 1930s.

2.8 Review of Documentary, Cartographic and Aerial Resources:

Documentary

A number of documents held by the Gwent Archives were examined, none of which contained additional information. They did however highlight the fact that Magor and Undy were profitable estates and were used un-ashamedly as Royal patronage for several hundred years.

Cartographic

The earliest map of the study area is one of the 1770s relating to the estate of Capel Hanbury showing land owned by the estate in the Undy area (D111/1). The map is in very poor condition and it is not possible to determine details with any clarity but it does show a stretch of coastline that corresponds to Cold Harbour Pill and possibly Magor Pill, though neither are named on the map. No details of field boundaries are visible for the development area.

The first coherent maps of the study and development areas are the Tithe maps of the Parishes of Magor and Undy (Figure 3), dating to 1847 and 1842 respectively. The map of Magor shows a series of irregular fields and a section of the coastal foreshore to the south, with the reen and mouth of Magor Pill forming the boundary between Magor and Undy. There are no buildings within or near the development area but the map does show the course of the sea wall to the west of Magor Pill; this wall turns north and follows the line of the Pill as it moves inland but the Undy map does not show the defences at all so the original course can only be postulated.

The apportionment for the map of Undy hints at the highly fragmentary nature of land ownership, where fields belonging to the same person would appear to be separated by fields belonging to others. This may be a reflection of the historic confusion of lordship or the sporadic nature of land reclamation, with ownership going to individuals who could invest in drainage and management. The map also reveals that the area was used almost exclusively as pasture, despite the apparently obvious ease with which these fields could be put to arable use. This may be a reflection of concerns about flooding from the sea or perhaps more likely a reflection of economic priorities and traditional practice.

The bulk of the proposed development falls within the parish of Undy, which is depicted on a Tithe map of 1842. This map shows a series of irregular but broadly rectangular fields that appear to be smaller to the west and north of Chapel Farm. What would later become the farmstead is depicted as a rectangular building, oriented south west/north east, with a small outbuilding immediately to the north. It is described as a Chapel on the map but the apportionment describes a chapel, house, garden and orchard; it is unclear which of the structures is a chapel and which is domestic. Since church properties were exempt from taxation, they are generally absent from Tithe maps. It is therefore of note that the land around the 'Chapel' is included in the tax assessment and that therefore they almost certainly did not have a religious character. It may be significant however that a single field south of the Chapel (land parcel number 149) remained in the ownership of the Bishop of Llandaff, though it was taxed along with its secular owned neighbouring fields. Collister Pill is not depicted but does form the boundary between Undy and Caldicot parish to the east.

There is no appreciable change in the field boundaries between the Tithe maps and the First Edition OS map of 1882. Geographical detail can be seen that demonstrates the unusual meandering nature of the embanked reen and sea wall north of Magor Pill which would later form part of the Brewery Sewerage site; this would appear to result in a kind of embanked inlet, probably to aid control of tidal flow. A section of the sea wall south of Chapel Farm is shown in stone and this probably corresponds to the remnants of a stone sea defence seen near the site of the Second World War Pillbox. Chapel Farm itself is depicted as a series of buildings surrounded by orchards, with the main building sharing the alignment of the larger building on the Tithe map. The farm is named as Chapeltump Farm, suggesting that the chapel itself may only have survived as earthworks by this period.

The 1st edition OS map dating to 1882 (Figure 4), 2nd edition OS map dating to 1901, 3rd edition OS map dating to 1921 and 4th edition OS map dating to 1961 (Figure 5) depict relatively unchanged field boundaries. High water marks are clearly labelled and reens are very clearly marked throughout. Minor field boundary adjustments occur between the editions, such as the removal of a distinctive crenelated boundary in a field west of Chapel Farm, but otherwise the most significant changes occur with the construction of the Brewery Sewerage plant on the meandering embanked ditch of the lower reaches of Magor Pill and the modification and expansion of Chapel Farm (shown on the First Edition as Chapel Tump Farm). A cottage, shown as Wharf Cottage and now known as Pennycloud was built just south of Chapel Farm after the Tithe survey of 1842. The modern name is probably an anglicised version of Pen y Clawdd, meaning 'head of the embankment' and almost certainly refers to the sea defences; it was modernised and extended in the 20th century but the boundaries remain unchanged.

The area west of Collister Pill reflects the in-filling of drainage features and gradual silting of the Pill itself, and the creation of a new, triangular field adjacent to the coast, as seen on the aerial photography sequence from 1946 to the present as outlined below.

Aerial Photography

Throughout the aerial photographs viewed, the proposed development area primarily consists of coastal land characterised by open pasture and arable fields defined by hedgerow boundaries. The earliest aerial photographs date to 1946. One source (CPE UK 1871) shows the field boundaries around Chapel farm as banks and ditches with a well-defined infield system. The crenelated field boundary west of the farm noted on the Tithe map has been removed but its course is still visible, and remains visible on most aerial photographs up to the present day. Grips and drainage features are visible in almost every field and west of Collister Pill; drainage ditch 05583g is open and apparently functional, although it is truncated by the shoreline to the west. A possible gout is visible near the mouth of Magor Pill. The Sewerage works is visible in the western portion of the development area.

By 1966 (OS 66 144), electricity pylons are visible in fields to the east of Chapel Farm for the first time. Drainage ditch 05583g has now been buried, with the triangular field now becoming part of the wider farm landscape. Chapel Farm is essentially unchanged from the 1940s photographs. A subsequent source (OS 66 145) also from 1966 shows evidence of possible platforms in the field immediately east of Chapel Farm; these may be earthworks 05310g. The same source shows a possible gout at Collister Pill.

A source from 1971 (7144 BKS) shows an expanded Magor Brewery Sewerage site, with new holding tanks having been constructed to the east, inside one of the meandering loops of the reen bank and ditch. Collister Pill has silted up significantly, with the possible gout no longer visible. Some of the fields east of Chapel Farm appear a little more regular and larger, with some boundaries having been altered but not significantly. There is no change in the fields north and west of Magor Pill. Another 1971 source (39 RAF 3764) again shows the possible platforms east of Chapel Farm but also shows some evidence of grips or similar drainage features in the foreshore south of the sea defences in the area of Collister Pill. This adds additional support from field boundary evidence for significant erosion of the coastline to have occurred in this area. There is no major change to field boundaries from this date and it is probable that the landscape seen today crystallised into its current form in the 1970s.

By 1984 (MAFF 1984) there has been further expansion to the east of the Brewery Sewerage plant and Chapel Farm has expanded with the addition of a large barn like building. There is no real change visible in any of the later photographs although Chapel Farm itself appears to go through a period of re-building/re-ordering of outbuildings between the early and late 1990s.

3. Archaeological Interests

There are 97 sites of known archaeological interest identified within the study area (see Table 1 and Figure 2). The study area contained one Scheduled Ancient Monument (MM226) and one site designated under the Convention on Wetlands of International Importance (RAMSAR).

Further information relating to these interests can be found in the gazetteer in Appendix V.

Five digit numbers with a letter suffix (g) are Primary Record Numbers (PRNs) recorded in the regional HER. Three to six figure numbers without a letter suffix are National Primary Record Numbers (NPRNs) of the NMR, as supplied to the HER under the ENDEX agreement. .

Table 1: Identified archaeological interests

PRN	Site Name	NGR	Period	Type	Status
00445g	Roman and medieval findspot Cold Harbour Pill	ST43208428	Roman	Findspot	None
00446g	Abergwaitha	ST43428445	Medieval	Port	None
00456g/45143	Lower grange	ST42838553	Post-medieval	House	None
00457g	More/moor/lower grange	ST42838553	Medieval	Grange	None
00458g/309436	Chapeltump	ST443854	Medieval	Chapel	None
00459g	Country house	ST44358537	Post-medieval	Country house	None
00460g	Watermill	ST43408520	Medieval	Water mill	None
00485g	Caldicot Moor	ST4480085671	Roman	Coin hoard	None
02529g	Chapeltump	ST446850	Iron Age	Round house	None
02530g	Prehistoric settlement Cold Harbour	ST43218420	Prehistoric	Settlement	None
03979g	Chapeltump 2	ST44708514	Bronze Age	Settlement	None
03980.0g	The Upton Trackway	ST44648504	Bronze Age	Trackway	None
03981g	Magor Pill	ST440846	Iron Age	Findspot	None
03995g	Roman pottery Magor Pill	ST435850	Roman	Findspot	None
04292g/270305	Portland grounds Pillbox	ST44408510	Modern	Pillbox	None
04319g	Magor Pill foreshore	ST438843	Roman	Findspot	None
04328.0g	Trackway	ST431841	Bronze Age	Trackway	None
04419g	Iron age pottery	ST438843	Iron Age	Findspot	None
04730g	Roman pottery	ST438850	Roman	Findspot	None
04777g	Magor Pill wreck	ST43828428	Medieval	Boat	None
04794g/MM226	Relict seawall alongside Collister Pill reen	ST4464886347	Medieval	Sea defences	SAM
05005g	Cold Harbour Pill trackway	ST4384	Prehistoric	Trackway	None
05258g	Chapeltump infield	ST442852	Medieval	Enclosure	None
05301g	Pottery	ST445850	Roman	Findspot	None
05307g	Animal remains	ST450850	Post-medieval	Findspot	None
05310g	Chapel farm earthworks	ST444853	Unknown	Earthwork	None
05583g	Drainage ditch	ST450858	Unknown	Drainage ditch	None
05754g	Fish trap	ST4290784037	Iron Age	Findspot	None
05755g	Footprint	ST4310884070	Mesolithic	Footprint	None
05756g	Roman pottery findspot	ST438846	Roman	Findspot	None
05757g	Animal footprints	ST4326184203	Prehistoric	Footprint	None
05758g	Footprint	ST4334684265	Mesolithic	Footprint	None

PRN	Site Name	NGR	Period	Type	Status
05759g	Pottery	ST4363884401	Medieval	Findspot	None
05760g	Iron age pottery	ST4398084657	Iron Age	Findspot	None
05761g	Hearth	ST4406284732	Prehistoric	Findspot	None
05762g	Trackway	ST4407884732	Prehistoric	Findspot	None
05764g	Fish trap	ST445845	Medieval	Findspot	None
05765g	Fish trap	ST449847	Medieval	Findspot	None
05766g	Pottery	ST445850	Iron Age	Findspot	None
05767g	Building	ST4456385109	Prehistoric	Findspot	None
05768g	Building	ST4457885189	Bronze Age	Findspot	None
05769g	Animal remains	ST4464685138	Prehistoric	Findspot	None
05770g/518375	Building	ST4526185501	Prehistoric	Findspot	None
05771g	Creel	ST457855	Prehistoric	Findspot	None
05772g	Trackway	ST4562085640	Prehistoric	Findspot	None
05773g	Pottery	ST4572985712	Prehistoric	Findspot	None
05774g	Animal remains	ST4580185735	Prehistoric	Findspot	None
05775g	Pottery	ST46008570	Prehistoric	Findspot	None
05776g	Trackway	ST4572985640	Prehistoric	Findspot	None
06155g	Bedwin sands pottery sherds	ST448845	Roman	Findspot	None
06165g	Roman pottery Magor Pill	ST43868463	Roman	Findspot	None
06278g	Roman pottery sherds	ST455855	Roman	Findspot	None
07561g	Enclosure	ST43518554	Medieval	Enclosure	None
07583g	Iron ore cargo	ST4382284270	Medieval	Cargo	None
07584g	Hearth	ST44608512	Bronze Age	Findspot	None
07595g	Hoofprints	ST4290784035	Prehistoric	Findspot	None
07596g	Animal remains	ST43108415	Prehistoric	Findspot	None
07597g	Pottery	ST4364584383	Roman	Findspot	None
07598g	Pottery	ST4457885189	Bronze Age	Findspot	None
07599g	Post alignment	ST4572985712	Prehistoric	Findspot	None
07602g	Post	ST44608512	Bronze Age	Findspot	None
07604g	Pottery	ST4369484361	Medieval	Findspot	None
07612g	Post	ST4291484038	Iron Age	Findspot	None
07613g	Creel	ST4364684397	Medieval	Findspot	None
07615g	Animal remains	ST44608512	Bronze Age	Findspot	None
07618g	Post	ST42928404	Iron Age	Findspot	None
07619g	Pottery	ST4367884426	Post-medieval	Findspot	None
07622g	Post	ST4292784045	Iron Age	Findspot	None
07623g	Pottery	ST4369484361	Medieval	Findspot	None
07625g	Post	ST4292784045	Iron Age	Findspot	None
07977g	Prehistoric and roman artefacts	ST438843	Multi-period	Findspot	None
07978g	Pottery	ST438843	Medieval	Findspot	None
08381g	Moor grange chapel	ST42838553	Medieval	Chapel	None
08887g	Cold Harbour Pill	ST4313484199	Natural	Pill	None
08888g	Cold Harbour reen	ST4310584326	Natural	Reen	None
08889g	Collister Pill	ST45258563	Natural	Pill	None
08902g	Magor Pill	ST4383784684	Natural	Pill	None
08991g	Cold Harbour Pill human footprint	ST431841	Bronze Age	Footprint	None
08992g	Cold harbour Pill fish-trap	ST43218420	Bronze Age	Findspot	None

PRN	Site Name	NGR	Period	Type	Status
506698	Caldicot Level sea wall	ST44638530	Post-medieval	Sea wall	None
275980	Relict Sea Wall alongside Collister Pill Reen	ST44618639	Post-medieval/modern	Sea defences	None
1003	Collister Pill Wreck	ST45588530	Post-medieval	Wreck	None
10687	Undy Methodist Church	ST4386	Post-medieval	Chapel	None
20304	Magorpill Farm	ST43268563	Post-medieval?	Farmhouse	None
440	Magor Pill Wreck I	ST43818427	Medieval	Wreck	None
415822	Magorpill, moated site.	ST43348583	Medieval/Post-medieval	Moated site.	None
518374	Early settlement site, Collister Pill	ST4578285538	Bronze Age	Settlement	None
518376	Early settlement site, Pratt Pill	ST4467585028	Bronze Age/Iron Age	Roundhouse	None
PG001	Boundary Stone	ST4401185274	Post-medieval	Boundary Stone	None
PG002	Boundary Stone	ST4402085285	Post-medieval	Boundary Stone	None
PG003	Boundary Stone	ST4422885045	Post-medieval	Boundary Stone	None
PG004	Boundary Stone	ST4416785000	Post-medieval	Boundary Stone	None
PG005	Boundary Stone	ST4496386085	Post-medieval	Boundary Stone	None
PG006	Boundary Stone	ST4499685875	Post-medieval	Boundary Stone	None
PG007	Boundary Stone	ST4401185274	Post-medieval	Boundary Stone	None
PG008	Boundary Stone	ST4382085152	Post-medieval	Boundary Stone	None
PG009	Boundary Stone	ST4501085968	Modern	Boundary Stone	None

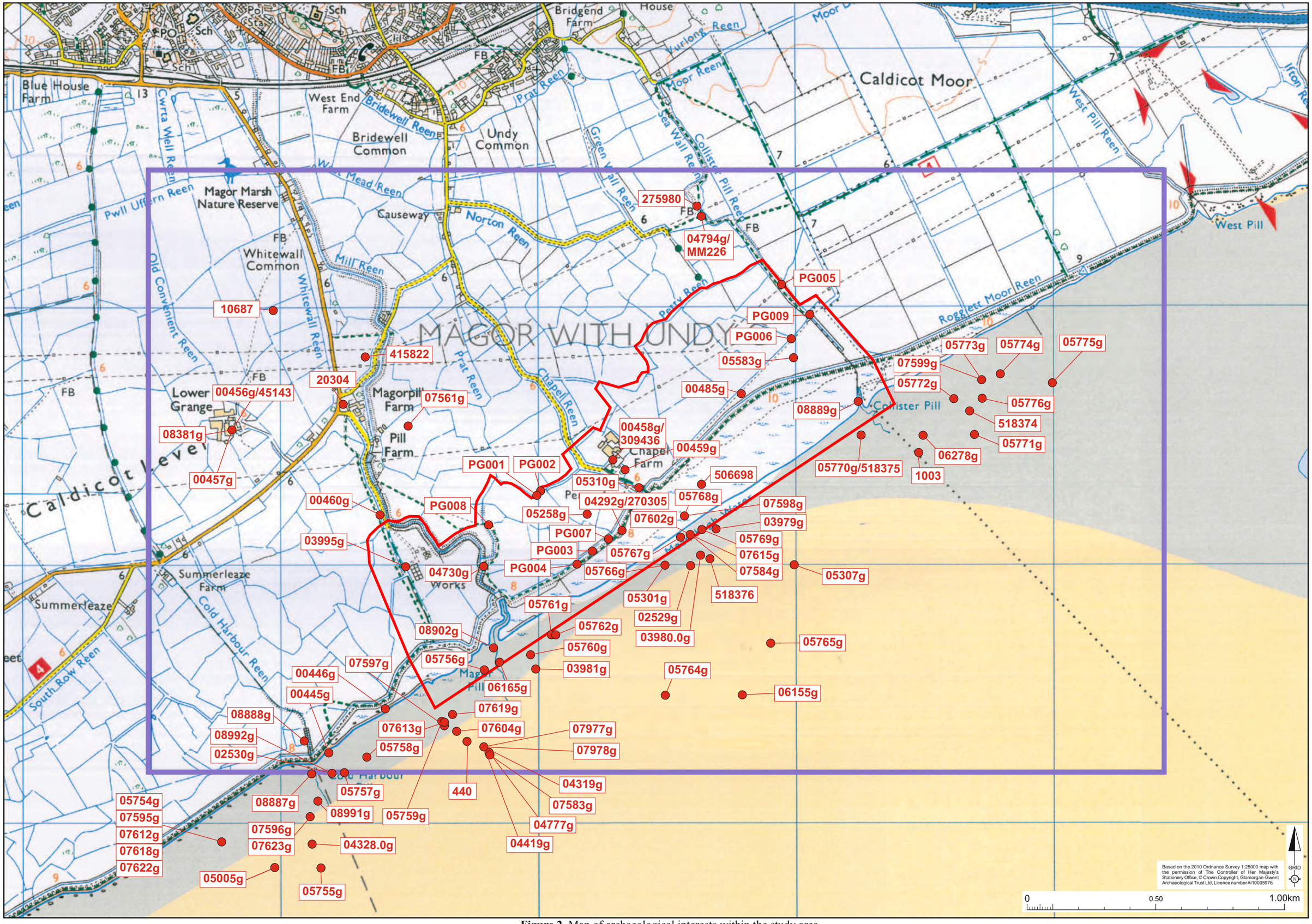

Figure 2. Map of archaeological interests within the study area.

4. Assessment

4.1 Effect of the development on archaeological sites

A total of 29 sites have been identified within the development area, of which nine sites will be potentially be affected by the development to some degree. Four sites have been assessed as being subject to a 'major' effect. These are the earthworks at Chapel Farm (05310g), the existing sea wall (506698) and both Collister Pill (08889g) and Magor Pill (08902g). The remaining five sites Chapeltump (00458g/309436), Chapeltump infield (05258g), the possible manor house (00459g) and the Second World War Pillbox (04292g/270305) and the drainage channel west of Collister Pill (05583g) have been assessed as being subject to a 'minor' effect.

Table 2: Effect of the development on archaeological interests

ID	Name	Period	Type	Status	Value	Condition	Rarity	Group association	Historical association	Confidence	Effect
05310g	Chapel Farm earthwork	Unknown	Earthwork	None	U	Unknown	Medium	Medium	Unknown	Medium	Major
08889g	Collister Pill	Natural	Pill	None	B	Intact	Medium	Medium	Unknown	High	Major
08902g	Magor Pill	Natural	Pill	None	B	Intact	Medium	Medium	Possible	High	Major
506698	Caldicot Level sea wall	Post-medieval	Sea wall	None	C	Intact	Low	High	Possible	High	Major
00458g/309436	Chapel	Medieval	Chapel	None	B	Unknown	Medium	Low	Unknown	High	Minor
00459g	Manor house	Post-medieval	Manor house	None	B	Destroyed	Low	Medium	Unknown	High	Minor
04292g/270305	Portland Grounds pillbox	Modern	Pillbox	None	B	Damaged	Medium	High	Unknown	High	Minor
05258g	Chapeltump infield	Medieval	Field	None	C	Intact	Low	High	Unknown	High	Minor
05583g	Drainage ditch	Unknown	Drainage ditch	None	D	Near destroyed	Low	High	Unknown	High	Minor

4.2 Justification of assessment

There are 29 known sites of archaeological interest within the development area, eleven of which are findspots. The proposed development will have no effect on the findspots though it should be noted that these artefacts date from the Prehistoric period up to the medieval and Post-medieval periods and are therefore indicative of what may be expected from the foreshore and the development area in general.

In the absence of more detailed construction plans, the assessment assumes that intrusive groundworks would take place in the vicinity of the development area.

The three medieval sites associated with Chapeltump (the lost manor (00459g), chapel (00458g/309436) and infield (05258g) are possibly part of the same complex. The chapel and manor house have been assessed as being subject to a minor effect as they are likely to be found beneath or close to the modern Chapel Farm complex and may therefore be unaffected by the proposed development; the infield, due to its location, has a greater chance of being disturbed, but this effect has also been assessed as 'minor' provided boundaries are maintained and respected. Similarly, the drainage ditch west of Collister Pill (05583g) is of unknown date but the arrangement of the current fields and its orientation point to a late medieval of early Post-medieval provenance. However, the ditch was open and visible on an aerial photograph of 1946 and there were no obvious associated features; the ditch has therefore been assessed as being subject to a 'minor' effect.

The Caldicot Level sea wall (506698) is listed on the NMR but is not on the Regional HER. The extant sea defences are believed to date to the 1960's although they almost certainly follow the line of pre-existing earlier defences. The proposed development has been assessed as having a 'major' effect on the extant sea wall; in that it would change the profile and raise the ground levels.

The Second World War Pillbox (04292g/270305) represents an element of an increasingly significant heritage asset. It is possible that the setting of the Pillbox could be affected by raising the height of the sea wall and it is possible that movement by plant or dumping of the spoil could affect the integrity of the structure, resulting in a 'minor' assessment of the effects of the development on the site.

The earthworks at Chapel Farm (05310g) are poorly understood at present, though it is possible they relate to the missing medieval structures detailed above. It is also possible however, that they relate to prehistoric or Roman features as suggested by finds from the foreshore. This site has therefore been assessed as subject to a potential 'major' effect from the proposed development. The remaining two sites, Collister Pill (08889g) and Magor Pill (08902g) have been assessed as subject to a 'major' effect. Whilst these are essentially natural watercourses, there is an unquestioned association between them and the historical exploitation of this particular part of the Severn Estuary since the prehistoric period. It is possible that virtually any significant intrusive groundwork in the vicinity of these two features will encounter archaeological remains of significance.

It should be noted that the majority of known archaeological sites identified within the proposed development area are clustered in and around the foreshore; the area behind the sea wall is relatively poorly understood and it is entirely possible that the repeated inundations and silting of the adjacent Levels conceal an unknown and possibly large quantity of exceptionally well preserved archaeological features of significance.

5. Mitigation

The Gwent Levels are a landscape of extraordinarily diverse environmental and archaeological potential. It is a supreme example of a 'hand-crafted' landscape, artificially created and entirely the work of man, preserving clear evidence of distinctive patterns of settlement, enclosure and drainage systems. However, because of recurrent phases of inundation and alluviation, there is also a proven, and quite possibly vast, potential for extensive, buried, waterlogged, archaeological and environmental deposits belonging to the earlier landscapes, which extend beyond the seawalls and banks into the intertidal mudflats. The Levels are therefore a uniquely rich archaeological and historical resource in Wales, and certainly of international importance and significance (Cadw/CCW/ICOMOS 1998). Wetland sites such as those on the Levels provide ideal conditions which favour the preservation of material cultures such as organic materials like wood, textiles, hides and basketry as well as pollen, insect, plant and micro-organism remains. Therefore, any future developments within the Gwent Levels have the potential to encounter environmental and archaeological deposits.

Intrusive groundworks in the vicinity of Chapel Farm are likely to disturb known archaeological sites (05310g, 00459g, and 00458g/309436). It is recommended that an archaeological watching brief is affected for any ground intrusion work, including foundation excavations, service provisions and landscaping work. The watching brief should consider the potential for disturbance of the archaeological resource and include contingencies for the provision of sufficient time and resources for the archaeological investigation to be undertaken and a report containing the results to be produced. Contingency plans should also be drawn up to allow for an appropriate response in the event of the discovery of significant archaeological remains during construction work. Provided the mitigation measures suggested are adhered to, the magnitude of effect of the development on the known archaeological resource can be reduced from 'major' to 'minor' or 'none'.

Intrusive groundworks carried out within the remainder of development area have the potential to disturb previously unknown and potentially significant archaeological remains; it is noted, however, that imported material is to be used to raise the level of the sea defences which will reduce the impact to the potential archaeological resource. In light of the significant archaeological potential of the development area, it is recommended that the watching brief is applied to the entire development area and any ground intrusive works undertaken therein.

The development area is located within a Registered Historic Landscape, the Gwent Levels (HLW (Gt) 2). Under normal circumstances an ASIDOHL2 would be required. However, as borrow pits are no longer part of the development, the archaeological advisor to the Local Planning Authority has determined that although the proposed works will cover a length of 1.5km, and involves raising the current height of the sea wall up by 0.6m, with the possibility of excavating up to 1m, the underlying character of the landscape will remain unchanged. As such it is the regional archaeological advisor's opinion that this will only have a local impact and therefore an ASIDOHL2 assessment is not required.

All archaeological work should be carried out to the standards laid down by the *Institute for Archaeologists*.

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Ordnance Survey 1:2500, 1961, Fourth Edition
Ordnance Survey OS OpenData © Crown copyright and database right 2011;
Soil Survey of England and Wales 1:250000, 1985
Tithe map for the Parish of Magor 1847
Tithe map for the Parish of Undy, 1842

APPENDIX I
Map regression

Figure 3. Extract from the Tithe maps of the Parishes of Magor and Undy (combined for this report). Development area shown in red.

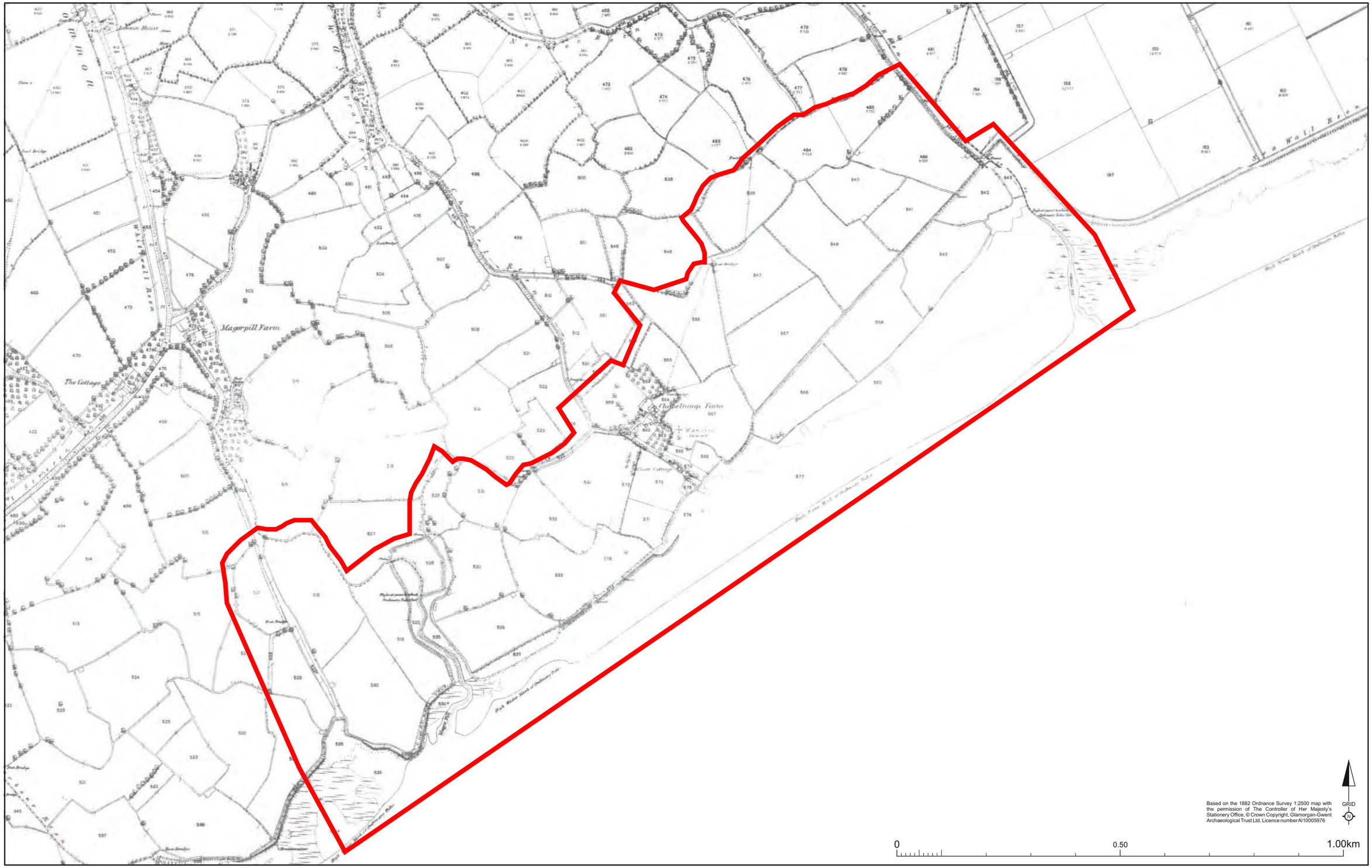

Figure 4. First Edition OS Map (1882). Development area shown in red

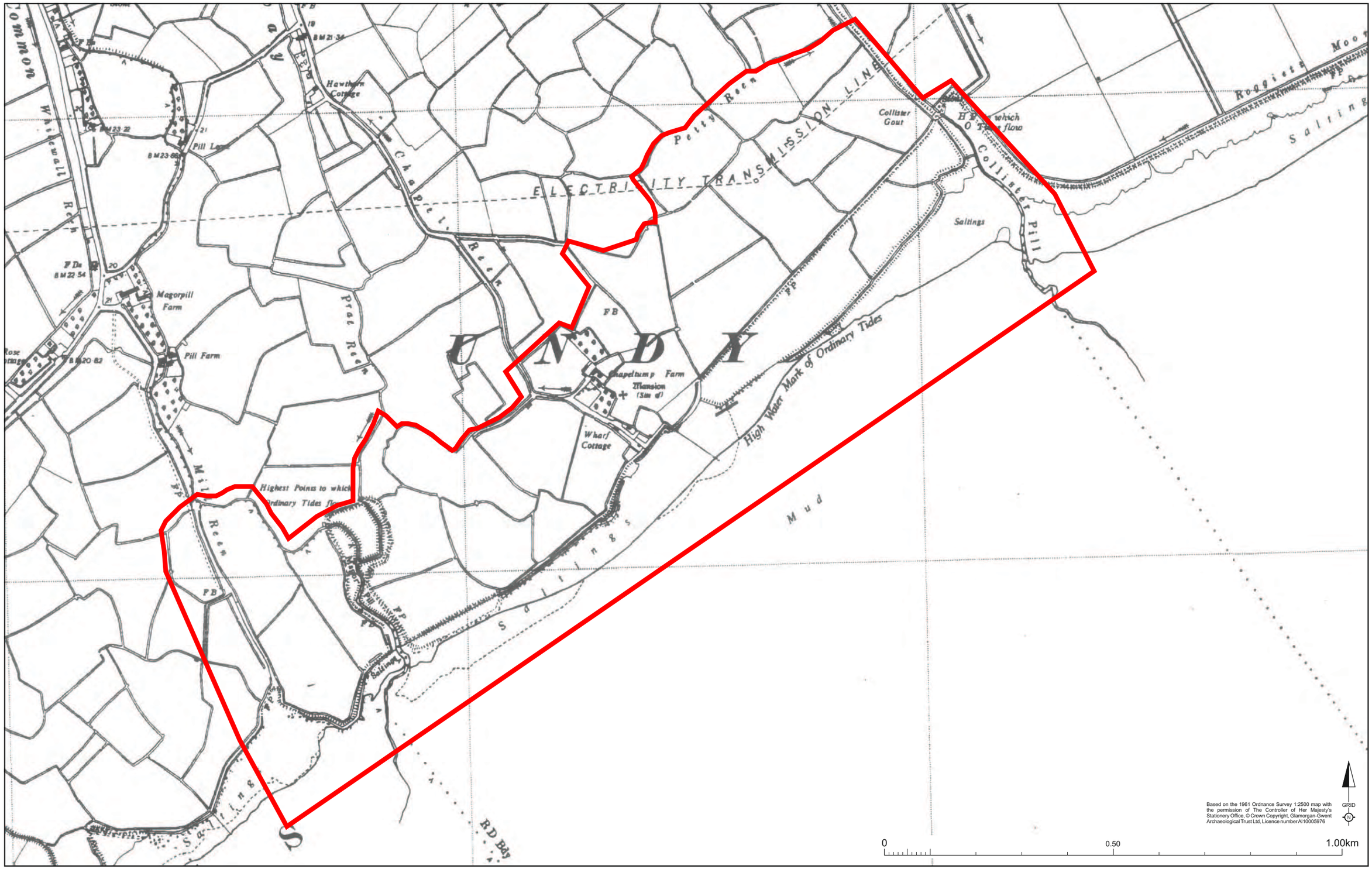

Figure 5. Fourth Edition OS Map (1961). Development area shown in red

Appendix II

Plates

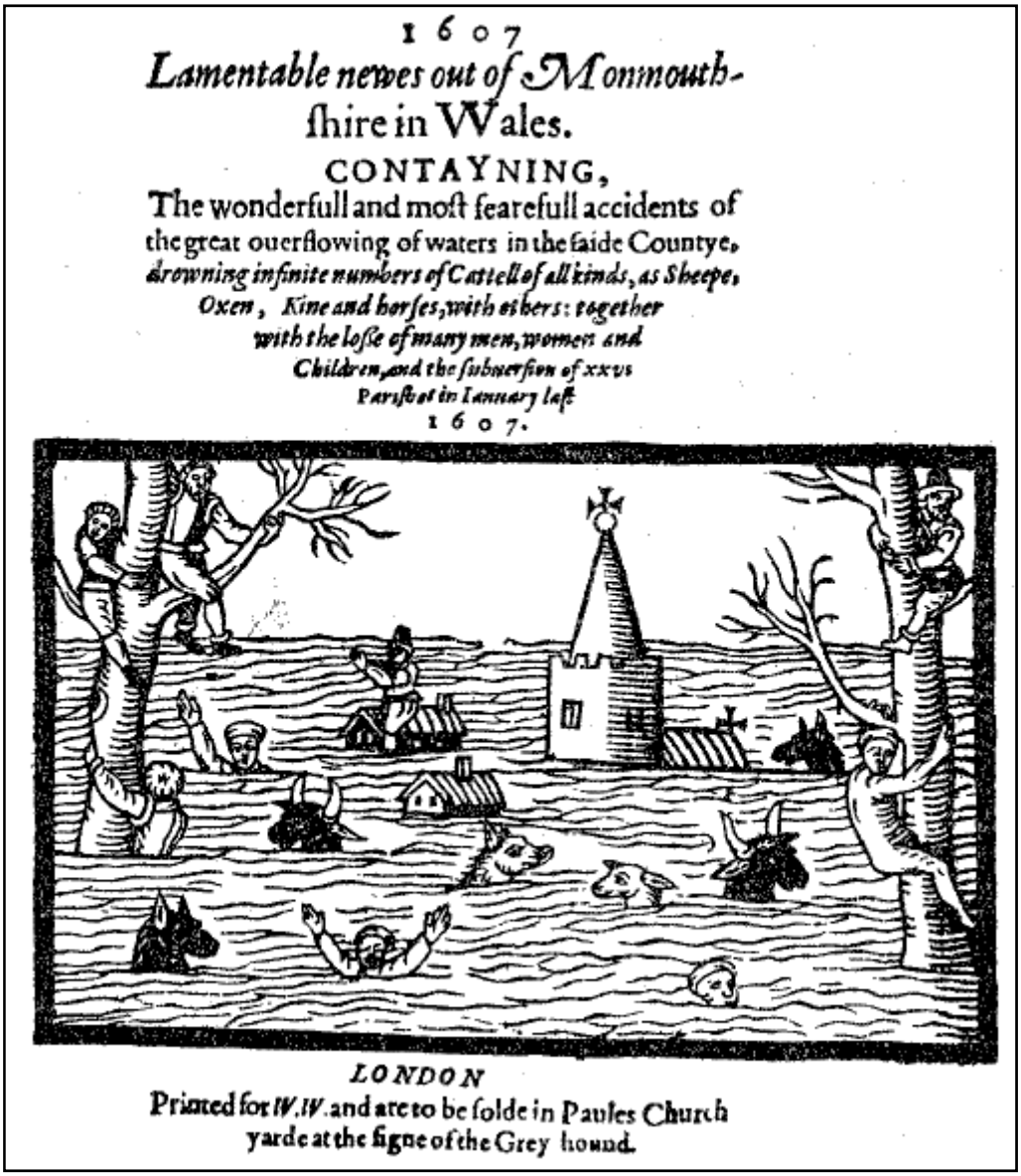

Plate 1: Image from the title Page of an 1884 reprint of pamphlet depicting the Great Flood of 1607 (Mason 1885)

Plate 2: Pillbox at foot of the seaward side of the sea wall (PRN 04292g/NPRN 270305)

Plate 3: Magor Pill (PRN 08902g) looking along the coast to the South West towards Cold Harbour

Plate 4: Remains of Collister Pill (08889g) looking north. This appears to have silted up since 1947.

Plate 5: Saltmarsh west of Magor Pill, looking towards Cold Harbour

Plate 6: Irregular field boundary typical of the fields

Appendix III

Aerial Photographs with Coverage of the Development Area

The following is a list of the aerial photographs with coverage of the development area held by the Central Registry of Air Photography for Wales.

Ref	Sortie	Date	Scale	Air Survey Org.	Type	Frames
200029		01/02/2000	1:10000	Getmapping	Colour	Available from Bluesky International
200401		01/01/2004		Geoinformation Group		Available from citiesrevealed.com
200601	COWI	06/06/2006	1:10000	COWI	Colour	Available from Bluesky International
1216	CPE UK 1871	04/12/46		RAF	B & W	
4651 525	CPE UK 1885	10/12/46	1:9800	RAF	B & W	3054-55
4901 1039	540 RAF 205	10/05/49	1:28000	RAF	B & W	5125-26
5134 5110	540 RAF 579	21/08/51	Oblique	RAF	B & W	110-112
6629	OS 66 145	03/07/66	1:7500	Ordnance Survey	B & W	98-99
6628	OS 66 144	03/07/66	1:7500	Ordnance Survey	B & W	23-24
7144	BKS	01/06/71	1:12000	BKS		157965-66
7156 2312	39 RAF 3764	07/09/71	Various	RAF	B & W	F43:90
7296	OS 72 353	23/08/72	1:25400	Ordnance Survey	B & W	71-72
8402	MAFF	10/06/84	1:12000	MAFF	B & W	209: 64-66
9139		01/08/91	1:10000	Geonex (NRSC)	Colour	5991: 109+115+165
9836	ADAS 747A,748	16/11/98	1:10000	ADAS	Colour	747A 180-181

Appendix IV

Apportionments relating to the Tithe Maps of Magor, 1842 and Undy 1855

The study area encompasses a portion of the Parishes of Redwick, Magor and Undy, all of which possess an extensive list of tithe apportionments. For the purpose of the study, the tithe apportionments pertaining to the development area are listed. For further information regarding the remaining Apportionments, please contact the Gwent Record Office.

Table 3: Tithe Apportionment for the Parish of Magor

Parcel number	Land owner	Occupier	Name of Plot	Cultivation and Land Use
175	William Edwards	William Phillips		Arable
175a	William Edwards	William Phillips		Pasture
177	William Cullimore	John Hodges		Pasture
178	William Cullimore	Sarah Jones		Meadow
179	William Phillips	William Edwards		Meadow
180	William Phillips	William Edwards		Meadow
181	William Phillips	William Edwards		Salt wharf

Table 4: Tithe Apportionment for the Parish of Undy

Parcel number	Land owner	Occupier	Name of Plot	Cultivation and Land Use	Quantity in Statute Measure			Amount of Rent Charge		
					A.	R.	P.	A	S	D
60	Richard Baker	In hand		Pasture	2	1	11	0	9	2
61	Richard Baker	In hand		Pasture	6	2	37	1	6	7
62	Richard Baker	In hand		Pasture	3	0	19	0	12	4
62a	Richard Baker	In hand		Pasture	2	3	24	0	11	6
63	Richard Baker	In hand		Pasture	1	1	39	0	4	7

Parcel number	Land owner	Occupier	Name of Plot	Cultivation and Land Use	Quantity in Statute Measure			Amount of Rent Charge		
64	Richard Baker	In hand		Pasture	2	0	13	0	0	9
65	Colthurst Bateman	Leonard James		Pasture	1	3	36	0	4	11
66	Colthurst Bateman	Leonard James		Pasture	3	1	28	0	8	6
67	David Carruthers	Lawrence Thomas		Pasture	0	1	5	0	1	0
68	Colthurst Bateman	Leonard James		Pasture	3	4	28	0	19	6
69	Charles Morgan, Baronet	Richard Baker		Arable	1	0	22	0	0	4
70	Charles Morgan, Baronet	Richard Baker		Pasture	6	2	32	1	6	6
70a	Charles Morgan, Baronet	Richard Baker		Road	0	1	10			
134	James Proctor	Thomas Lawrence		Pasture	6	2	32	1	6	6
136	David Carruthers	Thomas Lawrence		Pasture	2	3	37	0	11	10
137	Duke of Beaufort	John Hodges		Pasture	1	2	30	0	6	8
138	Charles Morgan, baronet	Samuel Musgrove		Pasture	1	1	13	0	4	1
141	James Proctor	Henry Phillips		Pasture	1	1	5	0	5	1
142				Road	0	0	34			
144	Anthony Gardner	William Leonard		Chapel, house, garden and orchard	0	3	30	0	7	0
145	James Proctor	Henry Phillips		Pasture	0	2	6	0	2	2
146	David Carruthers	James Willy		Pasture	6	2	0	1	5	8

Parcel number	Land owner	Occupier	Name of Plot	Cultivation and Land Use	Quantity in Statute Measure			Amount of Rent Charge		
147	James Proctor	Henry Phillips		Pasture	0	0	38	0	0	11
148	James Proctor	Henry Phillips		Pasture	0	1	16	0	1	4
149	Bishop of llandaff	Thomas Pride		Pasture	0	3	9	0	0	6
150	Rev William Jones		Common Wharf	Pasture	29	2	20			
151	David Carruthers	James Willy		Pasture	5	2	34	0	19	0
152	David Carruthers	James Willy		Pasture	7	0	31	1	4	0
153	Duke of Beaufort	Thomas Pride		Pasture	5	3	37	1	0	0
154	Ann and John Nicholl	Samuel Musgrove		Pasture	2	3	38	0	10	0
155	Duke of Beaufort	Thomas Pride		Pasture	6	1	29	1	5	5
156	Charles Morgan, baronet	Samuel Musgrove		Pasture	4	2	2	0	17	10
157	Duke of Beaufort	Thomas Pride		Pasture	7	3	31	1	11	5
158	David Carruthers	James Willy		Pasture	1	3	23	0	7	6
159	David Carruthers	James Willy		Pasture	4	1	23	0	17	4
159a	Duke of Beaufort	Thomas Pride		Pasture	5	0	21	1	0	3
160	David Carruthers	Thomas Lawrence		Pasture	7	1	16	1	9	0
161	David Carruthers	Thomas Lawrence		Pasture	6	3	12	1	7	0
162	Ann and John Nicholl	Samuel Musgrove		Pasture	4	2	28	0	18	6

Parcel number	Land owner	Occupier	Name of Plot	Cultivation and Land Use	Quantity in Statute Measure			Amount of Rent Charge		
163	David Carruthers	James Willy		Pasture	1	3	33	0	7	9
164	Duke of Beaufort	Thomas Pride		Pasture	3	3	24	0	15	04
164a	Duke of Beaufort	Thomas Pride		Pasture	3	3	26	0	15	5
164b	James Proctor	Thomas Pride		Pastire	1	0	0	0	4	0

Appendix V

Gazetteer of archaeological interests

ID *00445g* **NAME** *ROMAN AND MEDIEVAL FINDSPOT COLD HARBOUR PILL*

NGR *ST43208428* **TYPE** *Roman, Findspot,*

DESCRIPTION *Roman and medieval pottery, leather and bronze, found in 1950/51 on the mudflats about 100yds E of Cold Harbour Pill. The domestic character of the Roman finds is suggestive of a small Roman settlement-site, dating from the C2nd and later eroded by the encroachment of the sea.*

CONDITION *Moved*

STATUS *None*

ID 00446g **NAME** ABERGWAITHA

NGR *ST43428445* **TYPE** *Medieval, Port,*

DESCRIPTION *Ancient harbour of south Monmouthshire by the Welsh name Abergwaitha; S. of Magor & 4 miles W. of Sudbrook Pill. Called on the original OS map Cold Harbour Pill. Magor Pill is now believed to be the most likely site for the settlement.*

CONDITION *Not known*

STATUS *None recorded*

ID 00456g/45143 **NAME** LOWER GRANGE

NGR *ST42838553* **TYPE** *Post-medieval, House,*

DESCRIPTION *Rectangular 2-storey farmhouse, modern doors, windows & a slate roof. Inside are many thick, closely spaced ceiling beams though all are papered or boarded over.*

CONDITION *Restored*

STATUS *None recorded*

ID 00457g **NAME** MORE/MOOR/LOWER GRANGE

NGR *ST42838553* **TYPE** *Medieval, Grange,*

DESCRIPTION *Marked by Rees as More Grange (Pill) extant in the 14th Century. Grange of Tintern. Had 2 caracutes of arable and 50 acres of meadow in 1291 (Williams 1976, 113, 121; 2001, 187 fig 84, 230-1 fig 104; 311-2 no.179). Williams (2001, 230-1 fig 104) has mapped extent from tithe free land in parish of Magor. Lower Grange is basically an oval (subdivided) predating the rest of the field layout. Evans 2003: GGAT 73 Early-Medieval Ecclesiastical Sites Project database*

CONDITION *Not known*

STATUS *None recorded*

ID 00458g/309436 **NAME** CHAPEL TUMP

NGR *ST443854* **TYPE** *Medieval, Chapel,*

DESCRIPTION *At The Chapel Tump remains of buildings said to have once been a chapel. Considered by some to be the site of Merthyr Geryn but this is not tenable. The farmhouse and outbuildings of Chapel Tump Farm are modern and no remains were found of the chapel. Rees marks site as chapel extant in 14th century. Not in Brook 1988. Evans 2003: GGAT 73 Early-Medieval Ecclesiastical Sites Project database*

CONDITION *Not known*

STATUS *None recorded*

ID 00459g **NAME** SITE NAME NOT KNOWN

NGR *ST44358537* **TYPE** *Post-medieval, Country house,*

DESCRIPTION *The site of an ancient mansion - four chains SE of Chapeltump Farm. There are no visible remains of the building. The site is grass covered.*

CONDITION *Not known*

STATUS *None recorded*

ID 00460g **NAME** WATERMILL

NGR *ST43408520* **TYPE** *Medieval, Water mill,*

DESCRIPTION *A possible medieval water mill, although no remains are visible.*

CONDITION *Destroyed*

STATUS *None recorded*

ID 00485g **NAME** CALDICOT MOOR

NGR *ST4687, ST4480085671* **TYPE** *Roman, Coin hoard,*

DESCRIPTION *Roman coins found at Ifton: Coins include 1(3AE) Constantinopolis (330-5AD) 2(AR) Honorius (395-423), 1 (radiate) minim (c.300-400) 1(non-radiate) minim.*

CONDITION *Not known*

STATUS *None recorded*

ID 02529g **NAME** CHAPELTUMP

NGR *ST446850* **TYPE** *Iron Age, Round house (domestic),*

DESCRIPTION *Post and stake circle c10m in diameter, RC date of 960 + 70 bc (CAR-402), consistent with associated sherds. Evidence after 1986 excavation indicates a circular structure, with an outer ring of spaced stakes and planks, an inner ring of more subtantial posts and a central post. Finds include pot sherds similar to the Brean Down assemblage, potboilers, charcoal, a small fragment of chaff, and plant residues, indicating their use for food, building materials and fuel. Associated with NPRN 518376.*

CONDITION *Not known*

STATUS *None recorded*

ID 02530g **NAME** PREHISTORIC SETTLEMENT COLD HARBOUR

NGR *ST43218420* **TYPE** *Prehistoric, Settlement,*

DESCRIPTION *In same peat level as Chapeltump I (2529G) and II (3979G). Some small scale activity was attested by the discovery of 2 charcoal concentrations, several sharpened stakes, potsherds, potboilers and animal bone fragments. C14 date on charcoal of 950 + 60 bc (CAR 991).*

CONDITION *Not known*

STATUS *None recorded*

CROSS REFERENCES *related PRN 2529G, related PRN 3979G*

ID 03979g **NAME** CHAPELTUMP 2

NGR *ST44708514* **TYPE** *Bronze Age, Settlement,*

DESCRIPTION *Only structural features were located towards the centre of the site, consisting of an upright oak post with a flat cut end and a shallow depression, containing ash, potsherds, 4 worked bone points, and 2 wooden pegs. C14 dates from the site: charcoal sample 570 + 70 bc (CAR 899); human femur 1130 + 70 bc (CAR 956); oak post 880 + 70 bc (CAR 961).*

CONDITION *Not known*

STATUS *None recorded*

CROSS REFERENCES *related PRN 2529G*

ID 03980.0g **NAME** THE UPTON TRACKWAY

NGR *ST44648504* **TYPE** *Bronze Age, Trackway,*

DESCRIPTION *Trackway made from brushwood and wooden stakes.*

CONDITION *Near destroyed*

STATUS *None recorded*

ID 03981g **NAME** MAGOR PILL

NGR *ST440846* **TYPE** *Iron Age, Findspot,*

DESCRIPTION *Iron Age finds recorded though nature and quantity are unknown.*

CONDITION *Not known*

STATUS *None recorded*

ID 03995g **NAME** ROMAN POTTERY FINDSPOT MAGOR PILL FARM

NGR *ST435850* **TYPE** *Roman, findspot,*

DESCRIPTION *Greyware discovered during excavation of the sewage treatment works near Magor Pill Farm in 1967.*

CONDITION *Not known*

STATUS *None recorded*

CROSS REFERENCES *related PRN 3579g?*

ID 04292g*/270305* **NAME** PORTLAND GROUNDS

NGR *ST44408510* **TYPE** *Modern, Pill box,*

DESCRIPTION *Cantilever PB similar but smaller than a type built by FC construction. Described as a coastal observation post in modern OS mapping.*

CONDITION *Intact*

STATUS *None recorded*

ID 04319g **NAME** MAGOR PILL FORESHORE

NGR *ST438843* **TYPE** *Roman, Sherd,*

DESCRIPTION *Pottery and bones. includes Late Iron Age pottery sherds, Roman mortaria with potter's stamp (sherd) and Roman sherd grey ware and Roman samian sherd, Medieval cooking pot (sherds), Post Medieval pottery sherds (salt glazed etc.), antler and horn. 'Roman material appears to have been derived from stratified occupation buried beneath a recent saltmarsh' (Rippon 1996, 32).*

CONDITION *Moved*

STATUS *None recorded*

CROSS REFERENCES *related PRN 7977-8g, related PRN 7997-8g*

ID 04328.0g **NAME** TRACKWAY

NGR *ST431841* **TYPE** *Bronze Age, Trackway,*

DESCRIPTION *A number of mixed roundwood & brushwood concentrations were noted in intertidal exposures W.of Cold Harbour Pill.*

CONDITION *Not known*

STATUS *None recorded*

ID 04419g **NAME** IRON AGE POTTERY FINDSPOT MAGOR PILL

NGR *ST438843* **TYPE** *Iron Age, Findspot,*

DESCRIPTION *A small clay-filled channel flowing through the dark peat of the upper foreshore. Iron Age pottery has been recovered in the immediate area.*

CONDITION *Moved 1990*

STATUS *None recorded*

ID 04730g **NAME** ROMAN POTTERY FINDSPOT

NGR *ST438850* **TYPE** *Roman, findspot,*

DESCRIPTION *Parts of 7 pots were found with animal bones during construction of a sewerage plant. Other Roman finds in area.*

CONDITION *Not known*

STATUS *None recorded*

ID 04777g **NAME** MAGOR PILL WRECK

NGR *ST43828428* **TYPE** *Medieval, Boat,*
Medieval, Craft, RANK: 2

DESCRIPTION *A clinker-built, single-masted vessel of which the stem post, floor timbers and approximately 50 per cent of the keel and lower outer planking survive. Iron ore was found on the inside of the hull which was possibly a paying ballast as part of the cargo. Its original length measured around 14 metres and has been dated to the 13th century. Clinker built vessel, after mid C12th.*

CONDITION *Moved*

STATUS *None recorded*

ID 04794g/MM226 **NAME** RELICT SEAWALL ALONGSIDE COLLISTER PILL REEN

NGR *ST4464886347* **TYPE** *Medieval, Sea defences,*

DESCRIPTION *The site consists of the two best-preserved stretches (with 4793G) of the relict seawall running along the W side of Collister Pill Reen. This seawall was erected in the Middle Ages to enable the reclamation of the Gwent Levels in Undy parish. Earthen bank c11-12m wide at the back and 5m wide on the top.*

CONDITION *Intact*

STATUS *scheduled ancient monument MM226*

ID 05005g **NAME** COLD HARBOUR PILL TRACKWAY

NGR *ST4384* **TYPE** *Trackway*

DESCRIPTION *The trackway was exposed after a storm in 1987. The area exposed consisted of over 200 individual wood elements and is suggested to have been prehistoric in date, probably Bronze Age. The wood used varied in size, ranging from a diameter of 30mm to a max of 65mm. The longest stake was 650mm long. Monolith samples were taken but not anaylised, there was also no radio carbon dating.*

CONDITION

STATUS *None recorded*

ID 05258g **NAME** CHAPELTUMP INFIELD

NGR *ST442852* **TYPE** *Medieval, Enclosure,*

DESCRIPTION *Sub-circular field boundary truncated to south by the coast. Suggested as an infield associated with the farmstead at Chapel farm. Rippon, Gwent Levels, fig. 17*

.

CONDITION *Intact*

STATUS *None recorded*

ID 05301g **NAME** CHAPELTUMP

NGR *ST445850* **TYPE** *Roman, Sherd,*

DESCRIPTION *Roman pottery from foreshore: Newport Museum NPTMG:85.218*

CONDITION *Moved*

STATUS *None recorded*

ID 05307g **NAME** SITE NAME NOT KNOWN

NGR *ST450850* **TYPE** *Post-medieval, Animal remains,*

DESCRIPTION *Post-medieval horse bone: Newport Museum NPTMG:94.162*

CONDITION *Not known 1998-03-02 00:00:00*

STATUS *None recorded*

ID 05310g **NAME** CHAPEL FARM EARTHWORKS

NGR *ST444853* **TYPE** *Unknown, Earthwork,*

DESCRIPTION *Group of earthworks lying to east of Rippon's infield 5258g and to west of ridge-and-furrow. Allegedly near intact, nothing can now be seen from the sea wall although APs suggest they are present.*

CONDITION *Near intact*

STATUS *None recorded*

ID 05583g **NAME** SITE NAME NOT KNOWN

NGR *ST450858* **TYPE** *Unknown, Drainage ditch,*

DESCRIPTION *Infilled reen visible as cropmoark, west of Collister Pill. Probably relatively modern*

CONDITION *Near intact*

STATUS *None recorded*

ID 05754g **NAME** FINDSPOT AT REDWICK, NEWPORT

NGR *ST4290784037* **TYPE** *Iron Age, Fish trap,*

DESCRIPTION *woven basked-like possible fishtrap*

CONDITION *Not known*

STATUS *RAMSAR , SPA , SSSI*

ID 05755g **NAME** UNKNOWN

NGR *ST4310884070* **TYPE** *Mesolithic, Footprint,*

DESCRIPTION *Footprint found in buried layers on the foreshore*

CONDITION *Not known*

STATUS *None recorded*

ID 05756g **NAME** ROMAN POTTERY FINDSPOT

NGR *ST438846* **TYPE** *Roman, findspot,*

DESCRIPTION *Pottery collected when channel was excavated.(Newport Museum)*

CONDITION *Moved*

STATUS *None recorded*

ID 05757g **NAME** Animal footprints

NGR *ST4326184203* **TYPE** *Prehistoric, Footprint,*

DESCRIPTION *The footprints of a wolf or dog were noted crossing the palaeochannel.*

CONDITION *Not known*

STATUS *None recorded*

ID 05758g **NAME** UNKNOWN

NGR *ST4334684265* **TYPE** *Mesolithic, Footprint,*

DESCRIPTION *adult male and child footprints*

CONDITION

STATUS *None recorded*

ID 05759g **NAME** UNKNOWN

NGR *ST4363884401* **TYPE** *Medieval, Sherd,*

DESCRIPTION *Medieval pottery*

CONDITION *Not known*

STATUS *None recorded*

ID 05760g **NAME** Iron Age pottery findspot

NGR *ST4398084657* **TYPE** *Iron Age, Sherd,*

DESCRIPTION *25 sherds of Iron Age pottery which have been dated to the 1st century BC.*

CONDITION *Not known*

STATUS *None recorded*

ID 05761g **NAME** UNKNOWN

NGR *ST4406284732* **TYPE** *Prehistoric, Hearth,*

DESCRIPTION *No description available. Probably duplicate PRN number* 07584g

CONDITION *Not known*

STATUS *None recorded*

ID 05762g **NAME** UNKNOWN

NGR *ST4407884732* **TYPE** *Prehistoric, Trackway,*

DESCRIPTION *No description available but is likely to be similar to Upton Trackway*

CONDITION *Not known*

STATUS *None recorded*

ID 05764g **NAME** UNKNOWN

NGR *ST445845* **TYPE** *Medieval, Fish trap,*

DESCRIPTION *No description available.*

CONDITION *Not known*

STATUS *None recorded*

ID 05765g **NAME** UNKNOWN

NGR *ST449847* **TYPE** *Medieval, Fish trap,*

DESCRIPTION *No description available.*

CONDITION *Not known*

STATUS *None recorded*

ID 05766g **NAME** UNKNOWN

NGR *ST445850* **TYPE** *Iron Age, Sherd,*

DESCRIPTION *Associated with NPRN 518376*

CONDITION *Not known*

STATUS *None recorded*

ID 05767g **NAME** UNKNOWN

NGR *ST4456385109* **TYPE** *Prehistoric, Building,*

DESCRIPTION *truncated part of roundhouse*

CONDITION *Not known*

STATUS *None recorded*

ID 05768g **NAME** SITE NAME NOT KNOWN

NGR *ST4457885189* **TYPE** *Bronze Age, Building,*

DESCRIPTION *No description available. GGAT 72 Prehistoric Funerary and Ritual Sites Project 2003. Possibly relates to the Chapeltump group. Associated with NPRN 518376*

CONDITION *Not known*

STATUS *None recorded*

ID 05769g **NAME** UNKNOWN

NGR *ST4464685138* **TYPE** *Prehistoric, Animal remains,*

DESCRIPTION *Found within shallow depression in peat. Associated with NPRN 518376*

CONDITION *Not known*

STATUS *None recorded*

ID 05770g/518375 **NAME** UNKNOWN

NGR *ST4526185501* **TYPE** *Prehistoric, Building,*

DESCRIPTION *roundhouse. No description available, possibly relates to Chapeltump group. Associated with the various prehistoric finds (pottery, bones, trackways) is a feature interpreted as a roundhouse (see NPRN 518374).*

CONDITION *Not known*

STATUS *None recorded*

CROSS REFERENCE *NPRN 518374*

ID 05771g **NAME** UNKNOWN

NGR *ST457855* **TYPE** *Prehistoric, Creel,*

DESCRIPTION *NPRN 518374 given as a group number to include GGAT HER PRNs 05771-6g.*

CONDITION *Not known*

STATUS *None recorded*

ID 05772g **NAME** UNKNOWN

NGR *ST4562085640* **TYPE** *Prehistoric, Trackway,*

DESCRIPTION *No description available*

CONDITION *Not known*

STATUS *None recorded*

ID 05773g **NAME** UNKNOWN

NGR *ST4572985712* **TYPE** *Prehistoric, Sherd,*

DESCRIPTION *No description available*

CONDITION *Not known*

STATUS *None recorded*

ID 05774g **NAME** UNKNOWN

NGR *ST4580185735* **TYPE** *Prehistoric, Animal remains,*

DESCRIPTION *Skeleton of a young sheep.*

CONDITION *Not known*

STATUS *None recorded*

ID 05775g **NAME** UNKNOWN

NGR *ST46008570* **TYPE** *Prehistoric, Sherd,*

DESCRIPTION *No description available*

CONDITION *Not known*

STATUS *None recorded*

ID 05776g **NAME** SITE NAME NOT KNOWN

NGR *ST4572985640* **TYPE** *Prehistoric, Trackway,*

DESCRIPTION *Possible hurdle. No other description available*

CONDITION *Not known*

STATUS *None recorded*

ID 06155g **NAME** BEDWIN SANDS

NGR *ST448845* **TYPE** *Roman, Sherd,*

DESCRIPTION *Roman coarse pottery (BB, greyware, redware)*

CONDITION *Not known*

STATUS *None recorded*

ID 06165g **NAME** ROMAN POTTERY FINDSPOT MAGOR PILL

NGR *ST43868463* **TYPE** *Roman, Sherd,*

DESCRIPTION *Roman pottery found 9/3/90 'Roman material appears to have been derived from stratified occupation buried beneath a recent saltmarsh' (Rippon 1996, 32)*

CONDITION *Not known*

STATUS *None recorded*

ID 06278g **NAME** MAGOR PILL

NGR *ST455855* **TYPE** *Roman, Sherd,*

DESCRIPTION *Part of rim and a complete handle of a handled jar, grey ware, probably Caldicot ware, late 3rd - early 4th century A.D. Rims of 3 jars with curved everted rims, 2 flat flanges from conical bowls, 1 everted rim (Cavetto type) of black coarse gritted ware, 1 grey ware bodysherd from neck of a jar, 1 bodysherd of orange oxidised ware. 'Roman material appears to have been derived from stratified occupation buried beneath a recent saltmarsh' (Rippon 1996, 32). Possibly same as PRN 06165g.*

CONDITION

STATUS *None recorded*

ID 07561g **NAME** SITE NAME NOT KNOWN

NGR *ST43518554* **TYPE** *Medieval, Enclosure,*

DESCRIPTION *enclosure seen on RCAHMW APs 965105 55 sub rectangular with what appears to be rig and furrow - possible medieval date?*

CONDITION *Not known*

STATUS *None recorded*

ID 07583g **NAME** IRON ORE CARGO

NGR *ST4382284270* **TYPE** *Medieval boat cargo*

DESCRIPTION *Cargo of iron ore in boat remains*

CONDITION

STATUS *None recorded*

ID 07584g **NAME** UNKNOWN

NGR *ST44608512* **TYPE** *Bronze Age, Hearth,*

DESCRIPTION *-No description available. Probably duplicate PRN number* 05761g

CONDITION *Not known*

STATUS *None recorded*

ID 07595g **NAME** HOOFPRINTS AT REDWICK

NGR *ST4290784035* **TYPE** *Prehistoric, Natural feature,*

DESCRIPTION *Hoofprints at edge of palaeochannel*

CONDITION *Not known*

STATUS *None recorded*

ID 07596g **NAME** ANIMAL REMAINS

NGR *ST43108415* **TYPE** *Prehistoric, findspot,*

DESCRIPTION *A sheep or goats rib and a cow tooth were discovered.*

CONDITION *Moved*

STATUS *None recorded*

ID 07597g **NAME** UNKNOWN

NGR *ST4364584383* **TYPE** *Roman, Sherd,*

DESCRIPTION *Dorset BB1 and greyware*

CONDITION *Not known*

STATUS *None recorded*

ID 07598g **NAME** UNKNOWN

NGR *ST4457885189* **TYPE** *Bronze Age, Sherd,*

DESCRIPTION *3 struck flakes, Trevisker type sherds*

CONDITION *Not known*

STATUS *None recorded*

ID 07599g **NAME** UNKNOWN

NGR *ST4572985712* **TYPE** *Prehistoric, Post alignment,*

DESCRIPTION *three posts dipping into channel edge*

CONDITION *Not known*

STATUS *None recorded*

ID 07602g **NAME** UNKNOWN

NGR *ST44608512* **TYPE** *Bronze Age, Post,*

DESCRIPTION *upright oak post with flat cut end*

CONDITION *Not known*

STATUS *None recorded*

ID 07604g **NAME** UNKNOWN

NGR *ST4369484361* **TYPE** *Medieval, Sherd,*

DESCRIPTION *11th-16th century AD*

CONDITION *Not known*

STATUS *None recorded*

ID 07612g **NAME** UNKNOWN

NGR *ST4291484038* **TYPE** *Iron Age, Post,*

DESCRIPTION *linear alignment of roundwood posts*

CONDITION *Not known*

STATUS *None recorded*

ID 07613g **NAME** UNKNOWN

NGR *ST4364684397* **TYPE** *Medieval, Creel,*

DESCRIPTION *3 fine weave fishbaskets*

CONDITION *Not known*

STATUS *None recorded*

ID 07615g **NAME** UNKNOWN

NGR *ST44608512* **TYPE** *Bronze Age, Animal remains,*

DESCRIPTION *left human femur of adult male*

CONDITION *Not known*

STATUS *None recorded*

ID 07618g **NAME** SITE NAME NOT KNOWN

NGR *ST42928404* **TYPE** *Iron Age, Post,*

DESCRIPTION *Pointed stake*

CONDITION *Not known*

STATUS *None recorded*

ID 07619g **NAME** UNKNOWN

NGR *ST4367884426* **TYPE** *Post-medieval, Sherd,*

DESCRIPTION *16th-18th century AD*

CONDITION *Not known*

STATUS *None recorded*

ID 07622g **NAME** UNKNOWN

NGR *ST4292784045* **TYPE** *Iron Age, Post,*

DESCRIPTION *triple row of roundwood stakes. Probably duplicate PRN with 07625g*

CONDITION *Not known*

STATUS *None recorded*

ID 07623g **NAME** UNKNOWN

NGR *ST4369484361* **TYPE** *Medieval, Sherd,*

DESCRIPTION *11th-16th century AD*

CONDITION *Not known*

STATUS *None recorded*

ID 07625g **NAME** UNKNOWN

NGR *ST4292784045* **TYPE** *Iron Age, Post,*

DESCRIPTION *triple row of roundwood stakes. Probably duplicate PRN with 07622g*

CONDITION *Not known*

STATUS *None recorded*

ID 07977g **NAME** PREHISTORIC AND ROMAN FINDSPOT MAGOR PILL FORESHORE

NGR *ST438843* **TYPE** *Multiperiod, findspot,*

DESCRIPTION *Pottery and bones. includes Late Iron Age pottery sherds, Roman mortaria with potter's stamp (sherd) and Roman sherd grey ware and Roman samian sherd, Medieval cooking pot (sherds), Post Medieval pottery sherds (salt glazed etc.), antler and horn. 'Roman material appears to have been derived from stratified occupation buried beneath a recent saltmarsh' (Rippon 1996, 32).*

CONDITION *Moved*

STATUS *None recorded*

CROSS REFERENCES *related PRN 4319g, related PRN 7978g, related PRN 7997-8g*

ID 07978g **NAME** MAGOR PILL FORESHORE

NGR *ST438843* **TYPE** *Post-medieval, Sherd,*

DESCRIPTION *Pottery and bones. includes Late Iron Age pottery sherds, Roman mortaria with potter's stamp (sherd) and Roman sherd grey ware and Roman samian sherd, Medieval cooking pot (sherds), Post Medieval pottery sherds (salt glazed etc.), antler and horn. 'Roman material appears to have been derived from stratified occupation buried beneath a recent saltmarsh' (Rippon 1996, 32).*

CONDITION *Moved*

STATUS *None recorded*

CROSS REFERENCES *related PRN 04319g, related PRN 07977g*

ID 08381g **NAME** MOOR GRANGE CHAPEL

NGR *ST42838553* **TYPE** *Medieval, Chapel,*

DESCRIPTION *There was a chapel at Moor Grange (PRN 00457g), now built over (Williams 2001, 312) Evans 2003: GGAT 73 Early-Medieval Ecclesiastical Sites Project database*

CONDITION *Not known*

STATUS *None recorded*

ID 08887g **NAME** Cold Harbour Pill

NGR *ST4313484199* **TYPE** *Pill*

DESCRIPTION *Cold Harbour Pill, depicted on the 1st edition OS map (1882). The Pill has been heavily damaged by the construction of the sea defences and only approximately 50m in length remains intact. The feature is aligned north-south with no meanders apparent. (01 Dunning)*

CONDITION *Near Destroyed*

STATUS *None recorded*

ID 08888g **NAME** Cold harbour reen

NGR *ST4310584326* **TYPE** *Reen*

DESCRIPTION *Cold harbour reen, depicted on the 1st edition OS map (1882).*

CONDITION *Intact*

STATUS *None recorded*

ID 08889g **NAME** Collister Pill

NGR *ST4525085630* **TYPE** *Pill*

DESCRIPTION *Collister Pill, depicted on the 1st edition OS map (1882). The feature is almost*

completely masked by a build up of alluvium and only slightly raised areas either side of the Pill remain.

CONDITION *Near destroyed*

STATUS *None recorded*

ID 08902g **NAME** Magor Pill

NGR *ST4383784684* **TYPE** *Pill*

DESCRIPTION *Magor Pill has been identified as the historic site of Abergwitha (Aberwaythelles in Lewis 1927, 320) and is depicted on the 1st edition OS map (1882). Abergwitha was used as a harbour during the medieval period and was abandoned in the early 14th century. The Pill is aligned north-south with several meanders, and is approximately 450m in length and around 10m wide at its mouth where it opens into the River Severn.*

CONDITION *Damaged*

STATUS *None recorded*

ID 08991g **NAME** COLD AHARBOUR PILL HUMAN FOOTPRINT

NGR *ST431841* **TYPE** *Bronze Age, FOOTPRINT, RANK: -*

DESCRIPTION *A human footprint stratified in the upper Wentlooge Formation clay was recorded 12m from the excavation at Cold Harbour Pill during the GGAT 21 project. This footprint may possible be connect to a number of mixed roundwood & brushwood concentrations, which it is believed formed a light trackway (PRN 04328.0g), that was also dicovered during the excavation. Further human footprints (PRN05757g) from this period were discovered 180m to the northeast.*

CONDITION *Not known*

STATUS *None recorded*

CROSS REFERENCES *Related PRN 04328.0g, Related PRN 05757g*

ID 08992g **NAME** COLD HARBOUR PILL FISH-TRAP

NGR *ST43218420* **TYPE** *Bronze Age, FISH TRAP, RANK: -*

DESCRIPTION *A group of wooden structures were recorded in a palaeochannel, which probably represents a fish-trap. This structure was dated to 2520+/- 60bp (SWAN-214).*

CONDITION *Not known*

STATUS *None recorded*

CROSS REFERENCES *Related PRN 02530g, Related PRN 04328.0g*

ID 506698 **NAME** Caldicot Level Sea Wall

NGR *ST4638530* **TYPE** *Post-medieval sea wall*

DESCRIPTION *A section of the seawall is marked on an historic Admiralty chart, extending for some 1600m between Collister Pill and Prat Pill.*

CONDITION *Not known*

STATUS *None recorded*

ID 275980 **NAME** Relict sea wall alongside Collister Pill Reen

NGR *ST44618639* **TYPE** *Post-medieval/modern sea defence*

DESCRIPTION *A roughly 1.3km stretch of embankment on the western side of Collister Pill Reen: thought to be an early feature in the landscape - it is followed by early estate/parish boundary (Rippon 1996 'the Gwent Levels', 60ff), the irregular course of this feature suggests that it is not a primary landscape feature.*

CONDITION *Not known*

STATUS *None recorded*

ID 1003 **NAME** Collister Pill Wreck

NGR *ST45588530* **TYPE** *Post-medieval wreck*

DESCRIPTION *Fragment of carvel built wooden hull comprising oak planking attached to ribs by oak treenails. Plus fragments scattered over area of approx 0.5 square km on mudflats in intertidal zone. Unlikely to be the original wreck site. All fragments have been removed to storage by the Glamorgan-Gwent Archaeological Trust. Possibly 19th Century.*

CONDITION *Not known*

STATUS *None recorded*

ID 10687 **NAME** Undy Methodist Church

NGR *ST4386* **TYPE** *Post-medieval chapel*

DESCRIPTION *Undy Methodist Chapel was built in 1856 in the Simple Round-Headed and Simple Gothic style of the gable-entry type. By 1997 this chapel had been converted for other use.*

CONDITION *Not known*

STATUS *None recorded*

ID 20304 **NAME** Magorpill Farmhouse

NGR *ST43268563* **TYPE** *Post-medieval farmhouse*

DESCRIPTION

CONDITION *Not known*

STATUS *None recorded*

ID 20304 **NAME** Magorpill Farmhouse

NGR *ST43268563* **TYPE** *Post-medieval farmhouse*

DESCRIPTION

CONDITION *Not known*

STATUS *None recorded*

ID 440 **NAME** Magor Pill Wreck I

NGR *ST43818427* **TYPE** *Medieval wreck*

DESCRIPTION *The wreck at Magor Pill was discovered in 1994 when a wooden post was seen projecting from the mud on the Severn foreshore. Glamorgan-Gwent Archaeological Trust subsequently dendrochonogically dated a sample of the vessel's timbers to AD 1164, although the wood's outer ring would have given a somewhat later date than this, as the bark and sapwood had been stripped when the timber was originally prepared. The date of construction would therefore probably have been in the 13th century.*
A Cadw funded preliminary survey by the Trust noted 4-5 floor timbers or ribs, and evidence of at least 7 metres of surviving boat. In 1995 a full examination was carried out, and this revealed the vessel to be clinker-built in the North European tradition, with the remains comprising 7 metres of the incomplete forward section of a 15-20m boat. Split oak planks were attached to a solid oak keel, and to one another, with iron nails. The cargo remains comprised a mound of iron ore piled onto a hazel hurdle.

CONDITION *Not known*

STATUS *None recorded*

ID 415822 **NAME** Magorpill Moated site

NGR *ST43348583* **TYPE** *Medieval/Post-medieval moated site*

DESCRIPTION *Moated site measuring approx. 50m by 40m, approx. 250m north of Magorpill farm, within the Caldicot Levels.*

CONDITION *Not known*

STATUS *None recorded*

ID 518374 **NAME** Early Settlement Site, Collister Pill

NGR *ST4578285538* **TYPE** *Bronze Age settlement*

DESCRIPTION *Various prehistoric finds in this vicinity include Bronze Age pottery, bones and two brushwood trackways. Probably associated with the roundhouse recorded to the west (see NPRN 518375). Group number for GGAT HER PRNs 05771-6g*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE *NPRN 518375/PRN 05770g*

ID *518376* **NAME** *Early Settlement Site, Collister Pill*

NGR *ST4467585028* **TYPE** *Bronze Age roundhouse*

DESCRIPTION *Two roundhouses (one truncated) along with pot sherds similar to the Brean Down assemblage, potboilers, charcoal, a small fragment of chaff, horse skulls and plant residues have been recorded and excavated at this vicinity. Scientific dating notes 9600-70BC and 450BC.*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE *GGAT HER PRNs 05766-9g and 02529g*

ID PG001 **NAME** *Boundary stone*

NGR *ST 4401185274* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 1st OS map (1882).*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG002 **NAME** *Boundary stone*

NGR *ST 4402085285* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 1st OS map (1882).*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG003 **NAME** *Boundary stone*

NGR *ST 4422885045* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 1st and 2nd OS map (1882 – 1901)*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG004 **NAME** *Boundary stone*

NGR *ST 4416785000* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 1st and 2nd OS map (1882 – 1901)*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG005 **NAME** *Boundary stone*

NGR *ST 4496386085* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 1st OS map (1882)*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG006 **NAME** *Boundary stone*

NGR *ST 4499685875* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 1st and 2nd OS map (1882 – 1901)*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG007 **NAME** *Boundary stone*

NGR *ST 4428785101* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 2nd OS map (1901)*

CONDITION *Not known*
STATUS *None recorded*
CROSS REFERENCE

ID PG008 **NAME** *Boundary stone*

NGR *ST 4382085152* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 2nd OS map (1901)*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

ID PG009 **NAME** *Boundary stone*

NGR *ST 4501085968* **TYPE** *Boundary stone*

DESCRIPTION *Seen on the 3rd OS map (1921)*

CONDITION *Not known*

STATUS *None recorded*
CROSS REFERENCE

Glamorgan-Gwent Archaeological Trust Ltd (Projects Division)

QUALITY CONTROL

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Date: 15/01/14

As part of our desire to provide a quality service we would welcome any comments you may wish to make on the content or presentation of this report.

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