



Habitats Regulations Assessment: Appropriate Assessment

Perth Harbour Phase 1 Dredging

February 2022

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Document history

Document reference	Date	Notes
P2021-03-AA-R1	5 January 2022	Draft for client review
P2021-03-AA-R2	6 January 2022	Final issue
P2021-03-AA-R3	16 February 2022	Updated dredge plan

1. Introduction

Perth & Kinross Council is the harbour authority for Perth Harbour in Scotland. Perth Harbour accepts coastal and dry bulk ships up to 90 m in length, carrying up to 2,500 tonnes from Europe, the Baltic and Scandinavia.

The harbour was last dredged circa. 2004. Recent bathymetric surveys have revealed that navigable depths are severely compromised, placing significant restrictions on harbour operations. Following a review of the harbour's Navigational Risk Assessment, the Harbour Operator identified a number of mitigations that were required to reduce the likelihood of grounding. These mitigations have had a significant impact on harbour trade.

To restore navigable depths in the harbour, two phases of dredging are proposed:

- Phase 1: an urgent small-scale plough dredging operation to remove a 'bar' of sediment that has accumulated at the harbour entrance
- Phase 2: a larger scale dredging operation to restore the harbour to its previously dredged levels.

Phase 1 will proceed as soon as a marine licence can be obtained, and this will enable the harbour to remain operational in the short-term. A separate marine licence will be submitted for Phase 2 once the dredging and disposal method options have been determined.

Perth Harbour is within the River Tay Special Area of Conservation (SAC). This document describes the Phase 1 dredging and presents the Appropriate Assessment for the proposed dredging.

2. Requirement for a Habitats Regulations Assessment

The European Directive (92/43/EEC) on the Conservation of Natural Habitats and Wild Flora and Fauna (the Habitats Directive) protects habitats and species of European nature conservation importance. The Habitats Directive establishes a network of internationally important sites designated for their ecological status. These are referred to as Natura 2000 sites or European Sites, and comprise SACs and Special Protection Areas (SPAs). SPAs are classified under the Council Directive 79/409/EEC on the conservation of wild birds, the 'Birds Directive'.

In Scotland, the requirements of the Birds and Habitats Directives have been transposed into The Conservation (Natural Habitats, &c.) Regulations 1994 as amended.

Articles 6 (3) and 6 (4) of the Habitats Directive require HRA to be undertaken on proposed plans or projects which are not necessary for the management of the site but which are likely to have a significant effect on one or more Natura 2000 sites either individually, or in combination with other plans and projects.

There are four stages of the HRA process, as described in Table 1. The purpose of HRA is to assess the impacts of a project, in combination with the effects of other plans and projects, against the conservation objectives of a Natura 2000 site and to ascertain whether it has likely significant effects (Stage 1 – Screening). If no likely significant effects are predicted on Natura 2000 sites, there is no need for an Appropriate Assessment to be carried out (Stage 2). If effects are judged likely or uncertainty exists, the precautionary principle applies and an Appropriate Assessment is required to determine if the plan would adversely affect the integrity of the Natura 2000 site(s). Where there are adverse impacts, an assessment of mitigation options is carried out, and if these mitigation options cannot avoid adverse effects then development consent can only be given if stages 3 and 4 are followed.

Table 1 Four stage HRA process

Stage 1	Screening	The process to identify the likely impacts of a project upon a European site, either alone or in combination with other plans and projects, and consider whether the impacts are likely to be significant.
Stage 2	Appropriate Assessment	The consideration of the impacts on the integrity of the European site, either alone or in combination with other plans and projects, with regard to the site's structure and function and its conservation objectives. Where there are adverse impacts, an assessment of mitigation options is carried out to determine adverse effect on the integrity of the site. If these mitigation options cannot avoid adverse effects then development consent can only be given if stages 3 and 4 are followed.
Stage 3	Assessment of alternative solutions	Examining alternative ways of achieving the objectives of the project to establish whether there are solutions that would avoid or have a lesser effect on European sites.
Stage 4	Imperative reasons of over-riding public interest (IROPI)	This is the assessment where no alternative solution exists and where adverse impacts remain. The process to assess whether the development is necessary for IROPI and, if so, the potential compensatory measures needed to maintain the overall coherence of the site or integrity of the European site network.

2.1. Stage 1: Screening

In April 2018 the European Court of Justice issued a judgement that clarifies the stage in an HRA process when mitigation measures can be taken into account when assessing impacts on a Natura 2000 site. This is described in NatureScot's Guidance Note on the handling of mitigation in Habitats Regulations Appraisal – the People Over Wind CJEU judgement¹. According to this Guidance Note: *'The judgement...at face value disallows the consideration of any mitigating measures to a plan or project at the screening stage of an HRA that are intended to avoid or reduce likely significant effects (LSEs) on European sites. [NatureScot] interprets the judgement as meaning that it is those measures specifically intended to avoid*

¹ www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra-help-and

or reduce harmful effects to a European site which cannot be considered at the screening stage.’

For the Perth Harbour Phase 1 dredging, various measures are proposed to minimise effects on the River Tay SAC, so a Screening Assessment has not been carried out and an Appropriate Assessment is presented in this report.

3. Description of the project

The area to be dredged comprises a ‘bar’ of accumulated material at the harbour entrance, as shown on Figure 1. The volume of material to be dredged is approximately 1,500 m³ (2,400 wet tonnes), to achieve a depth of 1.5 m below Chart Datum.

A plough box mounted on a small tug will relocate material from the bar into deeper areas within the harbour, as shown on Figure 1. Due to the dredging technique, there is no associated disposal. A dredging method statement is provided in Appendix A.

Dredging will be carried out in Q1 – Q2 2022 subject to obtaining a marine licence. The dredging is likely to take between 2 – 6 weeks depending on the efficiency of the ploughing equipment. A marine licence has been requested for 12 weeks to allow for any unexpected delays to dredging, for example mechanical failure, unsuitable flow conditions (tidal or fluvial) or operational delays caused by harbour operations.

3.1. Mitigation measures

Table 2 describes the mitigation measures that will be in place during the dredging activity to minimise the disturbance and dispersion of silt, as this has the potential to affect the qualifying interests of the River Tay SAC.

Table 2 Mitigation measures to minimise silt dispersion

Mitigation Measure	Reason
Only dredge on flood tide	By restricting ploughing operations to the flood tide only, any suspended sediment will tend to be moved in towards the harbour by the rising tidal flow. By not dredging on the ebb tide the risk of significant quantities of suspended sediment migrating into the River Tay is mitigated against. The material to be dredged has a high fine sand content so it is expected that any material put into suspension will settle back to the riverbed quickly and will not migrate very far from the dredge area.
Only plough in towards the harbour	By ploughing the material from the river side into the harbour area, all material will be moved away from the river current and into the relatively benign area of the harbour. This will mitigate against any significant quantities of suspended material entering the River Tay.

Lower plough in small steps	By carrying out the ploughing activity in small depth increment steps (circa 0.1 m increments) it reduces the risk of the plough box filling up and material being released over the back of the box if overfilled. By limiting the depth of cut on each pass it also reduces the thrust required by the tug to pull the plough through the dredge area.
Plan the ploughing lines	By planning the ploughing lines based on the capacity of the plough, the risk of overfilling can be prevented and the need to use excessive thrust is minimised.
Minimise required thrust from the tug	As the plough is mounted over the stern of the vessel it is close to the propulsion system of the tug. By minimising the depth of cut of the plough, or overfilling, the propulsion thrust necessary can be minimised. This will minimise the risk of the propeller wash disturbing the material contained in the plough or the disturbed riverbed in the dredge area.
Have an accurate navigation system on the tug	By having an accurate navigation system on the tug, the dredging operation can be carefully controlled and carried out in the most efficient manner with all dredging being targeted in the required dredge area.
Provision of accurate tide/height information	By having access to accurate water level height, the dredging can be targeted accurately to only those areas where dredging is required. It will also enable to plough blade to be set to the required level hence minimising the risk of over cut or over dredge.

4. Consultation with NatureScot

Over the past five years, NatureScot have been consulted on various proposals to dredge within Perth Harbour and areas of the River Tay downstream of the harbour. The Phase 1 ploughing operation is smaller in scale than previous proposals. NatureScot's feedback that is relevant to the current operation has been incorporated into the Appropriate Assessment.

As recommended during consultation with NatureScot, the guidance document 'River Tay Special Area of Conservation (SAC) Advice to developers when considering new projects which could affect the River Tay SAC'² has been taken into account when assessing potential effects on the qualifying habitats and species of the SAC.

² <https://www.nature.scot/doc/river-tay-sac-advice-developers-when-considering-new-projects-which-could-affect-river-tay-sac>

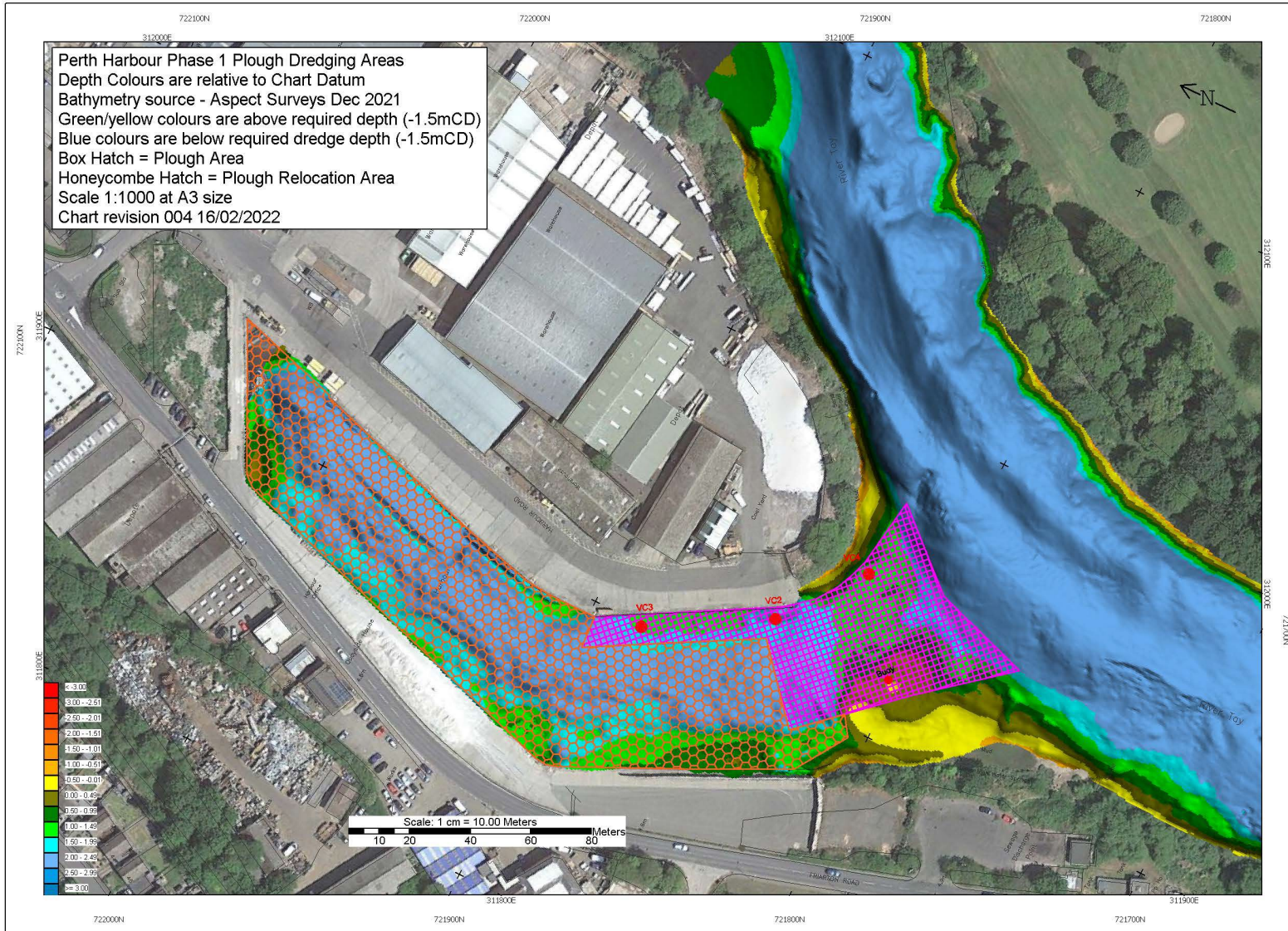


Figure 1 Dredge area and sample locations

5. Information on European designated sites

Perth Harbour is within the River Tay SAC. There are no other Natura 2000 sites in proximity to Perth Harbour.

5.1. River Tay SAC qualifying interests

5.1.1. Annex I habitat present as a qualifying feature, but not a primary reason for selection of this site

Clear water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels (Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*)

Conservation objectives

To avoid deterioration of the qualifying habitat (listed above) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying habitat that the following are maintained in the long term:

- Extent of the habitat on site
- Distribution of the habitat within site
- Structure and function of the habitat
- Processes supporting the habitat
- Distribution of typical species of the habitat
- Viability of typical species as components of the habitat
- No significant disturbance of typical species of the habitat

5.1.2. Annex II species that are a primary reason for selection of this site

Atlantic salmon *Salmo salar*

5.1.3. Annex II species present as a qualifying feature, but not a primary reason for site selection

- Sea lamprey *Petromyzon marinus*
- Brook lamprey *Lampetra planeri*
- River lamprey *Lampetra fluviatilis*
- Otter *Lutra lutra*

Conservation objectives

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types for salmon, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

6. Ecological surveys

In 2018, to support a proposal for a larger dredging operation, site surveys were carried out for otter and lamprey, as well as other species of importance that are not qualifying interests of the SAC (beaver, freshwater pearl mussel and invasive plants). Update surveys were carried out in 2021 for otter, beaver and freshwater pearl mussel, as agreed with NatureScot.

The results of the surveys are incorporated into this Appropriate Assessment and the survey report is provided in Appendix B.

7. Assessment of effects on site integrity

7.1. *Scope of the assessment*

There is no mechanism for a small-scale dredging operation within the existing harbour to affect the qualifying Annex I habitat 'Clear water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels'. NatureScot confirmed their agreement with this position in their consultation response to a marine licence application for a larger dredging operation at Perth Harbour in 2018³.

Without the mitigation measures described in this Appropriate Assessment, the proposed dredging is likely to have a significant effect on the following qualifying Annex II species:

- Atlantic salmon
- Sea lamprey
- Brook lamprey
- River lamprey
- Otter

This Appropriate Assessment considers the effects on site integrity for the River Tay SAC for the qualifying species listed above and their supporting habitats.

³ Letter from Gavin Clark, Operations Manager Tayside & Grampian, dated 29 March 2018, Ref: CNS/MSA/PK/Marine Licenses

7.2. Assessment of effects on site integrity

7.2.1. Atlantic salmon

The River Tay supports a high-quality Atlantic salmon population, with rod catch returns showing that the Tay is consistently one of the top three salmon rivers in Scotland. The Tay drains a very large catchment, and has the greatest flow of all UK rivers. There is considerable ecological variety in the Tay catchment, resulting in the Tay supporting the full range of salmon life-history types found in Scotland, with adult salmon entering the River Tay throughout the year to spawn in different parts of the catchment⁴.

The potential effects of the proposed dredging on Atlantic salmon are described in Table 3.

Table 3 Potential effects on Atlantic salmon

Potential effect	Assessment of significance
Physical presence of dredger – barrier to migration	As shown on Figure 1, the proposed dredging is confined to the harbour entrance, well outside the main river channel, so the dredging will not create a physical barrier to migrating salmon. Due to the small-scale and short-term nature of the dredging, seasonal restrictions are not considered necessary.
Changes to river flow regime – barrier to migration	The dredge area is small (approx. 0.002 km ²) and the average depth to be dredged is 0.5 m. This localised and minor change to the bathymetry will have negligible effects on the flow regime of the River Tay.
Removal of riverbed habitat – loss of refuge areas	<p>Although the dredging will remove the surface substrate, this is confined to the existing harbour entrance, which has a history of dredging albeit not in recent years (last dredged circa. 2004).</p> <p>The dredge area is extremely small (approx. 0.002 km²) relative to the River Tay SAC (approx. 95 km²).</p> <p>The area to be dredged is on the outside of a river bend and at the entrance to an operational harbour, so is considered unlikely to be an important refuge area for migrating salmon.</p>

⁴ <https://sac.jncc.gov.uk/species/S1106/>

<p>Increased suspended sediment concentration – barrier to migration/clogging of gills</p>	<p>The plough dredger will slowly drag material from the bar into deeper water within the harbour. The disturbance of sediments during the dredging process is similar to the localised disturbance created by vessels manoeuvring within the harbour.</p> <p>The material to be dredged has a high fine sand content so it is expected that any material put into suspension will settle back to the riverbed quickly and will not migrate very far from the dredge area.</p> <p>A number of mitigation measures will be in place to reduce the disturbance and dispersion of material during the dredging – see Section 3.1. With these mitigation measures in place, increases in suspended sediment concentration are expected to be minimal, localised and temporary, so effects on salmon are predicted to be negligible.</p>
<p>Release of contaminated material – toxic effects</p>	<p>Two surface samples were taken from the dredge area in June 2021, as shown on Figure 1). The results are presented in the Best Practicable Environmental Option Statement submitted with the marine licence application.</p> <p>The sample results have been compared to the Marine Scotland Revised Action Levels, which are used to determine the contaminant loading of the material and its suitability for disposal at sea.</p> <p>Levels of heavy metals copper and zinc were elevated above Marine Scotland Revised Action Level 1, but in all cases were well below Action Level 2.</p> <p>Tributyl tin marginally exceeded Action Level 1 in one sample, and all other organotins were below Action Level 1.</p> <p>Total hydrocarbons exceeded Action Level 1 in both samples, but levels of polycyclic aromatic hydrocarbons (PAHs) only marginally exceeded Action Level 1 for three individual PAHs (Dibenzo(ah)Anthracene, Fluoranthene and Pyrene).</p> <p>Based on the results of the sediment sampling, the material to be dredged is considered to be suitable for both dispersive dredging and disposal at sea, and so toxic effects on salmon are unlikely.</p>
<p>Water pollution – toxic effects</p>	<p>During any mechanical marine works, there is the potential for accidental pollution. During the plough dredging operation, the key risk is the spillage of fuel or oil from the tug. To minimise this risk, equipment will be well maintained and best practice guidelines will be followed during the works, including the Scottish Environment Protection Agency’s Guidance for Pollution Prevention (GPP) 1: Understanding your environmental responsibilities – good environmental practices; and GPP 5: Works and maintenance in or near water⁵. By following these guidelines, the risk of accidental pollution is low, and so toxic effects on salmon are unlikely.</p>

⁵ www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/

It is concluded that provided the mitigation measures in Section 3.1 are adhered to, there will be no significant adverse effects on Atlantic salmon.

7.2.2. Lamprey

The sea lamprey, an anadromous species, occurs in estuaries and easily accessible rivers. Sea lampreys need clean gravel for spawning, and marginal silt or sand for the burrowing juvenile ammocoetes. Features such as weirs and dams, as well as polluted sections of river, may impede migration to spawning grounds⁶.

The brook lamprey is a non-migratory freshwater species, occurring in streams and occasionally in lakes in north-west Europe. Like other lamprey species, the brook lamprey requires clean gravel beds for spawning and soft marginal silt or sand for the ammocoete larvae. It spawns mostly in parts of the river where the current is not too strong⁷.

The river lamprey is found in coastal waters, estuaries and accessible rivers. The species is normally anadromous, and pollution or artificial obstacles such as weirs or dams impede migration⁸.

In the 2018 survey (see Section 6), lamprey were recorded around the harbour mouth within soft, organic-rich substrate. Population numbers in the survey area were considered to be low (maximum of 2 ammocoetes in any one sample) and of no more than local importance. The River Tay supports populations of these species throughout the catchment. Spawning sites will be located upstream of Perth Harbour.

The potential effects of the proposed dredging on all lamprey species are described in Table 4.

Table 4 Potential effects on lamprey species

Potential effect	Assessment of significance
Removal of riverbed habitat – damage or disturbance	<p>Although the dredging will remove the surface substrate, this is confined to the existing harbour entrance, which has a history of dredging although not in recent years (last dredged circa. 2004).</p> <p>The dredge area is extremely small (approx. 0.002 km²) relative to the River Tay SAC (approx. 95 km²).</p> <p>It is not considered practical due to the low numbers of lamprey present and the depth and current of the water to translocate any prior to works (see Appendix B). The plough dredging process will move material into the harbour area and it is likely that most ammocoetes would survive the dredging works and disperse from these areas after works.</p>

⁶ <https://sac.jncc.gov.uk/species/S1095/>

⁷ <https://sac.jncc.gov.uk/species/S1096/>

⁸ <https://sac.jncc.gov.uk/species/S1099/>

<p>Increased suspended sediment concentration – smothering</p>	<p>The plough dredger will slowly drag material from the bar into deeper water within the harbour. The disturbance of sediments during the dredging process is similar to the localised disturbance created by vessels manoeuvring within the harbour.</p> <p>The material to be dredged has a high fine sand content so it is expected that any material put into suspension will settle back to the riverbed quickly and will not migrate very far from the dredge area.</p> <p>A number of mitigation measures will be in place to reduce the disturbance and dispersion of fine material during the dredging – see Section 3.1. With these mitigation measures in place, increases in suspended sediment concentration are expected to be minimal, localised and temporary.</p> <p>Lamprey spawning sites will be located upstream (see Appendix B) and will therefore be unaffected by the dredging.</p> <p>A Species Protection Plan (SPP) has been produced for lamprey – see Appendix C. The SPP will be shared with all workers involved in the dredging operation and a ‘toolbox talk’ (TBT) will be given prior to dredging commencing which will cover the requirements of the SPP for lamprey and other species.</p>
<p>Release of contaminated material – toxic effects</p>	<p>As described in Table 3, the material to be dredged is considered to be suitable for both dispersive dredging and disposal at sea, and so toxic effects on lamprey are unlikely.</p>
<p>Water pollution – toxic effects</p>	<p>During any mechanical marine works, there is the potential for accidental pollution. During the plough dredging operation, the key risk is the spillage of fuel or oil from the tug. To minimise this risk, equipment will be well maintained and best practice guidelines will be followed during the works, including the Scottish Environment Protection Agency’s Guidance for Pollution Prevention (GPP) 1: Understanding your environmental responsibilities – good environmental practices; and GPP 5: Works and maintenance in or near water. By following these guidelines, the risk of accidental pollution is low, and so toxic effects on lamprey are unlikely.</p>

It is concluded that provided the mitigation measures in Table 4 are adhered to, there will be no significant adverse effects on lamprey.

7.2.3. Otter

The otter, a semi-aquatic mammal, occurs in a wide range of ecological conditions including inland freshwater and coastal areas (particularly in Scotland). Populations in coastal areas utilise shallow, inshore marine areas for feeding but also require fresh water for bathing and terrestrial areas for resting and breeding holts. Coastal otter habitat ranges from sheltered wooded inlets to more open, low-lying coasts. Inland populations utilise a range of running and standing freshwaters. These must have an abundant supply of food (normally associated with high water

quality), together with suitable habitat, such as vegetated riverbanks, islands, reedbeds and woodland, which are used for foraging, breeding and resting⁹.

During the 2018 and 2021 otter surveys, fresh otter spraint, jelly and prints were recorded in the general vicinity of the harbour, but no confirmed resting up sites were found.

The potential direct and indirect effects of the proposed dredging on otter are described in Table 5.

Table 5 Potential effects on otter

Potential effect	Assessment of significance
Physical presence of dredger – disturbance to otters	<p>As shown on Figure 1, the proposed dredging area is predominantly subtidal, with a small intertidal section on the bar. No landside access to adjacent vegetated areas is required during the dredging. The presence of a small slow-moving tug/dredging vessel, within the entrance to an existing harbour, is unlikely to disturb otters.</p> <p>A SPP has been produced for otter – see Appendix D. The SPP will be shared with all workers involved in the dredging operation and a TBT will be given prior to dredging commencing which will cover the requirements of the SPP for otter and other species.</p>
Removal of riverbed habitat – damage or disturbance to otters or otter habitat	<p>As shown on Figure 1, the proposed dredging area is predominantly subtidal, with a small intertidal section on the bar. Due to its open nature this is not a suitable resting up area for otter, so disturbance of otter habitat is very unlikely.</p>
Release of contaminated material – toxic effects	<p>As described in Table 3, the material to be dredged is considered to be suitable for both dispersive dredging and disposal at sea, and so toxic effects on otter are unlikely.</p>
Water pollution – toxic effects	<p>During any mechanical marine works, there is the potential for accidental pollution. During the plough dredging operation, the key risk is the spillage of fuel or oil from the tug. To minimise this risk, equipment will be well maintained and best practice guidelines will be followed during the works, including the Scottish Environment Protection Agency’s Guidance for Pollution Prevention (GPP) 1: Understanding your environmental responsibilities – good environmental practices; and GPP 5: Works and maintenance in or near water. By following these guidelines, the risk of accidental pollution is low, and so toxic effects on otter are unlikely.</p>

It is concluded that provided the mitigation measures in Table 5 are adhered to, there will be no significant adverse effects on otter.

⁹ <https://sac.jncc.gov.uk/species/S1355/>

8. In-combination effects

The effects of a plan or project must be considered both individually and in combination with other relevant plans or projects. The in-combination assessment should take account of all current and proposed plans or projects where a regulatory consent has been applied for or granted. It is not necessary to take account of plans or projects for which there have been no formal applications under an approvals process.

A search of the Marine Scotland Information web portal has identified one project with the potential for in-combination effects: a marine licence application has been submitted for concrete repairs to pier crossheads and installation of new drainage on Friarton Bridge, approximately 1.2 km downstream of the Perth Harbour dredging works. The application form states that the proposed start date for the works is 1 November 2021, with completion by 18 April 2022; however, at the time of writing a marine licence has not been issued. It is possible that the works will partially overlap with the proposed dredging.

The application form notes that the scaffolds will be boarded to prevent materials from falling into the watercourse. No significant environmental impacts are predicted from the works.

As the pier crosshead repairs take place above water within a boarded scaffold, there is no mechanism for in-combination effects with the proposed dredging. Limited details are provided on the drainage installation but the works appear to be small scale with limited impacts on the river environment. It is assumed that an otter survey has/will be carried out prior to the bridge works, and that appropriate mitigation for otter will be in place. As such, in-combination effects on the qualifying features of the River Tay SAC are not anticipated.

9. Conclusion

No significant adverse effects are predicted on the qualifying interests of the River Tay SAC or their supporting habitats. It is concluded that providing the mitigation measures set out in this Appropriate Assessment are adhered to, there will be no adverse effect on the site integrity of the River Tay SAC from the proposed dredging at Perth Harbour, either in isolation or in combination with other projects.

Appendix A

Dredging Method Statement

Perth Harbour Phase 1 Plough Dredging

Dredging Method Statement

Introduction

The operation of Perth Harbour is presently being seriously hindered by the accumulation of natural sediment across the entrance to the harbour. This area is referred to as the 'Bar' and is shown on Figure 1 below.

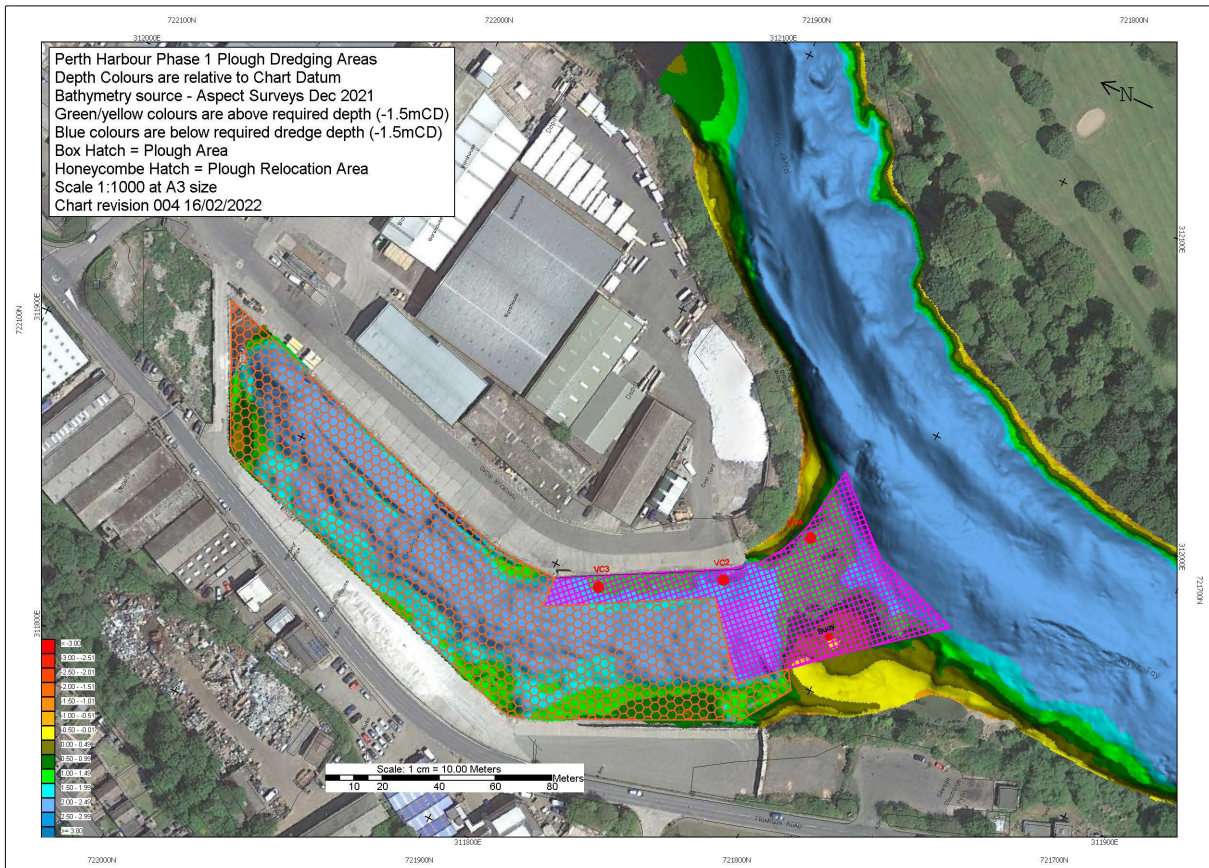


Figure 1. Bar across entrance to Perth Harbour. Blues show depths deeper than the design depth of -2.1mCD, all other colours are shallower than -2.1mCD

The harbour is presently gathering information to support a marine licence application to carry out the general dredging of accumulated sediment to restore the normal operational depth (-2.1mCD) in the whole harbour area. However, this process is taking time during which the Harbour is suffering significant operational restrictions that are impacting on the viability of the facility. In order to enable some trade to recommence, the harbour is looking to carry out a very limited dredging operation in order to increase the available depth over the bar by about 0.4m so as to establish an interim navigable depth of 1.5m below Chart Datum.

The recent bathymetric survey has identified that there are areas within the harbour that are presently deeper than the design depth of -2.1mCD (blue areas on Figure 1). The capacity of these deeper areas is greater than the volume of material that needs to be removed from the Bar in the

short term. It is therefore proposed to relocate the material from a limited area of the Bar into the deeper areas of the harbour in order to enable trade to re-commence, all be it in a limited fashion (Phase 1 dredging).

It is intended to remove the remaining material that exists above the design level of -2.1mCD at a later date under a separate marine license (Phase 2 dredging).

It is recognised that there are environmentally sensitive areas in the River Tay close to the harbour entrance, and this has been taken into consideration and mitigated against by the proposed dredging methodology.

Dredging Methodology

Due to the presence of sensitive environmental receptors in relatively close proximity to the target dredge area on the bar, it is intended to adopt a dredging procedure that will minimise the risk of suspended sediments being released into the wider River Tay and hence mitigate against the risk of smothering sensitive receptors.

It is proposed to carry out the dredging by relocating material from the bar into the deeper areas of the harbour. This will be achieved using a plough (see figures 2 and 3).



Figure 2. Plough fitted to the back of a suitable tug. The plough is lowered and raised by a winch running over the 'A' frame.



Figure 3. Close up images of the Plough.

This dredging method works by capturing the sediment to be dredged in an open bottom box that is pulled over the area to be dredged. The plough is lowered down to a specific depth on winch wires and is then directed towards the area to be dredged by the tug on which the plough is mounted. As the plough encounters an area that is shallower than the set height of the plough, the cutting blade, on the front of the plough, separates the shallower material from the bed and it accumulates within the plough box. When the plough passes out of the area to be dredged and into deeper water, the material accumulated in the plough box drops out. The plough is then raised and the tug is re-positioned on the outer side of the bar to repeat the process. By repeating this process many times the available depth, over the bar, will be gradually increased and the deeper water immediately inside the harbour will be progressively filled. The process is repeated until the required depth (-1.5mCD) is achieved, at which point the dredging process will be completed.

Mitigation Methods

It is proposed to implement a number of control measures to minimise the risk of releasing suspended sediment into the wider River Tay. These measures, and the reason for them, are set out in Table 1 below.

Item	Measure	Reason
1	Only dredge on flood tide	Sensitive environmental areas are located upstream and downstream of the dredge area. By restricting ploughing operations to the flood tide only, any suspended sediment will tend to be moved in towards the harbour by the rising tidal flow. By not dredging on the ebb tide the risk of significant quantities of suspended sediment migrating outside the harbour is mitigated against. The material to be dredged has a high fine sand content so it is expected that any material put into suspension will settle back to the

		seabed quickly and will not migrate very far from the dredge area.
2	Only plough in towards the Harbour	By ploughing the material from the river side into the Port area it means that all material will be moved away from the river current and into the relatively benign area of the harbour. This will mitigate against any significant quantities of suspended material entering the River Tay.
3	Lower plough in small steps	By carrying out the ploughing activity in small depth increment steps (circa 0.1m increments) it reduces the risk of the plough box filling up and material being released over the back of the box if overfilled. By limiting the depth of cut on each pass it also reduces the thrust required by the plough to pull the plough through the dredge area.
4	Plan the ploughing lines	By planning the ploughing lines based on the capacity of the plough the risk of overfilling can be prevented and the need to use excessive thrust is minimised.
5	Minimise required thrust from the tug	As the plough is mounted over the stern of the vessel it is close to the propulsion system of the tug. By minimising the depth of cut of the plough, or overfilling, the propulsion thrust necessary can be minimised. This will minimise the risk of the propeller wash disturbing the material contained in the plough or the disturbed seabed in the dredge area.
6	Have an accurate navigation system on the tug	By having an accurate navigation system on the tug the dredging operation can be carefully controlled and carried out in the most efficient manner with all dredging being targeted in the required dredge area.
7	Provision of accurate tide/height information	By having access to accurate water level height the dredging can be targeted accurately to only those areas where dredging is required. It will also enable to plough blade to be set to the required level hence minimising the risk of over cut or over dredge.

Appendix B
Perth Harbour Dredging Project
Ecological Survey Report



ECOLOGICAL SURVEY REPORT

PROTECTED SPECIES RESULTS AND RECOMMENDATIONS

PERTH HARBOUR DREDGING PROJECT – PERTH HARBOUR

Perth & Kinross

04.01.2022

CONFIDENTIAL

PREFACE

This document is a report for ecological services to be carried out by the company.

Direct Ecology Limited
Unit 1, Block 2
Duckburn Industrial Estate
Dunblane
FK15 0EW

Tel: +44 (0) 1786 826865
Mob:

info@directecology.co.uk
www.directecology.co.uk

Company Number: SC343106

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REVISION AND SIGN OFF

ISSUE DATE	AUTHORS	CHECKED BY	SIGNED OFF	VERSION	CHANGE REFERENCE
22.12.2021	Beccy Osborn Katherine Watson Sarah Moore	Beccy Osborn	Beccy Osborn	Draft	For client review
04.01.2022			Beccy Osborn		Updated following client review

EXECUTIVE SUMMARY

This report details the results of surveys for protected species in the proximity to Perth Harbour in relation to a proposed small-scale plough dredging at the Harbour entrance. This section of the River Tay is part of the River Tay Special Area of Conservation which includes lamprey (all species), salmon and otter as its qualifying features.

Survey were undertaken for otter, beaver, freshwater pearl mussel, lamprey and invasive non-native species. Both boat and shore-based surveys were carried out for freshwater pearl mussel and boat surveys for lamprey.

Otter signs (spraints and prints) were found along the shore line on both sides of the bank, with potential resting up sites in areas of dense vegetation and a hole in the embankment. However, no resting up sites were confirmed.

Beaver signs were found on Moncreiffe Island including feeding remains and gnawed trees.

Freshwater pearl mussel are not present in the harbour mouth as the substrate is unsuitable in this area, being too silty. Some were found 30 m downstream and higher numbers where the substrate is more mixed 200 m downstream.

Lamprey ammocoetes were found in the substrate in and around the harbour area, and along the river at the south east end of Moncreiffe Island.

Tool box talks should be given to workers for otter and beaver.

For the dredging of the harbour bar, no freshwater pearl mussel will be directly impacted. However, strict measures must be in place to ensure no silt dispersal downstream. In addition a species protection plan should be in place, that would include a pre-works check for any mussels that have been washed down to unsuitable habitat.

The number of lamprey ammocoetes found was not considered to be significant enough to warrant specific mitigation measures such as electrofishing and translocation prior to works. However, it is recommended that species protection plan is in place to minimise impacts..

Extensive areas of invasive non-native species (INNS) including Japanese knotweed, giant hogweed and Himalayan balsam are present close to the areas of works. However, works are marine based and no disturbance of INNS is anticipated. .

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1 PROJECT INFORMATION

1.1 INTRODUCTION

This report presents the results of ecological surveys undertaken in relation to a proposed small-scale plough dredging operation on the River Tay at Perth Harbour. This is an interim report in relation to urgent dredging required at Perth Harbour Entrance (the bar), to allow some limited operations to continue at the Harbour. A further report will be issued later in 2022 in relation to further more extensive dredging in the Harbour area.

The following have been considered in this report: otter; beaver; freshwater pearl mussel; Lamprey (all species); salmon; and Invasive non-native species (INNS). Initial surveys were undertaken in 2018 over a wider area and some limited update surveys were undertaken in 2021. NatureScot were consulted in relation to proposed update surveys and methods.

This report has been undertaken on behalf of Perth and Kinross Council.

1.2 SITE LOCATION AND DESCRIPTION

This part of the River Tay passes alongside industrial sites on its western and southern banks between Perth Harbour and the downstream end of the study area and, a golf course fringed by woodland cover on the southern part of Moncreiffe Island. The River Tay is tidal up to and beyond the furthest upstream point of the survey area, at Perth Harbour. The River Tay is navigable to ships of up to 90m in length, carrying up to 2,500 tonnes, as far as Perth Harbour. The current operation of Perth Harbour is presently being seriously hindered by the accumulation of natural sediment across the entrance to the harbour. This area is referred to as the 'Bar' and is shown on Figure 1 below.

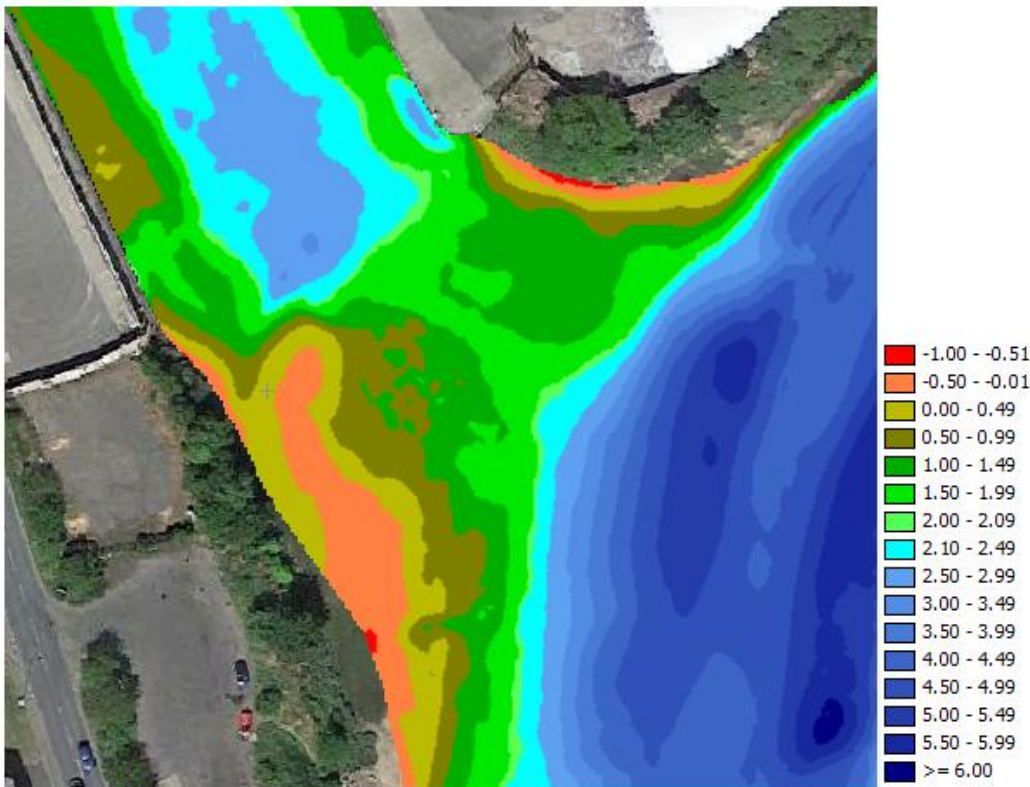


Figure 1: Bar across entrance to Perth Harbour. Blues show depths deeper than the design depth of -2.1mCD, all other colours are shallower than -2.1mCD.



Photo 1: Proposed Dredging area

1.3 POLICY, LEGISLATION AND GUIDANCE

The following legislation has been taken into account when undertaking the assessment:

- European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the Habitats Directive);
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (the Habitats Regulations) – transpose the Habitats Directive into UK law;
- Wildlife and Countryside Act 1981 (as amended) (WCA);
- Wildlife & Natural Environment (Scotland) Act 2011 (WANE);
- Nature Conservation (Scotland) Act 2004 (as amended);

The following industry guidance for ecological evaluation and assessment has been taken into account:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland; and
- Scottish Natural Heritage (2018). Environmental Impact Assessment Handbook (5th Edition).

Other specific guidance documents are referred to and referenced where necessary.

1.3.1 OTTER AND BEAVER

Otter and beaver and the places they use for shelter or protection (i.e. holts, resting up sites and couches) receive protection under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). This protection means that otters, and the places they use for shelter or protection, are capable of being a material consideration in the planning process. Details of this legislation and the subsequent protection afforded to otters can be found in Appendix 1.

1.3.2 FRESHWATER PEARL MUSSEL

Freshwater pearl mussel receive full protection by their inclusion on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), meaning it is an offence to kill, injure, disturb or take specimens of this species or to damage or destroy habitat used by this species. If activities are likely to contravene the legislation, licences can be applied for to allow certain operations to proceed under certain conditions.

1.3.3 LAMPREY SPECIES

River lamprey are afforded partial protection by their inclusion on Schedule 3 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), which prohibits certain methods of taking or killing the species.

1.3.4 INVASIVE NON NATIVE SPECIES (INNS)

Invasive non-native species are covered by the Wildlife and Natural Environment (Scotland) Act 2011. This states that it is an offence to release or allow escape of any non-native animal or cause the spread and growth of any non-native plant out with its natural range.

2 2018 & 2021 SURVEY METHODS

2.1 DESK STUDY

A desk study was undertaken to determine the presence of any protected species including otter, beaver and lamprey that have been recorded within 2 km of the site. Only records within the last 25 years have been included. In addition, a search was undertaken for any designated nature conservation sites within 2 km of the site.

The following sources were consulted:

- NatureScot SiteLink (NatureScot, 2021);
- Scotland's Environment Web Map;
- National Biodiversity Network (NBN) Atlas; and
- Other specific sources as listed in sections 3.

Existing information held for the area by Direct Ecology Ltd was consulted.

2.2 SURVEY METHODS

Survey dates are provided in Table 1 below. Ten figure grid references, using a handheld GPS, were taken, along with a target note of notable features. These positions were then plotted on a map using GIS software. Time and weather data for the survey visit are given in Table 1.

2.2.1 SURVEY PERSONNEL

Surveys were undertaken as per Table 1. Survey work and reporting was managed and overseen by Beccy Osborn, Principal Ecologist. She is an experienced ecologist with 16 years' experience and a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM). She holds survey licences for freshwater pearl mussel and otter. She undertakes training courses for CIEEM, including for otters.

Table 1: Survey times and dates

DATE	SURVEYORS	SURVEY TYPE	START / FINISH	WEATHER
31.05.2018	Beccy Osborn Phoebe Shaw Stewart Jethro Gauld	Shore based freshwater pearl mussel survey and protected species	11:30 / 15:30	Rain: 0 Temperature: 12°C Wind Speed: 2 CC: 4
12.06.2018	Iain Mackenzie Phoebe Shaw Stewart	Otter and protected species survey	10:00 / 15:00	Rain: 0 Temperature: 16 °C Wind Speed: 2 CC: 3
03-05.07.2018	Beccy Osborn Jethro Gauld	Boat based freshwater pearl mussel survey	10:00 / 15:00	Rain: 0 Temperature: 20 °C Wind Speed: 2 CC: 2
27.09.2018	Beccy Osborn Dr Colin Bull Phoebe Shaw Stewart	Boat based lamprey survey	09:30 / 13:30	Rain: 0 / 2 Temperature: 14 °C Wind Speed: 4 CC: 4
27.08.2021	Beccy Osborn Katherine Watson	Otter, protected species and freshwater pearl mussel shoreline survey	10:00 – 16:00	Rain: 0 Temp: 16 °C WS: 0 CC: 4
Key: Rain = 0-4 (0 = dry); Temp = Temperature (°C); WS = Wind speed - 0 (calm) 12 (hurricane); CC = Cloud cover (in eighths)				

2.2.2 OTTER

The survey area for otter included both banks and approximately 200m upstream and downstream in accessible areas. Survey was undertaken in both 2018 and 2021.

The methodology involved an assessment of the river bank and inland habitat for evidence of otter activity (in the form of spraints, resting up sites, couches, tracks and otter sightings). The term resting up site has been used in this report to include all 'resting areas' such as:

- holt sites - more permanent and often underground dens that may have been used for generation;
- hovers – temporary resting up sites that are dry and protected;
- couches – temporary above ground resting sites such as a patch of dense vegetation.

An indication is given as to whether the site is likely to have potential to be used as a breeding holt or is likely to be a more temporary resting up site.

A survey for otters can be undertaken at any time of the year, as long as the water levels are low, and vegetation growth is not high.

2.2.3 BEAVER

The survey area for beaver included both banks and approximately 200m upstream and downstream in accessible areas. Survey was undertaken in both 2018 and 2021. These areas were surveyed for signs of beaver activity from the bank and from the waterside. Beaver activity was recorded by following the methods used by Campbell *et al.* (2012) and included:

- Woody feeding
- Soft feeding
- Dam

- Canal/Digging
- Resting up site
- Burrow
- Lodge
- Scent mound
- Scent site
- Feeding station
- Prints/Feeding trail

Evidence of beaver activity was logged on a GPS and photographed.

2.2.4 SURVEY LIMITATIONS

Dense vegetation hindered survey in some areas. Areas of deep channel (some tidal) meant that access was not possible to all areas. Some areas of the shore were not safe to access with steep or man-made banks.

2.2.5 FRESHWATER PEARL MUSSEL

Shore-based survey for freshwater pearl mussel was undertaken along all accessible areas of the relevant shores as detailed in Figure 4. The survey area extended to 100m upstream and 500m downstream of the river. These surveys were undertaken in 2018 (east bank) and 2021 (west bank).

This survey was conducted using the methods approved by NatureScot for freshwater pearl mussel transect surveys (Young *et al.* 2003). Surveys were conducted, in an upstream direction and using a bathyscope. Georeferenced photographs were taken of the substrates encountered during survey. Two surveyors worked in parallel using bathyscopes to scan the water bed up to 1.5m either side of each surveyor. This allowed a strip of 15-20m out from the riverbank to be intensively surveyed for evidence of live mussels or dead shells; details of riverbed habitat were summarised. Survey was timed around low tide when water levels were at their lowest.

Where mussels were recorded, site details including a ten figure grid reference, substrate composition, were noted. Photographs of the majority of mussels found were also taken.



Photo 2: Example of freshwater pearl mussel being conducted.

2.2.6 SURVEY LIMITATIONS

The survey was limited to shallower areas of water, accessible bank and lower tide times.

2.2.7 2018 BOAT BASED SURVEY

The main channel is not accessible using waders and bathyscopes. As such surveys in deeper areas of water were performed from a small boat utilising an underwater camera to record images and footage of the riverbed.

For the survey an underwater Spyball™ camera and control unit supplied by Submertec Ltd was used as recommended by NatureScot (Cosgrove *et al.* 2007). This camera unit is mounted to an umbilical cord (Photos 3, 4) connecting it to a control unit with a large screen which allows users to view the riverbed, control the camera angle, zoom, focus and capture video and stills. The control unit also automatically records the footage and stills to an external USB drive for export to a computer for later analysis. The camera is able to rotate a full 360 degrees on two axes and is also equipped with a light to illuminate the riverbed that aids survey in darker conditions. This system was powered by a 110v supply from a small suitcase style generator suitable for use on board a boat. A stabilising weight attached to the bottom of the camera along with a fin was also employed for the survey. The boat was operated by John Kettles, arranged through Perth and Kinross Council.



Photo 3: Submertec Spyball Camera Unit



Photo 4: Submertec Spyball control unit in use

Points were surveyed between over 100m upstream of the harbour, into the harbour and over 500m downstream. Where the current of the river was weak, surveys of the riverbed were performed by performing spot checks at each of these locations whereby the camera would be manoeuvred around the boat by one surveyor while the other surveyor operated the control unit and made observations on the screen. This allowed approximately 5 -10m² of riverbed to be scanned during each survey with average recording time of 6 minutes per survey. Where current was too strong to permit a 'spot check' style survey, the boat was manoeuvred approximately 50m upstream of each survey point and allowed to drift to approximately 50m downstream (using the engine to control the boat speed). A ten figure OSGR was recorded for each start and end where this method was utilised. During each survey, the camera was slowly moved around the boat and where necessary held in position to allow the camera to focus in on features of interest such as suspected mussels. In shallower sections of river a bathyscope was also used from the boat. All footage recorded was then reviewed after the survey to permit details of riverbed habitat and mussels present within each survey section to be recorded.

2.2.8 SURVEY LIMITATIONS

The boat surveys using the spyball camera permitted large areas of riverbed to be surveyed relatively quickly however the footage only provides a snap shot of the riverbed habitat and total numbers of mussels present within the survey areas. The quality of the footage was also affected by strong currents and suspended silt which may have reduced the detection rate of mussels during some surveys.

Although an effective method for detecting large, adult mussels; camera-based survey is not thought to be effective for detecting juvenile mussels as these are significantly smaller than the adults (<30mm) and usually buried within the river substrate (Cosgrove and Hastie 2001). As such it is considered likely that juvenile mussels within the survey view were missed, however this survey is intended to indicate the presence of mussels within the area and not estimate population size.

2.2.9 LAMPREY

Surveys of the riverbed were performed (in 2018) by performing spot checks along the shores of the River Tay. The survey points were all accessed from a boat. The survey device used was made by Dr Colin Bull (University of Stirling) specifically for the purpose of surveying ammocoetes (lamprey larva) and consists of a length of plastic piping with a mesh bag attached to one end and a supply of compressed air to the base of the pipe (photo 5, 6). The base is weighted and partially submerged into soft substrate, the compressed air is released for a short time (maximum 5 seconds) and the substrate is lifted up the pipe along with the rising air. The material that is caught in the mesh bag is then transferred to a bucket and the contents inspected for the presence of ammocoetes.

Points were surveyed starting in the harbour area, over 100m upstream and over 500m downstream. A higher intensity of points was focussed around the harbour mouth where the habitat was considered more suitable.

Surveys of the riverbed were performed by performing spot checks at each of these locations whereby the survey equipment was deployed by Dr Colin Bell in order to obtain a suitable sample. If it was not possible to collect a sample from the specified point (e.g. due to strong current or the nature of the bed) then the nearest suitable area was surveyed, and a ten-figure grid reference was taken). A ten figure OSGR was recorded for each start and end where strong currents made remaining in one location impossible.

In 2021 an update habitat assessment was made.

2.2.10 SURVEY LIMITATIONS

The strength of the current proved problematic during the lamprey survey. Where possible, points were shifted out of the main current and a new grid reference taken.



Photo 5: The pipe equipment with mesh bag



Photo 6: The submerged equipment with air bubbles in the background

3 RESULTS

3.1 DESIGNATED SITE SEARCH

The River Tay Special Area of Conservation (SAC) covers the site and survey area. Details are summarised in Table 2 and on Figure 2. Although there are known to be good populations of freshwater pearl mussel on the River Tay, they are not a qualifying or notified feature for the SAC.

Table 2: Results of designated sites data search

PROTECTED AREA	DESIGNATION & LOCATION	STATUTORY INTEREST DETAILS
River Tay	Special Area of Conservation (SAC), the development site sits within this SAC.	Qualifying features include: Atlantic Salmon (<i>Salmo salar</i>) Brook Lamprey (<i>Lampetra planeri</i>) Clear water lakes or lochs with aquatic vegetation and poor nutrient levels Otter (<i>Lutra lutra</i>) River Lamprey (<i>Lampetra fluviatilis</i>) Sea Lamprey (<i>Petromyzon marinus</i>)
Key: SAC – Special Area of Conservation – European Site		

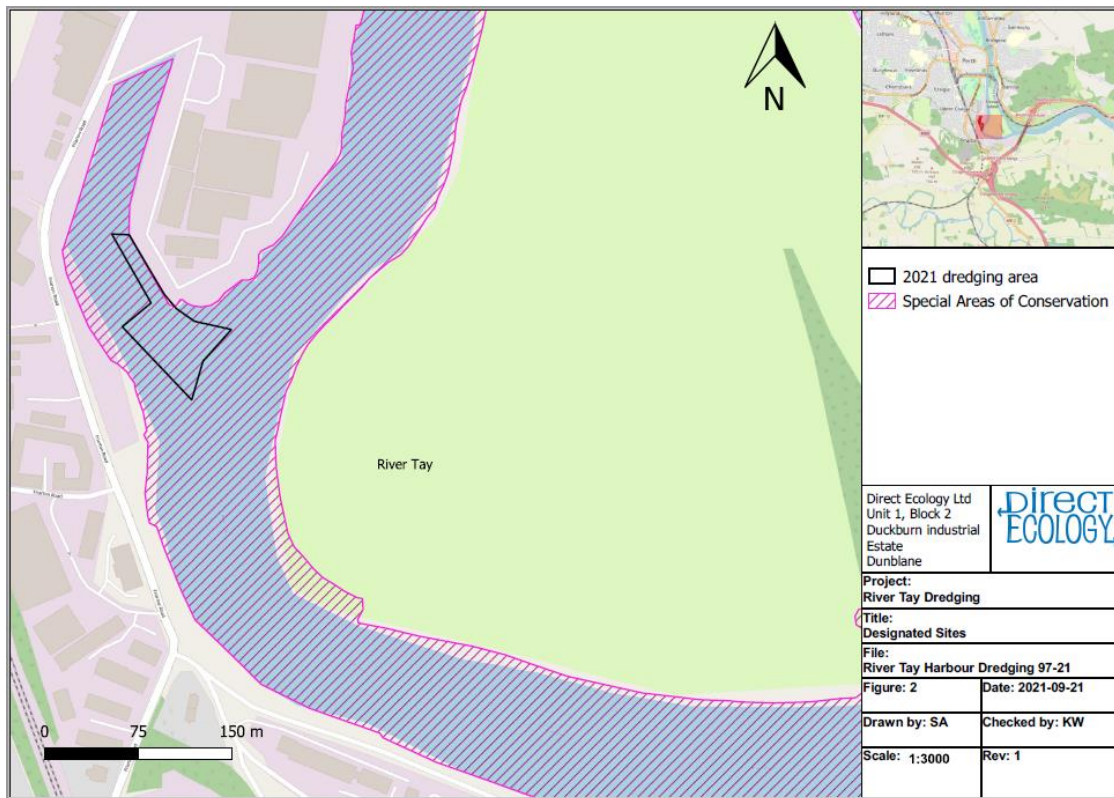


Figure 2: Designated site River Tay SAC

3.2 OTTER

3.2.1 DESK STUDY

Otter surveys were undertaken on the River Tay in 2012 and in 2003-2004 as part of Nature Scot's Site Condition Monitoring (SCM) programme, to assess the condition of this qualifying feature on the River Tay SAC. In addition, parts of the River Tay were surveyed for otters in 1991-1994, 1984-1985 and in 1977-1979 for the Scottish Otter Survey Database by the JNCC. Although the detailed survey areas and results from these surveys are not known, otters were recorded as present within the 10km square that includes the current survey area in all survey periods between 1977-1979 and 2012¹.

Direct Ecology has records of otter activity upstream of the proposed works and downstream of Friarton bridge.

3.2.2 SURVEY RESULTS 2018

Evidence indicating the presence of otter was recorded on Moncreiffe Island. Potential resting up sites were recorded during the survey including under fallen trees or in fox dens and in dense vegetation (Figure 3).

A number of spraint sites were recorded and otter prints, and a further two scats, possibly of mink, were recorded. Frequent strong paths were also recorded although these could not be definitively identified as being made by otters.

Further detailed target notes (TN) and photographs can be found in Appendix 2.

3.2.3 SURVEY RESULTS 2021

Fresh otter spraint and jelly was recorded on the beach on the west bank just downstream of the harbour (TN1). Prints were noted upstream of the harbour on the east bank of the river (TN2), and potential resting up areas are present under fallen trees and in thick vegetation. However, no confirmed resting up sites were found.



Photo 7: Otter spraint on western beach



Photo 8: Prints on eastern beach

3.3 BEAVER RESULTS 2018

3.3.1 Desk Study

34 Beaver records were obtained from within 1km of the site from 2017, the closest within 55m of the site. The data was from NBN and the Tayside Beaver Survey.

¹ Findlay, M., Alexander, L. & Macleod, C. 2015. Site condition monitoring for otters (*Lutra lutra*) in 2011-12. *Scottish Natural Heritage Commissioned Report No. 521*.

3.3.2 Survey Results 2018 and 2021

During the surveys evidence of beaver activity was noted in several locations on Moncreiffe Island within and beyond the current survey area including (TN7, TN31, Figure 3). A beaver was also seen entering the water on the east side of Moncreiffe Island during the boat survey on 04.07.2018.

This suggests that beaver are active across much of the Island with more frequent activity concentrated on the east side of the island away from the Harbour area.

No signs were identified during the 2021 survey. Further detailed target notes (TN) and photographs can be found in Figure 3 and Appendix 2.

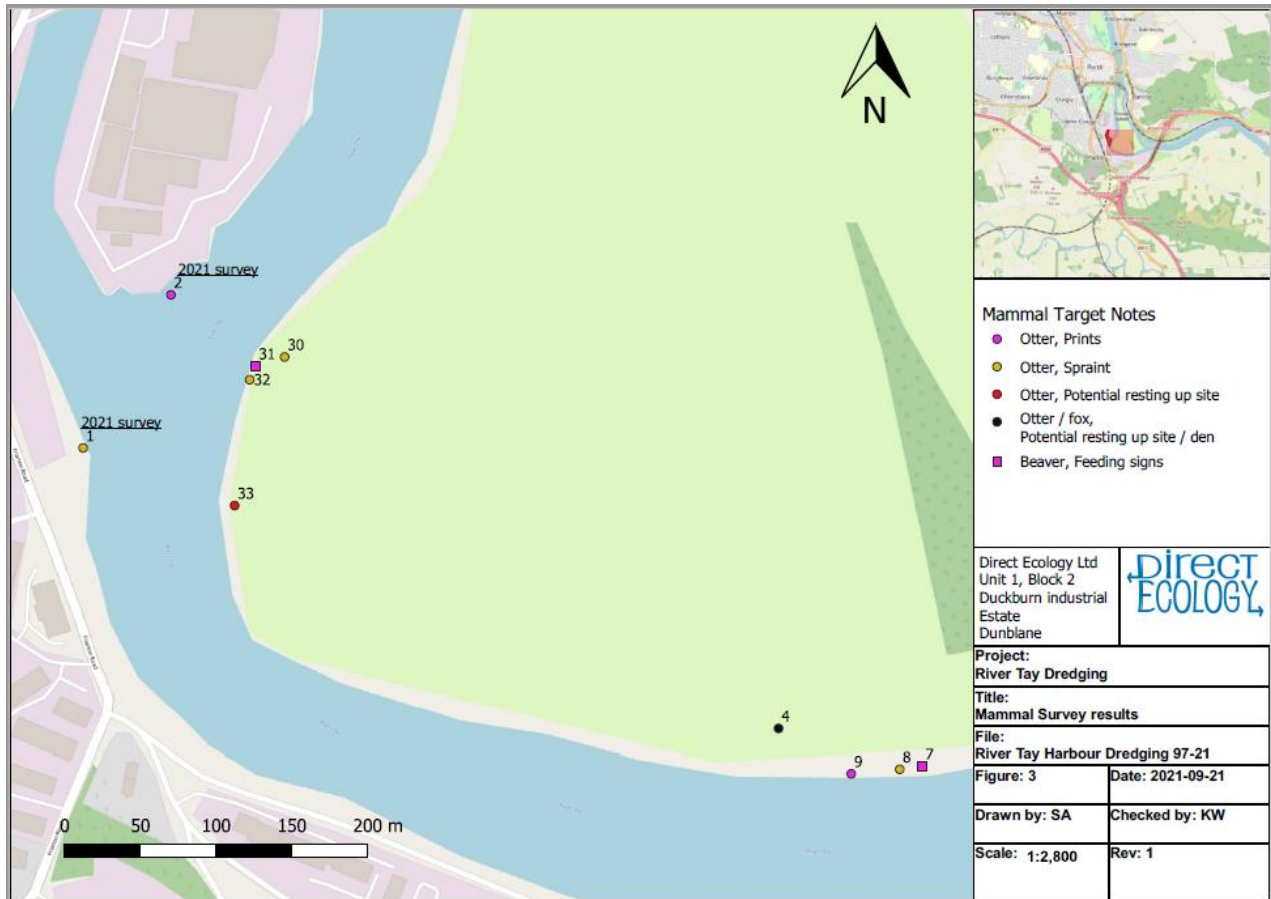


Figure 3: Mammal survey results

3.4 FRESHWATER PEARL MUSSEL

3.4.1 DESK STUDY

Survey for freshwater pearl mussel was undertaken by Direct Ecology at two sites within close proximity to the Harbour. The surveys undertaken in 2016 at the site upstream of the Harbour, recorded a sizeable population of freshwater pearl mussel.

Prior to the previous dredging, survey undertaken on behalf of Perth and Kinross Council in October 2003 identified freshwater pearl mussel as being present at several locations along the section of river downstream of the Harbour (between Moncreiffe and Inchyra). They found that in the areas of search the pearl mussel distribution was sparse and patchy.

3.4.2 SHORE-BASED SURVEY 2018

Approximately 18 live mussels (and a number of dead shells) were recorded around the south shore of Moncreiffe Island (see Figure 4). Good coverage of this area was achieved due to the low spring tide at the time of survey allowing access to near the main channel of the river.

Riverbed habitat in the areas with mussels present is of good quality for freshwater pearl mussel with a good mix of riverbed substrates including boulders, cobbles, pebbles, gravel, sand and silt. Further downstream towards the confluence, the riverbed substrate becomes almost pure silt of low suitability for freshwater pearl mussels.

3.4.3 BOAT BASED SURVEY 2018

The substrate within and immediately adjacent to the harbour in Perth is poor habitat for freshwater pearl mussel as the riverbed substrate consists of nearly 100% silt.

Downstream of the Harbour, as the river bends (and there is a faster flow), is an area of good quality habitat consisting of a fairly even percentage of the substrate covered by silt, pebbles, cobbles and boulders; this alternates between patches which are more dominated by silt and patches consisting of cobbles and boulders. Frequent mussels were recorded here. 28 live mussels were recorded on one transect and 10 mussels were recorded on another (see Figure 4). This is also the area where frequent mussels were found in 2021 (see below). In a lot of areas further downstream, the habitat was considered sub-optimal for freshwater pearl mussel due to the high percentage cover of silt.



Photo 9: Typical riverbed habitat along south shore of Moncreiffe Island. *Photo 10: Silt covered cobbles and boulders.*

3.4.4 SHORE-BASED SURVEY 2021 SURVEY

Over 30 live mussels (and a few dead shells) were recorded during the shore-based survey. All mussels found were present downstream of the harbour with no mussels recorded upstream during the update. Good coverage of the river upstream was difficult due deep silt and steep banks (and some mussels were found in the channel upstream on the boat survey - see Figure 4). The habitat immediately upstream of the harbour towards the banks is unsuitable for freshwater pearl mussel, being very silty (Photo 11). The mouth of the harbour the substrate is almost pure silt and of low suitability. Within the main channel, patches of more suitable habitat are present.

Riverbed habitat downstream is of good quality for freshwater pearl mussel with a good mix of riverbed substrates including boulders, cobbles, pebbles, gravel, sand and silt (Photo 12). However, towards the end of the 500m survey area, the bankside habitat is almost pure silt, of low suitability for freshwater pearl mussels.



Photo 11: Upstream of the harbour – unsuitable substrate on the banksides, thick silt



Photo 12: Within 100m downstream of the harbour, poor quality habitat

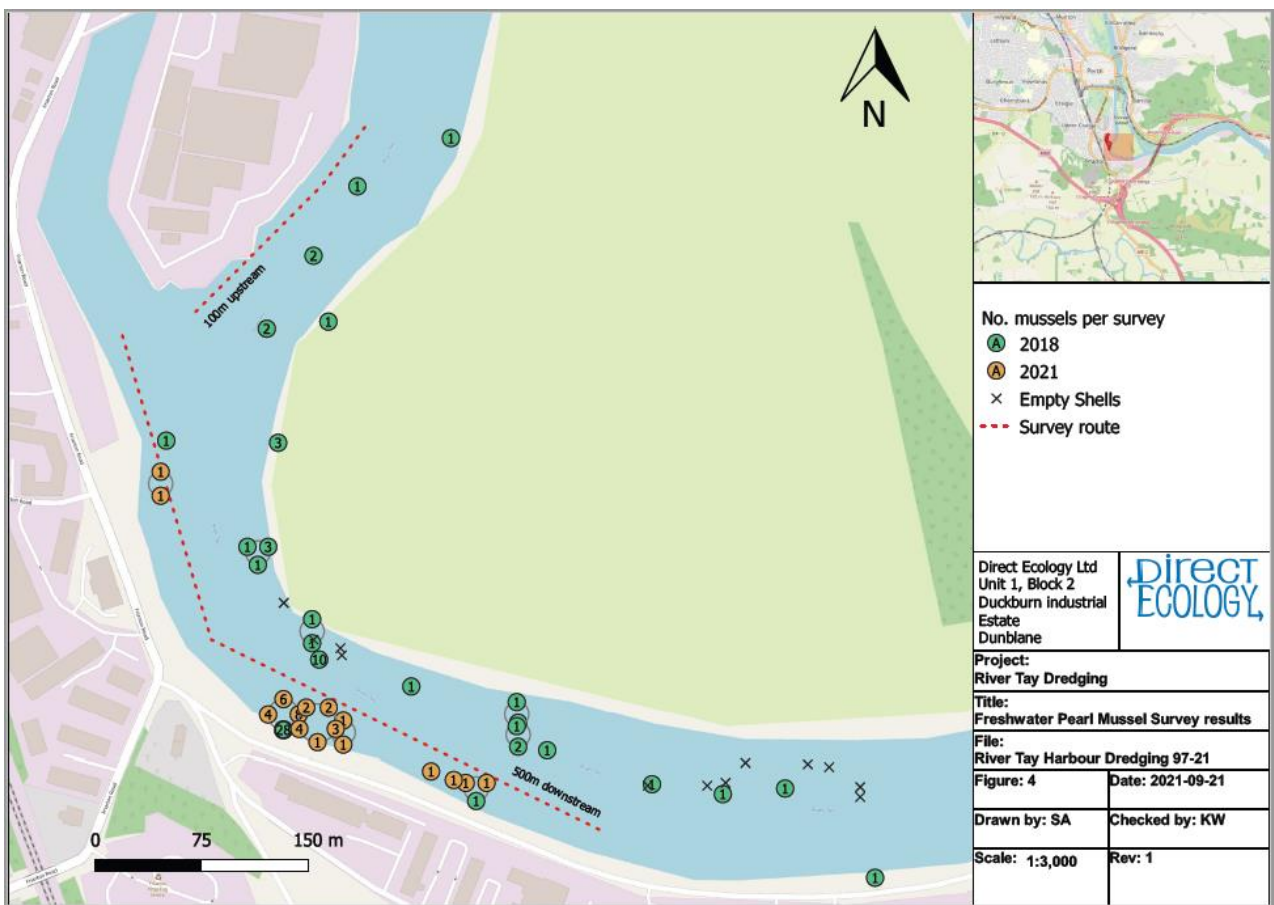


Figure 4: Overview of areas surveyed during shore based freshwater pearl mussel survey

3.5 LAMPREY

3.5.1 DESK STUDY

All three species of lamprey are listed as qualifying features of the River Tay SAC (see section 3.1, Figure 2).

A desk study search using NBN atlas for lamprey records within 2km of the survey area was performed. This revealed seven records of lamprey within 2km of the proposed dredging areas. All records are held by the Biological Records Centre within the Database for the Atlas of Freshwater Fishes. These records range in date from 1978 – 1990 and are concentrated in two areas. Three records are from near the railway bridge approximately 1.5km north of the harbour and the other records are approximately 1km downstream of dredging area 4 near the confluence of the River Earn with the Tay.

A largely desk-based study assessment, that looked at habitat characteristics of the dredging areas, was undertaken by British Waterways on behalf of their client Perth and Kinross Council in 2004. This assessment looked at adult lamprey and ammocoetes. The assessment undertaken at the time concluded that the dredging areas would present a hostile environment for lamprey ammocoetes and that due to the less than favourable habitat the study concluded that any potential impacts were likely to be 'very small to insignificant in the long term'. However, more recent survey has shown that this habitat would not necessarily be unfavourable (C. Bull, pers comms. 2018).

It has been made known (by NatureScot) that lamprey have also been found during a survey undertaken by another consultancy near to the causeway on the east of Moncreiffe Island.

3.5.2 SURVEY RESULTS 2018

Samples were successfully collected at recorded points along the river, starting within the harbour and continuing downriver.

Around the harbour mouth the substrate was soft and silty with high levels of organic material, this allowed for good-sized samples to be collected (see e.g. photo 13). Three individual lamprey were collected in this area (see e.g. photo 14), all were positively identified as *Lampreta sp.* (it is not possible to distinguish between juvenile stage river and brook lamprey). The lamprey collected at point 4 was 45mm long and considered to be around 1 year in age. The individuals collected at points 9 and 10 were smaller in length (15mm and 28mm respectively) and are therefore considered to be in their first year of life and are classified as 0+ years. Invertebrates were collected within these samples, including chironomids, Gammarus and caddisfly larvae.

Downstream at point 6, between the harbour and western shore of Moncreiffe Island, the substrate was predominantly gravel, with a variety of invertebrates and some weeds. A single *Lampreta sp.* was identified in point 6, 45mm long and around 1 year in age.

Further downriver the river bed was generally harder with patches of soft substrate that could be collected for survey. Points 11 to 13 consisted of sandy substrate with a variety of invertebrates and inorganic materials. No lamprey were collected in this area. Points 14-16 could not be surveyed due to hard base rock and no accessible patches of substrate to sample. The wind and current speed in this section of the river made it difficult to manoeuvre the survey equipment and boat, however it is not considered that this had a notable effect upon the survey results. Point 17 yielded a large amount of material including a variety of invertebrates and very fine substrate.

Point 18 was taken around the south east end of Moncreiffe Island where the substrate is very soft and full of fine organic materials. A single *Lampreta* sp was collected, 21mm and classified as 0+ years.



Photo 13: The substrate is sifted to search for lamprey

Photo 14: Ammocoetes

3.5.3 UPDATE LAMPREY HABITAT ASSESSMENT 2021

A habitat assessment was undertaken in 2021 and it was concluded that there was no change to the status of the habitat present. It is considered therefore that the baseline resource would be broadly similar to that from 2018.

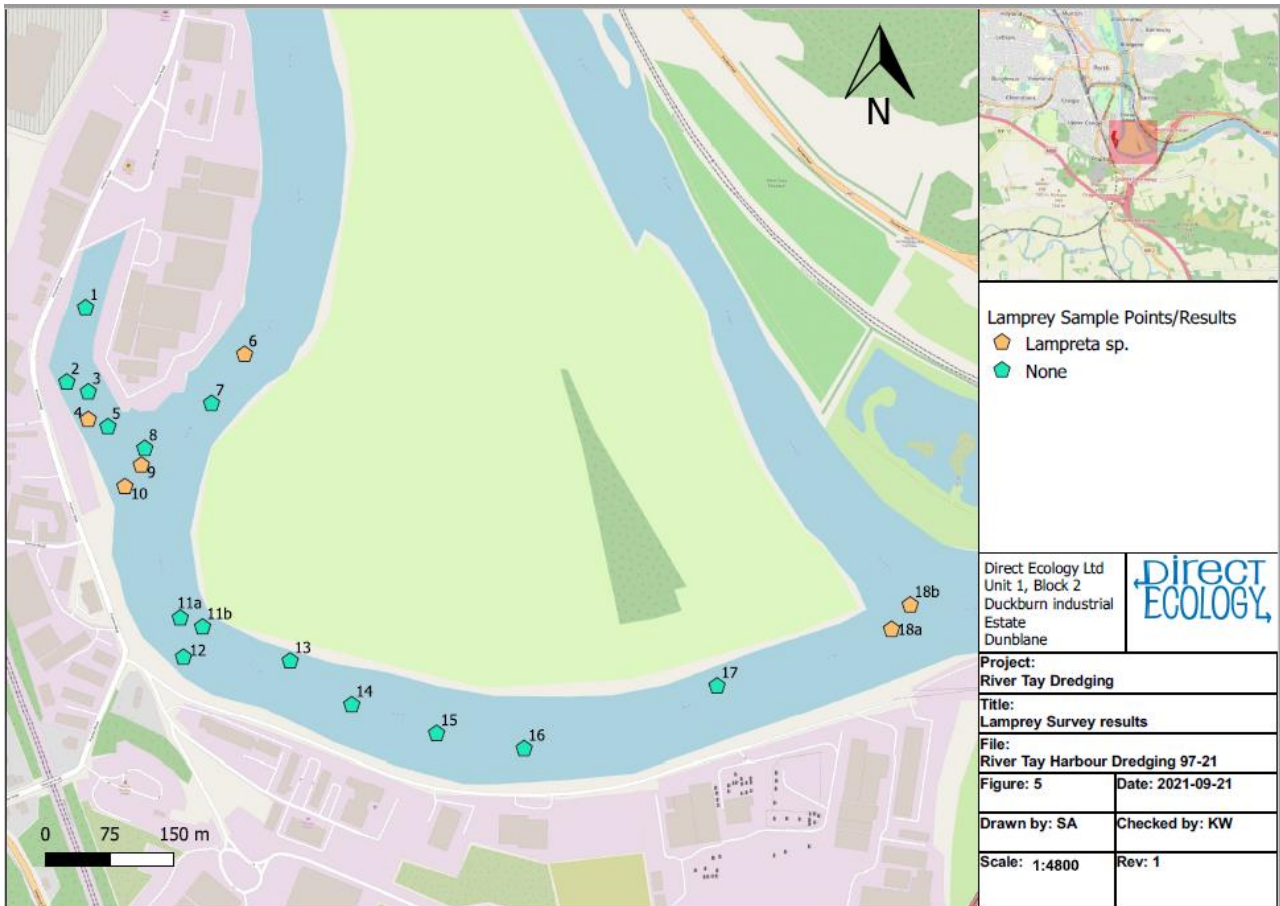


Figure 5: Lamprey survey points 1-18- from 2018

3.5.3.1 NON-NATIVE INVASIVE PLANTS

Japanese knotweed *Fallopia japonica*, giant hogweed *Heracleum mantegazzianum* and Himalayan balsam *Impatiens glandulifera* are present along much of the riverbank of Moncreiffe Island and the western river bank.

These species are considered non-native invasive plant species as defined on the Wildlife and Natural Environment (Scotland) Act 2011.



Photo 15: Stand of Japanese knotweed, south of the harbour

4 IMPACTS AND RECOMMENDATIONS

4.1 INTRODUCTION

Impacts are considered in relation to urgent dredging works at Perth Harbour. The plans are to dredge the Bar area.

Due to the presence of sensitive environmental receptors in relatively close proximity to the target dredge area on the Bar, it is intended to adopt a dredging procedure that will minimise the risk of suspended sediments being released in to the wider River Tay and hence mitigate against the risk of smothering sensitive receptors.

It is proposed to carry out the dredging by relocating material from the Bar into the deeper areas of the harbour. This will be achieved using a plough. A number of control measures to minimise the risk of releasing suspended sediment into the wider River Tay will be adopted as detailed in 'Perth Harbour Proposed Ploughing Methodology'.

These measures, and the reason for them, are set out with the referenced document and discussed below.

4.2 GENERAL BEST PRACTICE RECOMMENDATIONS

All works should be undertaken in accordance with best practice such as by using methods prescribed in Scottish Environment Protection Agency Guidance for Pollution Prevention (GPPs) and Pollution Prevention Guidelines (PPGs), to ensure that the watercourse within and downstream of the site is not adversely impacted by the proposed works from silt, chemicals or debris. The key GPPs are GPP1: *Understanding your environmental responsibilities – good environmental practices*; and GPP 5 *Works and maintenance in or near water*.

A Construction Method Statement (CMS) should be in place and include methods of works to minimise potential impacts to ecology and to ensure best practice.

An emergency procedure should be in place should a freshwater pearl mussel, any other protected species or their resting site (e.g. active bird nest or otter holt) be encountered during operations. All work should cease in the area immediately and an ecologist should be consulted to determine any mitigation requirements i.e. suitable set-backs or buffer zones, and consultation with statutory bodies or licence applications if required.

4.3 OTTERS

No resting up sites were confirmed in the vicinity of the works. It is considered that the proposed works will have no likely significant effect upon the local otter population and that there will be no long-term deterioration on otter habitat or significant disturbance to the species (which is a qualifying River Tay SAC species) with the proposed recommendations in place.

4.3.1 RECOMMENDATIONS

- All workers should receive a 'toolbox' talk (TBT) during which contractors should be informed of the presence of otters on site. A copy should be kept on site and all workers should be inducted in relation to otters.

The TBT should cover:

- Where otters can be found (e.g. undercut river banks, under tree roots).

- The known sensitive areas on site
 - Signs to look out for to indicate otter presence (e.g. spraints).
 - Reasonable checks that should be made in an area prior to works where no resting up sites are known (e.g. checking in areas of dense vegetation).
 - The need for update otter surveys.
 - The emergency procedure as outlined below.
 - Best practice works methods
- Otters do not have a set breeding season and therefore the timing of works within the year is not critical. However, if breeding is suspected at any time works would have to stop and NatureScot be consulted. Works in that area may have to cease until cubs were mobile (6-8 weeks).
 - An emergency procedure should be in place should an otter resting site, be encountered during operations. All work should cease in the immediate area and a suitably experienced ecologist should be consulted to determine any mitigation requirements i.e. suitable set-backs or buffer zones, and consultation with statutory bodies or licence applications if required. If an otter is seen simply passing through the site, this should be documented and reported to the otter specialist.
 - All works should be undertaken in accordance with best practice, e.g. the SEPA GPPs. .

4.4 BEAVERS

4.4.1 IMPACTS

Beaver are known to be present throughout large parts of the Tay catchment (Campbell-Palmer *et al.*, 2018), and signs of activity were recorded during the 2018 survey; however no evidence of the presence of beaver was observed during the 2021 survey, and it is considered that the proposed works will have no likely significant effect upon the beaver population of the River Tay.

4.4.2 RECOMMENDATIONS

No signs of beaver activity were found during the 2021 survey, although they are known to be present on the River Tay. As such no specific mitigation for beavers is proposed at this time although information about beavers should be included in the pre-works toolbox talk for protected species.

4.5 FRESHWATER PEARL MUSSEL

Dredging can be a destructive form of riverbed habitat modification for freshwater pearl mussel (Hastie and Young 2003). The reasons for this are two-fold, the process of dredging can displace and damage any mussel populations present and secondly the result of the dredging works is a significantly altered riverbed habitat which may no longer be suitable for freshwater pearl mussels (Gosselinm 2014). During the dredging, extensive amounts of silt could be released which could smother the mussels.

Without appropriate mitigation, the proposed works could result in the damage or destruction of freshwater pearl mussels.

The survey work has confirmed the presence of freshwater pearl mussel at a number of locations upstream and downstream of the harbour, but none in the harbour itself and the habitat in the Harbour area and on the Bar is considered to be of unsuitable for freshwater pearl mussel; therefore, the potential impacts arising from dredging works within this area are likely to arise from temporary

increase in suspended sediment which may indirectly impact upon mussels located further downstream. The impact upon mussels arising from the proposed dredging of the harbour bar is therefore likely to be negligible provided appropriate mitigation for silt can be implemented.

4.5.1 RECOMMENDATIONS

A Species Protection Plan should be prepared which will include mitigation measures (as outlined in the proposed Dredging Methods document)^d. The SPP will also include measures to minimise silt and pollution arising from the proposed works.

Pre-works surveys should be timetabled to enable checks for the presence of freshwater pearl mussel on the Bar area. None are expected to be there, although there is potential for one or two to have been washed downstream and to be present on the silt (in unsuitable habitat). If their absence is confirmed, a licence from NatureScot for the harbour dredging works would not be necessary because disturbance to freshwater pearl mussels is not predicted. Should freshwater pearl mussel be recorded during pre-works survey on the Bar, it would be necessary to consult with NatureScot and a licence maybe required.

A dredging procedure will be adopted that will minimise the risk of suspended sediments being released from the works site into the wider River Tay. This will involve relocating the dredged material from the bar into the deeper areas of the harbour using a plough fitted to the back of a tug². In addition, a number of control measures will be implemented during the dredging which will also minimise the risk of releasing suspended sediment into the wider River Tay and include only dredging on a flood tide; only ploughing in a direction towards the harbour and away from the river current; ploughing in small steps and planning the ploughing lines to minimise thrust from the tug and subsequent disturbance to the material in the dredge area. Use of a navigation system and accurate tide/height information will further allow the dredging operation to be carried out in the most efficient manner.

4.6 LAMPREY

Within the harbour, lamprey were only recorded concentrated around the harbour mouth within the soft, organic-rich substrate present here.

Lamprey are very sensitive to dredging either directly through habitat destruction, or indirectly through increased levels of silt in the water column. Population numbers in the survey area were considered to be low, with a maximum of 2 ammocoetes in any one sample. The spawning sites will be located upstream and will therefore be unaffected by the works.

While ammocoetes were positively identified around the harbour mouth, the number is not considered to be significant and of no more than local importance. The River Tay supports populations of these species throughout the catchment. Both Lampetra species are listed as qualifying features on the River Tay SAC. Without mitigation, the works could result in the loss of a (predicted) small number of Lampetra ammocoetes and a small area of habitat around the harbour and harbour mouth. With the recommendations in place listed below, it is considered that the proposed works will have no likely significant effect upon the local lamprey population and that there will be no long-term deterioration to their habitat or significant disturbance to the species (which is a qualifying River Tay SAC species). However, although no significant effects are predicted, the following recommendations are made.

² See Perth Harbour Proposed Ploughing Methodology document

4.6.1 Recommendations

A Species Protection Plan should be put in place.

It is not considered practical due to the low numbers present and the depth and current of the water to translocate any prior to works.

The material is being moved into the Harbour area and therefore it is anticipated that it is likely that most ammocoetes would survive the dredging works and disperse from these areas after works.

The timing of works is not considered critical in relation to lamprey. River and book lamprey spawn between March and April and Sea lamprey between May and August. However, there are no spawning sites within the proposed dredging areas, as all are upstream of the works. Therefore it is the migrating lamprey that could be affected. Lamprey migrate upstream from sea to spawning areas. Sea lamprey migrate in the spring and early summer and river lamprey during the autumn and spring (see <https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey>). The actual timing is fluid and will depend on water levels. Although some lamprey may be migrating up within the possible dredging timescale (Q1-Q2 2022), as the whole river bed will not be affected, then no notable disruption is anticipated should the works be carried out in the lamprey migration season (Colin Bull, pers. comm).

Previously, January to March had been recommended for former dredging works. It was suggested that at this time the river flows would be high, the temperature low and the dissolved oxygen at its highest. However, it is not considered that this restriction would be needed in relation to lamprey and that within these times, lamprey could be migrating.

4.7 OTHER SPECIES

4.7.1 Salmon

There is potential for silt affecting gills of adult migrating salmon. Adult salmon migrate up throughout the year, with the highest numbers moving in September and October. Prior to the previous dredging it was reported that Tay District Fisheries had said that the impact on adult salmon would be low at any time or year as long as there is a good flow of water (letter from British Waterways to Scottish Natural Heritage dated 18.08.2004). In summary in relation to timing it is considered that times of low flow may need to be avoided, but that generally there should be no timing restrictions in relation to salmon (or pearl mussels). It is advised that the Tay District Fisheries are informed of the proposed works.

4.7.2 NON-NATIVE INVASIVE PLANTS

Works are marine based and no disturbance of INNS is anticipated. Should any works be required that could disturb INNS appropriate methods of work should be in place.

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6 APPENDIX 1 – RELEVANT LEGISLATION

6.1 EUROPEAN PROTECTED SPECIES

European protected species are those that are protected by the EC Habitats and Species Directive 92/43/EEC. The Conservation (Natural Habitats, &c.) Regulations 1994 translates this European legislation into UK law. This has been amended in Scotland by The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2004 and 2007 and the Conservation (Natural Habitats, &c.) Amendment (No. 2) (Scotland) Regulations 2008. EPS includes bats (all species), otter, beaver, wildcat and great crested newt. These Regulations make it an offence to deliberately or recklessly:

- capture, injure or kill an EPS
- harass a wild animal or group of wild animals of EPS
- to disturb such an EPS while it is occupying a structure or place it uses for shelter or protection
- to disturb an EPS while it is rearing or otherwise caring for its young
- to obstruct access to a breeding site or resting place of an EPS or to otherwise deny an EPS use of a breeding site or resting place
- to disturb an EPS in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs
- to disturb an EPS in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young
- to disturb such an animal while it is migrating or hibernating

It is also an offence to:

- damage or destroy a breeding site or resting place of such an animal
- keep transport, sell or exchange or offer for sale or exchange any wild animal or plant EPS or any part or derivative of one (from 1st May 2007)

In relation to protected species of animal, licences can be issued under Regulation 44 to permit, for specific purposes, certain actions that would otherwise be against the law. Nature Scot is responsible for all EPS licensing under the Habitats Regulations (with the exception of some areas of licensing for whales and dolphins).

There is no provision for development licences as such, however, under Regulation 44 (2e) of the Conservation (Natural Habitats, &c.) Regulations 1994 licences may be granted for:

- Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.

However a licence will not be granted unless, importantly under 44 (3), the appropriate licensing authority is satisfied:

- That there is no satisfactory alternative; and

That the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

6.2 WILDLIFE AND COUNTRYSIDE ACT 1981





The Wildlife and Countryside Act 1981 provides protection to species and habitats. The Nature Conservation (Scotland) Act 2004 and Wildlife and Natural Environment (Scotland) Act 2011 amends the Wildlife and Countryside Act 1981 in Scotland.

6.2.1 SCHEDULE 5 ANIMALS

Enhanced protection is provided for species listed on Schedule 5, including red squirrel, water vole, pine marten and freshwater pearl mussel. It is an offence to recklessly kill, injure or take animals listed on Schedule 5, with the exception of water vole. Water voles are protected in respect of section 9(4) only (in Scotland), meaning that water vole habitat is protected, although the animals themselves are not.



It is also an offence to recklessly damage, destroy or obstruct access to any place used for shelter or breeding. Licences are available for development purposes if certain conditions are met. Applications for licences should be made to Nature Scot.

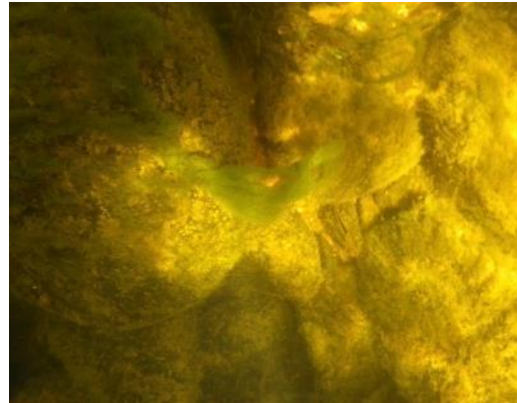

7 APPENDIX 2 – TARGET NOTES 2021

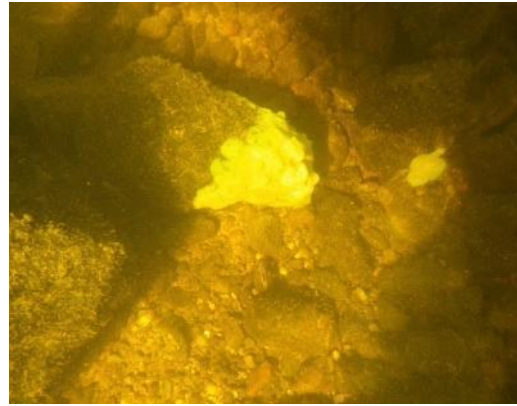

TN	OSGR	Species	Feature	Notes	Photo
2018 survey					
4	NO 12373 21553	Otter/ fox	Potential resting up site / den	Fresh excavation from hole in sandy bank; multiple indistinct prints; second hole c. 5m to the east. No spraint or scat. Recorded in 2018.	
7	NO 12463 21507	Beaver	Feeding signs	Beaver gnawed willow branch - fresh. Recorded in 2018.	
8	NO 12466 21495	Otter	Spraint	Otter spraint on bank near mature trees. Recorded in 2018.	
9	NO 12426 21488	Otter	Prints	Prints in sediment on shoreline. Recorded in 2018.	



TN	OSGR	Species	Feature	Notes	Photo
2018 survey					
30	NO 12047 21798	Otter	Spraint	On rock in woodland c. 10m from bank at high tide. Recorded in 2018.	
31	NO 12028 21792	Beaver	Feeding signs	Partially felled tree by river side. Recorded in 2018.	
32	NO 12024 21783	Otter	Spraint	Old otter spraint on log. Recorded in 2018.	No photo
33	NO 12014 21700	Otter	Potential resting up site	Hole in earth embankment. No spraint/signs. Recorded in 2018.	No photo
2021 survey					
1	NO 11914 21738	Otter	Spraint	Fresh spraints and jelly on beach recorded in 2021.	
2	NO 11972 21839	Otter	Prints	Fresh prints on beach recorded in 2021.	



APPENDIX 3 SHORE BASED FRESHWATER PEARL MUSSEL TARGET NOTES 2021



TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
1	NO 12155 21484	4.5	100	Present	10	Present	Present	40	50	Riverbed habitat is dominated by large boulders and cobbles with small areas of sand in between. One large mussel was located during the survey.		1
2	NO 12148 21485	4.5	100	Present	10	Present	Present	40	50	Riverbed habitat is dominated by large boulders and cobbles with small areas of sand in between. One large mussel was located during the survey.		1



TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
3	NO 12139 21493	4.5	100	Present	10	Present	Present	40	50	Riverbed habitat is dominated by large boulders and cobbles with small areas of sand in between. One large mussel was located during the survey.		1
4	NO 12123 21499	4.5	100	Present	10	Present	Present	40	50	Riverbed habitat is dominated by large boulders and cobbles with small areas of sand in between. One large mussel was located during the survey.		1

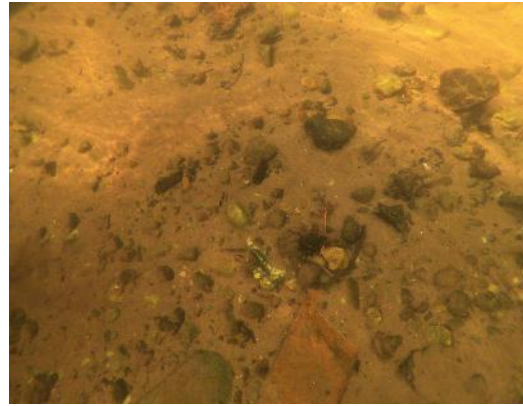
TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
5	NO 12066 21523	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		1
6	NO 12056 21530	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		1

TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
7	NO 12050 21531	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		1
8	NO 12045 21532	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		3

TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
9	NO 12044 21531	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		2
10	NO 12038 21535	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		2

TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
11	NO 12037 21537	6.0	100	5	5	Present	Present	Present	Present	Four adults in fast flowing section		4
12	NO 12027 21536	6.0	100	5	5	Present	Present	Present	Present	Eight		8

TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
13	NO 12023 21537	6.0	100	5	5	Present	Present	Present	Present	Six		6
14	NO 12009 21540	6.0	100	5	5	Present	Present	Present	Present	Quite silty with patches of suitable habitat. Several small areas of gravel and sand; mussels present were generally associated with these areas. Some high density areas.		4

TN	OSGR	Depth (M)	Width (M)	Silt (%)	Sand (%)	Gravel (%)	Pebble (%)	Cobble (%)	Boulder (%)	Notes	Photo	No. Mussels
15	NO 11932 21699	4.0	100	100	0	5	5	5	5	Silty but small patch of suitable habitat		1
16	NO 11932 21705	4.0	100	100	0	5	5	5	5	Silty but small patch of suitable habitat		1

8 APPENDIX 4 – SPECIES ECOLOGY

8.1 FRESHWATER PEARL MUSSEL ECOLOGY

The freshwater pearl mussel is endangered in every part of its range (Skinner *et al.*, 2003); and in many river systems populations no longer have any active recruitment and therefore could die out. Scotland holds some of the largest known remaining populations. Whilst originally the main threats to the species were freshwater pearl collection and industrial pollution, a host of other threats are now present, including river engineering (e.g. for hydro-schemes and flood defences), acidification, forestry operations and agricultural run-off, including chemical sheep dip (Young *et al.*, 2000). Declines in migratory salmonids are also believed to be a contributing factor to freshwater pearl mussel population declines, as these fish are necessary for the mussels to complete their life cycle (the larvae, or 'glochidia', attach onto the gills of salmonids fish species during their early growth, before dropping off to settle on the substrate) (Skinner *et al.*, 2003).

Within the Tay catchment salmonid populations have been relatively stable in recent years, benefitting from catchment wide management to improve habitat for salmon and remove potential barriers to fish migration (Tay District Fisheries board 2017).

Freshwater pearl mussels need unpolluted, oligotrophic (low nutrient) rivers and streams, and are found within areas of fine gravel and coarse sand (often in the lee of boulders or cobbles), where the mussels partly or wholly bury themselves (Young *et al.*, 2000).

Freshwater pearl mussels are a Scottish Biodiversity List Species and are listed on the Tayside Biodiversity Partnership Local Biodiversity Action Plan 2005. The species is considered to be critically endangered by the IUCN in Europe.

8.2 LAMPREY ECOLOGY

River lamprey (*Lampetra fluviatilis*) and brook lamprey (*Lampetra planeri*) are very similar species and are often referred to as 'satellite species' or 'paired species'. In their juvenile stage they are almost impossible to tell apart, they are therefore referred to as *Lampetra sp.* in this report. There is one other species of lamprey in UK waters, the sea lamprey (*Petromyzon marinus*). They all have a similar life cycle, with adults migrating upstream into rivers to find their spawning areas within flowing water with stony substrate. Nests consist of small depressions in the riverbed where stones are moved out of the way using the sucking mouthparts. While these nests are sometimes protected by surrounding stones or vegetation, more often they are in shallow water and exposed to predators. They spawn in pairs or groups.

The hatched young are called ammocoetes, and are washed downstream to an area of soft, silt substrate into which they burrow and remain for a few years to develop. The long larvae are blind with undeveloped mouthparts.

In some cases the damage caused to host fish by feeding lamprey is too great to recover from, and in parts of north America they are considered a serious pest to commercial fisheries.

All species of British lamprey have experienced a decline in population over the last decade. Weirs, dams and other obstructions in rivers mean that they are unable to travel upstream to reach spawning grounds. River lamprey are listed on Schedule 3 of the Conservation (Natural Habitats, &c,) Regulations 1994 (as amended). The river lamprey and sea lamprey are both UK Biodiversity Action Plan priority fish species.

9 APPENDIX 7 – RIVER TAY SPECIAL AREA OF CONSERVATION (SAC)

9.1 RIVER TAY SPECIES AREA OF CONSERVATION (SAC)

Designations date: 17 March 2005

Administrative area: Angus; Argyll and Stirling; Perth and Kinross; Stirling

Qualifying Interests for which the site is designated:

<i>Lampetra fluviatilis</i>	River lamprey
<i>Lampetra planeri</i>	Brook lamprey
<i>Lutra lutra</i>	Otter
Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoeto-Nanojuncetea</i>	Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels
<i>Petromyzon marinus</i>	Sea lamprey
<i>Salmo salar</i>	Atlantic salmon

9.2 CONSERVATION OBJECTIVES FOR RIVER TAY SPECIAL AREA OF CONSERVATION

- To avoid deterioration of the qualifying habitat (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and
- To ensure for the qualifying habitat that the following are maintained in the long term:
 - Extent of the habitat on site
 - Distribution of the habitat within site
 - Structure and function of the habitat
 - Processes supporting the habitat
 - Distribution of typical species of the habitat
 - Viability of typical species as components of the habitat
 - No significant disturbance of typical species of the habitat

Qualifying Habitat:

- Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels

To avoid deterioration of the habitat of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

- To ensure for the qualifying species that the following are maintained in the long term:
 - Population of the species, including range of genetic types for salmon, as a viable component of the site
 - Distribution of the species within site
 - Distribution and extent of habitats supporting the species
 - Structure, function and supporting processes of habitats supporting the species
 - No significant disturbance of the species

Qualifying Species:

- Atlantic salmon
- Brook lamprey
- Otter
- River lamprey
- Sea lamprey

The site overlaps with Rannoch Lochs and Forest of Clunie Special Protection Area

Appendix C

Lamprey Species Protection Plan

Perth Harbour Plough Dredging Species Protection Plan Lamprey

1. Introduction

Lamprey protected under the conservation (Natural Habitat, &c.) Regulations 1994 (as amended).

Due to their small size and burrowing tendencies, and the nature of plough dredging activity, it is highly unlikely that any juvenile lamprey within the dredge area will be observed during the works. The measures set out in this Species Protection Plan will ensure that lamprey are protected from indirect effects of dredging, i.e. smothering by silt.

2. Measures to protect lamprey

Mitigation Measure	Reason
Dredging may only be carried out on flood tide	By restricting ploughing operations to the flood tide only, any suspended sediment will tend to be moved in towards the harbour by the rising tidal flow. By not dredging on the ebb tide the risk of significant quantities of suspended sediment migrating into the River Tay is mitigated against. The material to be dredged has a high fine sand content so it is expected that any material put into suspension will settle back to the riverbed quickly and will not migrate very far from the dredge area.
Ploughing may only be carried out towards the harbour, i.e. ploughing material from the river side into the harbour area	By ploughing the material from the river side into the harbour area, all material will be moved away from the river current and into the relatively benign area of the harbour. This will mitigate against any significant quantities of suspended material entering the River Tay.
The plough must be lowered in small steps of approximately 0.1 m increments	By carrying out the ploughing activity in small depth increment steps (circa 0.1 m increments) it reduces the risk of the plough box filling up and material being released over the back of the box if overfilled. By limiting the depth of cut on each pass it also reduces the thrust required by the tug to pull the plough through the dredge area.
Ploughing lines must be planned in advance by the vessel master, ensuring that the plough box capacity is not exceeded on a single line	By planning the ploughing lines based on the capacity of the plough, the risk of overfilling can be prevented and the need to use excessive thrust is minimised.

<p>Thrust from the tug propulsion system must be minimised at all times</p>	<p>As the plough is mounted over the stern of the vessel it is close to the propulsion system of the tug. By minimising the depth of cut of the plough, or overfilling, the propulsion thrust necessary can be minimised. This will minimise the risk of the propeller wash disturbing the material contained in the plough or the disturbed riverbed in the dredge area.</p>
<p>An accurate navigation system must be operational at all times</p>	<p>By having an accurate navigation system on the tug, the dredging operation can be carefully controlled and carried out in the most efficient manner with all dredging being targeted in the required dredge area.</p>
<p>The tug master must have access to accurate tide/height information</p>	<p>By having access to accurate water level height, the dredging can be targeted accurately to only those areas where dredging is required. It will also enable the plough blade to be set to the required level hence minimising the risk of over cut or over dredge.</p>

Appendix D

Otter Species Protection Plan

Perth Harbour Plough Dredging Species Protection Plan Otter



1. Introduction

Otters are a European Protected Species (EPS) and are protected under the conservation (Natural Habitat, &c.) Regulations 1994 (as amended). Under this legislation it is an offence to:

- Kill, injure, capture or harass an otter;
- Disturb an otter whilst it is occupying a structure/holt (underground den) or other place it uses for shelter or protection, or while it is rearing or otherwise caring for its young, or in any way that impairs its ability to survive or breed, or significantly affects the local distribution or abundance of otters;
- Obstruct access to an otter breeding site or resting place (e.g. holt or couch), or otherwise prevent their use; and
- Damage or destroy an otter breeding site or resting place, whether or not deliberate or reckless.

This Species Protection Plan (SPP) sets out the measures that must be adhered to at all times during the dredging works to protect otter.

2. Otter distribution

Otters are known to be present in and around the River Ray close to Perth Harbour. Fresh otter spraints, jelly and prints were recorded in the general vicinity of the harbour during recent surveys.

3. Measures to protect otter

As the dredging works will take place within subtidal and intertidal waters, it is unlikely that otter breeding or resting places will be encountered or disturbed during the works. If otter are encountered, the emergency procedure set out in Section 4 must be followed.

Dredging equipment or crew must not disturb or access vegetated riverbank habitat except in an emergency.

4. Emergency procedure if otters are encountered

If an otter is encountered at any point during the dredging works, either in the water or on the adjacent riverbanks, all work in the immediate area must cease as soon as it is safe to do so.

If the otter is simply passing through the dredge area or adjacent riverbank, this should be documented and reported to Perth & Kinross Council.

If the otter remains within or immediately adjacent to the dredging works, dredging may not recommence until the otter has moved away of its own accord.

In the unlikely event that an otter breeding or resting place is encountered during the dredging works (e.g. in vegetated areas adjacent to the dredging), works must cease immediately and may not recommence until Perth & Kinross Council have given approval. Perth & Kinross Council will contact a qualified ecologist to determine any mitigation requirements, e.g. establishing suitable set-backs or buffer zones, and consultation with statutory bodies or licence applications if required.