Maine Sluices 1-18 Maintenance 2023 - Natura Impact Statement

Final

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This report describes work commissioned by the Office of Public Works. Steven Heathcote and Sky Wallis of JBA Consulting carried out this work.

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Abbreviations

CHS	Circular Hollow Section
CIEEM	Chartered Institute of Ecology and Environmental Management
DoEHLG	Department of the Environment, Heritage and Local Government
EC	European Community
EPA	Environmental Protection Agency
HDPE	High density polyethylene
NRA	National Rivers Authority
OP	Operation Procedure
OPW	Office of Public Works
SAC	Special Area of Conservation, protected under the EU Habitats Directive
SC	Security Clearance
SPA	Special Protection Area for birds, protected under the EU Habitats Directive
WFD	Water Framework Directive

Executive Summary

This report presents a Natura Impact Statement for the maintenance of fourteen sluices along embankments E1, E2, E43, and E43A as part of the Maine Arterial Drainage Scheme by The Office of Public Works. The scheme is the implementation of the legal duty under the Arterial Drainage Acts of 1945 and 1995 to maintain sluices that form part of the scheme and provide drainage and flood protection to the benefiting lands. The existing sluices have reached the end of their design life and require replacement to maintain function.

The sluices will be replaced by isolating them from the river and ditches before excavating out the old sluice and replacing each with a new one. The works will take place from the landward side of the embankment and on the crest. There will be no in-channel works except to isolate the sluice outfall at low tide. The work assessed here is beyond the scope of works considered in the existing NIS for the Maine Arterial Drainage Scheme so is subject to a separate Appropriate Assessment.

A desk-based assessment was used to identify the baseline ecological conditions on and adjacent to the scheme channels. This assessment used field survey information from other Arterial Drainage Schemes and an intertidal sediment survey report for the study area, as well as other information on the site and the designated sites in the zone of influence.

The project zone of influence was determined based on the size and scale of the proposed works using the source-receptor-pathway method. This uses variable distances depending on pathways of impact. A total of four Natura 2000 sites were considered. These are Castlemaine Harbour Special Area of Conservation (SAC) and Special Protection Area (SPA), Slieve Mish Mountains SAC and Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA. The screening process identified that in the absence of mitigation the scheme had Likely Significant Effects on two Natura 2000 sites, Castlemaine Harbour SAC and SPA. The scheme therefore required an Appropriate Assessment. Details of the site are presented including qualifying interest features, conservation objectives and threats and pressures.

A detailed assessment of impacts using the source-pathway-receptor was carried out. The assessment identified several pathways to impact including increased suspected solids, and direct habitat loss and disturbance (both direct and through noise or visual impact and vibrations). Avoidance and reduction measures are suggested for the works, and these are considered sufficient to avoid and mitigation all potential effects on each of the qualifying interest features, so that the proposed works would have no adverse effect on the integrity of any Natura 2000 site, either alone or in-combination with any other plans or projects.

Of note, Otter resting places are present near to the works. Otter are a qualifying interest feature of Castlemaine Harbour SAC, and specific mitigation is required to avoid impacts on Otter that would otherwise undermine the site's conservation objectives.

The Appropriate Assessment has concluded that with the avoidance and mitigation measures proposed the proposed work to repair the fourteen sluices would not have an adverse impact on any Natura 2000 site.

1 Introduction

1.1 Background

JBA Consulting has been appointed by the Office of Public Works (OPW) to undertake an Appropriate Assessment of the effects of a project to refurbish fourteen sluices in a tidal section of the River Maine, as part of the Maine Arterial Drainage Scheme maintenance works. This Natura Impact Statement (NIS) documents the Appropriate Assessment process and results in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) which transposes into Irish law Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora).

The proposed project is part of the maintenance of the Maine Arterial Drainage Scheme, required as part of maintenance activities under the Arterial Drainage Acts of 1945 and 1995. However, the proposed activities go beyond the scope of standard activities considered in the Maine Arterial Drainage Scheme NIS (JBA 2018) and therefore require separate assessment. The locations of the sluices are shown in Figure 1-1.

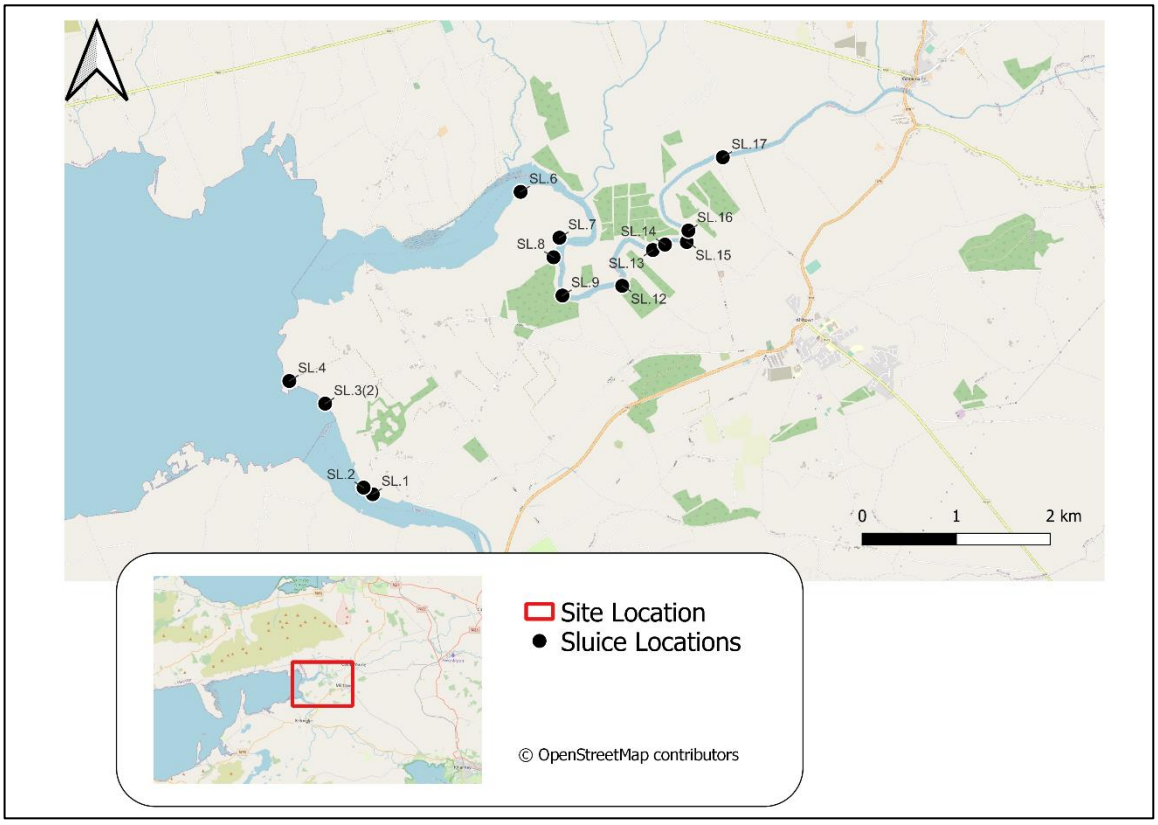

Figure 1-1: Location of sluices.

1.2 Legislative Context

The Habitats Directive (Directive 92/43/EEC) aims to maintain or restore the favourable conservation status of habitats and species of community interest across Europe. The requirements of Articles 6(3) and 6(4) of the Habitats Directive have been transposed into Irish legislation by means of the European Communities (Birds and Natural Habitats) Regulations 2011-21.

Under the Directive a network of sites of nature conservation importance have been identified by each Member State as containing specified habitats or species requiring to be maintained or returned to favourable conservation status. In Ireland the network consists of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), and candidate sites, which together form the *Natura 2000* network.

Article 6(3) of the Habitats Directive requires that, in relation to European designated sites (i.e. SACs and SPAs that form the *Natura 2000* network), "*any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to* ***appropriate assessment*** *of its implications for the site in view of the site's conservation objectives*".

A competent authority, in this case the OPW as a public body, can only agree to a plan or project after having determined that it will not adversely affect the integrity of the site(s) concerned.

1.3 Appropriate Assessment Process

Guidance on the Appropriate Assessment (AA) process was produced by the European Commission in 2002, which was subsequently developed into guidance specifically for Ireland by the Department of Environment, Heritage and Local Government (DEHLG, 2010). These guidance documents identify a staged approach to conducting an AA, as shown in Figure 1-2.

Figure 1-2: The Appropriate Assessment Process

1.3.1 Stage 1 - Screening for AA

The initial, screening stage of the Appropriate Assessment is to determine whether the proposed plan or project is directly connected with, or necessary for, the management of the European designated site for nature conservation

if it is likely to have a significant adverse effect on the European designated site, either individually or in combination with other plans or projects

For those sites where potential adverse impacts are identified, either alone or in combination with other plans or projects, further assessment is necessary to determine if the proposals will have an adverse impact on the integrity of a European designated site, considering the sites conservation objectives (i.e. the process proceeds to Stage 2).

1.3.2 Stage 2 - AA

This stage requires a more in-depth evaluation of the plan or project, and the potential direct and indirect impacts arising from it on the integrity and the interest features of the European designated site(s), alone and in-combination with other plans and projects, considering the site's structure, function and conservation objectives. Where required, mitigation or avoidance measures will be suggested.

The competent authority, in this case the OPW, can only agree to the plan or project after having ascertained that it will not adversely affect the integrity of the site(s) concerned. If this cannot be determined, and where mitigation cannot be achieved, then alternative solutions will need to be considered (i.e. the process proceeds to Stage 3).

1.3.3 Stages 3 & 4 – Alternative solutions and IROPI

Where adverse impacts on the integrity of Natura 2000 sites are identified, after mitigation measures have been applied, or the mitigation measures are not certain / capable of being successfully implemented, alternative ways of achieving the objectives of the plan or project that avoid adverse impacts need to be considered. If none can be found, the assessment must demonstrate Imperative Reasons of Overriding Public Interest (IROPI) and provide suitable compensation.

1.4 Structure of this report

To provide the competent authority with the relevant information to determine with confidence their conclusions on the overall impacts of the project to the integrity of the sites concerned, this NIS presents the following:

Section 2: Details of the methods used in this assessment.

Section 3: A detailed description of the proposed project.

Section 4: A detailed description of the baseline conditions within the area of works.

Section 5: A screening of Natura 2000 sites based on those that are located within the Zone of Influence of the proposed works.

Section 6: A description of those Natura 2000 sites that are screened in for being at risk for potential adverse impacts from the proposed works.

Section 7: Identification of potential sources of impact to the screened in Natura 2000 sites and assessment of the impacts for significance. Where effects are present specific mitigation is proposed.

Section 8: Summary of the impacts and mitigation with overall assessment on the coherence of the Natura 2000 network.

2 Methodology

2.1 Guidance

This NIS has been prepared having regard to the Birds and Habitats Directives, the European Communities (Birds and Natural Habitats) Regulations 2011-21 as amended and relevant jurisprudence of the EU and Irish courts. The following documents have also been used to provide guidance for the assessment:

- DEHLG (2010) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government.
- European Commission (2019) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission.
- European Commission (2021) Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission.
- EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.
- Fossitt, J. (2000). A Guide to Habitats in Ireland. The Heritage Council, Kilkenny.
- OPR (2021) Appropriate Assessment Screening for Development Management. OPR Practice Note PN01.
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal, Version 2.1.

2.2 Desktop Survey

A desktop survey was conducted in January 2023 of available published and unpublished information, along with a review of data available on the National Parks and Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) web-based databases, to identify key habitats and species (included legally protected and species of conservation concern) that may be present within ecologically relevant distances from the scheme as explained below. The data sources below were consulted for the desktop study:

- NBDC species data within the following 1 km grid squares, which include the sluices, within the past 10 years: Q7902, Q7901, Q7900, Q800, Q8001, Q8101, Q8102, Q7600, Q7700, Q7699, Q7799, Q7798, Q7898
- NPWS website (www.npws.ie), (https://www.npws.ie/), where site synopses, Natura 2000 data forms and conservation objectives were obtained along with Annex 1 habitat distribution data and status reports.

- NBDC Maps (http://maps.biodiversityireland.ie/#/Map)
- Environmental Protection Agency (EPA) maps website (https://gis.epa.ie/EPAMaps/)
- Water Maps (www.watermaps.wfdireland.ie)
- Review of existing survey reports including the NIS for the OPW's Arterial Drainage Scheme work 2019-2023 (JBA 2018), work to embankments at Garrane East and Callinafercy (JBA 2016) and a detailed survey of the mudflats in the study area (MERC Consultants 2018), along with previous sluice maintenance (JBA 2021) and embankment maintenance (JBA 2022). As well as providing baseline, these works are further considered in the in-combination assessment.

2.3 Site Visit

A site walkover was completed by JBA ecologists Hannah Mulcahy and Johanna Healy on 15th February 2023. The walkover was conducted to identify and map any Annex 1 habitats and record evidence of protected species within the project footprint and adjacent areas. The walkover covered the area around all sluices and 200m upstream and downstream.

2.4 Screening Method

The screening method is based on the method developed to screen impacts of Arterial Drainage Schemes by Ryan Hanley (2014a) and OPR (2021). This involves a careful consideration of the impacts likely via land, surface water and groundwater. The screening method has been updated to consider generic environmental procedures (EP) (Brew & Gilligan, 2019; see Section 3.3) which are considered part of the project description, that is they will be implemented regardless of setting and there is high confidence in their effectiveness. Some EPs are implemented only in specific locations, so these are not considered part of the project description. In particular, the impacts of the implementation of EP7 and EP10, which are always implemented to reduce impacts related to poor-practice for vegetation and silt management respectively. The OPW implements a programme of training and audit which ensures these EPs are implemented with a high degree of confidence allowing them to be included with certainty as part of the project description.

2.5 Screening: the Likely Significant Effects Test

The test for AA screening is whether the Scheme could have a 'Likely Significant Effect' (LSE) on any Natura 2000 site. A likely significant effect is defined as any effect that could undermine the conservation objectives of a Natura 2000 site, either alone or in combination with other plans or projects. There must be a causal connection between the Scheme and the qualifying interest of the site which could result in possible significant effects on the site. The LSE test is a lower threshold for the screening assessment than 'adverse effect on site integrity' considered at the full

Appropriate Assessment stage (Stage 2) as screening is intended to be a preliminary examination for potential effects.

The Zone of Influence was used to identify Natura 2000 sites that could be impacted by the project. For each of these sites, the Qualifying Interest features and their associated conservation objectives were identified, and the possibility of LSE was determined by a combination of location, ecological and hydrological connectivity, sensitivity of receptor and magnitude of the source of impact.

2.6 The Adverse Effect on Site Integrity test

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of qualifying interest. The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level. Upon the conclusion of the Appropriate Assessment, the competent authority, in this case the OPW, should grant consent to the plan or project only after having ascertained that it will not adversely affect the integrity of the Natura 2000 site(s) concerned.

An assessment of whether there could be an adverse effect on site integrity is done using the source-pathway-receptor model which is a conventional model used for determining the risk of impact to a site or qualifying interest (OPR 2021; Ryan Hanley 2014b). Risk is the likelihood or expected frequency of a specified adverse consequence or impact. Applied to the Scheme, it expresses the likelihood of an adverse impact arising because of the Scheme activities. A hazard presents a risk when it is likely to affect something of value (i.e. the Natura 2000 sites and their Qualifying Interests (QIs)). It is the combination of the probability of the hazard occurring and its consequences that is the basis of a risk assessment which is what an NIS essentially is:

Risk = probability of an event x consequential damage

The source-pathway-receptor model is a useful tool to determine if a risk is present, and to help quantify the risk to see if the threshold of an adverse effect on site integrity is reached. For a risk to be present, all three elements must be present.

Source: The source considered in this NIS is the proposed works or activity that will occur as a result of the Scheme. Key considerations in assessing the source are the nature and scale of the potential impacts that may arise, such as the type of contaminants that may arise, the contaminant loading and other physical attributes. The point of occurrence is a critical reference point for assessing the attributes of the source of any potential adverse impacts.

Pathway: Pathways are established by surface water, ground water and land connections. The pathway includes everything between the source and the receptor; from point of release of potential adverse impacts, such as contaminants, to the

receptor. The location, nature, connectivity and extent of wells, groundwater dependent ecosystems, aquifers and faults can all influence the nature of a pathway. Rivers, streams and drainage ditches could all act as potential pathways for potential waterborne impacts. Where the pathway includes surface or groundwater bodies, the WFD status of that body is reviewed as this informs the ability of it to transfer impacts and its resistance and resilience of adverse impacts. Land pathways to be considered include those that may transfer direct physical impacts, noise and visual disturbance (vibrations).

Receptor: The receptor is the QI features of the relevant Natura 2000 sites, their Conservation Objectives (COs) and the overall integrity of the Natura 2000 sites. To determine the significance of potential adverse impacts on the integrity of the Natura 2000 site, the COs of each site are assessed relative to the potential impacts that may occur because of the proposed works. The conservation objectives are the fundamental unit on which the assessment is based. If the project were to undermine or make these objective more difficult to achieve, the conservation status of the QI features becomes harder to achieve, and the quality and condition of the site will be reduced, reducing the 'integrity' of the Natura 2000 site. Each Natura 2000 site will either have specific or generic conservation objectives. Detailed site-specific conservation objectives have now been provided for most SACs and SPAs throughout Ireland.

The overall aim of COs is to maintain or restore the favourable conservation conditions of the Annex I habitats and/or the Annex II species for which a SAC has been selected, under which the site-specific objectives contain more detailed attributes, measures and targets.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The conservation objectives for SPAs are also to maintain or restore the favourable conservation condition of the bird species listed as QIs for SPAs, which are defined by the following list of attributes and targets:

- Population trend: Measure of percentage change and whether the long-term population trend is stable or increasing.
- Distribution: Number, range, timing and intensity of use of areas. There is to be no significant decrease in the range, timing or intensity of use of areas by specific or generic bird species, other than that occurring from natural patterns of variation.

The conservation objectives for non-breeding birds QIs for SPAs are as follows:

- To maintain the favourable conservation condition of the non-breeding water bird Special Conservation Interest species listed for a SPA.
- To maintain the favourable conservation condition of the wetland habitat for a SPA as a resource for the regularly occurring migratory water birds that utilise it.

Some Natura 2000 sites do not have specific COs for each QI and instead have only the general objectives listed above. Where these sites are screened into the assessment, detailed COs have been derived from other nearby Natura 2000 sites with the same QIs. In these cases, the necessary assumption has been made that the sites have similar characteristics, and the conservation objectives are likely to be similar for the specific habitat or species type in terms of conservation requirements.

Site integrity is assessed based on each conservation objective of each qualifying interest feature. Should any conservation objective be undermined by the proposed work, the site integrity will therefore be adversely affected. Low-impact effects that are too small or short-lived to undermine the achievements of the conservation objectives are therefore not likely to adversely affect site integrity.

2.6.1 Avoidance and mitigation measures

To ensure that any recommended mitigation measures are sufficient and proven to be successful, they are designed in accordance with the most up to date best practise guidelines and tailored where necessary to the conditions on-site and nature of the relevant receptors. OPW have a detailed process to ensure ecological measures and included during project implementation, along with audits to check compliance. Any avoidance and mitigation measures are assessed for evidence of their effectiveness and the certainty with which they can be implemented, as well as certainty with which they will avoid or reduce impacts. This forms a critical part of the assessment of residual effects and whether these could still result in adverse impacts.

2.7 In-combination Assessment

The in-combination assessment method was based on searching for plans and projects, including the ongoing OPW Arterial Drainage Scheme works, where the River Maine sluice works had residual impacts that may be increased in-combination

with other projects. Where these impacts were identified, the relevant screening distance for QI feature based on its ecology was applied to Natura 2000 site. Within this screening distance any plans and projects were searched for. If the plan or project had a published NIS which was not subject to a further information request, this was reviewed for possible in-combination impacts. If this NIS concluded no impacts (including no non-significant residual impacts) alone, the plan or project was ruled out of the in-combination assessment, and this is noted in the text. If the NIS included potential residual impacts, or if it was subject to a further information request, then it was taken forward for impact assessment in-combination with the arterial drainage scheme.

2.8 Consultation

No consultations in relation to these works were noted at the time this report was prepared. However, it should be noted that OPW maintain constant communication with NPWS (the Statutory Nature Conservation Body) and IFI over ongoing maintenance works.

2.9 Competent Persons

The assessment has been carried out by JBA principal ecologist Dr Steven Heathcote BA(Hons) DPhil CEcol MCIEEM. Dr Steven Heathcote has undertaken numerous Appropriate Assessment reports and NIS assessments for a variety of schemes in Ireland as well as assessment of projects under Article 6 of the Habitats Directive in a range of European countries over the past 10 years.

2.10 Limitations and Constraints

The conclusion of this report necessarily relies on some assumptions, and it is inevitably subject to some limitations. Most of the assumptions and limitations would not affect the conclusion but the following points are recorded to ensure the basis of the assessment is clear:

- Some field data for the works are taken from previous assessments of the Maine Arterial Drainage Scheme, and with the habitats unlikely to have changed significantly, this is considered to provide relevant and up-to-date information on the habitats present.
- No surveys of the SPA birds have been undertaken, and a combination of existing information, general behaviour patterns of coastal birds, and precautionary assessment have all been used to assess impacts on these species.

3 Project Description

3.1 The 'Project'

The proposed maintenance of fourteen sluices (E1 SL6-SL9 and SL12-15, E2 SL16-17, E43 SL3-4 and E43A SL1-SL2) under the Maine Arterial Drainage Scheme meets the criteria of a 'Project' as defined in the Habitats Directive and is not directly connected with or necessary to the management of any Natura 2000 site. Therefore, the project is subject to the requirements of the Appropriate Assessment process.

The OPW is statutorily obligated to maintain arterial drainage schemes under the 1945 Arterial Drainage Act, and since their completion, maintenance of these Arterial Drainage Schemes has been ongoing. Significant works not included in the standard maintenance are subject to separate assessment, as is the case with the maintenance of sluices on the River Maine and Castlemaine Estuary.

The project description given below is based on a standard OPW method statement for sluice maintenance works, with relevant extracts given below.

3.2 Project Location

The sluices are located on four embankments in the tidal section of the River Maine and the estuarine section of Castlemaine Harbour (Figure 1-1) in OPW's south-west region in County Kerry. All of the sluices are located on the left bank of the River Maine. Sluices 6-9 and 12-17 are located on the left bank on Embankments E1 and E2, and sluices 1-4 are located along Castlemaine Harbour to the west.

3.3 Description of Project Activities

The proposed works will replace the existing sluice headwalls and pipes. All the sluice replacements will be carried out using the methods set out as follows:

1. Damming of back drain to prevent water ingress to works area achieved using 360° excavator to place steel plate across channel, remaining low levels of water will be controlled by standby pump, if pumping is required, waters will be pumped over land to allow for natural filtration through soils.
2. Vehicles will only track to and from site on existing haul roads and all disturbed ground, including ruts and depressions, will be reinstated, and/or re-established and reseeded. Some sod from excavated areas around sluices, will be kept aside and reinstated after works so the existing seedbank will re-establish.
3. 360° excavator to commence lowering embankment for working platform, disturbed embankment material will be stockpiled away from works area and sealed using 360° excavator bucket to mitigate runoff and will be used for reinstatement at a later stage. (NOTE: No plant will operate on the waterside of the embankment).

4. At low tide, existing headwall will be removed, and first length of pipe exposed. 360° excavator will prepare the headwall footprint to receive foundation steel reinforcement/ 9” shuttering formwork.
5. Concrete will be delivered to site via existing access road and poured into 360° excavator bucket for placing in prepared foundation. Once placed, excavation will be gradually flooded to allow concrete to cure overnight.
6. Shuttering formwork will be removed, and 360° excavator will place precast concrete headwall on new foundation (on footprint of existing headwall). Precast concrete headwalls will be delivered to site on tractor low-loader.
7. 360° excavator will reduce levels along existing pipe route and remove existing pipe. Pipe will be loaded to tractor low-loader and disposed of off-site.
8. New high-density polyethylene (HDPE) pipes will be placed along footprint of existing pipe until run to rear back drain is complete. 360° excavator will back fill and bed pipes using previously excavated material. No imported pipe bedding is required.
9. Existing rear headwall will be removed using 360° excavator. Excavator will prepare the headwall footprint to receive foundation steel reinforcement/ 9” shuttering formwork.
10. Concrete will be delivered to site via existing access road and poured into 360° excavator bucket for placing in prepared foundation and allowed to cure overnight.
11. Shuttering formwork will be removed, and 360° excavator will place precast concrete headwall on new foundation (on footprint of existing headwall). Precast concrete headwalls will be delivered to site on tractor low-loader.
12. Operatives will commence with grouting of pipes surrounds where pipes meet headwall concrete using high strength grout (Sika or similar).
13. Operatives will assemble and install circular hollow section (CHS) tube handrails on top of headwalls in pre cored holes.
14. 360° excavator will remove steel plate from back drain and allow water flow as before.
15. 360° excavator will reinstate embankment and surrounding disturbed areas using previously stockpiled material.
16. 3-4t Rock armour will be delivered to site via access route and placed at vulnerable points either side of headwall to protect against future erosion. Permeable geotextile will be placed behind rock armour to prevent fine soil particles from washing out.

For clarity there will be no access at all by machinery onto the tidal side of embankments.

Although the above description is the core works description, some elements have a clear effect of avoiding or reducing impacts on Natura 2000 sites and the project could potentially go ahead without them. This is particularly in relation to silt management in points 1 and 3, access in point 2, and concrete management in points 4-11.

3.3.1 Works Access

For sluices on Embankment E2 access would be along an existing access track immediately to the south of the embankment. To the north, a temporary extension of the existing aggregate haul road 5m x 0.3m on the landside of the embankment will be used, which is the same route used for previous embankment repairs.

3.3.2 Timing of Works

Works on site will be carried out during standard OPW hours (08:00 – 17:00). It is intended to carry out works from spring 2023 onwards.

3.3.3 Guidance for Drainage Maintenance Activities

The OPW Environmental Guidance: Drainage Maintenance and Construction (Brew & Gilligan, 2019) sets out how Drainage Maintenance and Construction work is to be carried out. The guidance document includes procedures which are instructions to help OPW staff, in the form of a practical handbook. The Guidance aims to deliver good drainage and flood relief functions while reducing the associated environmental impacts. The Environmental Procedures (EPs) set out in this book include a range of standard mitigation and are compulsory on OPW projects. These compulsory EPs provide a basic level of Environmental Mitigation, and are embedded in the project, so are included in the project description, rather than being considered as ‘avoidance or reduction’ measures which could only be considered in the Appropriate Assessment (Stage 2). Some EPs are not compulsory on all schemes, and these are ‘avoidance or reduction’ measures and are not considered until later.

The implementation of these EPs is done with a high degree of certainty as staff receive training on them and are audited in the field. This ensures that maintenance teams are complying with the standards.

3.4 Summary of Project Impacts

The potential sources of impact from the project are summarised in Table 3-1.

Table 3-1: Summary of project impacts

Project Elements	Comment
Size and scale	The proposed works would involve the maintenance of 14 sluices. This operation is a relatively small-scale operation compared to standard OPW works to maintain hundreds of kilometres of embankment. In the

Project Elements	Comment
	context of the Maine Arterial Drainage Scheme, the project is of a small size, affecting around 1% of the total length of embankments.
Land-take	There would be no permanent land take, with all operations being temporary. The temporary land-take would be a small amount of agricultural land for the access route, then temporary alteration of the grassy embankment itself.
Distance from Natura 2000 site or key features of the site	Five sluices (SL1-4 and SL6) are within or on the boundary of Castlemaine Harbour SAC and SPA. All other sluices are upstream of this boundary. However, at these sluices, as with all others, there will be no access for vehicles off the embankment into the tidal reaches of the river. The main SAC and SPA features likely to be found in the project area are discussed in the subsequent Chapters.
Resource requirements (water abstraction etc.)	Any additional material to complete the works would be sourced externally and imported to the site. No abstraction will be required.
Emissions (disposal to land, water or air)	There will be a negligible quantity of airborne emissions from construction vehicles. No other emissions are anticipated.
Excavation requirements	The sluice maintenance involves excavation of the flood bank down to the level of the sluice, this is made ground, and will not break ground within Annex 1 habitat inside the SAC and SPA. There may be a small amount of excavation to create the haul roads, but this will be less than 1m deep and will not reach any groundwater bodies or leave any deep holes on the site.
Transportation requirements	There would be a requirement to transport material to the site to construct the haul road and maintain the sluices, as well as to transport machines to the site.
Duration of construction, operation, decommissioning etc.	The duration of works would likely be up to six months. The banks are expected to remain operational indefinitely but may require further repair works in future.

3.5 Potential Impacts of the Project

Based on the project description and requirements, the following potential impacts are considered as plausibly occurring:

- Release of suspended solids via surface water;
- Direct loss or damage of Annex 1 habitats; and
- Killing, injuring and disturbance of species (through direct impact, entrapment, and movement, sound or vibration causing disturbance).

3.6 Project Zone of Influence

There are no Freshwater Pearl Mussels so the initial screening distance of 15km is used to identify sites near the scheme, and subsequently these sites are screened for potential impacts related to land and surface water, to determine if there are any likely significant effects which need further consideration. The land pathway would result in impacts in the works area and land immediately adjacent. This impact is extended up to 600m for disturbance of birds, which is a precautionary maximum distance for such disturbance (Ryan Hanley 2014a). For surface water, the maximum impact is assessed as 1km downstream (upstream impacts are not relevant for these works) which is consistent with APEM (2022) and Brew and Gilligan (2019), and given the size and scale of the works, is an appropriate precautionary distance. No impacts to groundwater will occur as the works will replace existing sluices on a raised embankment with no potential for changes to groundwater levels or quality.

4 Ecology Baseline

4.1 Overview

This section summarises the baseline information about the environment within the project footprint. This is based on a review of the information listed in Section 2.2.

4.2 Habitats

Habitat data has been compiled from walkover surveys completed previously and for the current works, along with NPWS data on habitat distribution. In the works area, the river represents a lowland depositing river [FW2], and the embankments are vegetated with improved grassland [GA1] and dry meadows [GS2]. The surrounding land is a mix of improved grassland [GA1], upper saltmarsh [CM2], lower saltmarsh [CM1], wet grassland [GS4], and a small area of forestry [WD4] all with abundant drainage ditches [FW4]. Stands of reeds and tall herbs are common on the edges of the river and estuary [FS1]. No additional Annex 1 habitats were noted in proximity to the proposed works. The Annex I habitats recorded at Castlemaine Harbour are given in Table 4-1 and their distribution is shown in FIGX and FIGX

Table 4-1: Annex 1 habitats recorded near embankments E1, E2, E43 & E43A

Annex I Habitat Type	Equivalent Fossitt Habitats	Location and source
1130 Estuaries	CW2 and adjacent habitats includes FS1, FS2, CM1, CM2, MW4.	Field survey (2018, 2023)
1140 Mudflats and sandflats not covered by sea water at low tide	MW4	Field survey (2018, 2023)
1220 Perennial vegetation of stony banks	CB1	Field survey (2018) over 3km from the site
1330 Atlantic Salt Meadows	CM1/ CM2	Field survey (2018, 2023)
1410 Mediterranean Salt Meadows	CM1/ CM2	Field survey (2018, 2023)
6430 Hydrophilous tall herb fringe communities	FS2	Field survey (2018) present along river side of E9

4.2.1 Estuaries [1130]

The main estuary of the River Maine is adjacent to several of the proposed sluice works (SL6-9 and SL12-17) and corresponds to the Annex I habitat Estuaries. The habitat indicated by site surveys and sediment sampling closely resembles the Marine Nature Conservation Review (MNCR) habitat “LS.LMu.UEst.Hed.OI: Hediste

diversicolor and oligochaetes in littoral mud". This biotope is represented by a species-poor community found in mud or slightly sandy mud in low salinity conditions, typically at the head of estuaries where there is strong freshwater influence. The infauna is dominated by the ragworm *Hediste diversicolor* which is typically superabundant. Oligochaetes, including tubificids and *Heterochaeta costata*, can be abundant, as well as spionids. This community is species-poor and bivalves are virtually absent. The most common macrobenthos found in sediment samples from the area (MERC Consultants 2018) were the ragworm *Hediste diversicolor*, the oligochaete *Baltidrilus costatus* and the amphipod *Corophium volutator*. Diversity was low and the abundance of these species high, as is typical of the biotope. However, these dominant species possess ecological traits which have important impacts on the key functions of the ecosystem. The Estuary habitat includes areas of mudflat (4.2.2).

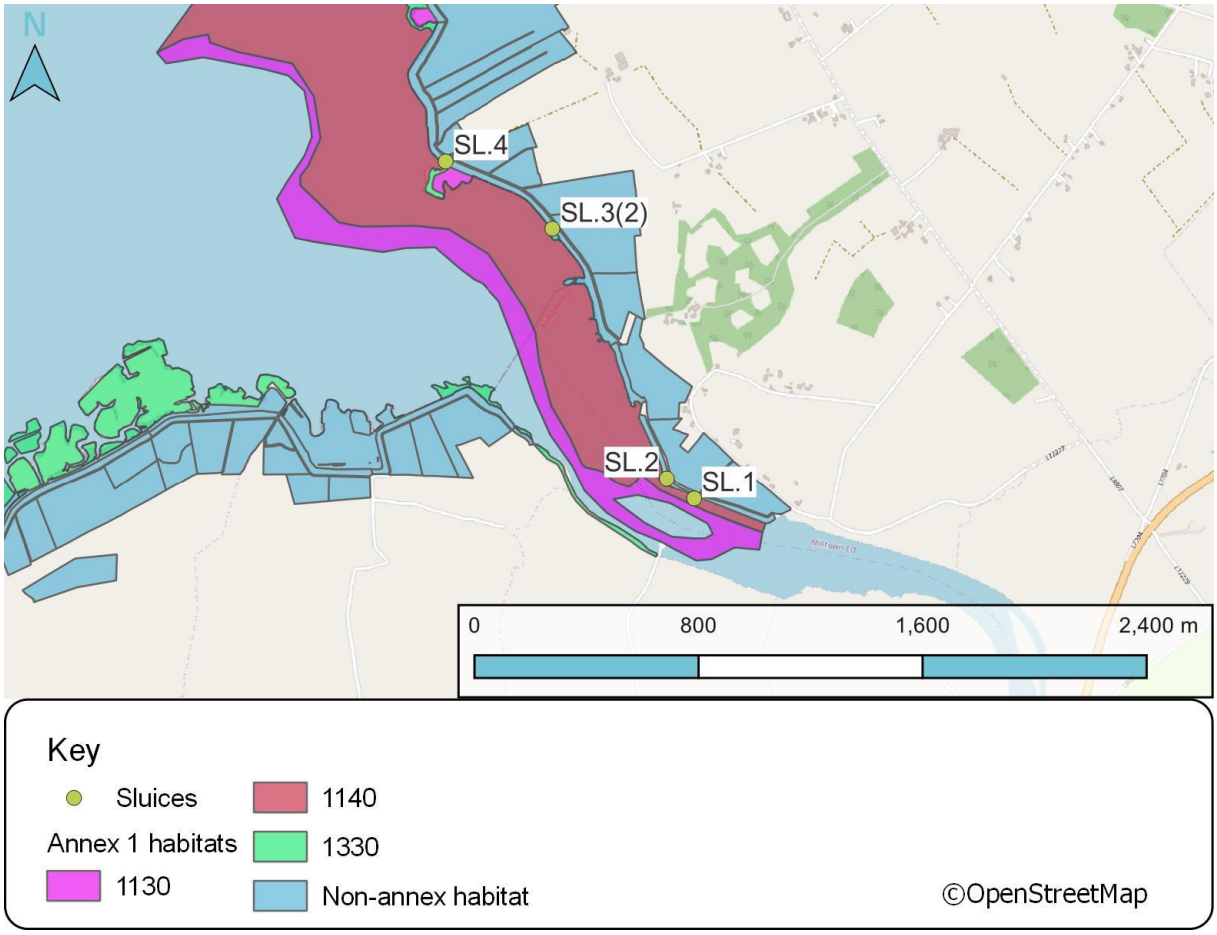

Figure 4-1. Annex 1 habitat in proximity to sluices 1-4

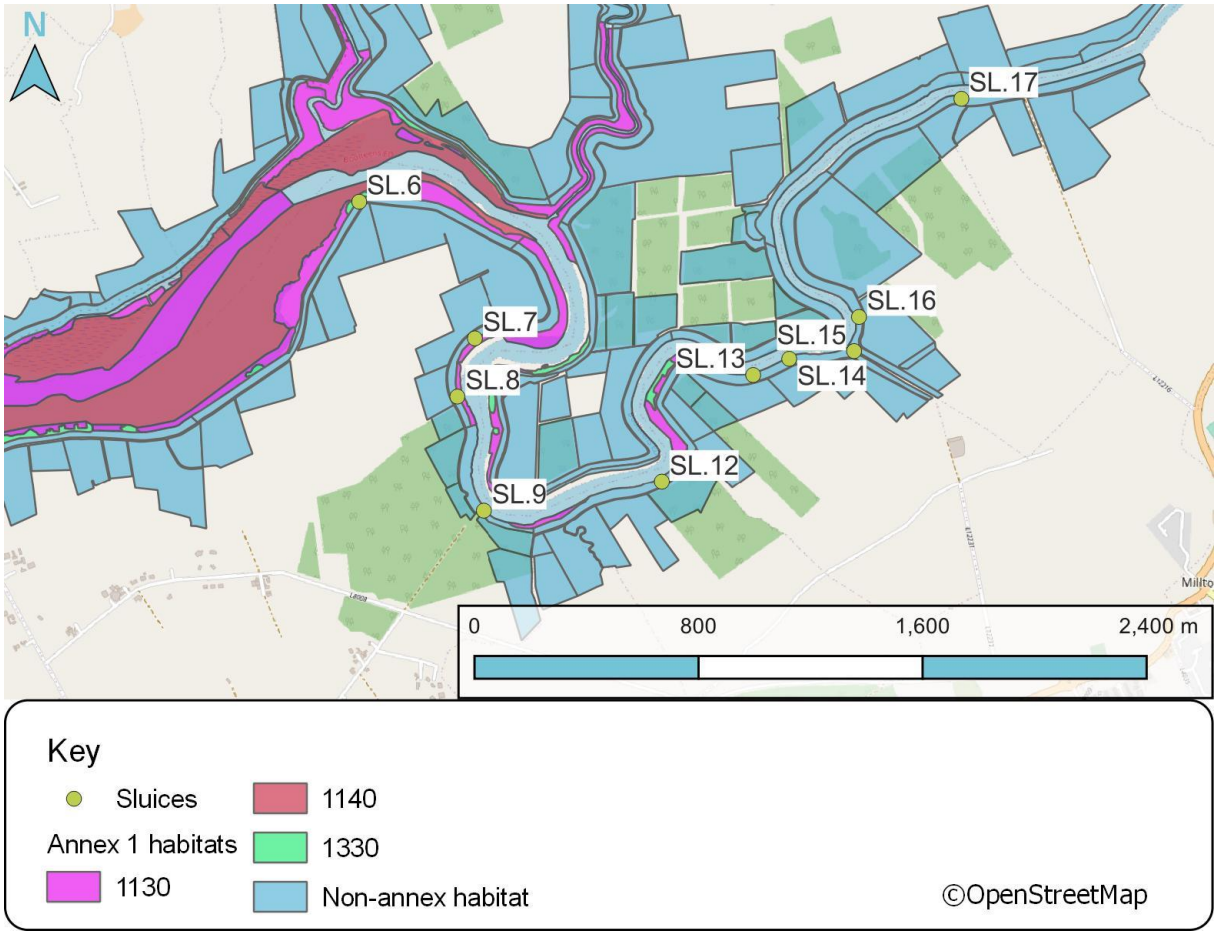

Figure 4-2. Annex 1 habitat in proximity to sluices 6-17

4.2.2 Mudflats and sandflats not covered by seawater at low tide [1140]

This Annex I habitat is found primarily in the River Maine estuary and on the south shore of Castlemaine Harbour, located adjacent to some of the proposed works (SL1-4). They are formed of very fine sediment and usually occur along the most sheltered sections of coastline. This area is characterised by elevated mudflats that are dissected by networks of shallow channels associated with flooding and drainage. The mud is often very soft and fluid, with a 'wet' surface appearance, or it may be compacted and form steep banks in the upper parts of macro-tidal estuaries and along saltmarsh creeks. Observations concluded that all areas of intertidal estuary around the sluices, are within a deposition-dominated environment and classified as the Annex 1 mudflats habitat.

4.2.3 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

Tall-herb swamp habitat is found at several locations on the north side of the estuary under Fybagh and well away from the proposed sluice works. It is identified by stands of herbaceous vegetation that occur in wet areas where the water table is above the

ground surface for most of the year. This habitat contains *Iris sp.,* Bulrush *Typha latifolia*, Branched Bur-reed *Sparganium erectum,* Lesser Spearwort *Ranunculus flammula*, Watercress *Nasturtium officinale*, Marsh Bedstraw *Galium palustre*, Fools Watercress *Apium nodiflorum*, Water Pepper *Persicaria hydropiper*, Brooklime *Veronica beccabunga*, Marsh Willowherb *Epilobium palustre*, Purple Loosestrife *Lythrum salicaria* and rushes *Juncus spp*..

4.2.4 Perennial vegetation of stony banks [1220]

Shingle structures develop when a sequence of foreshore beaches is deposited at the limit of high tide. More permanent ridges are formed as storm waves throw pebbles high up on the beach, from where the backwash cannot remove them. Several beaches may be piled against each other and extensive structures can form. The ecological variation in this habitat type depends on stability, the amount of fine material accumulating between pebbles, climatic conditions, width of the foreshore, and past management of the site. The ridges and lows formed also influence the vegetation patterns, resulting in characteristic zonation of vegetated and bare shingle. This habitat is present adjacent to the proposed works.

4.2.5 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]

Lower salt marsh is subject to prolonged submersion by sea water and is strongly saline. Lower saltmarsh occurs within the area of the proposed works. Plant species present were Sea arrowgrass *Triglochin maritima*, the non-native Common Cordgrass *Spartina anglica*, Sea Aster *Aster tripolium* and Sea Lavender *Limonium humile*. Upper salt marsh is subject to less frequent and less prolonged inundation by the sea and, as a result, is not as saline in character as lower salt marsh. Species which occurred were Phragmites with Sea Aster, Sea Arrowgrass *Triglochin maritima*, Sea Milkwort *Glaux maritima* and Sea Beet *Beta vulgaris* present. Upper saltmarsh is found throughout the area of works in the intertidal zone, typically as small scattered stands.

4.2.6 Mediterranean salt meadows (Juncetalia maritimi) [1410]

This habitat includes saltmarshes in the Mediterranean basin dominated by rushes, especially Sea Rush *Juncus maritimus* tolerant of saline soils. Stands were present on the north side of the estuary, but no stands have been recorded in proximity to the sluices under consideration here, with the most extensive stands on the south side of the estuary located between sluices 4 and 6 in an area where no works are proposed.

4.3 Protected Flora and Fauna

This section presents the records of protected flora and fauna from NBDC data and field observations. There is then a discussion of the species relevant to the Natura 2000 sites.

4.3.1 Background data

The list of Annex I, II, IV and V and Protected Species: Wildlife Acts fauna recorded within the last 10 years and held in the relevant 1 km grid squares by the NBRC are shown in Table 4-2.

Table 4-2: Protected species recorded near the scheme channels

Species Name	Title of Dataset	Designation
Amphibians		
Common Frog (*Rana temporaria)*	National Frog Survey of Ireland 2010/2011	Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Birds		
Common Wood Pigeon (*Columba palumbus*)	Birds of Ireland	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex II >> Annex III, Section I Bird Species
Eurasian Curlew (*Numenius arquata*)	Birds of Ireland	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex II, Section II Threatened Species: Birds of Conservation Concern - Red List
Little Egret (*Egretta garzetta*)	Birds of Ireland	Protected Species: Wildlife Acts || Protected Species: EU Birds Directive >> Annex I Bird Species
Terrestrial Mammals		
Brown Long-eared Bat (*Plecotus auritus*)	National Bat Database of Ireland	Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Eurasian Badger (*Meles meles*)	Mammals of Ireland 2016-2025	Protected Species: Wildlife Acts
Eurasian Pygmy Shrew (*Sorex minutus*)	Atlas of Mammals in Ireland 2010-2015	Protected Species: Wildlife Acts
Eurasian Red Squirrel (*Sciurus vulgaris*)	Atlas of Mammals in Ireland 2010-2015	Protected Species: Wildlife Acts

Species Name	Title of Dataset	Designation
European Otter (*Lutra lutra*)	Mammals of Ireland 2016-2025	Protected Species: EU Habitats Directive >> Annex II >> Annex IV || Protected Species: Wildlife Acts
Lesser Horseshoe Bat (*Rhinolophus hipposideros*)	National Lesser Horseshoe Bat Database	Protected Species: EU Habitats Directive >> Annex II >> Annex IV || Protected Species: Wildlife Acts
West European Hedgehog (*Erinaceus europaeus*)	Hedgehogs of Ireland	Protected Species: Wildlife Acts

There were no plant species listed under the Flora (Protection) Order 2022 found during the ecological walkover surveys.

The following Qualifying Species have not been found in National Biodiversity Data Centre records or on the ecological walkover but are known to occur in the River Maine Catchment: Sea Lamprey *Petromyzon marinus*, River Lamprey *Lampetra fluviatilis,* Brook lamprey *Lampetra planeri* and Atlantic Salmon *Salmo salar* (O'Connor 2014, NPWS 2015). Salmon, a Qualifying Interest for the Castlemaine Harbour SAC, has been identified as being present in significant numbers, as juveniles, in the River Maine Catchment (O'Connor 2014, NPWS 2015). The critically endangered European Eel *Anguilla anguilla* is also known to be present in the Maine catchment (O'Connor 2014; NBDC 2018).

4.3.2 Field Surveys

Surveys in February 2023 examined the precise footprint of the proposed works. Whilst no mammal sightings were observed during the survey, mammal paths were identified adjacent to SL8. Further to this, several bird species such as Shelduck *Tadorna tadorna* and Snipe *Gallinago gallinago* were identified along the survey route.

During the 2022 surveys, Otter was seen using the main channel and evidence of their presence on the banks were recorded in the form of footprints and feeding remains. No holts were found to be present within 250m of the proposed works, including the embankment and the any access roads. No new couches were found in this survey.

Previous surveys have recorded Otter resting places (couches) in two locations between embankment E9 5500 and 5600 chains, approximately 1km upstream of the most eastern sluice SL17. These were well-used hollows on the banks of the main channel, in each case less than 30m from embankment E9.

A few other protected fauna species were recorded in and around the works areas including:

- Evidence of Badger *Meles meles* at several location, although no setts are present near the sluices.
- Multiple sightings of Kingfisher *Alcedo atthis* were recorded within the site.
- A wide range of wetland birds were recorded on the river or using the adjacent fields, all in small numbers.

4.4 Non-native Invasive Species

No invasive non-native species were recorded during the 2023 survey. Invasive non-native species recorded during the previous ecological walkover survey in 2022 include Himalayan Balsam *Impatiens glandulifera* and Japanese Knotweed *Fallopia japonica*. Both species are recorded grouped in locations within Castlemaine Harbour SAC. Montbretia *Crocosmia x crocosmiflora* has been recorded occasionally. Table 4-3 presents a list of protected fauna recorded on the site within the last 10 years and held in the relevant 10 km grid squares by the NBRC.

Table 4-3: Invasive species recorded near the scheme embankments.

Species name	Date of last record	Designation
Flowering Plants		
Butterfly-bush (*Buddleja davidii*)	06/06/2005	Medium Impact Invasive Species
Giant Knotweed (*Fallopia sachalinensis*)	06/06/2005	High Impact Invasive Species Regulation S.I. 477 (Ireland)
Japanese Knotweed (*Reynoutria japonica*)	09/08/2009	High Impact Invasive Species Regulation S.I. 477 (Ireland)
Rhododendron ponticum	20/11/2009	High Impact Invasive Species Regulation S.I. 477 (Ireland)
Sycamore (*Acer pseudoplatanus*)	06/06/2008	Medium Impact Invasive Species
Turkey Oak (*Quercus cerris*)	19/08/2015	Medium Impact Invasive Species
Terrestrial Mammals		
American Mink (*Mustela vison*)	16/03/2012	High Impact Invasive Species

Species name	Date of last record	Designation
		Regulation S.I. 477 (Ireland)
Bank Vole (*Myodes glareolus*)	15/05/2014	Medium Impact Invasive Species
Sika Deer (*Cervus nippon*)	08/01/2017	High Impact Invasive Species Regulation S.I. 477 (Ireland) Protected Species: Wildlife Acts

5 Screening Assessment

The project was screened for impacts via land pathways (including disturbance of species) and surface water up to 1km downstream of the proposed works. This assessment does not include avoidance or mitigation measures, which are only considered in stage 2 of the assessment.

5.1 Surface Water Pathways

The surface water pathways are based on river catchments. The embankments are located within the Maine catchment (WFD waterbody Maine_SC_050). There are four Natura 2000 site within these same surface water catchment as detailed in Table 5-1.

Table 5-1: Surface Water Pathways

Natura 2000 Site (Site Code)	Is site within the same surface water catchment as the scheme?	Is there surface water connectivity with the scheme?	Is the site within 1km?
Castlemaine Harbour SAC	Yes	Yes	Yes
Castlemaine Harbour SPA	Yes	Yes	Yes
Slieve Mish Mountains SAC	Yes	Yes	No
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Yes	Yes	No

The screening has identified that two sites are within the relevant screening distances and could potentially be impacted via surface water pathways. All surface-water dependent features of the following sites have the potential for Likely Significant Effects and are screened in for further assessment:

- Castlemaine Harbour SAC
- Castlemaine Harbour SPA

Two sites are screened out for surface water impacts: Slieve Mish Mountains SAC and Stack’s to Mullaghareik Mountains, West Limerick Hills and Mount Eagle SPA.

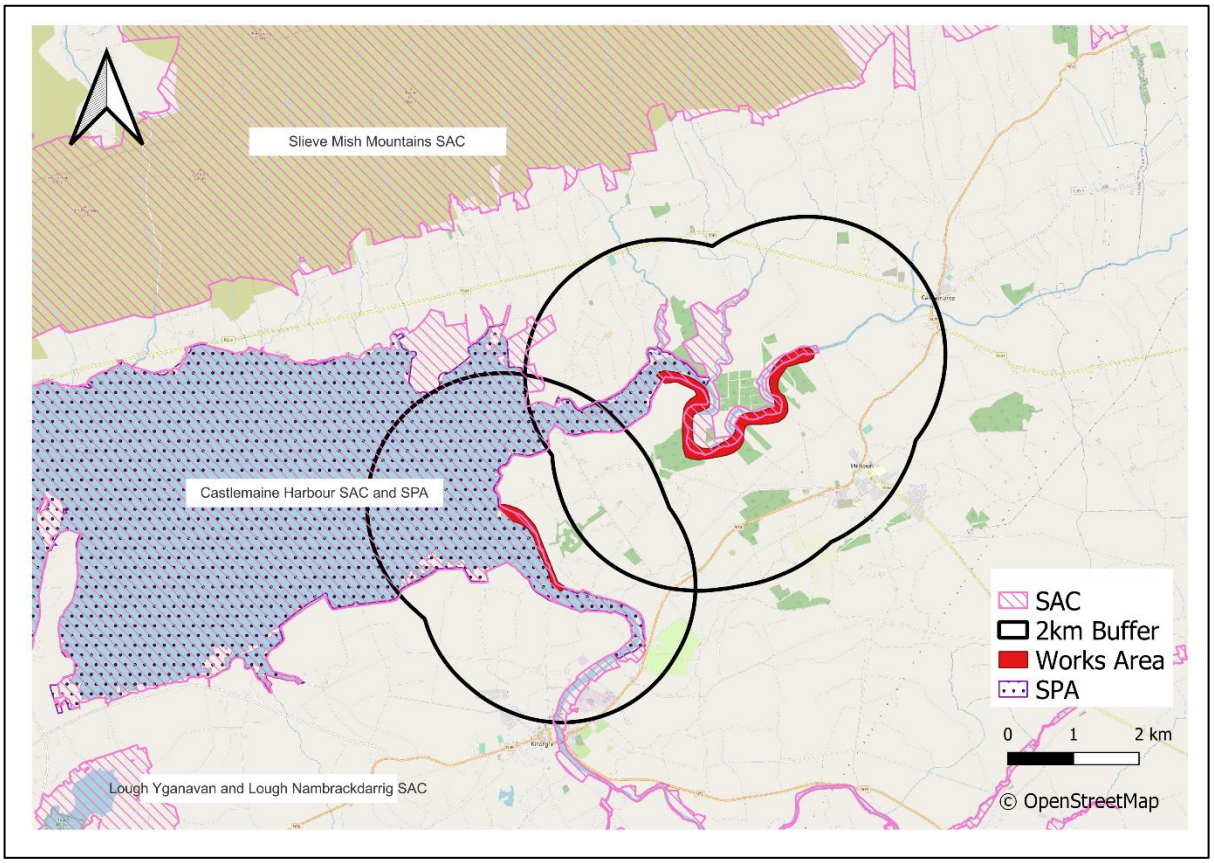

Figure 5-1: Proximity of protected sites to the scheme

5.2 Land Pathways

The relevant Zone of Influence for land pathways is up to 0.6km from the Scheme. As a result of the screening assessment, there are two Natura 2000 site within the relevant distance for Land Pathways (Table 5-2).

Table 5-2: Land and Air Pathways

Natura 2000 Site	0.6km Buffer Zone	0.01km (Overlap)
Type of Impact	Indirect impacts for noise and visual disturbance through air pathways	Direct impacts from physical disturbance of habitats through land pathways
Castlemaine Harbour SAC	Yes	Yes
Castlemaine Harbour SPA	Yes	Yes

The distribution of habitats is taken from a combination of published NPWS data and field surveys completed for previous parts of the Arterial Drainage Scheme. Summary results of QIs with potential for significant impact by land pathways are shown for the Natura sites in Table 5-3.

Table 5-3: Summary results of QIs / FOIs with potential land connectivity

QI	QI location relative to drainage maintenance activity	Location of Impact	Result
Castlemaine Harbour SAC			
Estuaries [1130]	Adjacent	Footprint	LSE
Mudflats and sandflats not covered by seawater at low tide [1140]	Adjacent	Footprint	LSE
Annual vegetation of drift lines [1210]	>0.6km	-	No LSE
Perennial vegetation of stony banks [1220]	>0.6km	-	No LSE
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	>0.6km	-	No LSE
Salicornia and other annuals colonising mud and sand [1310]	Adjacent	Footprint	LSE
Atlantic salt meadows [1330]	Adjacent	Footprint	LSE
Mediterranean salt meadows [1410]	Adjacent	Footprint	LSE
Embryonic shifting dunes [2110]	>0.6km	-	No LSE
Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	>0.6km	-	No LSE
Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	>0.6km	-	No LSE
Dunes with Salix repens ssp. argentea [2170]	>0.6km	-	No LSE
Humid dune slacks [2190]	>0.6km	-	No LSE
Alluvial forests with Alnus glutinosa and Fraxinus excelsior	>0.6km	Present along River	No LSE

QI	QI location relative to drainage maintenance activity	Location of Impact	Result
[91E0]		Laune	
Petromyzon marinus (Sea Lamprey) [1095]	Adjacent	Footprint + 600m	LSE
Lampetra fluviatilis (River Lamprey) [1099]	Adjacent	Footprint + 600m	LSE
Salmo salar (Salmon) [1106]	Adjacent	Footprint + 600m	LSE
Lutra lutra (Otter) [1355]	Adjacent	Footprint + 600m	LSE
Petalophyllum ralfsii (Petalwort) [1395]	>0.6km	-	No LSE
Castlemaine Harbour SPA			
Red-throated Diver (*Gavia stellata*) [A001]	Adjacent	Footprint + 600m	LSE
Cormorant (*Phalacrocorax carbo*) [A017]	Adjacent	Footprint + 600m	LSE
Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	Adjacent	Footprint + 600m	LSE
Wigeon (*Anas penelope*) [A050]	Adjacent	Footprint + 600m	LSE
Mallard (*Anas platyrhynchos*) [A053]	Adjacent	Footprint + 600m	LSE
Pintail (*Anas acuta*) [A054]	Adjacent	Footprint + 600m	LSE
Scaup (*Aythya marila*) [A062]	Adjacent	Footprint + 600m	LSE
Common Scoter (*Melanitta nigra*) [A065]	Adjacent	Footprint + 600m	LSE
Oystercatcher (*Haematopus ostralegus*) [A130]	Adjacent	Footprint + 600m	LSE
Ringed Plover (*Charadrius hiaticula*) [A137]	Adjacent	Footprint + 600m	LSE
Sanderling (*Calidris alba*) [A144]	Adjacent	Footprint + 600m	LSE

QI	QI location relative to drainage maintenance activity	Location of Impact	Result
Bar-tailed Godwit (*Limosa lapponica*) [A157]	Adjacent	Footprint + 600m	LSE
Redshank (*Tringa totanus*) [A162]	Adjacent	Footprint + 600m	LSE
Greenshank (*Tringa nebularia*) [A164]	Adjacent	Footprint + 600m	LSE
Turnstone (*Arenaria interpres*) [A169]	Adjacent	Footprint + 600m	LSE
Chough (*Pyrrhocorax pyrrhocorax*) [A346]	Adjacent	Footprint + 600m	LSE
Wetland and Waterbirds [A999]	Adjacent	Footprint + 600m	LSE

In summary, the following QIs of the Natura 2000 sites have been identified as potentially being at risk from significant adverse impacts from land pathways and require further assessment:

Castlemaine Harbour SAC

- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Salicornia and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]

Castlemaine Harbour SPA

- Red-throated Diver (*Gavia stellata*) [A001]
- Cormorant (*Phalacrocorax carbo*) [A017]
- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
- Wigeon (*Anas penelope*) [A050]
- Mallard (*Anas platyrhynchos*) [A053]
- Pintail (*Anas acuta*) [A054]
- Scaup (*Aythya marila*) [A062]
- Common Scoter (*Melanitta nigra*) [A065]

- Oystercatcher (*Haematopus ostralegus*) [A130]
- Ringed Plover (*Charadrius hiaticula*) [A137]
- Sanderling (*Calidris alba*) [A144]
- Bar-tailed Godwit (*Limosa lapponica*) [A157]
- Redshank (*Tringa totanus*) [A162]
- Greenshank (*Tringa nebularia*) [A164]
- Turnstone (*Arenaria interpres*) [A169]
- Chough (*Pyrrhocorax pyrrhocorax*) [A346]
- Wetland and Waterbirds [A999]

5.3 Screening Assessment Conclusion

The screening assessment identified four Natura 2000 sites within the Zone of Influence of the Scheme and determined that there is potential for likely significant effects from the proposed sluice works on two Natura 2000 sites (Table 5-4). An Appropriate Assessment is therefore required.

Table 5-4: Conclusions of screening assessment for likelihood of significant effects

Site	Pathway of Impact			Comment
	Surface Water	Land	Ground water	
Castlemaine Harbour SAC	Yes	Yes	No	There is potential for the Natura 2000 site to be impacted by surface water and land pathways given that the habitats present have connectivity to surface water, and that the embankment falls within the site.
Castlemaine Harbour SPA	Yes	Yes	No	The works are over 600m from the SPA in a direct line and 1km via the surface water pathway, the maximum distance over which non-trivial impacts could occur.
Slieve Mish Mountains SAC	No	No	No	This site is sufficiently distant and upgradient from the proposed works so is screened out.
Stack's to Mullaghareik Mountains, West Limerick Hills and Mount Eagle SPA	No	No	No	This site is sufficiently distant and upgradient from the proposed works so is screened out.

6 Natura 2000 Sites

The Screening Assessment identified that the proposed sluice works had the potential to result in likely significant effects on two Natura 2000 sites. This section presents more detail on the sites and their QIs, with details of the conservation objectives given in Appendix A.

6.1 Castlemaine Harbour SAC (000343)

This is a large site located on the south-east corner of the Dingle Peninsula, Co. Kerry. It consists of the whole inner section of Dingle Bay, i.e. Castlemaine Harbour, the spits of Inch and White Strand/Rosbehy and a little of the coastline to the west. The River Maine, almost to Castlemaine, and much of the River Laune catchment, including the Gaddagh, Gweestion, Glanooragh, Cottoner's River and the River Loe, are also included within the site (NPWS 2015).

The site is of major ecological importance for its diversity and range of coastal habitats and species. The Inch sand spit is the largest and arguably one of the best dune systems in the country. The dune systems are highly dynamic and possess very fine examples of embryonic dunes, shifting marram dunes, fixed dunes and dune slacks. Salt marshes, both Atlantic and Mediterranean types, are also particularly well developed and extensive in area. The site has one of the largest expanses of intertidal sand and mud flats in the country. A fine stand of native alluvial forests occurs on the River Laune. The fixed dunes have *Petalophyllum ralfsii* and three Red Data Book vascular plant species are known from the site. Castlemaine Harbour supports important populations of wintering waterfowl, with internationally important numbers of *Branta bernicla hrota* and nationally important populations of a further 16 species. *Pluvialis apricaria* and *Limosa lapponica*, both listed on Annex I of the EU Birds Directive, occur regularly. The site provides habitat for *Bufo calamita*, a very localised species in Ireland and listed in the Red Data Book. The site is also utilized by *Lutra* and supports important populations of *Salmo salar*, *Petromyzon marinus* and *Lampetra fluviatilis* (NPWS 2015).

6.1.1 Qualifying Interests

The site is a SAC selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1210] Annual Vegetation of Drift Lines
- [1220] Perennial Vegetation of Stony Banks

- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [1310] Salicornia Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [2110] Embryonic Shifting Dunes
- [2120] Marram Dunes (White Dunes)
- [2130] Fixed Dunes (Grey Dunes)*
- [2170] Dunes with Creeping Willow
- [2190] Humid Dune Slacks
- [91E0] Alluvial Forests*

- [1095] Sea Lamprey (*Petromyzon marinus*)
- [1099] River Lamprey (*Lampetra fluviatilis*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1355] Otter (*Lutra*)
- [1395] Petalwort (*Petalophyllum ralfsii*)

Not all the qualifying features of the SAC occur in the Zone of Influence of the proposed works. The qualifying features that could be potentially present in the vicinity and therefore have the potential to be significantly impacted through water quality and/or disturbance include:

- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1310] Salicornia Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [1095] Sea Lamprey (Petromyzon marinus)
- [1099] River Lamprey (Lampetra fluviatilis)
- [1106] Atlantic Salmon (Salmo salar)
- [1355] Otter (Lutra lutra)

6.1.2 Site Vulnerabilities

Negative pressures or threats identified in the Standard Natura 2000 form for this site are listed in Table 6-1.

Table 6-1: Threats and Pressures to Castlemaine Harbour SAC (NPWS 2017a)

Negative impacts	Rank
Dispersed habitation	Medium
Grazing	Medium
Walking, horse riding and non-motorised vehicles	High
Marine and Freshwater Aquaculture	High
Camping and caravans	Medium
Removal of beach materials	Low
Invasive non-native species	Medium
Leisure fishing	Medium
Infilling of ditches, dykes, ponds, pools, marshes or pits	High
Urbanised areas, human habitation	High

6.1.3 Conservation Objectives

The conservation objectives for only the qualifying interests of the SAC that are of relevance to this NIS are detailed in Appendix A.

6.2 Castlemaine Harbour SPA (004029)

Castlemaine Harbour SPA is a large coastal site occupying the innermost part of Dingle Bay. It extends from the lower tidal reaches of the River Maine and River Laune to west of the Inch and Rosbehy peninsulas (ca. 16 km from east to west). The average width of the estuary is 4-5 km, though it is ca. 11 km wide at the outer limit. The site comprises the estuaries of the River Maine and the River Laune, both substantial rivers, and has extensive areas of intertidal sand and mud flats. A number of other rivers, e.g. the Caragh and the Emlagh, flow into the site, as well as numerous small streams. Conditions in the bay are very sheltered due to the presence of three protruding sand spits on its seaward side. These spits overly gravel banks. Two of the spits, Rosbehy and Inch, are included within the site. Salt marshes fringe much of the shoreline. A very large dune system occurs on the Inch peninsula, and a substantial area of shallow marine water is included in the site.

Castlemaine Harbour SPA is a very important ornithological site, with one species, Light-bellied Brent Goose, occurring in numbers of international importance. In addition, it supports nationally important populations of a further fifteen species. Of particular note is that five species that occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Red-throated Diver, Great Northern Diver, Golden Plover, Bar-tailed Godwit and Chough. The site includes a Nature Reserve and two Wildfowl Sanctuaries (NPWS, 2011).

6.2.1 Qualifying Interests

The site is a SPA selected for the following species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [A001] Red-throated Diver (*Gavia stellata*)
- [A017] Cormorant (*Phalacrocorax carbo*)
- [A046] Light-bellied Brent Goose (*Branta bernicla hrota*)
- [A050] Wigeon (*Anas penelope*)
- [A053] Mallard (*Anas platyrhynchos*)
- [A054] Pintail (*Anas acuta*)
- [A062] Scaup (*Aythya marila*)
- [A065] Common Scoter (*Melanitta nigra*)
- [A065] Oystercatcher (*Haematopus ostralegus*)
- [A137] Ringed Plover (*Charadrius hiaticula*)
- [A144] Sanderling (*Calidris alba*)
- [A157] Bar-tailed Godwit (*Limosa lapponica*)
- [A162] Redshank (*Tringa totanus*)
- [A164] Greenshank (*Tringa nebularia*)
- [A169] Turnstone (*Arenaria interpres*)
- [A346] Chough (*Pyrrhocorax pyrrhocorax*)
- [A999] Wetland and Waterbirds

All the qualifying features of the SPA occur in the Zone of Influence of the proposed works.

6.2.2 Site Vulnerabilities

Negative pressures or threats identified in the Standard Natura 2000 form for this site are listed in Table 6-1.

Table 6-2: Threats and Pressures to Castlemaine Harbour SAC (NPWS 2017a)

Negative impacts	Rank
Continuous urbanisation	Medium
Dispersed habitation	Low
Outdoor sports and leisure activities, recreational activities	Medium
Marine and freshwater aquaculture	High
Invasive non-native species	High
Fertilisation	Medium

6.2.3 Conservation Objectives

The conservation objectives for only the qualifying interests of the SPA that are of relevance to this NIS are detailed in Appendix A.2.

7 Stage 2 Appropriate Assessment

7.1 Introduction

The following chapter assesses the screened in Natura 2000 sites in more detail and examines where adverse impacts may arise from the potential sources of impact identified above. The full impact assessment on these features is below. The screened in Natura 2000 sites are Castlemaine Harbour SAC and Castlemaine Harbour SPA.

7.2 Identification of Potential Sources of Impact

This section further examines the source > pathway > receptor chains that could potentially result in adverse impacts arising on the screened in Natura 2000 sites in the Arterial Drainage Scheme. Table 5-4 details which of the possible pathways of impact (i.e. surface water, land and ground water) have been identified as potentially affecting the screened in Natura 2000 sites.

7.2.1 Identification of Potential Sources of Impact via Surface Water Pathways

Release of suspended solids - this is most likely to occur because of sediment being released into the River Maine and Castlemaine Estuary during the works. It may come from erosion of exposed areas of embankment, poorly stored excavation material and bare ground created by vehicle movements.

Release or changes in nutrient levels – given that the proposed works are only replacing existing structures and restoring the embankment, there will be no changes in nutrient levels so this impact is not considered further.

Release of pollutants – this would be a construction impact due to vehicles and site compound locations creating a local release of polluting material such as fuel or liquid concrete. The OPW procedures are in place to manage these impacts. These procedures, in particular EP17, would mean that the possibility of a pollution event occurring is very low, and if such an event occurred it would be very small and quickly dealt with, and the effects on the site would therefore be negligible. This impact is therefore not considered further.

Changes in water levels/channel morphology – given that the proposed works will only restore the sluices to their normal operation based on the design levels there will be no alterations to water levels or channel morphology. This impact is therefore not considered further.

7.2.2 Potential Sources of Impact via Land Pathways

Direct habitat loss – There will be a small amount of habitat loss within the SAC and SPA in the immediate footprint of the sluices. The temporary loss of areas of

embankment may impact on Otters where they use this habitat by reducing the amount of resting habitat available for the duration of the works. There will be a small amount of in-channel works around the outfall of the sluices where temporary dams will be installed at low tide to create a dry working area. The area affected by these dams is negligible.

Physical disturbance – most of the works will be carried out from the landward side of the embankment, but some works will take place from the embankment. There will be a small amount of in-channel works around the outfall of the sluices where temporary dams will be installed at low tide to create a dry working area. There are some Annex 1 habitats within the work area. The only species that may suffer physical disturbance are Otter and fish species as other species are sufficiently mobile that they would move away from the works, and installing a dry working area at low tide should ensure fish are not present in the works area. For Otter, the excavations also create a potential trap should no escape routes be provided. The works may temporarily block passage of fish through the sluices, although they are unlikely to be using these as the ditch network in the agricultural land does not provide good quality habitat and the sluices prevent easy access. The obstruction will only be for a maximum of five days, so will not alter the seasonal movement of fish. Obstruction of fish passage is therefore not considered further.

Noise and visual disturbance – this would occur during the construction phase and would impact specifically on Otter from the SAC and bird species from the SPA where noise and visual disturbance could displace animals from the habitats within the SAC/SPA and in supporting habitat. The impacts of noise and visual disturbance on species is a complex impact to quantify. The impact of noise disturbance decreases with distance, with noise at the louder end of worst-case construction activities (c. 120dB) falling below 60dB (moderately disturbing to birds) at around 600m, although obviously with significant variation due to condition. Bird species respond to visual stimuli at distances up to 275m (for Curlew *Numenius arquata*, the most sensitive species studied for the TIDE toolbox), with a precautionary value of 300m assumed for assessment. Sensitivity is also increased over winter, when birds are at additional stress and have higher reliance on estuarine habitat. Otters are mostly active at night, and unlikely to be directly disturbed unless works are very close to resting places. The use of lights overnight can be disruptive to Otter activity, and even if there are no night works, security lights may be used to help protect equipment that cannot be removed from the site. The works are not expected to cause any disturbance to fish in the channel.

7.2.3 Potential Sources of Impact via Groundwater Pathways

No potential impacts were identified via groundwater pathways.

7.2.4 Do Nothing Impact

The do-nothing impact is always subject to a significant amount of uncertainty. In the absence of other interventions, the do-nothing option is likely to involve failure of the sluices leading to increased risk of flooding and isolation of the ditch network from the main river. Impacts are likely to be modified by human responses to changes and no attempt is made here to predict these.

7.3 Impact Evaluation

Table 7-1 evaluates the screened in Natura 2000 sites and potential impacts as discussed in Section 7.2 in more specific detail, and examines where potentially adverse impacts may arise from the sources identified above. Where potentially significant adverse impacts are identified, avoidance and mitigation measures are proposed to offset these impacts. Impacts are identified as 'no adverse impact' where detailed consideration shows no impact, or the mitigation prevents any impact. Where there is a small but not significant impact, the residual impact is described as 'no significant effect', but the residual effect will need to be considered in the subsequent in-combination assessment.

Mitigation measures required to prevent adverse impacts include those described in the OPW EPs which are not considered to be project mitigation.

Table 7-1: Impact evaluation table for screened in QI and pathways

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
Castlemaine Harbour SAC					
Estuaries [1130] Tidal Mudflats and Sandflats [1140] Salicornia Mud [1310]	Release of suspended solids	Habitat extent, habitat distribution, species composition	The release of suspended solids would likely result in increased sediment deposition in the mudflats and sandflats downstream of the works. This habitat has a natural depositional environment and is likely to be able to tolerate these changes, unless in extreme concentrations.	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
				using seed mixes or preserved turves (sod) to ensure rapid re-vegetation.	
	Direct habitat loss and physical disturbance	Habitat area Community distribution	The works will result in temporary loss of habitat in the immediate footprint of the sluices which is already modified habitat. This will be restored following works and is expected to recover quickly to the pre-works state.	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment.	No adverse impact
Atlantic salt meadows Mediterranean salt meadows	Release of suspended solids	Habitat extent, habitat distribution, species composition	The release of suspended solids would likely result in increased sediment deposition in mid to upper saltmarsh downstream of the works. This habitat has a natural depositional environment and is likely to be able to tolerate these changes, unless in extreme concentrations.	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
				located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated using seed mixes or preserved turves (sod) to ensure rapid re-vegetation.	
	Direct habitat loss and physical disturbance	Habitat area Community distribution	There is no saltmarsh directly in the footprint of the sluices, so direct loss or disturbance would only happen where vehicles would end up travelling on the seaward side of the embankment which is not planned.	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river/estuary side of the embankment. Any excavations carried out on the seaward side of the embankment should be kept to a minimum.	No adverse impact
Petromyzon marinus (Sea Lamprey) [1095] *Lampetra fluviatilis*	Release of suspended solids	% of river accessible, number of age/size groups	The release of suspended solids has the potential to give rise to both acute and chronic impacts because of gill irritation (impacting adult River Lamprey residing in the estuary, on adults of both species migrating upstream to spawn, and on metamorphosed juveniles of both species migrating	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
(River Lamprey) [1099]			downstream).	leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated using seed mixes or preserved turves (sod) to ensure rapid re-vegetation.	
	Noise and visual disturbance	Number of age/size groups	The works will require installation of a temporary dam on the river side of the embankment which could potentially trap fish. The works would create movement, noise and some, albeit limited in intensity and duration, vibration. Lamprey are not sensitive to this type of disturbance	The temporary dam on the river side of the embankment will be installed at low tide when no fish will be present.	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
			so no effect is likely.		
Salmo salar (Salmon) [1106]	Release of suspended solids	Number of spawning adults; Water quality	The release of suspended solids has the potential to give rise to both acute and chronic impacts because of gill irritation (impacting on adults migrating upstream to spawn, and on smolts migrating downstream).	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated using seed mixes or preserved turves (sod) to ensure rapid re-vegetation.	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
	Noise and visual disturbance	Number of spawning adults; % river accessible	The works will require installation of a temporary dam on the river side of the embankment which could potentially trap fish. The works would create movement, noise and some, albeit limited in intensity and duration, vibration. This may cause temporary displacement but Salmon are not thought to be sensitive to this impact.	The temporary dam on the river side of the embankment will be installed at low tide when no fish will be present.	No adverse impact
Lutra lutra (Otter) [1355]	Release of suspended solids	Distribution, extent of marine habitat, number of couching and holt sites	The release of suspended solids would impact Otters via reduced quality of habitat and feeding resources which would alter their distribution and the carrying capacity of the habitat.	All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
				located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated using seed mixes or preserved turves (sod) to ensure rapid re-vegetation.	
	Direct Habitat Loss	Distribution, extent of marine habitat, number of couching and holt sites	Field survey confirmed that there are no couches or holts near the embankments and on inland habitats within or adjacent to the works areas. Much of the habitat is agricultural land which is unsuitable for this species. The nearest couches and holts, adjacent to the river, are outside the works footprint so there will be no loss.	Not required.	No adverse impact
	Physical disturbance	Distribution, extent of marine habitat, number of couching and holt sites	Otters would be physically disturbed where compaction works take place within a close distance of an existing holt. Field survey confirmed that there are no holts or couches adjacent to the works area. Otter may become trapped in	Any excavations will have a suitable shallow ramp to allow Otter to escape if they enter the excavation. If the natural slope of the sides does not permit this, then a wooden board or similar will be added.	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
			excavations where there is no escape route provided.		
	Noise and visual disturbance	Distribution, extent of marine habitat, number of couching and holt sites	Otters are very mobile and would be expected to avoid works areas. The noise and visual disturbance would be limited to the day, with Otters mainly active over night. Works will not take place over night. There remains the possibility of disturbing Otter that are active in the day. None of the sluices are within 60m of a known couch or holt.	No night-time lighting (e.g. security lights) will be directed in a way that causes artificial illumination of the river and estuary.	No adverse impact
Castlemaine Harbour SPA					
Wintering birds: Red-throated Diver (*Gavia stellata*) Cormorant (*Phalacrocorax carbo*) Light-bellied Brent Goose (*Branta*	Release of suspended solids	Habitat extent, habitat distribution, species composition	The release of suspended solids would likely result in increased sediment deposition in the estuarine area of the SPA downstream of the works. These changes could alter the available foraging habitat for wintering birds in the immediate area of the works. This is likely to be most acute during works but may be ongoing where borrow pit edges erode and where material washes from embankments. However, this	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
bernicla hrota) Wigeon (*Anas penelope*) Mallard (*Anas platyrhynchos*) Pintail (*Anas acuta*) Scaup (*Aythya marila*) Common Scoter (*Melanitta nigra*) Oystercatcher (*Haematopus ostralegus*) Ringed Plover (*Charadrius*			habitat has a natural depositional environment and is likely to be able to tolerate these changes, unless in extreme concentrations.	will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated using seed mixes or preserved turves (sod) to ensure rapid re-vegetation.	
	Direct Habitat Loss	Habitat area, population abundance and species distribution	Habitats supporting the qualifying interest species will not be lost as a result of the project.	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. Any excavations carried out on the seaward side of the embankment should be kept to a minimum.	No adverse impact
	Physical disturbance	Population abundance and species distribution	Physical disturbance of birds would occur only where vibrations were more disturbing than noise and visual disturbance, which will not occur as even where vibration	Not required.	No adverse impact

Qualifying Interest	Potential Source of Impact	Relevant COs to impact	Impact on Attribute and Target Prior to Mitigation / Avoidance	Avoidance / Mitigation Measures	Residual Impact
hiaticula) Sanderling (*Calidris alba*) Bar-tailed Godwit (*Limosa lapponica*) Redshank (*Tringa totanus*) Greenshank (*Tringa nebularia*) Wetland and Waterbirds			occurs, this will be preceded by noise and movement that would cause birds to move away.		
	Noise and visual disturbance	Population abundance and species distribution	The works will cause noise and visual disturbance to the qualifying interests of the SPA but will be completed outside the most important over-wintering season. Machines operating consistently during low tide windows would maintain the amount of noise disturbance at or below the 70dB level, meaning disturbance effects would only be severe within 300m. Excavations and work on the seaward side of the embankment will only be carried out at low tide in the dry, for practical reasons and to reduce release of suspended solids and disturbance to birds using the adjacent habitat for foraging. At this time in the tide cycle, the wintering birds would be wanting to use the estuarine habitats for foraging, and noise and visual disturbance could prevent them from using this habitat area temporarily.	All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. Any excavations carried out on the seaward side of the embankment should be kept to a minimum. Visual disturbance would be limited by making sure that access to the intertidal zone is only done within 3 hours either side of low tide.	No likely adverse impact

7.4 Site Specific Mitigation Measures

Specific mitigation measures are identified in Table 7-1 as necessary in order to reduce and avoid the identified potential impacts on the above Natura 2000 site; these measures are detailed in Table 7-2.

Table 7-2: Specific mitigation measures

Potential Impact	Specific Avoidance and Mitigation Measures
Release of suspended solids and release or changes in nutrient levels on: Atlantic salt meadows Mediterranean salt meadows *Petromyzon marinus* (Sea Lamprey) *Lampetra fluviatilis* (River Lamprey) *Lutra lutra* (Otter) All SPA QIs	All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. The working area will be fully isolated and this will be checked carefully to ensure no concrete can leak out of the works area. Pumping water out of the isolated section of sluice will be to land to allow water to filter naturally and will not result in direct release of sediment into the River Maine or connected channels. Stockpiles of material will be located >10m away from watercourses and always on the landward side of the embankment and stored in a way to reduce run off to a minimum. Embankments will be re-vegetated using seed mixes or preserved turves (sod) to ensure rapid re-vegetation. **Rationale**: These measures will reduce the quantity of suspended solids generated and released into the water. Where they are released, they are isolated from the River Maine, so they can settle out before the waters mix. Levels of suspended solids entering the River Maine will therefore not reach levels at which any ecological impact would occur. **Confidence**: The measures will form part of the work Method Statement and are simple measures that can be implemented with a high degree of confidence.

Potential Impact	Specific Avoidance and Mitigation Measures
Physical Disturbance and Noise and Visual Disturbance on: *Lutra lutra* (Otter)	Where compaction of the embankment during restoration works takes place, a check will be made to ensure Otter are not actively using the area. If Otters are using this location, any compaction should be postponed until the following day when the check for Otters will be repeated before works proceed. No night-time lighting (e.g. security lights) should be directed in a way that causes artificial illumination of the river. Any excavations will have a suitable shallow ramp to allow Otter to escape should they enter the excavation. If the natural slope of the sides does not permit this, then a wooden board or similar should be added. **Rationale**: These are a simple measure that will ensure Otter behaviour and habitat use is not significantly altered by the works. **Confidence**: These are simple avoidance measure that can be implemented easily by the site team and therefore they have a high degree of certainty.
Physical Disturbance and Noise and Visual Disturbance on: All SPA QIs	All work will be from the landward side or bank top. No vehicle will move onto the river side of the embankment. Any excavations carried out on the seaward side of the embankment should be kept to a minimum. Visual disturbance would be limited by making sure that access to the intertidal zone is only done 3 hours either side of low tide.
Habitat Loss on: All SPA QIs	Vehicles will use haul roads on the landward side of the embankment. All work will be from the landward side or bank top. No vehicle will move onto the river/estuary side of the embankment.

7.5 Impact on Site Integrity

The residual impacts identified in Table 7-1 could adversely impact overall site integrity. This is set out in Table 7-3 and Table 7-4.

Table 7-3: Integrity of Site Checklist- Conservation Objectives

Conservation objectives: does the project or plan have the potential to:	Yes or No and explanation
Cause delays/interruption in progress towards achieving	No – there are no residual effects that would prevent conservation objectives from being

Conservation objectives: does the project or plan have the potential to:	Yes or No and explanation
the conservation objectives of the sites?	achieved.
Disrupt those factors that help to maintain the favourable conditions of the site?	No – the works will be carried out on the landward side of the embankment on habitats that are not key to the functioning of the SAC and SPA.
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No – the works will not cause any long term changes in key species of the SAC and SPA.

Table 7-4: Integrity of Site Checklist- Other Objectives

Other objectives: does the project or plan have the potential to:	Yes or No
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No – there will be no changes to defining aspects of the ecosystem.
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No – there is no obvious mechanism for this type of impact.
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No –the purpose of the works to restore the full function of the sluices which allow the land to drain to the river.
Reduce the area of key habitats?	No – works will not reduce areas of key habitat
Reduce the population of key species?	No – no long-term impacts on populations of key species are expected, with only temporary displacement during works.
Change the balance between key species?	No – the balance between species is not expected to be permanently impacts.
Reduce diversity of the site?	No – overall diversity on site is likely to remain unchanged.

Other objectives: does the project or plan have the potential to:	Yes or No
Result in disturbance that could affect population size or density or the balance between key species?	No – there is no clear mechanism for this type of impact.
Result in fragmentation	No – the works will not change any habitats and are temporary
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding etc.)?	No – there will be no long-term changes to habitats from the works.

7.6 In-combination effects

As the project will have no effect on any Natura 2000 site in isolation, there is therefore no possibility of there being impacts in combination with other projects. Therefore no further consideration of in-combination impacts is necessary to inform the conclusion.

8 Conclusion

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the qualifying interests and conservation objectives for the Natura 2000 network, and ensuring that avoidance and mitigation measures are implemented as proposed, it has been concluded by the authors of this report that the project will have **no adverse effects** on the integrity of any Natura 2000 sites or coherence of the Natura 2000 network.

A Conservation Objectives

Detailed information on the conservation objectives for each Natura 2000 site screened into the Appropriate Assessment.

A.1 Castlemaine Harbour SAC and SPA

- The following information is taken from NPWS (2011a) which presents the detailed conservation objectives for both sites in a single document.

Qualifying Interest	***Petromyzon marinus* (Sea Lamprey) [1095]**	
National Overall Conservation Status	**Bad**	
Conservation Objectives	To maintain the favourable conservation condition of Sea lamprey in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary
Population structure of juveniles	Number of age/size groups	At least three age/size groups present
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive
Qualifying Interest	***Lampetra fluviatilis* (River Lamprey) [1099]**	
National Overall Conservation Status	**Favourable**	
Conservation Objectives	To maintain the favourable conservation condition of River lamprey in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:	

Attribute	Measure	Target
Distribution	% of river accessible	Access to all water courses down to first order streams
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive
Qualifying Interest	***Salmo salar* (Salmon) [1106]**	
National Overall Conservation Status	**Inadequate**	
Conservation Objectives	To maintain the favourable conservation condition of Salmon in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling
Out-migrating smolt abundance	Number	No significant decline
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA
Qualifying Interest	***Lutra lutra* (Otter) [1355]**	

National Overall Conservation Status	**Favourable**	
Conservation Objectives	To restore the favourable conservation condition of Otter in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Distribution	Percentage positive survey sites	No significant decline
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 162ha above high-water mark (HWM); 193ha along riverbanks
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 812ha
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 104km
Couching sites and holts	Number	No significant decline
Fish biomass available	Kilograms	No significant decline
Barriers to connectivity	Number	No significant decline
Qualifying Interest	**Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]**	
National Overall Conservation Status	**Inadequate**	
Conservation Objectives	To maintain the favourable conservation condition of Atlantic salt meadows in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Inch - 9.48ha, Rosbehy - 7.29ha, Whitegate- Fybagh - 2.72ha, Cromane - 13.97ha. See map 6 (NPWS 2011)
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution (NPWS 2011)
Physical	Presence/ absence	Maintain natural circulation of sediments

structure: sediment supply	of physical barriers	and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)
Qualifying Interest	**Mediterranean salt meadows (*Juncetalia maritimi*) [1410]**	
National Overall Conservation Status	**Inadequate**	
Conservation Objectives	To maintain the favourable conservation condition of Mediterranean salt meadows in Castlemaine Harbour SAC, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Inch - 29.11ha, Rosbehy - 16.10ha, Cromane - 29.31ha and Whitegate-Fybagh - 2.72ha. See map 6 (NPWS 2011)
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution (NPWS 2011)

Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species	Percentage cover	Maintain range of sub- communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

A.2 Castlemaine Harbour SPA

Qualifying Interest	**Wigeon *Anas penelope* [A050]**	
National Population size in SPA network	**Decrease**	
Conservation Objective	To maintain the favourable conservation condition of Wigeon in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying	**Red-throated Diver Gavia stellata [A001]**	

Interest		
National Population size in SPA network	**Increase**	
Conservation Objective	To maintain the favourable conservation condition of Red-throated Diver in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Cormorant *Phalacrocorax carbo* [A017]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Cormorant in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Light-bellied Brent *Goose Branta bernicla hrota* [A0046]**	
National Population size in SPA network	**NA**	
Conservation Objective	To maintain the favourable conservation condition of Light-bellied Brent Geese in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural

	use of areas	patterns of variation
Qualifying Interest	**Mallard *Anas platyrhynchos* [A0053]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Mallard in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Pintail *Anas acuta* [A0054]**	
National Population size in SPA network	**Unknown**	
Conservation Objective	To maintain the favourable conservation condition of Pintail in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Scaup *Aythya marila* [A0062]**	
National Population size in SPA network	Decrease	
Conservation Objective	To maintain the favourable conservation condition of Scaup in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing

Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Common *Scoter Melanitta nigra* [A0065]**	
National Population size in SPA network	**Decrease**	
Conservation Objective	To maintain the favourable conservation condition of Common Scoter in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Oystercatcher *Haematopus ostralegus* [A0130]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Oystercatcher in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation

Qualifying Interest	**Ringed Plover *Charadrius hiaticula* [A0137]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Ringed Plover in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Sanderling *Calidris alba* [A144]**	
National Population size in SPA network	**Increase**	
Conservation Objective	To maintain the favourable conservation condition of Sanderling in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Bar-tailed Godwit *Limosa lapponica* [A0157]**	
National Population size in SPA network	**Increase**	
Conservation Objective	To maintain the favourable conservation condition of Bar-tailed Godwit in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing	No significant decrease in the numbers or

	and intensity of use of areas	range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Redshank *Tringa totanus* [A0162]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Redshank in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Greenshank *Tringa nebularia* [0164]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Greenshank in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Turnstone Arenaria interpres [0169]**	
National Population size in SPA network	**Fluctuating**	
Conservation Objective	To maintain the favourable conservation condition of Turnstone in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**

Population trend	Percentage change	Long term population trend stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation
Qualifying Interest	**Chough *Pyrrhocorax pyrrhocorax* [A346]**	
National Population size in SPA network	**Stable**	
Conservation Objective	To maintain the favourable conservation condition of Chough in Castlemaine Harbour SPA, which is defined by the following list of attributes and targets:	
Attribute	**Measure**	**Target**
Population trend	Percentage change	Long term population stable or increasing
Distribution	Range, timing and intensity of use of areas	No significant decrease in the numbers or range of areas used

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