

APPENDIX W



WFD

Southmoor Managed Realignment

Environment Agency

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1. Introduction

1.1 Background

The Southmoor Managed Realignment Scheme (hereafter referred to as the proposed scheme) has been developed with the intention of improving existing Environment Agency (EA) coastal defences in the north east of Langstone Harbour. The current defences are in poor condition, and so intervention is necessary to avoid the risk of defence failure and the potential tidal flooding of hinterland and nearby residential and commercial properties in the nearby towns of Langstone and Havant. The main site location is shown in **Figure 1-1**, and in more detail showing the red line boundary in **Appendix A**.

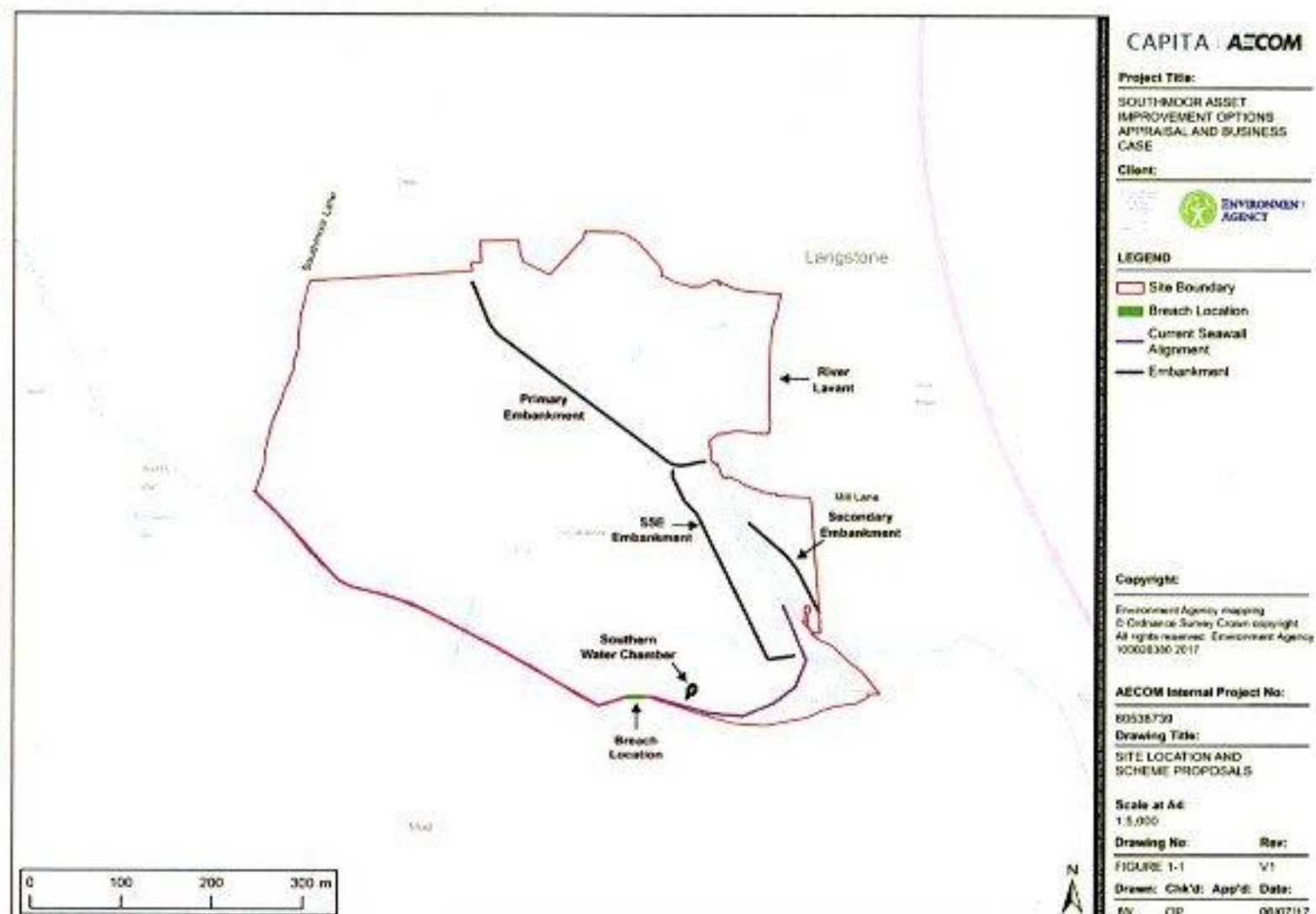


Figure 1-1: Site Location showing Scheme Proposals

In addition to providing a sustainable flood and coastal erosion management scheme with an appropriate standard of protection, the pressing need for creating new intertidal habitat to address losses across the Solent will also be addressed. In providing intertidal habitat, the existing site has a number of ecological destinations in close proximity or overlapping the site:

- Chichester and Langstone Harbours Special Protection Area (SPA)
- Chichester and Langstone Harbours Ramsar
- Solent Maritime Special Area of Conservation (SAC)
- Langstone Harbour Site of Special Scientific Interest (SSSI)
- Southmoor – Big Field (South Edge) Site of Importance for Nature Conservation (SINC) (within site boundary)
- Southmoor Reserve SINC (within site boundary)

The proposed scheme will include, primarily, removal of a 20 m section of the existing sea wall and provision of a new clay-cored embankment, some 340 m in length, situated approximately 300 m further inland allowing the creation of a new inter-tidal habitat. The sea wall is proposed to be removed during a neap low tide with removal completed within one tidal cycle i.e. avoiding wet working. The material required for the embankment will be

obtained outside of the site and therefore the ground levels within the site, other than the new defence, will not change upon completion of the scheme. The embankment construction methodology (for this embankment and others) could involve the use of lime as an additive to reduce the moisture level in the clay material and improve its robustness. The embankment will maintain the intended standard of protection against flooding to at least 0.5% AEP present day chance of flooding in any given year and will have a finished crest height of 3.2 m AOD. The crest width of the embankment will be approximately 2 m and the seaward and landward slopes will have a gradient of approximately 1 in 3, pending confirmation during the detailed design stage. Figure 1-1 also includes the proposals with a detailed drawing of the alignment and design in **Appendix B**.

A second, shorter, clay-cored embankment of 125 m in length, will be implemented adjacent to the left bank of the River Lavant to prevent outflanking of existing harbourside defences fronting the village, and fluvial flooding from the River Lavant, in order to maintain protection to properties in Langstone Village. The proposed crest level for the eastern embankment will be set at 3.5 m AOD.

A third embankment is to be constructed to provide protection to SSE 33 kV High Voltage buried cables that are situated in the raised ground along the southeastern perimeter of the right hand bank of the Lavant. The crest level of this embankment will be 2.6 m AOD.

A 1 m x 1 m box culvert is proposed for the primary embankment where the drainage network intersects the embankment (Figure 1-2). This figure also shows the public rights of way; the route "Havant. 49" is the key route across the site that the primary embankment is aligned with. The culvert will allow freshwater to drain through the site and maintain land drainage. The culvert will have an invert level of +1.737 m AOD. The design is intended to permit flood flows to discharge to the sea during the periods when the culvert is not tide locked – this should be approximately 8 hours during a 12.5 hour tidal cycle i.e. the majority of the cycle. It is designed to function during typical and extreme tides. This measure, combined with the partial removal of the sea wall, is intended to avoid retention of flood water to the north of the primary embankment and not alter existing flood risk.

There will be ground raising around a Southern Water manhole chamber, which is on the southern boundary of the main Southmoor site, bordering the existing sea wall. The raising will effectively create a 'circular embankment' with a crest level of 2.2 m AOD, tying into the existing sea wall and permitting operative access during typical spring tides.

The proposals also include improved public access (Figure 1-2). This will be achieved via a recycled plastic walkway, along the route of public right of way "Havant. 51" to the north of the primary embankment. Secondly, an existing footpath ("Havant. 45" is proposed to be diverted from the frontline of the site along the western flank of the area to be inundated to link up with the primary embankment.

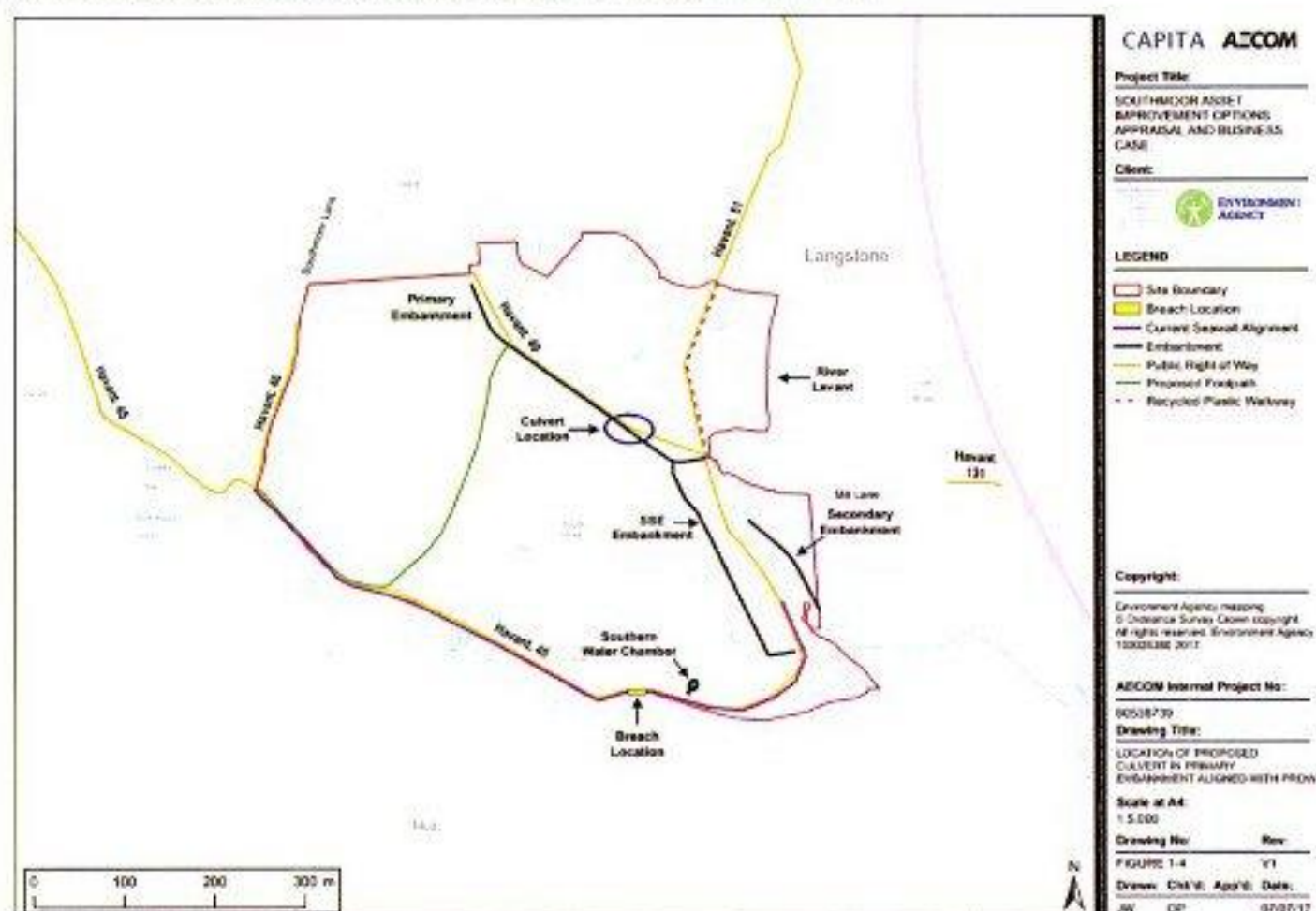


Figure 1-2: Scheme Proposals showing public access via PRow

The River Lavant runs southwards to the east of the site, exiting into Langstone Harbour. Upstream of the site culverted sections of the watercourse can occasionally cause the backing up of flows. At present the high flows result in the Lavant spilling into the floodplain to the north of the site with more freshwater overtopping the river bank adjacent to the site. Once the flood defences have been moved inland towards Langstone and Havant, it is important that the embankments do not impede the floodplain flows from the north and the site is able to accommodate freshwater ingress in order to avoid the existing flood risk being increased on the landward side of the new flood defence. Therefore the intent is that the culvert in the primary embankment will allow fluvial flows to move south towards the newly created intertidal area and to discharge via the breach into Langstone Harbour. The proposed breach of the existing defences should be sufficiently wide (20 m) to avoid freshwater input during extreme fluvial events significantly raising tidal water levels on the site.

AECOM has been appointed by the EA to prepare a Water Framework Directive assessment (WFDa) to accompany the planning application for the proposed scheme. Information on the current WFD status of water bodies that have the potential to be impacted by the proposed scheme is presented in **Section 2.2** of this report. The assessment methodology is described in **Section 3** and the WFD Assessment is provided in **Section 4**.

1.2 Legislative Context

The Water Framework Directive (WFD) aims to protect and enhance the quality of the water environment across all European Union (EU) member states. It takes a holistic approach to the sustainable management of water by considering the interactions between surface water (including transitional and coastal waters, rivers, streams and lakes), groundwater and water-dependent ecosystems.

Under the WFD, 'water bodies' are the basic management units and are defined as all or part of a river system or aquifer. These water bodies form part of a larger 'river basin districts' (RBD), for which 'River Basin Management Plans' (RBMPs) are developed by EU member states and environmental objectives are set. RBMPs are produced every six years, in accordance with the river basin management planning cycle. The first RBMPs were published in December 2009, with the second cycle of RBMPs published in February 2016 for the period 2015-2021.

The WFD requires all EU member states to classify the current condition or 'status or potential' of surface and groundwater bodies and to set a series of objectives for maintaining or improving conditions so that water bodies maintain or reach 'good status or potential' during the next river basin management planning cycle. The Environment Agency is the competent authority for implementing the WFD in England. As part of its role, the Environment Agency must consider whether proposals for new developments have the potential to:

- Cause a deterioration of a water body from its current status or potential; and/ or
- Prevent future attainment of good status or potential where not already achieved.

As a result, new developments that have the potential to impact on current or predicted WFD status are required to assess their compliance against the WFD objectives of the potentially affected water bodies.

2. Water Body Status

2.1 Background to Surface Water Body Status

Under the WFD, surface water body status is classified on the basis of chemical and ecological status or potential. Ecological status is assigned to surface water bodies that are natural and considered by the Environment Agency not to have been significantly modified for anthropogenic purposes. Ecological potential is assigned to artificial and man-made water bodies (such as canals), or natural water bodies that have undergone significant modification; these are termed Heavily Modified Water Bodies (HMWBs). The term 'ecological potential' is used as it may be impossible to achieve good ecological status because of modification for a specific use, such as navigation or flood protection. The ecological potential represents the degree to which the quality of the water body approaches the maximum it could achieve. The worst case classification is assigned as the overall surface water body status, in a 'one-out all-out' system. This system is summarised below in **Figure 2-1**.

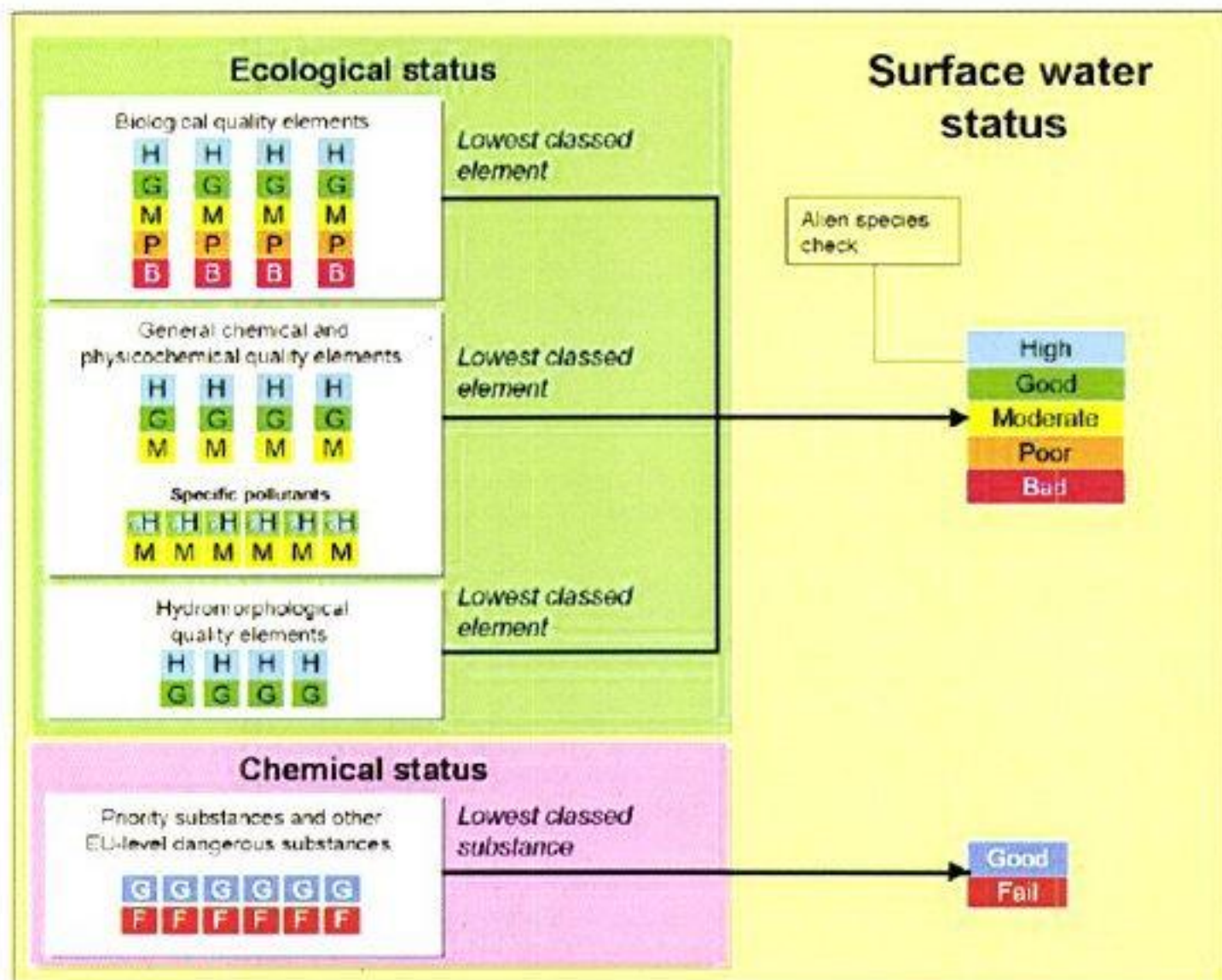


Figure 3-1. WFD classification elements for surface water body status (Environment Agency, 2013)

2.1.1 Chemical Status

Chemical status is defined by compliance with environmental standards for chemicals that are priority substances and/or priority hazardous substances, in accordance with the Environmental Quality Standards Directive (2008/105/EC). This is assigned on a scale of good or fail. Surface water bodies are only monitored for priority substances where there are known discharges of these pollutants; otherwise surface water bodies are reported as being at good chemical status.

2.1.2 Ecological Status or Potential

Ecological status or potential is defined by the overall health or condition of the watercourse. This is assigned on a scale of High, Good, Moderate, Poor or Bad, and on the basis of four classification elements or 'tests' (Environment Agency, 2013), as follows:

- **Biological:** This test is designed to assess the status indicated by a biological quality element such as the abundance of fish, invertebrates or algae and by the presence of invasive species. The biological quality elements can influence an overall water body status from Bad through to High.
- **Physico-chemical:** This test is designed to assess compliance with environmental standards for supporting physicochemical conditions, such as dissolved oxygen, phosphorus and ammonia. The physicochemical elements can only influence an overall water body status from Moderate through to High.
- **Specific pollutants:** This test is designed to assess compliance with environmental standards for concentrations of specific pollutants, such as zinc, cypermethrin or arsenic. As with the physico-chemical test, the specific pollutant assessment can only influence an overall water body status from Moderate through to High.
- **Hydromorphology:** For natural, non-HMWBs, this test is undertaken when the biological and physico-chemical tests indicate that a water body may be of High status. It specifically assesses elements such as water flow, sediment composition and movement, continuity, and structure of the habitat against reference or 'largely undisturbed' conditions. If the hydromorphological elements do not support High status, then the status of the water body is limited to Good overall status. For artificial or HMWBs, hydromorphological elements are assessed initially to determine which of the biological and physico-chemical elements should be used in the classification of ecological potential. In all cases, assessment of baseline hydromorphological conditions are an important factor in determining possible reasons for classifying biological and physico-chemical elements of a water body as less than Good, and hence in determining what mitigation measures may be required to address these failing water bodies.

2.2 Relevant Surface Water Bodies and Status

There are three classified surface water bodies in the vicinity of the proposed scheme. Information on the potential of these water bodies has been taken from the 2015 South East River Basin District RBMPs and the 2016 cycle of the EA Catchment Data Explorer (CDE). The water bodies are summarised as follows:

1. Langstone Harbour

The proposed scheme lies in the north east of the heavily modified Langstone Harbour (water body ID GB580705130000). The water body is a transitional water with a surface area of 18.9 km².

- The overall potential of the surface water body is 'Moderate' (objective to achieve 'Good' status by 2027).
- The ecological quality of the water body is 'Moderate' (objective to achieve 'Good' status by 2027).
- The chemical quality of the water body is 'Good'.

The Langstone Harbour water body has the following protected area designations: Habitats Directive (for the Solent & Isle of Wight Lagoons and Solent Maritime Special Areas of Conservation (SACs)) ; Nitrates Directive; Conservation of Wild Birds Directive (for the Chichester and Langstone Harbours Special Protection Area (SPA) and RAMSAR); Shellfish Directive; and Urban Waste Water Treatment Directive.

The water body is designated as heavily modified for coastal protection, with a use identified as flood protection.

2. River Lavant

The River Lavant (water body ID GB107042016420), referred to as Lavant (Hants) on the CDE, runs southwards to the east of the proposed scheme, and empties into Langstone Harbour. There are five drainage ditches crossing the site, three of which connect into the River Lavant. The length of the watercourse is 6.5 km, with a catchment area of 57.4 km².

- The overall potential of the surface water body is 'Poor' (objective to achieve 'Good' status by 2027).
- The ecological quality of the water body is 'Poor' (objective to achieve 'Good' status by 2027).
- The chemical quality of the water body is 'Good'.

The River Lavant water body is linked to the Nitrates Directive protected area designation.

3. Chichester Harbour

Whilst the site resides within Langstone Harbour, Chichester Harbour (water body ID GB580705210000) does connect to Langstone Harbour to the north of Hayling Island, east of the site. Chichester Harbour is also a heavily modified transitional water body with a surface area of 30.1 km².

- The overall potential of the surface water body is 'Moderate' (objective to achieve 'Good' status by 2027).
- The ecological quality of the water body is 'Moderate' (objective to achieve 'Good' status by 2027).
- The chemical quality of the water body is 'Good'.

The Chichester Harbour water body has the following protected area designations: Habitats Directive (for the Solent Maritime SAC); Nitrates Directive; Conservation of Wild Birds Directive (for the Chichester and Langstone Harbours SPA and RAMSAR); Shellfish Directive; and Urban Waste Water Treatment Directive.

The water body is designated as heavily modified for coastal protection, with a use identified as navigation, ports and harbours.

2.3 Background to Groundwater Body Status

Under the WFD, groundwater body status is classified on the basis of quantitative and chemical status. Status is assessed primarily using data collected from the Environment Agency monitoring network; therefore, the scale of assessment means that groundwater status is mainly influenced by larger scale effects such as significant abstraction or widespread/ diffuse pollution. The worst case classification is assigned as the overall groundwater body status, in a 'one-out all-out' system. This system is summarised in **Figure 2-2**.

2.3.1 Quantitative Status

Quantitative status is defined by the quantity of groundwater available as baseflow to watercourses and water-dependent ecosystems, and as 'resource' available for use as drinking water and other consumptive purposes. This is assigned on a scale of Good or Poor, and on the basis of four classification elements or 'tests' as follows:

- **Saline or other intrusions:** This test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.
- **Surface water:** This test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the ecological status of associated surface water bodies.
- **Groundwater Dependent Terrestrial Ecosystems (GWDTEs):** This test is designed to identify groundwater bodies where groundwater abstraction is leading to "significant damage" to associated GWDTEs (with respect to water quantity).
- **Water balance:** This test is designed to identify groundwater bodies where groundwater abstraction exceeds the "available groundwater resource", defined as the rate of overall recharge to the groundwater body itself, as well as the rate of flow required to meet the ecological needs of associated surface water bodies and GWDTEs.

2.3.2 Chemical Status

Chemical status is defined by the concentrations of a range of key pollutants, by the quality of groundwater feeding into watercourses and water-dependent ecosystems and by the quality of groundwater available for drinking water purposes. This is assigned on a scale of Good or Poor, and on the basis of five classification elements or 'tests' as follows:

- **Saline or other intrusions:** This test is designed to identify groundwater bodies where the intrusion of poor quality water, such as saline water or water of different chemical composition, as a result of groundwater abstraction is leading to sustained upward trends in pollutant concentrations or significant impact on one or more groundwater abstractions.
- **Surface water:** This test is designed to identify groundwater bodies where groundwater abstraction is leading to a significant diminution of the chemical status of associated surface water bodies.

- **Groundwater Dependent Terrestrial Ecosystems (GWDTes):** This test is designed to identify groundwater bodies where groundwater abstraction is leading to "significant damage" to associated GWDTes (with respect to water quality).
- **Drinking Water Protected Areas (DrWPAs):** This test is designed to identify groundwater bodies failing to meet the DrWPA objectives defined in Article 7 of the WFD or at risk of failing in the future.
- **General quality assessment:** This test is designed to identify groundwater bodies where widespread deterioration in quality has or will compromise the strategic use of groundwater.

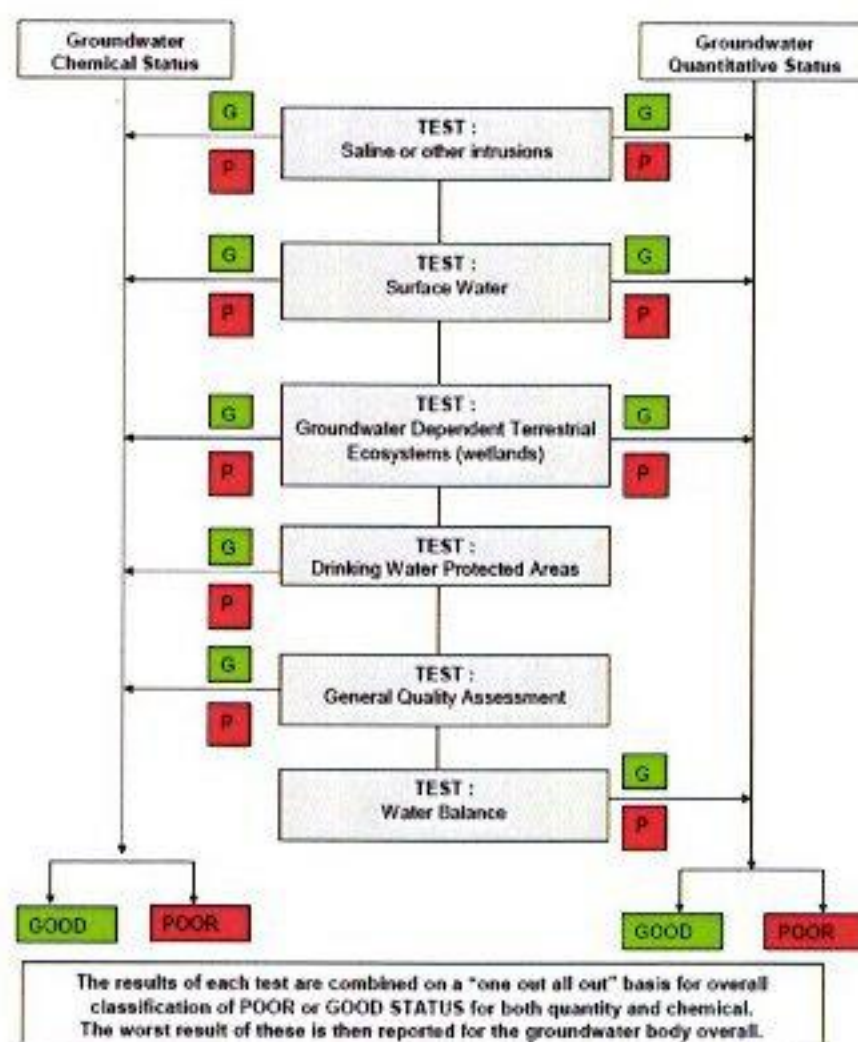


Figure 2-2. WFD Classification Elements for Groundwater Body Status (UK Technical Advisory Group on the Water Framework Directive, 2007)

2.4 Relevant Groundwater Bodies and Status

There is one groundwater body in the vicinity of the proposed scheme: the East Hants Chalk (water body ID GB40701G502700). Information on the potential of these water bodies has been taken from the 2015 South East River Basin District RBMPs and the 2016 cycle of the EA Catchment Data Explorer.

- The overall potential of the groundwater body is 'Poor'.
- The quantitative quality of the water body is 'Poor'.
- The chemical quality of the water body is 'Poor' (objective to achieve 'Good' status by 2027).

The East Hants water body has the following protected area designations: Nitrates Directive and Drinking Water Directive, and safeguard zones for the Bedhampton and Havant Springs and Maindell sources.

3. Assessment Methodology

3.1 Introduction

Proposed schemes that have the potential to impact on current or predicted WFD status are required to assess their compliance against the objectives defined for potentially affected water bodies. As part of its role, the Environment Agency must consider whether proposals for new developments have the potential to:

- Cause a deterioration of a water body from its current status or potential; and/ or
- Prevent future attainment of Good status (or potential where not already achieved).

3.2 No Deterioration Assessment

3.2.1 Defining No Deterioration

No deterioration was defined by the Environment Agency in its Position Paper (Environment Agency, 2013). Steps are required to prevent deterioration of the ecological status, ecological potential and chemical status of surface water and the qualitative status and quantitative status of groundwater.

Originally deterioration was defined by the Environment Agency as deterioration from one status class to a lower one, however following a ruling by the Court of Justice of the European Union (CJEU) in July 2015, this has been redefined. The CJEU ruling clarified that:

- “deterioration of the status” of the relevant water body includes a fall by one class of any **element** of the “quality elements” even if the fall does not result in the a fall of the classification of the water body as a whole;
- ‘Any deterioration’ in quality elements in the lowest class constitutes deterioration; and
- Certainty regarding a project’s compliance with the Directive is required at the planning consent stage; hence, where deterioration ‘may’ be caused, derogations under Article 4.7 of the WFD are required at this stage.

While deterioration within a status class does not contravene the requirements of the WFD, (except for Drinking Water Directive parameters in drinking water protected areas), the WFD requires that action should be taken to limit within-class deterioration as far as practicable. For groundwater quality, measures must also be taken to reverse any environmentally significant deteriorating trend, whether or not it affects status or potential.

The no deterioration requirements are applied independently to each of the elements that come together to form the water body classification as required by Annex V of the Water Framework Directive and Article 4 of the Groundwater Daughter Directive.

- **Surface water:** To manage the risk of deterioration of the biological elements of surface waters, the no deterioration requirements are applied to the environmental standards for the physico-chemical elements, including those for the Moderate/Poor and Poor/Bad boundaries.
- **Groundwater:** The no deterioration requirements are applied to each of the four component tests for quantitative status and the five component tests for chemical status. The no deterioration requirement may not apply to elements at High status and elements at High status may be permitted to deteriorate to Good status, provided that:
 - The water body’s overall status is not High;
 - The RBMP has not set an objective for the water body of High status;
 - The objectives and requirements of other domestic or European Community legislation are complied with; and
 - Action is taken to limit deterioration within High or Good status or potential classes as far as practicable.

The no deterioration baseline for each water body is the status that is reported in Section 2.2 and Section 2.4.

3.2.2 Surface Water No Deterioration Assessment

Table 1 presents the matrix used to assess the effect of the proposed development on surface water status or potential class. It ranges from a major beneficial effect (i.e. a positive change in overall WFD status) through no effect to deterioration in overall status class. The colour coding used in **Table 1** is applied to the spreadsheet assessments of Langstone Harbour and the River Lavant in **Appendices C and D**.

Table 1. Surface Water Assessment Matrix

Effect	Description/criteria	Outcome
Major beneficial	Impacts that taken on their own or in combination with others have the potential to lead to the improvement in the ecological status or potential of a WFD quality element for the entire waterbody	Increase in status of one or more WFD element giving rise to a predicted rise in status class for that waterbody.
Minor /localised beneficial	Impacts when taken on their own or in combination with others have the potential to lead to a minor localised or temporary improvement that does not affect the overall WFD status of the waterbody or any quality elements	Localised improvement, no change in status of WFD element
Green (no impact)	No measurable change to any quality elements.	No change
Yellow - Localised/ temporary adverse effect	Impacts when taken on their own or in combination with others have the potential to lead to a minor localised or temporary deterioration that does not affect the overall WFD status of the waterbody or any quality elements. Consideration will be given to habitat creation measures.	Localised deterioration, no change in status of WFD element when balanced against mitigation measures embedded in the scheme.
Orange -adverse effect on class of WFD element	Impacts when taken on their own or in combination with others have the potential to lead to the deterioration in the WFD status class of one or more biological quality elements, but not in the overall status of the waterbody. Consideration will be given to habitat creation measures.	Decrease in status of WFD element when balanced against positive measures embedded in the scheme.
Red – adverse effect on overall WFD class of waterbody	Impacts when taken on their own or in combination with others have the potential to lead to the deterioration in the ecological status or potential of a WFD quality element, which then lead to a deterioration of status/potential of waterbody.	Decrease in status of overall WFD waterbody status when balanced against positive measures embedded in the scheme.

3.2.3 Groundwater No Deterioration Assessment

Table 2 presents the matrix used to assess the effect of the proposed development on groundwater status class. It ranges from a beneficial effect through no effect to deterioration in overall status class. The colour coding used in **Table 2** is applied to the spreadsheet assessment in **Appendix E**.

Table 2. Groundwater Assessment Matrix

Magnitude of Impact of Scheme Element on WFD Element i.e. in individual cells	Effect on WFD Element within the assessment boundary i.e. at end of row	Effect on Status of WFD element at the Groundwater Body Scale
Impacts lead to beneficial effect	Combined impacts have the potential to have a beneficial effect on the WFD element.	Improvement but no change to status of WFD element
No measurable change to groundwater levels or quality.	No measurable change to WFD elements.	No change and no deterioration in status of WFD element
Impacts when taken on their own have the potential to lead to a minor localised or temporary effect	Combined impacts have the potential to lead to a minor localised or temporary adverse effect on the WFD element.	Combined impacts have the potential to lead to a minor localised or temporary effect on the WFD element. No change to status of WFD element and no significant deterioration at groundwater body scale.
Impacts when taken on their own have the potential to lead to a widespread or prolonged effect.	Combined impacts have the potential to have an adverse effect on the WFD element.	Combined impacts have the potential to have an adverse effect on the WFD element, resulting in significant deterioration but no change in status class at groundwater body scale.
Impacts when taken on their own have the potential to lead to a significant effect.	Combined impacts in combination with others have the potential to have a significant adverse effect on the WFD element.	Combined impacts in combination with others have the potential to have an adverse effect on the WFD element AND change its status at the groundwater body scale

3.3 Future Status Objective

RBMPs are used to outline water body pressures and the actions that are required to address them. The future status objective assessment considers the ecological potential of a surface water body and the mitigation measures that defined the ecological potential. Assessments in this project have made reference to mitigation measures defined in the 2015 South East RBMP and information downloaded from the government data centre (dataset: WFD Cycle 2 mitigation measures assessment classification). Guidance on WFD assessment provided by the Environment Agency has also been reviewed (Water Framework Directive assessment: estuarine and coastal waters - December 2016), which replaced the previous WFD *Clearing the Waters* guidance. The assessment has considered whether any aspect of the proposal could cause or contribute to deterioration of status and/or threaten the water body achieving good status. It has considered if the proposed scheme has the potential to prevent the implementation or impact the effectiveness of any defined mitigation measures.

4. Water Framework Directive Compliance Assessment

4.1 General Approach and the Scheme Assumptions

The WFD compliance assessment uses a spreadsheet tool to assess the effects of the scheme on each of the WFD elements (biological, physico-chemical and hydromorphological surface water elements, and quantitative and chemical groundwater elements).

Both the surface water assessments and the groundwater assessment examine the potential effects of the existing defence breach and the creation of new defences further inland. The full spreadsheet assessments are provided in **Appendices C, D and E**.

The design drawings for the scheme are provided in **Appendix B**. In summary:

- A 20 m breach of an existing sea defence will be undertaken to the south of the site. This will allow tidal waters to enter the Southmoor site, aiding in the natural creation of intertidal habitat. The sea wall is proposed to be removed during a neap low tide with removal completed within one tidal cycle i.e. avoiding wet working.
- A new clay-cored earth embankment with a crest level of 3.2 m AOD will be constructed approximately 300 m north of the breach, in order to protect the nearby towns of Havant and Langstone from tidal flooding. It will be 340 m in length. This is referred to as the "primary" embankment in the assessment. A 1 m x 1 m box culvert will dissect this embankment, allowing fluvial overland flows to travel southwards towards the harbour. The culvert will have an invert level of +1.737 m AOD. This will prevent the backing up of fluvial water behind the new embankment from fluvial overland flow from the River Lavant, which might otherwise cause flooding. The design is intended to permit flood flows to discharge to the sea during the periods when the culvert is not tide locked, during typical and extreme tides.
- A second, clay-cored earth embankment (crest level: 3.5 m AOD) will be constructed to the east of the site on the left hand bank of the River Lavant, with the aim of protecting nearby properties from tidal and fluvial flooding. This is referred to as the "secondary" embankment in the assessment.
- A third, clay-cored embankment is to be constructed to provide protection to SSE 33 kV High Voltage buried cables that are situated in the raised ground along the southeastern perimeter of the right hand bank of the Lavant. The crest level of this embankment will be 2.6 m AOD. This is referred to as the "SSE" embankment in the assessment.
- There will be some minor, localised ground raising around a Southern Water manhole chamber, which is on the southern perimeter of the main Southmoor site, bordering the existing sea wall. The raising will effectively create a 'circular embankment' with a crest level of 2.2 m AOD, tying into the existing sea wall and permitting operative access during typical spring tides.
- The proposals also include improved public access via a recycled plastic walkway to the north of the primary embankment, which will be piled and very low profile i.e. floating over the ground. Secondly, an existing footpath will be diverted from the frontline of the site along the western flank of the area to be inundated to link up with the primary embankment. This will involve granular material being laid down to firm up the access along the western flank of the inundated area.

The existing Southmoor site is used as farmland and is classified as a priority habitat of coastal and floodplain grazing marsh. The proposed scheme will result in the inundation of the site, transforming the area into a diverse intertidal habitat.

Key assumptions for the assessment are as follows:

- **Ground Works:** There are 3 areas of land raising detailed by the scheme. This includes clay-cored embankments with crest levels of between 3.5 m AOD and 2.6 m AOD. The embankment construction methodology could involve the use of lime as an additive to reduce the moisture level in the clay material and

improve its robustness. The scale of the land raising works around the Southern Water access chamber is unlikely to have a significant effect at the water body scale, and is therefore not specifically referred to in the assessment.

- **Dewatering:** It is assumed that no groundwater dewatering is required as part of the scheme.
- **Existing Defence Walls:** The existing sea wall will be breached along a 20 m length, allowing tidal waters from the Langstone Harbour to inundate the Southmoor site in the south.
- **Code of Construction Practice (CoCP) / Construction Environmental Management Plan (CEMP):** It is assumed that suitable plans will be in place to reduce risks to groundwater, surface water and ecology.
- **Surface Water Run-off:** It is assumed that the proposed scheme will have a negligible impact on surface water run-off.

For the surface water waterbodies (Langstone Harbour, Chichester Harbour and River Lavant), the potential influences on WFD status identified relate to changes in flows and mobilising of sediments and include:

- The process of breaching of defences during the construction phase, and function of the breach in operation;
- The creation of new embankments during the construction phase;
- Temporary landtake on site in order to undertake works during the construction phase;
- Pollution due to discharges or spillages during the construction phase;
- Mobilisation of sediments during the construction phase;
- Potential scour during operation; and
- Permanent landtake during operation.

The scheme is also identified as having potential of mobilising sediments into the Langstone Harbour waterbody column that could impact on the WFD Shellfish Water Protected Area.

For the East Hants Chalk groundwater body, the potential influences on WFD status identified were similar to the surface water bodies, plus a need to consider potential impact from saline intrusion and site contamination:

- Pollution due to discharges or spillages during the construction phase;
- The process of breaching of defence during the construction phase, and function of the breach in operation;
- The creation of new embankments during the construction phase; and
- Post-operation of the works.

Appendices C, D and E contain surface water and groundwater assessments where the above potential effects are considered. The colour coded system referred to in **Tables 1 and 2** is used to give a visual impression of the compliance assessment. The results of the Chichester Harbour assessment is presented as a commentary in Section 4.2.4.

4.2 No Deterioration Assessment

4.2.1 Langstone Harbour

The Langstone Harbour waterbody is directly impacted by the Southmoor managed realignment scheme, as it is bound to the north by the existing EA sea defence and will be extended in area once the defence is breached.

Hydraulic conditions characteristic of the waterbody will change locally to the breach, as the new gap will narrow tidal flows, resulting in increased velocities. Once the breach has been passed, water will dissipate and decrease in velocity. These variations in conditions (along with increased wetness and wave exposure) are predicted to improve habitat heterogeneity of the Southmoor site, providing ecological and geomorphological benefits. Furthermore, the removal of defence effectively contributes to returning the site to 'natural' conditions, which is a key aim of the WFD.

The change in hydraulic conditions as a result of the breach could initiate a change in sediment transport characteristics in this location. Some areas will be more prone to erosion or deposition, and there is predicted to be variations in transport velocities (for example, flow velocity increases from approximately 0.1 m/s to around 1 m/s in the breach location and sediment loadings). This could in turn influence the quantities and structure of sediment within the waterbody, as well as harbour depth and width dimensions. However, it is not expected for these changes to have a significant impact at the waterbody scale, and the new processes should reach an

equilibrium over time. The variations in sediment may also provide habitat variation that will promote 'good' status of the water body.

There may be a reduction in the abundance and diversity of species within the vicinity of the Southmoor site, as following completion of the breach construction works, this could impact intertidal habitat via smothering of organisms (invertebrates). Protected areas in the vicinity of the waterbody (such as the 'Chichester and Langstone Harbours SPA') may be at risk of from the changes near the breach and embankments during the construction phase. This is a particularly sensitive issue within the Langstone Harbour water body, as it has a Shellfish Water Protected Area. Any increase in velocities and sediments as a result of land / habitat disturbance from the works may cause the mobilisation of sediments and contaminants, resulting in a deterioration of water quality and reduced populations of shellfish e.g. clams.

The latest water quality monitoring data in Langstone Harbour by the Environment Agency confirms the Good status of the water body on physico-chemical quality elements. Despite the potential for direct and indirect hydraulic and sedimentary impacts, when considering the scale of the works in relation to water body size, any potential negative impacts on physico-chemical elements, habitats and protected areas are predicted to be temporary and localised following the removal of the sea wall. Natural recovery and adaptation will take place over time during operation. The impacts are mitigated and compensated for by the creation of intertidal habitat by breaching of the existing defence, which will provide an increased area for the colonisation of a variety of species i.e. outweighing temporary construction impacts. In order to limit impacts on the Shellfish Water Protected Area, specific mitigation may be required - including providing silt curtains in areas if it is considered there is a likelihood of significant contamination / sediment flow during any phase of breach construction. The overall impact with mitigation implemented is predicted to be beneficial.

Saltwater and freshwater flows will mix as a result of the breach and culverted primary embankment. This is due to saline intrusion as the Langstone Harbour transitional waters enter the Southmoor site from the south, and fluvial overland flows are conveyed through the new, primary flood embankment from the north. It is unlikely that this will cause deterioration of the waterbody's WFD 'moderate' status, as these conditions are typical of the marine location and may potentially result in a variation in environmental conditions that will improve habitat heterogeneity.

The construction of the footpath diversion will result in minor loss of habitat within the Southmoor Big Field (South Edge) SINCD but this will be mitigated by the creation of intertidal habitat.

A CoCP / CEMP and pollution response plan will mitigate potential impacts on the harbour from spillages during construction.

Overall, the proposed scheme is not expected to result in significant deterioration of the overall 'moderate' waterbody status, but is expected to offer improvements and contribute to helping promote 'good' status which is required by 2027.

4.2.2 River Lavant

Owing to its position and relative lack of connectivity to the site, the River Lavant is only predicted to be impacted by the new, primary and secondary flood embankments that are proposed on the right hand and left hand banks of the River Lavant, respectively.

The embankments may impede overland flows from the River Lavant. This could result in the backing up of fluvial water and increased flood risk to properties in Langstone and Havant. Whilst the impacts of this would likely be temporary and local to Southmoor, the primary embankment has been designed to include a box culvert (1 m x 1 m) in order to convey overland flows southwards towards to Southmoor site and to the Langstone Harbour, mitigating the risk. The culvert may slightly alter the natural characteristics of overland flows and river continuity over the Southmoor site, but would provide a greater benefit than the existing defence, which does not have any designed outfalls for overland flows.

There was a concern that the new embankments may disconnect and impact existing habitats and species populations that are characteristic of the River Lavant riparian zone. These localised impacts have been deemed negligible considering the scale of the waterbody, and the potential for vegetation to adapt to any saline-brackish conditions that may occur in the vicinity of the primary embankment.

The latest water quality monitoring data in the River Lavant by the Environment Agency confirms the High status of the water body on physico-chemical quality elements. There could be some potential indirect impacts on the physico-chemical elements of the water body as a result of the works. The breach of the existing defence may cause sediments to become mobilised and the saline inundation resulting in the mixing of fluvial and transitional waters within the site. This could result in changes to dissolved oxygen and phosphate levels, as well as chemical water quality. Whilst these indirect impacts may have the potential to impact the River Lavant, the changes are not considered to be significant because there is limited direct connectivity between the Langstone Harbour water body and the Lavant water body (and indirectly via groundwater water body) because of the presence of the primary embankment. If there were any impacts, including during the construction of the primary embankment, these would be minor and the local area surrounding the River Lavant waterbody would recover naturally over time.

The construction of the recycled plastic walkway is predicted to result in minor loss of habitat within the Southmoor Reserve SINC. The presence of the walkway, however, should not result in a disconnect between the watercourse and riparian zone because of its comparable profile with existing site access.

A CoCP / CEMP and pollution response plan will mitigate potential impacts from spillages, e.g. hydrocarbons or lime, during embankment construction.

The River Lavant is currently designated as having 'poor' overall and ecological WFD status, with the aims of achieving 'good' by 2027. The Southmoor managed realignment scheme is unlikely to hinder this, and so it is predicted that the scheme should have negligible impacts on the River Lavant water body.

4.2.3 East Hants Chalk Group

The proposed breach and embankments may impact the ability for fluvial / pluvial flows to infiltrate to groundwater, and also cause saline inundation of the water body. However, these impacts are predicted to have very negligible impacts given the size of the water body and the limited abstraction potential as indicated by the site not being in a Groundwater Source Protection Zone nor Drinking Water Protected Area. Therefore, the status of the quantitative and chemical saline intrusion elements should remain as Good and not affect the overall water body status.

The proposed scheme is not anticipated to involve dewatering, which limits the potential construction impacts of the scheme on the groundwater body. Based on the results of a recent ground investigation on site and previous historic studies, there is limited potential to impact the WFD status of the groundwater body and neighbouring surface water bodies. The results suggest there will be no deterioration in chemical quality elements and the status of the water body, which is currently 'Poor'.

A CoCP / CEMP should mitigate potential adverse impacts on the East Hants Chalk Group from spillages during construction.

Therefore, the scheme is not anticipated to result in significant deterioration or change in the 'poor' status of the East Hants Chalk Group water body.

4.2.4 Chichester Harbour

In response to consultation with the Environment Agency, an assessment has been undertaken of the likely impacts of the scheme on Chichester Harbour waterbody via a comparison with the status of Langstone Harbour. Although the Chichester Harbour water body is not directly connected to the site, being situated over 500 m away from the site, the connectivity of the Langstone Harbour and Chichester Harbour waterbodies means that impacts of Langstone Harbour could potentially extend to Chichester Harbour. In order to consider specific potential impacts on Chichester Harbour, the status of the two harbour water bodies has been reviewed to identify particular sensitivities / pressures and areas of weaker status. The outcome of this process finds that:

- At the highest level, the overall status of the waterbodies is the same;
- At the second highest level, the Ecological (both Moderate) and Chemical status (both Good) is the same; and
- Distinctions in status occur at elemental level and in all instances Chichester Harbour status is poorer than Langstone.

The elements of note for Chichester Harbour are:

- Biological Quality Elements (Invertebrates and Macroalgae);
- Hydromorphological Supporting Elements (Hydrological Regime); and
- Physico-chemical quality elements (Dissolved Inorganic Nitrogen).

The likelihood of specific impacts potentially being more hazardous to Chichester Harbour as a result of its weaker status is considered to be unlikely based on the Langstone Harbour assessment. For the specific elements noted above, the overall impact of the proposals should not change Chichester Harbour's objectives existing status and threaten the overall 2027 Good Status target.

4.3 Future Good Status

The status objectives for Langstone Harbour, Chichester Harbour and the River Lavant as reported within the 2015 RBMP is Good by 2027. Mitigation measures that have been identified by the Environment Agency for Good ecological potential (Environment Agency, 2016), which are exemplified by the proposals through implementation of a breach in the sea wall and the creation of intertidal habitat, are:

- *Remove obsolete structures*
- *Preserve or restore habitats*
- *Realign flood defence*
- *Structural modification to enhance ecology*

The nature of the managed realignment scheme with clear habitat creation benefits and temporary construction impacts is such that there are not considered to be any aspects of the proposed development that are predicted to prevent Good status being achieved in 2027. The realignment of flood defences and creation of intertidal habitat offers the opportunity for good ecological potential to be realised.

5. Conclusions

The WFD assessment indicates that based on the current understanding of the Southmoor Managed Realignment Scheme, there is potential for minor temporary or localised effects on water bodies as a result of the associated defence breach and flood embankment construction. However it has been assessed there will be no significant deterioration or change in water body status from its operation as the environment recovers and adapts to the scheme. Overall, the scheme is likely to encourage rather than prevent attainment of future good status or potential via habitat creation benefits.

6. References

Environment Agency, February 2016. South East River Basin District River Basin Management Plan, updated December 2015.

Environment Agency, 2016. Water Framework Directive assessment: estuarine and coastal waters (and mitigation measures table) (accessed June 2017).

Environment Agency, 2017. Catchment Data Explorer: <http://environment.data.gov.uk/catchment-planning/> (accessed June 2017).

Appendix A - Site Location and Boundary Plan

See below

Appendix B - Proposed Scheme Drawing

See below

Appendix C - Langstone Harbour WFD Assessment

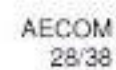
See below

Appendix D - River Lavant WFD Assessment

See below

Appendix E - East Hants Chalk WFD Assessment

See below



Water Framework Directive assessment: scoping template for activities in estuarine and coastal waters

Use this template to record the findings of the scoping stage of your Water Framework Directive (WFD) assessment for an activity in an estuary or coastal water.

If your activity will:

- take place in or affect more than one water body, complete a template for each water body
- include several different activities or stages as part of a larger project, complete a template for each activity as part of your overall WFD assessment

The [WFD assessment guidance for estuarine and coastal waters](#) will help you complete the table.

Your activity	Description, notes or more information
Applicant name	Tony Haffenden
Application reference number (where applicable)	
Name of activity	Southmoor Asset Improvement Project (Managed Realignment)
Brief description of activity	<i>The site is currently a coastal grassland reserve, protected by an existing concrete seawall along its southern boundary with a 1 in 200 year Standard of Protection (SoP). The seawall is currently in poor condition and is subject to wave overtopping and at risk of a breach event. Intervention is therefore required to avoid the risk of defence failure which would increase the risk of flooding to the hinterland and nearby residential and commercial properties.</i> <i>An existing bund along the west bank of the River Lavant serves as a flood defence to residential properties in Langstone.</i>
Location of activity (central point XY coordinates or national grid reference)	Lat = 50.839636° Lon = -0.989769°
Footprint of activity (ha)	Approximately 9ha
Timings of activity (including start and finish dates)	Construction period March 2018 to October 2018
Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	A summary of the works include the following: • The removal and storage of topsoil from the footprints of the new embankments; • Construction of embankments using clay excavated from the borrow pits on site; • Installation of rip rap (rock) scour protection with a geotextile layer along the toe of selected embankments; • The reuse and seeding of the topsoil on the embankments; • Installation of a pre cast box culvert through the Main Rear Embankment, for the SSE Embankment a pipe will be installed through the embankment; • Creation of footpath on the Main Rear Embankment;

	- Installation of manhole cover on 'extension' of Southern Water asset; - Breaching a 20 m wide section of the existing seawall.
Use or release of chemicals (state which ones)	Lime (soil conditioning)

Water body ¹	Description, notes or more information
WFD water body name	<i>The River Lavant (Hants)</i> <i>Langstone Harbour (GB580705130000).</i> <i>Chichester Harbour</i> <i>East Hants Chalk</i>
Water body ID	<i>The River Lavant - (GB107042016420)</i> <i>Langstone Harbour (GB580705130000).</i> <i>The Chichester Harbour (GB580705210000)</i> <i>The East Hants Chalk (GB40701G502700)</i>
River basin district name	
Water body type (estuarine or coastal)	<i>Coastal</i>
Water body total area (ha)	
Overall water body status (2015)	<i>The River Lavant (Hants) - Poor</i> <i>East Hants Chalk - Poor</i>
Ecological status	<i>Langstone Harbour - potential of Moderate</i> <i>Chichester Harbour - potential of Moderate</i>
Chemical status	
Target water body status and deadline	
Hydromorphology status of water body	
Heavily modified water body and for what use	
Higher sensitivity habitats present	

Lower sensitivity habitats present	
Phytoplankton status	
History of harmful algae	
WFD protected areas within 2km	

¹ Water body information can be found in the Environment Agency's catchment data explorer and the water body summary table. Magic maps provide additional information on habitats and protected areas. Links to these information sources can be found in the WFD assessment guidance for estuarine and coastal waters.

Specific risk information

Consider the potential risks of your activity to each of these receptors: hydromorphology, biology (habitats and fish), water quality and protected areas. Also consider invasive non-native species (INNS).

Section 1: Hydromorphology

Consider if hydromorphology is at risk from your activity.

Use the water body summary table to find out the hydromorphology status of the water body, if it is classed as heavily modified and for what use.

Consider if your activity:	Yes	No	Hydromorphology risk issue(s)
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	Requires impact assessment	Impact assessment not required	
Could significantly impact the hydromorphology of any water body	Requires impact assessment	Impact assessment not required	
Is in a water body that is heavily modified for the same use as your activity	Requires impact assessment	Impact assessment not required	

Record the findings for hydromorphology and go to section 2: biology.

Section 2: Biology

Habitats

Consider if habitats are at risk from your activity.

Use the water body summary table and Magic maps, or other sources of information if available, to find the location and size of these habitats.

Higher sensitivity habitats ²	Lower sensitivity habitats ³
chalk reef	cobbles, gravel and shingle
clam, cockle and oyster beds	intertidal soft sediments like sand and mud
intertidal seagrass	rocky shore
maerl	subtidal boulder fields
mussel beds, including blue and horse mussel	subtidal rocky reef
polychaete reef	subtidal soft sediments like sand and mud
saltmarsh	
subtidal kelp beds	
subtidal seagrass	

² Higher sensitivity habitats have a low resistance to, and recovery rate, from human pressures.

³ Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures.

Consider if the footprint ⁴ of your activity is:	Yes	No	Biology habitats risk issue(s)
0.5km ² or larger	Yes to one or more – requires impact assessment	No to all – impact assessment not required	
1% or more of the water body's area			
Within 500m of any higher sensitivity habitat			
1% or more of any lower sensitivity habitat			

⁴ Note that a footprint may also be a temperature or sediment plume. For dredging activity, a footprint is 1.5 times the dredge area.

Fish

Consider if fish are at risk from your activity, but only if your activity is in an estuary or could affect fish in or entering an estuary.

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	Continue with questions	Go to next section	
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	Requires impact assessment	Impact assessment not required	
Could cause entrainment or impingement of fish	Requires impact assessment	Impact assessment not required	

Record the findings for biology habitats and fish and go to section 3: water quality.

Section 3: Water quality

Consider if water quality is at risk from your activity.

Use the water body summary table to find information on phytoplankton status and harmful algae.

Consider if your activity:	Yes	No	Water quality risk issue(s)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Requires impact assessment	Impact assessment not required	
Is in a water body with a phytoplankton status of moderate, poor or bad	Requires impact assessment	Impact assessment not required	
Is in a water body with a history of harmful algae	Requires impact assessment	Impact assessment not required	

Consider if water quality is at risk from your activity through the use, release or disturbance of chemicals.

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s)
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment	Impact assessment not required	
It disturbs sediment with contaminants above Cefas Action Level 1	Requires impact assessment	Impact assessment not required	

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s)
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment ⁵	Impact assessment not required	

⁵ Carry out your impact assessment using the Environment Agency's surface water pollution risk assessment guidance, part of Environmental Permitting Regulations guidance.

Record the findings for water quality go on to section 4: WFD protected areas.

Section 4: WFD protected areas

Consider if WFD protected areas are at risk from your activity. These include:

- special areas of conservation (SAC)
- special protection areas (SPA)
- shellfish waters
- bathing waters
- nutrient sensitive areas

Use Magic maps to find information on the location of protected areas in your water body (and adjacent water bodies) within 2km of your activity.

Consider if your activity is:	Yes	No	Protected areas risk issue(s)
Within 2km of any WFD protected area ⁶	Requires impact assessment	Impact assessment not required	

⁶ Note that a regulator can extend the 2km boundary if your activity has an especially high environmental risk.

Record the findings for WFD protected areas and go to section 5: invasive non-native species.

Section 5: Invasive non-native species (INNS)

Consider if there is a risk your activity could introduce or spread INNS.

Risks of introducing or spreading INNS include:

- materials or equipment that have come from, had use in or travelled through other water bodies
- activities that help spread existing INNS, either within the immediate water body or other water bodies

Consider if your activity could:	Yes	No	INNS risk issue(s)
Introduce or spread INNS	Requires impact assessment	Impact assessment not required	

Record the findings for INNS and go to the summary section.

Summary

Summarise the results of scoping here.

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology		
Biology: habitats		
Biology: fish		
Water quality		
Protected areas		
Invasive non-native species		

If you haven't identified any receptors at risk during scoping, you don't need to continue to the impact assessment stage and your WFD assessment is complete.

If you've identified one or more receptors at risk during scoping, you should continue to the impact assessment stage.

Include your scoping results in the WFD assessment document you send to your activity's regulator as part of your application for permission to carry out the activity.