Port of Inverness
Shore Street Quay Remedial Works
Environmental Report

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Glossary

Acronym	Definition
AA	Appropriate Assessment
CD	Chart Datum
COSHH	Control of Substances Hazardous to Health
dB	Decibel
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EPS	European Protected Species
GEN	General Planning Principle
HDV	Heavy Duty Vehicles
HES	Historic Environment Scotland
HRA	Habitat Regulation Appraisal
IAQM	Institute of Air Quality Management
IEEM	Institute of Ecology and Environmental Monitoring
IEMA	Institute of Environmental Monitoring and Assessment
LNR	Local Nature Reserve
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MS-LOT	Marine Scotland Licensing Operations Team
NCSA	Nature Conservation (Scotland) Act 2004
NMP	Noise Monitoring Point
NNMS	Non-Native Marine Species
NSR	Noise Sensitive Receptor
OD	Ordinance Datum
PAC	Pre-Application Consultation
PAN	Planning Advice Note
PM	Particular Matter
RBMP	River Basin Management Plan
RIGS	Regionally Important Geological Sites
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SLM	Sound Level Meter
SNH	Scottish Natural Heritage
SoM	Schedule of Mitigation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TAN	Technical Advice Note
UNCLOS	United Nation Convention on the Law of the Sea
WCA	The Wildlife and Countryside Act 1981

1 Introduction

This Environmental Report has been produced on behalf of the Port of Inverness, to support the Marine Licence and Planning Permission applications for the proposed remedial works to Shore Street Quay.

Shore Street Quay, located on the River Ness, has fallen into a state of disrepair, with the pile face corroding severely and being undermined, causing the structure to become unstable. In order to stabilise the structure, the Port of Inverness propose to install a rock armoured bund at the base of the pile wall to provide scour protection and reinforce the existing quay face. A fibre concrete face will also be applied to the pile wall, in order to protect it from future corrosion. In addition, it is proposed to install a new flood wall along front of the existing quay, to reduce the flood risk of the adjacent area, the aim being to widen the range of potential uses of the land for future development. Further details of the proposed works, together with a justification of their need is provided in Section 2: Project Description.

The works above mean low-water springs (MLWS) will be consented under the Town and Country Planning (Scotland) Act 1997, while a Marine Licence will be sought for works below Mean High Water Springs (MHWS), under the Marine (Scotland) Act 2010. As detailed in Section 3: Statutory Context, the project does not fall under Schedules 1 or 2 of Environmental Impact Assessment (EIA) Regulations, as such an EIA will not be required to support the Marine Licence or planning applications.

The above notwithstanding, several environmental topics have been assessed to support these permit applications. The purpose of this report is to provide an overview of the outputs of these assessments, and detail the mitigation required to reduce potential negative environmental impacts.

2 Project Description

2.1 Location

Shore Street Quay is located within the Port of Inverness, on the east bank of the southernmost navigable reaches of the River Ness. The quay is bounded to the south by the River Ness viaduct, to the east by Shore Street, and to the north by Central Quay. Shore Street Quay is situated behind a groyne, which separates the quay from the rest of the River Ness, allowing a deeper dredge pocket to be formed. The groyne also helps to direct the river flow away from the quay wall. The quay was condemned in 1998 due to concerns over its structural integrity, and owing to the trend of increasing size and draught of vessels visiting the Port of Inverness, would not be suitable for use as an operational berth even if repaired.

The centre grid reference of the site is NH 66418 46050, as shown in Drawing 59.01. The proposed works fall within The Highland Council's area of jurisdiction.

Drawing 59.01 details the red line boundaries for both the planning and Marine Licence applications. Table 2.1 provides the bounding coordinates of the planning and Marine Licence red line boundaries, the points relate to the labels in Drawing 59.01.

The area enclosed within the planning application red line boundary is 0.40Ha, while the area of the Marine Licence red line boundary is 0.31Ha. There is an overlap between the planning and Marine Licence boundaries, therefore the total site area is 0.66Ha.

Table 2.1: Red Line Boundary Coordinates

Point	Position
Planning Application	
1	NH 66374 45960
2	NH 66379 45969
2	NH 66389 45965
4	NH 66429 46138
5	NH 66448 46130
6	NH 66408 45956
7	NH 66401 45945
Marine Licence	
A	57º 29.053'N 004º 13.830'W
B	57º 29.151'N 004º 13.793'W
C	57º 29.150'N 004º 13.782'W
D	57º 29.143'N 004º 13.779'W
E	57º 29.051'N 004º 13.813'W

2.2 Project Need

The existing sheet piles at the 170m long Shore Street Quay have corroded to a degree that now renders them theoretically structurally inadequate to support this section of quayside. The sheet piles allowed the quay to be dredged to a level below the founding level of the original concrete quay wall, and hence the toe of the original concrete wall is currently unsupported, risking imminent collapse.

If Shore Street Quay were to collapse, the resulting debris are likely to obstruct access to the adjacent berths, including the South Citadel fuel berth, with major implications for the Port of Inverness' operations, and the wider bulk fuel supply to Inverness. The release of debris into the River Ness would also have significant environmental implications. It is therefore necessary to reinforce the toe of the quay wall, and protect the pile face from further corrosion in order to stabilise the structure and prevent a collapse.

Since Shore Street Quay is no longer suitable for use as an operational berth, the Port of Inverness are seeking to facilitate alternative options for uses of the area going forward. Currently, the River Ness Flood Alleviation Scheme flood wall runs along the west side of Shore Street, leaving Shore Street Quay on the wet side of the scheme, meaning that future uses of the site are restricted to water compatible uses, which are extremely limited. In order to increase the options available for future uses of Shore Street Quay, it is necessary to provide flood protection to the site. It is therefore proposed to construct a new flood wall along the western edge of Shore Street Quay, which will be tied into the existing flood wall, and adopted as part of the River Ness Flood Alleviation Scheme.

2.3 Project Components

The Shore Street Quay remedial works include the following elements, details are provided in Drawings 2021/105 and 2021/106:

- **Rock Armour Bund**
  - To stabilise the wall an armoured rock fill bund will be constructed in front of the sheet piled wall to a level of +2.0m Chart Datum (CD), which is above the

original quay wall foundation level. The rock armour bund has a volume of approximately 6,100m³ with a footprint on the riverbed of 0.19 Ha.

- The bund will be constructed using crushed rock fill of 6AP grading (with mininal fines) and scour protection rock armour stone layers (0.4t to 0.6t top layer 1.2m thick and 0.04t to 0.06t underlayer 0.5m thick).

- **Fibre Concrete Pile Facing**
  - To prevent further corrosion and improve the aesthetics of the existing pile face, a fibre concrete facing will be applied.
  - The concrete facing will be constructed above the rock armour bund, with a concrete base constructed on top of the rock under layer, up to the top of the primary armour (Drawing 2021/106).
  - Macro fibre concrete will be used for the concrete facing to improve the life of the concrete and prevent shrinkage cracking. The fibre replaces the requirement for steel reinforcement bars which could corrode in the future.
  - The volume of fibre concrete required is estimated to approximately 375m³.
  - Steel bars will be welded to existing sheet piles to lock the new facing concrete onto the sheet piles. The tonnage of steel bars is estimated to be 1.0t.
- **Concrete Capping Beam and Flood Wall**
  - A new upstanding capping beam at the quay edge to become part of the River Ness Flood Alleviation Scheme. The length of the wall is approximately 205m.
  - This will replace the existing flood wall at the back of the quay, but the existing structure will not be removed.
  - The new flood wall will be supported on the front quay wall. Where the flood wall crosses the quayside to tie back for connection to the existing wall, a concrete foundation will be provided to ensure it can resist the horizontal loading of the flooding event.
  - The volume of concrete is estimated to be approximately 165m² in the raised capping beam and flood wall.
- **Drainage System**
  - A new surface water drainage system will be required as illustrated on the cross section of Drawing 2021/106.
  - This will be connected to a full retention Class 1 oil interceptor and outfall.
  - The outfall will be fitted with a Tideflex check mate valve inside a manhole (for access and maintenance) to prevent back flows.
  - The interceptor will also include a downstream shut off valve, to enable the outfall to be isolated in the event of contaminants entering the drainage system.
  - A simple licence for surface water drainage will be sought from SEPA, in line with the Water (Controlled Activities) (Scotland) Regulations 2011, as amended.

2.4 Construction Phases

During the construction phase, site working hours will be restricted to 07:00 to 19:00 Monday-Friday, 07:00 to 13:00 on Saturdays, with no working on Sundays.

The proposed works will commence with the construction of the rock armour bund, in order to stabilise the quayside and prevent the risk of collapse during the construction of the

remaining elements. It is envisaged that the rock armour bund construction will take approximately 8 weeks on site.

The rock fill and armour will be delivered to the quayside from a local quarry on a 'just-in time' basis, using road going tipper trucks. A 360-degree excavator will then be used to marshal the material, and feed it to a long reach excavator which will place the material into the river, and shape it to form the rock armour bund.

Once the rock armour bund is complete, work will commence on the installation of the fibre concrete pile facing and flood wall. All concrete works will use ready-mix concrete, delivered to site using concrete mixer trucks. An excavator, telehandler, and small mobile crane will also be used to place concrete and construct the required shuttering. It is predicted that this phase will take a further 8 to 10 weeks of construction.

The base of pile facing will first be installed in top of the rock armour bund. Shuttering will be installed, and the concrete will be poured directed into the shuttering. Tidal working will be employed in so far as possible, to minimise the need to conduct underwater concrete pours. The steel ties will also be welded to the existing pile face while the base is being formed.

On completion of the preparatory works, the shuttering for the fibre concrete pile facing and flood wall will be installed. Prior to concrete pours commencing, the shuttering will be thoroughly inspected to ensure it is properly sealed to the base, in order to prevent loss of concrete into the River Ness. Concrete will then be poured directly into the shuttering to form the new quay wall facing and flood wall. Once the concrete is placed and properly cured, the shuttering will be removed.

It is noted that concrete facing and the flood wall could also be installed separately, with the actual working method to be informed by the final design.

Finally, the drainage infrastructure will be installed. A 360-degree excavator will be used to cut the trenches required for the drainage runs, and void for the interceptor. A telehandler will then be used to place and install the surface water drains, interceptor, and outfalls. The trenches and excavations will then be backfilled, and the surface reinstated.

3 Statutory Context

This section provides a summary of the statutory requirements for the proposed remedial works to Shore Street Quay. In addition, statutory requirements specific to a given topic area are discussed in the relevant topic specific sections.

3.1 Marine Licence

Under the Marine (Scotland) Act 2010 a number of activities listed in Part 4, Section 21 of the Act require a Marine Licence issued by the Marine Scotland Licensing Operations Team (MS-LOT). This includes any activity where the project intends to do any of the following below the Mean High Water Spring (MHWS):

- Deposit or remove substances or objects in the sea either on or under the seabed; and
- Construct/alter/improve any works in or over the sea or on or under the seabed.

The formation of the rock armour bund will involve the deposit of material on the seabed, while the application of the fibre concrete facing to the pile wall is classed as improvement works over the sea, hence the project will require a Marine Licence.

3.2 Onshore Consenting

Under the Town and Country Planning (Scotland) Act 1997, any type of development, i.e. carrying out of building, engineering, mining, or other operations in, on, over or under land, or the making of any material change in the use of any buildings or other land, above MLWS will require Planning Permission, in this case from The Highland Council.

The construction of the new flood wall falls under the definition of building works over land; thus, the proposed remedial works will require Planning Permission.

3.3 Environmental Impact Assessment

The requirement for an EIA to support Marine Licence and planning applications is prescribed by The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017, and The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Specifically, Schedules 1 and 2 of these regulations define the types and scales of projects for which the EIA regulations apply.

Remedial works to existing pier structures are not included under Schedule 1 of these regulations. Works to ports and harbours are included under Item 10(g) of Schedule 2, however, an EIA is only required where the area of works exceeds 1 hectare. The total footprint of the proposed remedial works is approximately 0.66 hectares; hence the project does not fall under the Schedule 2 definition.

Therefore, an EIA is not required to support either the Marine Licence or planning applications. However, in line with best practice, it is still necessary to gain an understanding of the potential environmental effects which may result from the proposed works, and identify appropriate mitigation

3.4 Pre-Application Consultation

The Marine (Scotland) Act 2010, together with the Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013 prescribe that certain classes of development must be subject to the Pre-Application Consultation (PAC) procedure. Specifically, a marine licensable activity involving:

> *'Alteration or improvement of works (other than for a renewable energy structure) in or over the sea or on or under the seabed where the area of those works, as extended, exceeds 1,000 square metres.'*

is required to implement the PAC process. The footprint of the proposed rock placement works exceeds 1,000m^2. As such the PAC process has been conducted, and a separate PAC Report is provided in support of the Marine Licence Application.

It is noted that PAC is not required to support the planning application, as it is not be defined as a 'major development' under the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009.

4 Methodology

This section sets out the process undertaken in order to provide a methodical and robust environmental assessment that has been implemented throughout the assessment of all topics detailed in this environmental report.

4.1 Baseline Assessments

Baseline assessments have been completed for each of the environmental topic areas considered as part of this report. The following sources of information have been utilised in the compilation of baseline data:

- Desk based studies, making use of publicly available reports and data;
- Stakeholder dialogue, to identify additional data sources and information; and
- Site surveys and monitoring, when appropriate.

Full details of data sources used, and survey and monitoring methods employed for each topic are provided within the topic-specific sections.

The baseline information is utilised to understand the value of each environmental receptor and its sensitivity to the potential impacts associated with the development. This is then utilised to assess whether significant effects may result through the construction of the proposed remedial works.

4.2 Assessment Criteria

The criteria used in this report to assess potential environmental impacts are outlined below. These criteria are used in all assessment, unless otherwise stated in the topic specific sections.

The environmental assessment is conducted in two stages. The first stage characterises the nature of the impacts (positive or negative) and the second determines the level of significance of the effects. An effect results from the consequences of a change (or impact) acting on a resource / receptor. The precise nature of the effect will depend on the interaction between the degree of impact (e.g. extent, duration, magnitude, permanence etc.) and the sensitivity, value, or number of the resources / receptor in each case.

The assessment identifies the origins of environmental impacts, positive (beneficial) and negative (adverse), from the project and predicts their effects on resources or receptors. A resource is any environmental component affected by an impact (e.g. items of environmental capital such as landscape, views and community facilities). A receptor is any environmental or other defined feature (e.g. human beings) that is sensitive to or has the potential to be affected by an impact.

Each potential impact was assessed in terms of its receptor's sensitivity or value (e.g. landscape value or amenity value), followed by an assessment of the magnitude of the impact, and thus determination of whether or not significant effects result. For each significant effect identified, appropriate secondary mitigation measures are prescribed.

4.2.1 Receptor Sensitivity

Sensitivity values were assigned to individual resources or receptors, using a set of criteria and terminology defined within Table 4.1.

Table 4.1: Receptor Sensitivity

Category	Definition
High	High importance and rarity, international scale and very limited potential for substitution.
Medium	Medium importance and rarity, national scale and some potential for substitution.
Low	Low or medium importance and rarity, regional/local scale and ample potential for substitution.
Negligible	Low importance or rarity, local scale.

4.2.2 Impact Severity and Magnitude

In considering the impact severity a range of factors are taken into account as applicable to the subject matter. The factors utilised are based on the Institute of Ecology and Environmental Monitoring (IEEM) guidelines of ecological assessment (CIEEM, 2018) but are applicable to most topic areas. They include the:

- Extent: spatial or geographical area affected;
- Magnitude (Scale): size, amount, intensity, volume;
- Duration: typically: short, medium, long-term and permeant or temporary;
- Frequency and timing: how often and when (time of day or seasonality); and
- Reversibility: can the effect be reversed or is it irreversible.

The magnitude of the impact takes into account the extent, scale, frequency and timing. The magnitude of impact terminology and criteria are defined in Table 4.2.

Table 4.2: Impact Magnitude

Category	Definition
Major	Loss of resource and/or quality and integrity of receptor, severe damage to key characteristics ,features or elements.
Moderate	Loss of Resource, but not affecting integrity, partial loss of / damage to key characteristics, features or elements.
Minor	Some measurable change in attributes, quality or vulnerability, minor loss of or alteration to one (possibly more) key characteristics, features or elements.
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements.
No Change	No loss or alteration of characteristics, features or elements, no observable impact in either direction.

The duration of the impact is also noted, as permanent or temporary. Temporary impacts can be further sub-divided if necessary, in accordance with the following definitions, although use of this terminology is highly dependent on other factors within the environmental topic being assessed:

- Short-term: less than 1 year in duration;
- Medium-term: between one to three years in duration; and
- Long-term: more than three years in duration.

Whether or not an impact is reversible is also noted.

The initial assessment of impacts takes account of primary and tertiary mitigation (see Section 4.2.4). Potential significant adverse effects are then reassessed to understand the residual effects taking account of all mitigation proposed.

4.2.3 Determination of Significant Effects

For each impact identified, a determination of whether or not it will result in a significant effect was made; taking into account both the sensitivity / value of the resource / receptor, and the magnitude of impact. Table 4.3 provides an example of how these two elements can be combined to give an overall significance category.

Table 4.3: Categorising Significance of Effects

Magnitude of Impact	Sensitivity/Value of Receptor			
	High	Medium	Low	Negligible
Major	Major	Moderate	Minor	Negligible
Moderate	Moderate	Moderate	Minor	Negligible
Minor	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect

The categories provide a threshold to determine whether or not significant effects may result from the proposed works. A typical categorisation is shown in Table 4.4.

Table 4.4: Categorisation and Definition of Effects

Category	Definition
Negligible	No detectable change to the environment resulting in no significant effect.
Minor	A detectable, but non-material change to the environment resulting in no significant effect.
Moderate	A material, but non-fundamental change to the environment, resulting in a possible significant effect.
Major	A fundamental change to the environment, resulting in a significant effect.

Key

	Significant Effect

For the purposes of this environmental report, a significant effect will be defined as moderate in level or higher (Table 4.3 and Table 4.4). The duration and reversibility of the effect will also be noted as discussed in Section 4.2.2.

For adverse significant effects, secondary mitigation will be proposed where practicable in order; to prevent, reduce, or offset the significant adverse effect. Effects determined as minor or lower will be considered to have no likely significant effect, and secondary mitigation will not be identified, except where the application of recognised industry best practice would further reduce the impact magnitude.

4.2.4 Approach to Mitigation

The Institute of Environmental Monitoring and Assessment (IEMA) define three categories of mitigation in their guidance for Shaping Quality Development (IEMA, 2015). These categories are used throughout this report and are outlined below:

- **Primary (Inherent) Mitigation**: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken.
    - E.g. Identifying a key habitat or archaeological feature that should remain unaffected by the development's layout and operation.
- **Secondary (Foreseeable) Mitigation:** Actions that will require further activity in order to achieve the anticipated outcome. These will be determined through the outcomes of the environmental assessments conducted to inform this report.
    - E.g. Adoption of an otter watching brief during the construction works.
- **Tertiary (Inexorable) Mitigation:** Actions that would occur with or without input from this assessment feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
    - E.g. Considerate contractors' practices that manage activities which have potential nuisance effects.

As per the above IEMA categories, all the primary and tertiary mitigation embedded in the design and proposed construction techniques are set out in the Section 2: Project Description, with topic specific elements discussed in the relevant section of this report. The primary and tertiary mitigation measures will be used when assessing the significance of effects, since both these forms of mitigation are certain to be delivered. Thus, any effects that might arise without the primary and tertiary mitigation, do not need to be identified as potential effects, as there is no potential for them to arise.

Secondary mitigation measures will be proposed where practicable for any potential significant adverse effects that are identified. Mitigation measures will then be developed, as required, taking into account current guidance, precedents from similar projects, effectiveness and feasibility of solutions, and incremental costs. It should be noted that may only be possible to reduce the severity of potential adverse effects through secondary mitigation, and some cannot be eliminated entirely.

A Schedule of Mitigation (SoM) has been produced and in line with The Highland Council's Guidance (The Highland Council, 2010) and IEMA's guide to Delivering Quality Development (IEMA, 2016). The SoM is included as Appendix 1 to this report.

5 Environmental Assessments

This section provides details of the various environmental assessments which were conducted to identify the potential impacts which may result from the proposed remedial works to Shore Street Quay. Mitigation measures required to reduce the impact of possible significant effects are also identified within the topic specific sub sections.

An initial review of the environmental aspects which may be affected by the proposed works was conducted to inform the content of the environmental assessments. Where the scale or location of the project allowed it to be determined that no impacts are expected for a particular topic, without the need for any further assessment, these topics were not considered further in the assessment. Topics not assessed on this basis include impacts on:

- Human population;
- Human health;
- Material assets;
- Climate change; and
- Major Incidents.

5.1 Acoustics: In-Air

Environmental, or community noise, is a broad term that encompasses noise emitted from many sources, including road, rail & air traffic, industry, construction, public work and neighbourhood noise. All of these sources potentially contribute adversely to the overall noise environment. It is therefore reasonable to expect communities to be sensitive to any change in their acoustic environment as a result of a proposed development. This section considers the possible noise effects associated with the proposed remedial works.

5.1.1 Policy and Guidance

At a national level the relevant policy documents are: Planning Advice Note (PAN) 1/2011 – *'Planning and Noise*,' (The Scottish Government, 2011a) and the associated *Technical Advice Note (TAN) – 'Assessment of Noise' (*The Scottish Government, 2011b).

The BS5228:2009 *Noise and vibration control on construction and open sites. Code of practice for basic information and procedures for noise and vibration control'* parts 1 to 5 provides useful guidance on practical noise control. Part 1 provides recommendations for basic methods of noise control including sections on community relations, training, occupational noise effects, neighbourhood nuisance and project supervision. The annexes provide information on noise sources, noise calculation procedures, mitigation measures and their effectiveness.

Part 1 also contains sound power level data for a variety of construction plant. This data was obtained from field measurements of actual plant operating on construction and open sites in the United Kingdom and is therefore appropriate to use as source level data for construction noise predictions.

The 2009 version of BS5228 was subject to an additional update in 2014. Accordingly, the construction noise assessment in this section has been undertaken in accordance *with BS5228 1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise'*, (BSI, 2014), hereafter referred to as BS5228.

5.1.2 Methodology

5.1.2.1 Study Area

Noise Sensitive Receptors (NSRs) are properties, people or fauna which are sensitive to noise and, therefore, may require protection from nearby noise sources. The Study Area for the noise assessment has been defined through the identification of the closest NSRs to the development. Specifically, the study area has been defined on the assumption that if noise levels are within acceptable levels at the closest receptors then it is reasonable to assume they will also be acceptable at more distant locations.

Table 5.1.1 and Drawing 59.02 details the closest identified NSRs to the Development that are considered within the noise impact assessment.

Table 5.1.1: Nearest Identified NSR Groups

NSR ID	NSR Descriptor	Location
NSR01	River View Apartments	One of the closest NSRs to the proposed development. A block of residential apartments to the south of Shore Street Quay.
NSR02	Anderson Street	A number of residential NSRs are located on Anderson Street, opposite Shore Street Quay to the west, on the far bank of the River Ness.

5.1.2.2 Baseline Data Collection

Attended baseline sound level monitoring was undertaken on 26th March 2019 at two locations during the daytime period. No monitoring was conducted during evening or night-time periods, as construction will not be ongoing during these times, as detailed in Section 2. The Noise Monitoring Points (NMPs) are shown on Drawing 59.02 and detailed in Table 5.1.2.

Table 5.1.2: Noise Monitoring Points

NMP ID	NML Descriptor	Grid Reference
NMP01	River View Apartments	NH 66395 45948
NMP02	Anderson Street	NH 66278 46086

All measurements were made with the sound level meter (SLM) mounted on a tripod at approximately 1.2 – 1.5 metres above the ground and away from nearby reflective surfaces i.e. building façades, fences etc.

The noise monitoring equipment consisted of a Cirrus Optimus Green integrating sound level meter (SLM), fitted with a standard wind shield. All noise monitoring equipment (calibrator, SLM and microphone) used for the study are categorised as Class 1, as specified in IEC 61672-1 *Electroacoustics. Sound level meters. Specifications*' (International Electrotechnical Commission, 2002). The equipment was calibrated on site at the beginning and end of each measurement period with no significant deviations noted. Appendix 3 contains the equipment and laboratory calibration details.

5.1.2.3 Assessment Criteria

Annex E, part E.3.2 of BS5228, clearly sets criteria for assessing the significance of construction noise effects and gives examples of acceptable limits for construction noise.

Table E.1 of BS5228 (represented here as Table 5.1.3) contains an example of the significance criteria that can be used to assess construction activities.

Table 5.1.3: Example of Threshold of Potential Significant Effect at Dwellings (dB(A))

Assessment Category and Threshold Value Period	Threshold Value LAeq,T dB		
	Category $A_{(A)}$	Category $B_{(B)}$	Category $C_{(C)}$
Night-Time (23:00 – 07:00)	45	50	55
Evenings and Weekends	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 to 13:00)	65	70	75
(A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values; (B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values; (C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values;			

The threshold values can be considered limits for the construction noise levels (quantified using the L_{Aeq} noise metric). The limits in each category are to be used where the existing noise level at each location, rounded to the nearest 5dB, is below the level given for a particular time of day.

Therefore, the assessment of significance of effects for construction noise reflects a specific noise threshold for the locality (set relative to the existing ambient noise levels) for a particular period of the day, rather than an absolute noise level. Any predicted levels above the relevant category threshold (A, B or C) is assessed as a significant effect; whilst predicted levels below the relevant category threshold is assessed as a non-significant effect.

5.1.2.4 Prediction of Construction Noise Levels

In order to ascertain the likely noise levels at the nearest noise sensitive receptors, it is first necessary to predict the noise emissions arising from the construction activities during the Shore Street Quay remedial works. This was done in accordance with Annex F of BS5228, using the documented source noise levels for typical items of plant provided in Part 1 of BS5228.

Once the construction noise emissions levels were determined, a simple propagation loss model was used to predict the noise levels at the nearest sensitive receptors, accounting for the distance between the construction works and the receptor. This was done using the propagation loss formula for hard ground (as a worst-case scenario) provided in Annex F of BS5228, as detailed below, where K_h is the propagation loss over hard ground, and R is the distance between source and receptor:

$$K_h = 20Log_{10}R$$

The K_h values calculated for each of the NSRs was then subtracted from the total predicted construction source noise levels, in order to estimate the received noise levels at the receptors. This value was then assessed against the criteria detailed in Section 5.1.2.3, in order to determine the significance.

It is acknowledged that this is a simple noise prediction approach, and actual noise levels at the NSRs are likely to differ from those predicted. However, the results represent the worst-case scenario, and hence are appropriate for the assessment. The approach has the following limitations:

- The method assumes all noise sources are operating simultaneously, estimating a worst-case source noise level;
- No account of barrier attenuation effects has been made, again estimating a worst case received noise level; and
- All mobile plant (excavators, dozers, rollers etc) are considered to be point sources operating within the centre of their anticipated work areas. This will give an approximation of the overall noise levels from mobile plant at receptor locations; however, in reality noise levels will fluctuate as construction plant and activities moves around the activity area.

5.1.3 Baseline

The site is an existing harbour within the city of Inverness. The immediate area to the east and north of Shore Street Quay is an industrial estate, with residential areas to the south, and to the west on the opposite bank of the River Ness. Ambient noise levels in the area are generally elevated, due predominantly to road traffic on Shore Street, which is noted as carrying industrial traffic servicing the industrial estates and the Port of Inverness. Other dominant noise sources include the Inverness to Beauly rail line which crosses the River Ness immediately to the south of Shore Street Quay together with existing harbour activities.

5.1.3.1 Ambient Noise Monitoring Results

Table 5.1.4 details the measured L_{Aeq} noise levels for the daytime period at the two NMPs. Full results from the noise monitoring are provided in Appendix 3.

Table 5.1.4: Measured ambient noise levels, dB $L_{Aeq(t)}$

Noise Monitoring Point		Daytime Ambient Sound Level, dB $L_{Aeq(1hr)}$	BS5228 Threshold Value Catergory
NMP ID	Descriptor		
NMP01	River View Apartments	65	B
NMP02	Anderson Street	54	A

Having due regard to the existing ambient noise levels at NSRs around the proposed development, the BS5228 threshold values categories (as detailed in Table 5.1.3) have been determined. As detailed in Table 5.1.4, the assessment category which will be used for River View Apartments and Anderson Street are B and A, respectively.

5.1.4 Assessment

At this stage, a detailed plant list is not available, so a generic plant list based upon experience of similar projects has been used, as well as input from Wallace Stone, the Project's Design Engineers, on the likely plant to be used.

The compliment of plant considered by this assessment is detailed in Table 5.1.5, together with the predicted L_{Aeq} noise levels from BS5228. The table also detailed the calculated combine noise emissions from the construction works, assuming all items plant are operating simultaneously.

Table 5.1.5: Plant Compliment and Predicted Noise Levels

Item of Plant	BS5228 Sound Pressure Level L_{Aeq} dB at 10m	Calculated Overall Sound Pressure Level L_{Aeq} dB at 10m (assuming 100% on-time)
Tracked Excavator – 30t	75	85
Tracked Excavator – Long Reach – 40t	78	
Lorry – 8 Wheel Tipper – Discharging	80	
Concrete Mixer Truck – Discharging	80	

The calculated received noise levels at the two NSRs were calculated, and are provided in Table 5.1.6, together with a comparison against the appropriate BS5228 threshold criteria detailed in Table 5.1.3, in order to determine significance of the predicted noise impacts.

Table 5.1.6: Predicted Noise Levels at NSRs and Impact Significance Assessment

NSR ID	NSR Descriptor	Distance	Predicted Sound Pressure Level at NSR	BS5228 Daytime Threshold Criteria	Comparison with Threshold Criteria	Noise Impact Significance
NSR01	River View Apartments	104m	64 L_{Aeq} dB	**B** - 70 L_{Aeq} dB	-6dB	**Non-Significant**
NSR02	Anderson Street	149m	61 L_{Aeq} dB	**A** - 65 L_{Aeq} dB	-4dB	**Non-Significant**

The predicted noise levels resulting from the construction of the Shore Street Quay remedial works are substantially below the BS5228 Threshold Criteria at both River View Apartments and Anderson Street. Accordingly, this assessment concludes that in air noise impacts are **non-significant** for all relevant receptors.

5.1.5 Mitigation

While no significant impacts have been identified, and hence no specific mitigation is required, Section 8 of BS5228 recommends a number of simple noise control measures which will be implemented as a matter of best practice. These include:

- Site working hours will be restricted to 07:00 to 19:00 Monday-Friday, 07:00 to 13:00 on Saturdays, with no working on Sundays. Haulage vehicles will not arrive at or leave the site outwith these times;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and 'smart' broadband reversing alarms and be subject to programmed maintenance;
- Inherently quiet plant will be selected where appropriate – and all ancillary equipment will be 'sound reduced' models;
- Machines will be shut down between work periods or throttled down to a minimum;
- Regular maintenance of all equipment used on site will be conducted, including maintenance related to noise emissions; and
- All material movements will be performed carefully, ensuring minimal drop heights so as to minimise noise during these operations.

5.2 Acoustics: Underwater

5.2.1 Policy and Guidance

The Scottish Governments National Marine Plan includes the following general policy regarding underwater noise emissions:

- ***GEN 13 Noise:*** *Development and use of the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects* (Scottish Government, 2015a).

The Scottish government has released a series of good environmental status descriptors within Scotland's National Marine Plan. Specifically:

- ***GES 11:*** *Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.* (Scottish Government, 2015b).

5.2.2 Assessment

There is the potential for underwater noise to be generated during the construction of the proposed remedial works, which can negatively affect noise sensitive marine receptors in the waters adjacent to the works. Specifically, elevated underwater noise emissions have the potential to disturb and injure marine mammals and fish, thus could result in negative individual and population level effects.

The only activity associated with the proposed remedial works that will result in elevated underwater noise emissions, is the construction of the rock bund at the base of the pile wall. Detailed underwater noise monitoring of marine rock bund installation was undertaken by Affric Limited during the construction of the Invergordon Service Base Phase 3 Development. These studies were presented to Marine Scotland, and found that noise emissions from rock revetment construction were non-impulsive, broadband, and low energy, hence did not have the potential to result in significant adverse effects on either marine mammals or fish (Affric, 2015 & Affric, 2018). The methods that will be utilised to construct the Shore Street Quay rock bund are very similar to those used during the Invergordon Phase 3 Development, hence, underwater noise emissions will be comparable. Therefore, the proposed remedial works are not anticipated to result in increased underwater noise emissions of a magnitude that would adversely affect relevant marine receptors.

Furthermore, Shore Street Quay is located immediately adjacent to the Port of Inverness, a busy industrial harbour. As such, noise emissions from the rock bund construction will be set in the context of the existing shipping and harbour activities. It is therefore concluded that noise emissions from the proposed remedial works are unlikely to constitute a detectable change from baseline conditions, and will not be of a magnitude which has the potential to result in significant negative impacts on marine receptors. Underwater noise impacts on marine receptors are therefore assessed as **no-change**, and will not be considered further in this report.

5.3 Air Quality

In this section the potential effects of the project on air quality are discussed and assessed. The focus is on fugitive dust emissions associated with the construction of the rock armour bund.

5.3.1 Policy and Guidance

Relevant air quality policy to the Shore Street Quay remedial works is provided by the Scottish National Marine Plan:

- **GEN 14 Air Quality**: *Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits (Scottish Government 2015a).*

While Paragraph 4.70 states that:

'Some development and use may result in increased emissions to air, including particulate matter and gases. Impacts on relevant statutory air quality limits must be taken into account and mitigation measures adopted, if necessary, to allow an activity to proceed within these limits' (Scottish Government 2015a).

The Institute of Air Quality Managements (IAQM) provide applicable guidance:

- Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014)

5.3.2 Methodology

The dust assessment methodology utilised in this IAQM Guidance detailed above.

5.3.2.1 Screening

The IAQM Guidance (IAQM, 2014) screening methodology takes account of the exponential decrease in dust deposition rates and airborne concentrations over distance.

Where human receptors are found within 350m of the boundary of the site or within 50m of the route used by construction vehicles on public road, an assessment of the dust impacts will be required.

Similarly, where an ecological receptor is located within 50m of the construction site boundary or 50m of the route used by construction vehicles on public road, a further assessment is required.

5.3.2.2 Evaluation of Receptors

The sensitivity of various receptors to air pollution is determined by a number of factors including:

- Duration spent within the area, i.e. transient or constant presence;
- Sensitivity of receptor i.e. the very old, or young, or certain plant species; and
- Distance from the source.

Table 5.3.1 takes into account a range of factors based on the IAQM Guidance (IAQM, 2014) to define sensitivity of air quality receptors.

Table 5.3.1: Air Quality Receptor Sensitivity

Sensitivity	Criteria
High	Hospitals, Care homes, Schools within 50m of the source. >10 residences within 20m of the source. >100 residences within 50m of source. Areas where people expect a high level of enjoyment of an amenity or where people are continually present or will spend long periods of time e.g. museum within 50m. Amenities of high cultural or sensitive nature within 50m. Long-term car parks within 50m. Internationally or Nationally designated sites and the designated feature may be affected by dust soiling is within 20m. Community of dust sensitive species included in the Red Data list species within 20m.
Medium	>100 residences within 100m of source. 10-100 residences within 50m of source. 1-10 residences within 20m of source. Non-residential properties where people are present for long periods of time e.g. offices within 50m. Areas of amenity users would expect to enjoy at a reasonable level continuously or regularly for extended periods e.g. parks within 100m. Medium-term car parks within 100m. Internationally or Nationally designated sites where the qualifying feature dust sensitivity is uncertain or unknown or may be sensitive within 50m (SSSI).
Low	1 residence within 20m of source. >10 residences within 100m of source. Transient exposure groups, people moving through an area i.e. footpaths. Short term car parks. Where users would not reasonably expect the enjoyment of the amenity and reasonably be expected to be present only for limited time. Non-residential properties where people are present for long periods of time e.g. offices within 100m. Locally designated sites where the qualifying feature may be sensitive to dust. Internationally or Nationally designated sites and the designated feature may be affected by dust soiling is within 100m.

5.3.2.3 Magnitude of Impact

The Shore Street Quay development poses dust generation risks through material handling associated with the construction of a rock armour bund (Drawing 2021/1035A), and track-out from heavy duty vehicles (HDV) delivering rock for the rock armour bund to site.

The definitions of impact magnitude for material handling and track-out that may generate dust during the project construction are provided in the IAQM Guidance (IAQM, 2014) and these are to be utilised as outlined in Table 5.3.2.

Table 5.3.2: Magnitude of Potential Impact

Dust Emissions Classes for Material Handling	
Large	Total site area > 10,000m^{2,} potentially dusty soil type, >10 heavy earth moving vehicles active at any one time, total material moved >100,000 tonnes
Medium	Total site area <2,500m^2 – 10,000m^2, moderately dusty soil, 5-10 heavy earth moving vehicles active at any one time, total material moved 20,000 tonnes – 100,000 tonnes
Small	Total site area < 2,500m^2, soil type with large grain size, < 5 earth moving vehicles active at any one time, total material moved <20,000 tonnes, earthworks during wetter months
Dust Emissions Classes for Track-Out	
Large	>100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m
Medium	25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m
Small	<25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m

5.3.2.4 Significance Evaluation

The significance of effects will be determined as per Table 5.3.3 taking account of receptor sensitivity and impact magnitude.

Table 5.3.3: Assessing the Significance of Effects

Magnitude of Impact	Receptor Sensitivity		
	High	Medium	Low
Large	Major	Moderate	Minor
Medium	Moderate	Moderate	Minor
Small	Minor	Minor	Negligible

Key

	Significant Effect

5.3.3 Baseline

A desk study was undertaken to identify the baseline air quality status surrounding the Shore Street Quay Development. Information was extracted from the Air Quality in Scotland website (Ricardo Energy & Environment, 2019) which provides data and maps on local air quality parameters.

5.3.3.1 Environment

Based on a climate model with approximately 30km spatial resolution, the location of the Shore Street Quay development results in prevailing winds mostly occurring from a south west direction, with wind speeds mostly of >12mph for 263h/year (Meteoblue, 2019).

The only air quality monitoring site in Inverness that records particular matter (PM), relevant to a dust assessment is located in Telford Street, approximately 800m south west of the development. In 2018, an annual hourly mean of 5 µg/m^3 and 13 µg/m^3 of $PM_{2.5}$ and PM_{10} were recorded respectively at the station. From the 1st of January until the 7th of May 2019, the max daily mean of $PM_{2.5}$ was 29 µg/m^3 and 73 µg/m^3 for PM_{10}. In line with the Air Quality Standards (Scotland) Regulations 2010, only one day exceedance of daily mean >50 µg/m^3 of PM_{10} occurred at the station from 1st of January till the 7th of May 2019. In 2018, no exceedances of $PM_{2.5}$ or PM_{10} occurred (Ricardo Energy & Environment, 2019).

5.3.3.2 Receptors

In the vicinity of the development multiple receptors were identified, as detailed in Table 5.3.4 and shown on Drawing 59.02 it should be noted that this is not an exhaustive list, instead receptors were selected on a worst-case basis (those closest to the proposed works). Non-residential properties and medium term-car parks located within 50m of the Shore Street Quay remedial works, according to Table 5.3.1, these would be defined as **medium** sensitivity.

The residential areas and associated apartment carparks, of River View Apartments and Anderson Street are located within 150m, but outwith 100m. A conservative approach has been taken to include theses receptors in the assessment, despite being outwith the criteria set in Table 5.3.1. The distance between the potential dust source and these receptors means the residential and associated residential carparking receptors are considered to be of **low** sensitivity.

No dust sensitive ecological receptors were identified within 150m of the proposed development.

Table 5.3.4: Receptors

Receptor	Type	Distance & Direction from Development	Sensitivity
Shore Street Industrial Area	Non-Residential	35m E	Medium
Shore Street Industrial Area Carparks	Carpark	35m E	Medium
River View Apartments	Residential	105m SW	Low
River View Apartments Carparks	Carpark	105m SW	Low
Anderson Street	Residential	150m W	Low
Anderson Street Carparks	Carpark	150m W	Low

5.3.4 Assessment

Due to the proximity of potentially sensitive receptors, to the proposed remedial works, an air quality assessment is required according to the screening criteria detailed in Section 5.3.2.1.

Sources of dust associated with the Shore Street Quay development are likely to be associated with the movement and placement of the rockfill material required to construct the rock bund at the base of the pile face. Track-out may also result via the HGVs required to deliver rock fill and rock armour materials to site.

5.3.4.1 Material Handling

As detailed in Section 2, the construction of the rock bund is required to provide scour protection and reinforce the existing quay. The rock bund has a footprint of approximately 1,800m^2, and will be constructed using three grades of rock, as per Drawing 2021/106 including:

- Clean crushed rockfill with no fines in the base layer.
- Rocks of between 0.04t to 0.06t, will be used to form a mid-layer; and
- Rock weighing between 0.4t to 0.6t will form the final top surface.

There is the potential for dust emissions to result from handling and storage of dry rock material, particularly during a period of dry windy weather. However, dust emission will be extremely limited considering the quantity of material involved (much less than 20,000 tonnes) the low fines content of the material. The rock material is also anticipated to be delivered on

a 'just in time' basis, and only stored for a minimal amount of time at the construction site, prior to being placed into the submerged rock bund, reducing likelihood of dust emissions. As per Table 5.3.2 the material quantities involved gives rise to a **small** magnitude of impact. Therefore, the overall impact of dust arising from the material handling required to form the rock bund is assessed as **short-term** and **reversible**, constituting to a **negligible: non-significant** and **minor: non-significant** effect on receptors of low and medium sensitivity respectively.

5.3.4.2 Track-Out

Vehicle movements associated with the delivery of material, required for the construction of the rock armour bund have the potential to result in dust/mud track-out onto the public roads, leading to dust spreading beyond the boundaries of the site. Due to the small scale of the rock bund, and hence low volumes of materials required to constructed, fewer than 25 HGV movements per day will take place to deliver the material to site. In addition, the entire site is surfaced with concrete, with no areas of bare ground, reducing the likelihood of dust and mud track-out. All HGVs will access the site via the A82, and Harbour Road, thereby avoiding any residential areas. As per Table 5.3.2 this gives rise to a **small** magnitude of effect. Therefore, the impact of track-out is assessed as constituting a **negligible to minor: non-significant** effect on receptors.

5.3.5 Mitigation

No significant impacts on air quality have been identified as a result of the construction of the proposed rock armour bund. As such, no specific mitigation measures are required to reduce impacts on receptors. However, the following measures have been considered in arriving at this conclusion, and will be implemented during construction:

- Rock material will be clean and low fines;
- Materials stored on site will be minimised where practicable, by utilising a just in time delivery system; and
- HGVs will access site via the A82, and Harbour Road.

Standard industry good practice including those detailed in the Pollution Prevention Guidelines 6: Working at Construction and Demolition Sites (Environment Agency et al., 2012) to minimise dust emissions nonetheless should be implemented. Specially, the following tertiary mitigation will be implemented during construction:

- All HGV's delivering rock material to site will be covered; and
- Good housekeeping to be employed across the site.

5.4 Archaeology and Cultural Heritage

5.4.1 Policy and Guidance

The Scottish Government has released general policies and planning advisory notes pertaining to archaeological and cultural heritage as part of the Scotland's National Marine Plan, and Scottish Planning Policy:

- **GEN 6 Historic Environment**: *Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance* (Scottish Government, 2015a); and
- **PAN 2/2011**: *Planning and Archaeology* (Scottish Government, 2011).

5.4.2 Baseline

A review of the following sources of information was conducted in order to identify sites of potential archaeological and cultural heritage interest:

- Historic Environment Scotland's PastMap interactive mapping service (HES, 2019); and
- The Highland Council's Historic Environmental Record Website (The Highland Council 2019).

Within 350m of the proposed development area there are 5 listed buildings, 2 of which are located at the western end of Grant Street, and are effectively screened from the proposed development by adjacent buildings so are not considered further. A single scheduled monument is located within the search area. The receptors taken for assessment due to their archaeological or cultural value are outlined in Table 5.4.1, and shown on Drawing 59.03.

Shore Street Quay is not located within a historic conservation area, and there are no battlefields, Wold Heritage Sites, or Gardens and Designated Landscapes within the vicinity of the site.

A review of PastMaps identified that there are 4 ships wrecks recorded in the immediately north of Shore Street Quay, however these records are all noted as 'Position Approximate' and are not shown on the marine charts (HES, 2019). Furthermore, the reported positions are within the dredge pocket of the Citadel Quay, an area subject to regular dredging works. As such, if wrecks were present in this location, they would have been previously identified. Therefore, it is considered highly unlikely that any remains of the wrecks are present at the reported position, and these sites are not considered further.

Table 5.4.1: Relevant Cultural Heritage Sites

Site Name	Type	Direction & Distance	Description	Sensitivity
1 Anderson Street	Listed Building	209m WSW	Mid-19th century building.	Medium
2 & 4 Grant Street	Listed Buildings	213m WSW	Mid-19th century building.	Medium
Remains of Cromwell's Fort	Scheduled Monuments	316m NNE	Remains of one of the five bastions of Cromwell's Fort in Inverness. Built in the 1650s.	Medium
Clock Tower, Cromwell Road	Listed Building	340m N	18th century, possibly 1767 2-stage, near square-plan clock tower.	Medium
Argyle Bar, 1 Grant Street	Listed Building	230m WSW	Public House build probably circa 1900.	Medium

5.4.3 Assessment

Due to the distances between Shore Street Quay and the receptors identified in Table 5.4.1, there is no potential for the proposed remedial works to result in direct effects on these sites. Therefore, only the potential for indirect effects exists, specifically changes to setting, resulting from the formation of the rock bund and construction of the flood wall. Since the majority of this structure is below MLWS, only the very top of the bund will be visible at low tide, and it will be entirely submerged for most of the time. As such, impacts of this structure on the setting of the receptors are extremely limited. The fibre concrete pile facing, and revised flood

wall will be visible, however in the context of the existing industrial nature of Shore Street Quay and its surroundings, these structures do not constitute a marked change in setting. Therefore, magnitudes of effect on all the sites listed in Table 5.4.1 are assessed as **no-change**.

5.4.4 Mitigation

No significant impacts have been identified on archaeological and cultural heritage features; hence no specific mitigation is proposed. Although, it is recognised that a low probability exists that previously unknown archaeological artefacts are present within the footprint of the proposed rock bund. Due to the fact that no excavation will take place during construction of the bund, it is very unlikely that these would be identified or recovered. However, in the event that an artefact is recovered, a Protocol for Archaeological Discoveries will be implemented, in line with the Crown Estates Guidance (TCE, 2014).

5.5 Biodiversity

This section lays out the policy and guidance relevant to ecological receptors and the assessment methodology that the following topic-specific sections then utilise:

- 5.7 – Ornithology;
- 5.8 – Marine Mammals;
- 5.9 – Otters;
- 5.10 – Atlantic Salmon; and
- 5.11 – Benthic Ecology.

5.5.1 Policy and Guidance

5.5.1.1 The Habitats Directive

The European Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, also referred to as the 'Habitats Directive' (European Commission, 1992). The primary aim of the Habitats Directive is to maintain biodiversity within the Member States and is transposed into Scottish law by a combination of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland), commonly known and the 'Habitat Regulations' together with the Habitats Regulations 2010 (in relation to reserved matters).

The Habitats Regulations identify several habitats or species whose conservation interest requires the designation of Special Areas of Conservation (SACs), which form the Natura 2000 network of protected sites, in conjunction with Special Protection Areas.

In addition, the Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. These species are commonly termed European Protected Species (EPS), and include all cetaceans in Scottish waters, as well as otters.

5.5.1.2 The Birds Directive

Directive 2009/147/EC of the European Parliament and of the Council, on the conservation of wild birds, commonly known as the Birds Directive, protects all wild birds, their nests, eggs and habitats within the European Community (European Union, 1979). It gives member states of the European Union, the power and responsibility to classify Special Protection Areas (SPAs), to protect birds which are rare or vulnerable in Europe, as well as all migratory birds which are regular visitors. The 2009 Directive is the consolidated (or 'codified') version of Council

Directive 79/409/EEC which originally came into force in 1979, and was amended many times before being replaced by the current version (European Commission, 2010).

5.5.1.3 Wildlife and Countryside Act 1981 and Nature Conservation (Scotland) Act 2004

The Wildlife and Countryside Act 1981 (WCA) (as amended in Scotland) was originally conceived to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Birds Directive in Great Britain. It has been extensively amended since it first came into force.

Schedule 5 of the WCA provides special protection to selected animal species other than birds, through section 9(4) of the Act, against damage to "*any structure or place which [any wild animal included in the schedule] uses for shelter and protection*" and against causing disturbance whilst in such places.

The WCA contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9. It also provides a mechanism making the above offences legal through the granting of licenses by the appropriate authorities.

Important amendments to the WCA have been introduced in Scotland including the Nature Conservation (Scotland) Act 2004 (NCSA). Part 3 and Schedule 6 of this Act make amendments to the WCA, strengthening the legal protection for threatened species. The NCSA is also the instrument under which Sites of Special Scientific Interest (SSSI) are protected in Scotland.

The Wildlife and Natural Environment (Scotland) Act 2011 provided a new licensing element to the WCA within Scotland, specifically for certain non-avian protected species 'for any other social, economic or environmental purpose'. This licensing purpose is qualified by two constraints; "*that undertaking the conduct authorised by the licence will give rise to, or contribute towards the achievement of, a significant social, economic or environmental benefit; and that there is no other satisfactory solution*".

5.5.1.4 Planning Policy

The Scottish Government has released general policies and planning advisory notes relevant to ecological receptors, as part of the Scotland's National Marine Plan, and Scottish Planning Policy:

- **GEN 9 Natural heritage**: *Development and use of the marine environment must:*
  - *Comply with legal requirements for protected areas and protected species;*
  - *Not result in significant impact on the national status of Priority Marine Features;*
  - *Protect and, where appropriate, enhance the health of the marine area* (Scottish Government, 2015a).
- **PAN 60**: *Planning for Natural Heritage.* (Scottish Government, 2000).

5.5.2 Methodology

The assessment of the significance of predicted impacts on ecological receptors is based on both the 'value' of a receptor and the 'nature and magnitude' of the impact that the development will have on it. Effects on biodiversity may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance), on receptors located within or outwith the respective survey area. The Ecological Impact Assessments (EcIAs), in principle, followed the assessment methodology outlined in Section 4: Methodology, with the specific ecological assessment methods and criteria detailed below.

5.5.2.1 Evaluation of Ecological Receptors

The evaluation methodology has been adapted from the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018). A key consideration in assessing the effects of any development on flora and fauna is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by biophysical changes caused by project activities, however remote from the respective survey area.

The approach that has been undertaken throughout the ecological assessments is to identify 'valued ecological receptors' i.e. species and habitats that are both valued in some way and could be affected by the proposed development and separately, to consider legally protected species. Both species populations and habitats have been valued using a broad geographical basis with full details in Table 5.5.1.

The approach taken in these assessments is that a species population or habitat area that is of Regional or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore, if a species population is considered to be of High Local value or less, the proposed development is not anticipated to have as great an effect on the species population as a whole. Exceptions are made if the species population or habitat area has been identified as having a high social or economic value, or if the species is legally protected, for example if they are a Schedule 1 or Schedule 5 species under the WCA, or an EPS.

Table 5.5.1 Nature Conservation Receptor Evaluation Criteria

Value	Criteria
International	• An internationally important site (SAC or SPA) or a site proposed for, or considered worthy of designation, or qualifying feature thereof; • A regularly occurring substantial population of internationally important species (e.g.. EPS listed on Annex IV of the Habitats Directive).
National	• A nationally designated site (SSSI), or a site proposed for, or considered worthy of such designation; • A viable area of habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; or • A regularly occurring substantial population of a nationally important species, e.g. listed on Schedule 5 & 8 of the WCA.
Regional	• Areas of internationally or nationally important habitats which are degraded but are considered readily restored; • Viable habitats or populations of a species identified as a PMF, or smaller areas/populations which are essential to maintain the viability of a larger area/population as a whole; • Regionally important population/assemblage of an EPS, WCA Schedule 1 and/or 5 species. • Regionally important assemblages of other species or habitats.
High Local	• Locally important population/assemblage of an EPS, WCA Schedule 1 and/or 5 species; or • Sites containing viable breeding populations of species known to be county rarities, or supplying critical elements of their habitat requirements.
Moderate Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the local context (within 2km radius from the site) and may benefit from mitigation as a good practice measure.
Low Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the immediate environs of the site and may benefit from mitigation as a good practice measure.
Negligible	• Common and widespread or modified habitats or species.
Negative	• Invasive, alien species often scheduled under Section 14, Schedule 9 of the WCA.

The approach of these assessments is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself, although this is a factor in the evaluation process with the level of use of the site (number of individuals using the site and nature and level of use) taken into consideration. An assessment is then made of the value of the site to that species, based upon a combination of data sources, professional judgment and knowledge of the site and wider area.

5.5.2.2 Legal Protection of Species

There is a need to identify all legally protected species that could be affected by the proposed development, to ensure that the development complies with all relevant nature conservation legislation. It is, therefore, appropriate to take into full consideration the legal protection of a species within the evaluation process.

5.5.2.3 *Nature and Magnitude of Impact*

Impacts can be: permanent or temporary; direct or indirect; adverse or beneficial; reversible or irreversible; and may also have a cumulative function with other activities out with the assessed development. These factors are taken into consideration in the context of the sensitivity of the valued ecological receptor and the range of potential effects. To identify whether impacts are significant or not, it is important to undertake the assessment in terms of the integrity (coherence of the ecological structure and function), and conservation status (ability of the receptor to maintain its distribution and/or extent/size) of the receptor.

Table 5.5.2 provides an overview of the range of impact magnitudes referred to within this assessment. In addition, impacts may also be positive in nature.

Table 5.5.2 Definition of Magnitude of Impact

Magnitude	Description
High	Total loss of, or major alteration to conservation status or integrity of a receptor with situation likely to be irreversible, even in the long term. Fundamental alteration to the character and composition of the Site.
Medium	Clear effect on the conservation status or integrity of the receptor in the short to medium term (6-15 years), although this is likely to be reversible or replaceable in the long-term (15 years plus).
Low	Minor shift away from baseline conditions. Effects will be detectable but unlikely to be of a scale or duration to have a significant effect on the conservation status or integrity of the receptor in the short term (1-5 years). Overall baseline character of site will not alter substantially.
Negligible	Very slight change from the baseline conditions. Changes barely detectable, approximating to the 'no change' situation. Any effects likely to be reversible within 12 months and not affect the conservation status or integrity of the receptor.

5.5.2.4 *Impact Significance*

The significance of an effect is a product of the value of the ecological receptor and the magnitude of the impact on it, moderated by professional judgment. Table 5.5.3 illustrates a matrix based on these two parameters which is used for guidance in the assessment of significance. Only effects which are 'moderate' or 'major' are considered significant, the others constituting a non-significant effect.

Table 5.5.3 Significance of Effects Matrix

Magnitude of Impact	Value				
	International	National	Regional	Moderate Local/ High Local	Low Local /Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect

5.6 Designated Sites

Designated protected areas represent the very best of Europe's landscapes, plants and animals, rocks, fossils and landforms. Their protection and management will help to ensure that they

remain in good health for all to enjoy, both now and for future generations. They may be designated to meet the needs of international directives and treaties, national legislation and policies, or more local needs and interests.

5.6.1 Types of Designation

5.6.1.1 International Designations

Special Areas of Conservation

SACs are internationally important for threatened habitats and species. They form part of the Natura Site network, alongside Special Protection Areas. They are also selected for a number of habitats and species, both terrestrial and marine, which are listed in the Habitats Directive.

Special Protection Areas

SPAs are internationally important for threatened habitats and species. They are also selected for a number of rare, threatened or vulnerable bird species listed in Annex I of the Birds Directive, and also for regularly occurring migratory species.

Where a potential site to be designated as a SAC has been identified, and the details of that site have been put out to public consultation, it is referred to as a proposed SPA (pSPA); pSPAs are afforded full legislative protection, and as such will be considered to have equal value as SPAs.

Ramsar Sites

Ramsar sites are wetlands of international importance, designated under the Ramsar Convention (Ramsar, 1971). Wetlands are defined as areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

All Ramsar sites in Scotland are also either SPAs or SACs and many are also Sites of Special Scientific Interest (SSSIs), (Scottish Natural Heritage, 2017). As such, Ramsar sites will not be considered separately by this report, and instead potential impacts on these sites will be identified during the assessments for their corresponding SACs or SPAs.

5.6.1.2 National Designations

Sites of Special Scientific Interest

Sites of Special Scientific Interest (SSSI) are those areas of land and water (to the seaward limits of local authority areas), that SNH considers to best represent our natural heritage; its diversity of plants, animals and habitats, rocks and landforms, or a combination of such natural features. They are the essential building blocks of Scotland's protected areas for nature conservation. Many are also designated as Natura sites (SPAs and SACs). The national network of SSSIs in Scotland forms part of the wider Great Britain series. SNH designates SSSIs under the Nature Conservation (Scotland) Act 2004.

5.6.1.3 Local Designations

Local natural heritage designations identify areas that are important to people, generally in a Council area. Local nature conservation sites and special landscape areas may be known locally by other names, but all are used to direct local planning policies and highlight local sites of interest. Local Nature Reserves (LNR) are areas of at least locally important natural heritage value, which local authorities own or manage, to provide opportunities for people to find out

about their environment. Local designations are generally made by local authorities, though many are proposed by special interest and conservation groups, such as local Regionally Important Geological Sites (RIGS) Groups or the Scottish Wildlife Trust.

5.6.2 Habitats Regulations Appraisal

When a project may have a likely significant effect on a Natura Site (SAC or SPA), a Habitats Regulation Appraisal (HRA) and, when required, an Appropriate Assessment (AA) needs to be completed by the competent authority. The legislative context for carrying out an HRA is based on the Habitats Directive (92/43/EEC), in particular Article 6(3), and The Conservation (Natural Habitats, &c.) Regulations.

Information the competent authority requires in order to carry out an HRA and AA has been provided within this Environmental Report. Appendix 4 provides a Habitats Regulations Appraisal Pre-Screening Report, produced to aid the competent authority's assessment of the designated sites which may have their qualifying interests potentially affected by the proposed Shore Street Quay remedial works.

5.6.3 Identification of Relevant Designated Sites

There are several designated sites in the area surrounding the Shore Street Quay, which may be relevant to the proposed development. The sites identified are shown in Table 5.6.1, along with their qualifying features. Drawing 59.04 provides a map showing the locations of the designated sites relative to the proposed development. A description of the sites and reasons why they were or weren't taken forward for assessment are provided in the remainder of this section.

Table 5.6.1: Relevant Designated Sites

Site	Direction & Distance	Value	Qualifying Features	Considered by Assessment?
Moray Firth pSPA	1.2km N straight line	International	• Great northern diver (*Gavia immer*), non-breeding; • Red-throated diver (*Gavia stellate*), non-breeding; • Slavonian grebe (*Podiceps auratus*), non-breeding; • Greater scaup (*Aythya marila*), non-breeding; • Common eider (*Somateria mollissmia*), non-breeding; • Long-tailed duck (*Clangula hyemalis*), non-breeding; • Common scoter (*Melanitta nigra*), non-breeding; • Velvet scoter (*Melanitta fusca*), non-breeding; • Common goldeneye (*Bucephala clangula*), non-breeding; • Red-breasted merganser (*Mergus serrator*), non-breeding; and • European shag (*Phalacrocorax aristotelis), breeding & non-breeding.*	No
Moray Firth SAC	1.4km N by sea	International	• Bottlenose dolphin (*Tursiops truncates*); and • Subtidal sandbanks.	**Yes** Bottlenose Dolphin Only

Site	Direction & Distance	Value	Qualifying Features	Considered by Assessment?
Merkinch LNR	1.6km NW by sea and 1.1 NW km straight line	High Local	• Mammals (Otter, stoat, common shrew and roe deer); • Birds (waders, ducks, passerines and migratory birds); • Butterflies (11 species); • Dragonflies (2 species); • Beetles (3 species); • Bugs (24 species); and • Complex of habitats.	**Yes** Otters Only
Beauly Firth SSSI	3.9km W by sea and 2.5km W straight line	National	• Goosander (*Mergus merganser*), non-breeding; • Greylag goose (*Anser anser*), non-breeding; • Red-breasted merganser (*Mergus serrator*), non-breeding; • Saltmarsh; and • Vascular plant assemblage.	No
Inner Moray Firth SPA/ Ramsar	3.9km W & E by sea and 2.5km W & E straight line	International	**SPA** • Bar-tailed godwit (*Limosa lapponica*), non-breeding; • Common tern (*Sterna hirundo*), breeding; • Cormorant (*Phalacrocorax carbo*), non-breeding; • Curlew (*Numenius arquata*), non-breeding; • Goldeneye (*Bucephala clangula*), non-breeding; • Goosander (*Mergus merganser*), non-breeding; • Greylag goose (*Anser anser*), non-breeding; • Osprey (*Pandion haliaetus*), breeding; • Osprey (*Pandion haliaetus*), foraging; • Oystercatcher (*Haematopus ostralegus*), non-breeding; • Red-breasted merganser (*Mergus serrator*), non-breeding); • Redshank (*Tringa tetanus*), non-breeding; • Scaup (*Aythya marila*), non-breeding; • Teal (*Anas crecca*), non-breeding; • Waterfowl assemblage, non-breeding; and • Wigeon (*Anas penelope*), non-breeding. **Ramsar** • Bar-tailed godwit (*Limosa lapponica*), non-breeding; • Greylag goose (*Anser anser*), non-breeding; • Red-breasted merganser (*Mergus serrator*), non-breeding; • Redshank (*Tringa totanus*), non-breeding; • Waterfowl assemblage, non-breeding; • Intertidal mudflats and sandflats; • Saltmarsh; • Sand dunes; and • Shingle.	No

Site	Direction & Distance	Value	Qualifying Features	Considered by Assessment?
River Moriston SAC	40km SW by sea	International	• Atlantic salmon (*Salmo salar*); and • Freshwater pearl mussel (*Margarritifera margaritifera*)	**Yes** Atlantic Salmon Only

5.6.3.1 Moray Firth pSPA

The Moray Firth proposed Special Protection Area (SPA) is designated for a variety of ornithological species as detailed in Table 5.6.1, and covers an area of 1,762 km^2, stretching seaward from the Helmsdale coast to Portnosy and includes the outer Dornoch and Cromarty Firths, Beauly and Inverness Firths, and part of the Moray Firth (SNH, 2016).

Notable qualifying species are the great northern diver (6% of UK population), red-throated diver (2% of UK population) and Slavonian grebe (4% of UK population) which are all Annex 1 species. In addition, the velvet scoter has a population size of 1,490 within the pSPA, which represents 60% of the total UK population. The site also contains large populations of long-tailed duck, greater scaup and European shag, which represent 46%, 18% and 16% of the UK population respectively (SNH, 2016).

The site only contains one breeding bird species, the European shag, with an estimated population of 5,490, representing approximately 10% of the whole breeding European shag population in the UK (SNH, 2016).

As detailed in Section 5.7, none of the qualifying bird species of this site are likely to be present within the immediate vicinity of the development, nor does the development area offer any suitable breeding or nesting habitat for these species. This combined with the distance between the development and the designated site means that no ecological connectivity exists between the Moray Firth pSPA and Shore Street Quay, hence the site is not taken forward for further assessment.

5.6.3.2 Moray Firth SAC

The Moray Firth Special Area of Conservation (SAC) is located in the north-east of Scotland, covering an area of 15,1274 ha. The SAC is designated for subtidal sandbanks and bottlenose dolphin. The area is of key importance to the UK east coast bottlenose dolphin population, and is regularly utilised by over 100 individuals annually, which equates >50% of the population (Cheney et al., 2018). It has been shown that the percentage of the population utilising the SAC has declined, however this is likely due to the fact that the population size is increasing, and hence the population is utilising a larger habitat area (Cheney et al., 2018).

Bottlenose dolphins are highly mobile, and are known to frequent the lower reaches of the River Ness, and hence may be present in the vicinity of the proposed works. As such this site is taken forward for assessment, with respect to the bottlenose dolphin qualifying features. Due to this distance between the proposed works and the subtidal sandbanks feature of this site, there is not potential for this feature to be affected, and hence it shall not be considered further.

5.6.3.3 Merkinch LNR

The Merkinch Local Nature Reserve (LNR) is located in the north of Inverness and covers 54.7ha of land and foreshore to the west of the mouth of River Ness. To the south it borders the Caledonian Canal, to the north west the Carse Industrial Estate and to the east, the residential Merkinch area. The site contains a mixture of interlinking habitats including saltmarsh,

freshwater marsh with reed beds, bog, scrub, wooded embankments and costal environs. Records from the Highland Biological Recording Group identified 71 species including: mammals (otter, stoat, common shrew and roe dear), birds (104 recorded species, 46 breeding), butterflies (11 species), dragonflies (2 species), beetles (3 species) and bugs (24 species) (Taylor et al., 2008).

Due to the distance between this site and the proposed works, there is no potential for direct effects to result on the various habitats within this site. It is also highly unlikely that indirect effects will result on the avian, insect, or mammal (with the exception of otters) features of this site, due to the lack of ecological connectivity with the proposed development. Otters however are highly mobile, and as detailed in Section 5.9, are known to frequent the River Ness, and hence the otter features of this site may be present within the development area. The Merkinch LNR is therefore taken forward for assessment, but only with regard to its otter feature.

5.6.3.4 Inner Moray Firth SPA/ Ramsar

The Inner Moray Firth SPA is located north of Inverness, comprising of the Beauly Firth and Inverness Firth, covering 2,339ha of extensive intertidal flats and small areas of saltmarsh. The site is designated for its large wintering and migratory waterfowl assemblage. It had a mean number of waterfowl of 39,709 over the 5-year period 2011-2016 (BTO, 2018). Rich invertebrate fauna found within the intertidal flats supports large numbers of wintering and migrating birds, as detailed in Table 5.6.1. These habitats also provide important foraging grounds for locally breeding osprey and common tern (JNCC, 2005).

The Inner Moray Firth SPA is also designated as a Ramsar site for birds, waterfowl assemblages and costal habitat features (saltmarsh, sand dunes, shingle, intertidal mudflats and sandflats) as detailed in Table 5.6.1 (SNH, 2018).

This site is not taken forward for further assessment due to a lack of ecological connectivity. This is because none of the qualifying bird species of this site are likely to be present within the immediate vicinity of the development, nor does the development area offer any suitable breeding or nesting habitat for these species, as detailed in Section 5.7. The distance between the development and the qualifying coastal habitats of the Ramsar site mean that no direct or indirect impacts on these features are expected.

5.6.3.5 Beauly Firth SSSI

Beauly Firth Special Site of Scientific Interest (SSSI) extends 13km from the mouth of River Beauly in the west to the east of Inverness, covering 1,243ha. The site is designated for non-breeding goosander, greylag goose, red-breasted merganser, saltmarsh and vascular plant assemblages (SNH, 2018).

Surveys conducted between 1999 and 2004 identified red-breasted merganser and goosander within the SSSI to be in unfavourable condition with average numbers of both species <1% of the GB wintering population. The greylag goose population was found to be in a favourable condition during 1999 to 2004 (SNH, 2008).

Monitoring of the saltmarsh in August 2001 identified the feature to be in a favourable condition. Similarly, surveys of the vascular plant assemblages in August 2004 found the feature in a favourable condition (SNH, 2008).

As detailed in Section 5.7, none of the qualifying bird species of this site are likely to be present within the immediate vicinity of the development, nor does the development area offer any suitable breeding or nesting habitat for these species. This combined with the distance between the development and the designated site means that no ecological connectivity exists between the Beauly Firth SSSI and Shore Street Quay, hence the site is not taken forward for further assessment.

5.6.3.6 River Moriston SAC

River Moriston SAC is part of the Ness catchment and flows through Glen Moriston, entering the northern side of Loch Ness. The site covers 194 ha and is designated for Atlantic salmon and freshwater pearl mussel. The last assessment identified both designated species to be in an unfavourable condition (SNH 2019).

The wild Atlantic salmon population in Scotland is in decline, a pattern also shown in the Ness system (Ness DSFB 2018). However, salmon counts through the Dundreggan Dam located on River Moriston showed an increase in salmon from low's during the mid-1970's to the mid 1990's, with salmon counts peaking at 377 fish in 2015. Although, catches since 2015 have decreased again, with only 262 fish recorded in 2018 (Ness DSFB 2018).

Similarly, the population freshwater pearl mussels' in Scotland is in decline through anthropogenic pressures such as poaching and degradation of rivers water quality. However, surveying of the freshwater pearl mussel population identified a high proportion (40%) of juveniles in River Moriston (JNCC 2019), indicating the freshwater pearl mussel population in is viable.

Salmon migrating to and from the marine environment will transit past the proposed works. As such this site is taken forward for assessment, with respect to the Atlantic salmon qualifying feature. Due to this distance between the proposed works and the pearl mussel beds in the River Moriston, there is no potential for this feature to be directly affected, and hence it shall not be considered further. It is acknowledged that the larval phase of pearl mussels is reliant on the integrity of the salmon population, however impacts on this phase of the pearl mussel life cycle are directly correlated to impacts on Atlantic salmon, so there is no need to consider this aspect separately.

5.7 Ornithology

Shore Street quay is an area of concrete hard standing, and a sheet piled quay face. As such, the development site provides no suitable habitat for avian receptors. The site is bounded by further concrete hard standing to the north, an industrial estate to the east, and a combination of residential and industrial areas to the south, none of which are likely to support population of sensitive avian receptors. The River Ness runs immediately to the west of the site, with the western banks of the River Ness being predominantly residential areas, with a narrow band of shrub and rock revetments extending along the riverbank. This area was subject to an ornithological survey, conducted in 2017, to support a potential development located approximately 300m north of Shore Street quay. The survey report is provided in Appendix 5. The survey found that the western banks of the River Ness did not provide any valuable avian habitat.

As detailed in Appendix 5, no rare, protected, or notable bird species were recorded in the vicinity of the Shore Street Quay during the bird surveys. Furthermore, none of the qualifying features of the various ornithological designated sites detailed in Section 5.6.3 were present.

The lack of suitable avian habitat, together with the low number of birds utilising the area means that proposed works are not anticipated to result in any negative impacts on birds or valuable avian habitat. Therefore, the effects of the proposed development on all ornithological receptors are assessed as **no-change**.

5.8 Marine Mammals

5.8.1 Baseline

The River Ness discharges into the Beauly Firth, an area renowned and designated for its importance to marine mammals, specifically bottlenose dolphins and common seals. As detailed in Section 5.6.3.2, the Beauly Firth forms part of the Moray Firth SAC, which is designated for bottlenose dolphins. While no formal surveys have been conducted in the area, local knowledge suggests that bottlenose dolphins are regularly present in the Beauly Firth, and lower reaches of the River Ness up to the southern extent of Longman Quay, approximately 900m inland. Infant and juvenile animals are also often present int his area during the summer months. These waters are likely to provide a valuable seasonal feeding resource in the form of Atlantic salmon and mackerel. It is noted that bottlenose dolphins are not generally encountered further south than Longman Quay, and are very unlikely to be present within 400m of the proposed works.

The Beauly designated common seal haul-out is situated in the Beauly Firth, approximately 2km west of the River Ness (Scottish Government, 2019). Historically, common seals were regularly encountered in this area. However, their numbers have been in decline here, with 220 counted during dedicated aerial surveys in 1992, and only 5 recorded in 2017. The cause of this decline is unknown, although numbers of common seals recorded in the Culbin Sands and Findhorn area (approximately 25km east) increased rapidly over same time period, from 58 to 526 (SCOS, 2018). As with bottlenose dolphins, Atlantic salmon and mackerel are likely to provide a valuable seasonable food resource for common seals in the Beauly Firth area. According to local knowledge, common seals are not often observed within the River Ness.

Other marine mammal species, including harbour porpoises and grey seals may also be occasionally present within the Beauly Firth. However, these species are not specifically considered due to the infrequency of their occurrence, and the fact that the potential impacts bottlenose dolphins and common seals will be analogous to those for all other cetacean or phocid receptors which may be present.

5.8.2 Assessment

Typically, impacts on marine mammals resulting from marine construction works include disturbance and injury resulting from underwater noise emissions, injury through direct physical interactions, and water quality impacts. All marine mammal species and the Moray Firth SAC are assigned the value of **International,** as per the criteria laid out in Table 5.5.1.

As detailed in Section 5.2, underwater noise emissions associated with the proposed remedial works are not anticipated to be of a magnitude which could negatively impact marine mammals. It is also extremely unlikely that marine mammals will be present in the footprint of the works, approximately 1.4km up the River Ness, hence there is no viable risk of physical

interactions with plant and equipment resulting in physical injury. As such, these aspects are assessed as **no-change**, and are not considered further. The only potential impacts on marine mammals which may occur during the Shore Street Quay Remedial works are therefore associated with reductions in water quality associated with increased sediment loading and release of a hazardous substance, and are assessed in turn below.

5.8.2.1 Increased Sediment Loading

The construction of the rock armour bund discussed in Section 2 has the potential to increase sediment loading in the water column, through the release of fines into the marine environment. Increased sediment loading in the water column, increases turbidity, and can reduce the foraging success of marine mammals, particularly visual predators such as seals. Increased turbidity may also cause marine mammals to avoid the affected area; potentially resulting in displacement of animals or interruption of transiting animals. As such, negative effects may result if water frequently used by bottlenose dolphins and common seals suffer an increase in sediment loading (Priotta et al., 2013).

As detailed in Section 5.13, sediment plumes resulting from the rock bund construction are anticipated to be highly localised and short-lived. This is due to the fact that the rock fill material will be low fines, and will be placed not dropped during the construction of the rock armour bund. It is also noted that the location of the works behind the existing groyne, as detailed in Drawing 2021/105A, will reduce the velocity of water flow at the site, further limiting the dispersal of sediments.

It is therefore considered highly unlikely that marine mammal receptors will be affected by increased sediment loading. This is because neither bottlenose dolphins or common seals are likely to be present in the immediate vicinity of the works, and sediment plumes are not expected to persist further downstream or into the Beauly Firth. Hence, the potential impacts on all marine mammal receptors resulting from increased sediment loading are assessed as **no-change**.

5.8.2.2 Release of Hazardous Substances

A release of oils or other potential pollutants may result in both short and long-term impacts on both bottlenose dolphins and common seals. Short term effects include reduction in the thermal properties of seals' fur, resulting in hypothermia and potentially death, as well as poisoning of both seals and cetaceans through inhalation or ingestion of the contaminant, resulting in sickness or death. Both seals and cetaceans may also avoid a contaminated area, which could impact foraging behaviour. In the longer term, both seals and cetaceans may accumulate toxic pollutants through the ingestion of contaminated food, or through a prolonged exposure to low levels of pollution. Such a toxic build-up may lead to reductions in reproductive success, illness, and increased mortality rates (Gubbay & Earll 2000).

The adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Section 5.13, significantly reduce or remove the risk of a spill occurring. If a spill were to occur, the pollution response protocols will limit the volume released, and ensure contaminants are contained within the immediate vicinity of Shore Street Quay. As such, it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact marine mammals or their designated sites will occur; therefore, the potential effect is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **minor: non-significant.**

5.8.3 Mitigation

No significant impacts on marine mammals have been identified, hence no specific mitigation is proposed.

5.9 Otters

5.9.1 Baseline

Otter are known to be present within the lower section of the River Ness, and have also been recorded within the Merkinch LNR, as detailed in Section 5.6.3.3. As such, an otter survey of Shore Street Quay, the Port of Inverness and the wider tidal reaches of the River Ness was conducted in the spring of 2019, in order to determine the extent and nature of otter utilisation of this area. Full details of the otter survey, including methodologies and results are provided in Appendix 6: Otter Survey Report.

The survey found extensive evidence demonstrating that otters are present within the survey area, although it was noted that no signs of natal holts, layups or couches were identified, suggesting the area is not utilised for breeding or long-term resting area by otters. Two otter activity hotspots were identified; on the rock armour to the northeast of the Inverness Marina, and on the rock armour to the south of the Gaelforce Marine compound, approximately 1km and 550m north from Shore Street Quay respectively. Numerous spraints and feeding remains were found in both areas.

Old spraints were also found on the Longman and South Citadel Quays, showing these areas are frequented by otters, although less regularly. No evidence of otters was recorded on Shore Street Quay or in its immediate vicinity. The closest sign of otters to the proposed works was an old spraint located approximately 300m to the north. It is noted that Shore Street Quay's concrete laydown area and piled quay wall provide no suitable habitat or food resource for otters, nor does the area offer any access or egress routes from the river to adjacent terrestrial environs.

5.9.2 Assessment

Potential impacts on otters resulting from the Shore Street Quay remedial works include disturbance, reduction in water quality (due to increased sedimentation or release of hazardous substances), injury and entrapment, and habitat fragmentation. The assessment of these impacts follows the methodology outlined in Section 5.5 to determine the potential significance of these effects.

According to the criteria laid out in Table 5.5.1, otters and the Merkinch LNR are assigned the values of **International** and **High Local** respectively.

5.9.2.1 Disturbance

The presence and movement of personnel and plant at Shore Street Quay during the remedial works may result in potential disturbance of otters. However, given the industrial nature of the area, and existing port activities, this is not considered to be a substantive change from baseline conditions. Furthermore, the otter survey did not find any signs of otter activity in the immediate vicinity of the works, hence the impact on otter and the Merkinch LNR is assessed as **no-change**.

5.9.2.2 Increased Sediment Loading

The rock placement to construct the rock armour bund has the potential to increase sediment loading in the water column through the release of fines. Further information is provided in

Section 5.13: Water Quality. Increased sediment loading in the water column, and the resultant increase in turbidity may reduce the foraging success of the otter, however it is thought otters hunt primarily by sight it is also understood that they are successful foragers at night and in murky or turbid waters by utilising their whiskers (vibrissae) to detect the presence of fish (Chanin, P. 2013). Increased turbidity may also cause otters to avoid affected areas, although as stated above, the species is known to be relatively tolerant of turbid waters.

Rock placement will be conducted within the sheltered waters of the existing groyne, as detailed in Drawing 2021/105A. As discussed in Section 5.13 the rock fill and rock armour material will be of large grain size and clean (low fines), thus limiting the introduction of sediment into the water column. Where sediment plumes arise, these are anticipated to be small, localised and short-lived as sediments will quickly disperse/drop-out in the shallow waters (<10m). It is also noted that the location of the works behind the existing groyne, as detailed in Drawing 2021-105A, will reduce the velocity of water flow at the site, further limiting the dispersal of sediments.

While otters do utilise the waters of the River Ness, they are documented as being relatively tolerant of increased sediment loading. Furthermore, they are highly mobile animals, and due to the availability of alternative habitat locally, are likely to be able to avoid localised affected areas if needed, without suffering adverse individual or population level effects. As such, the effects of increase sediment loading on otters and the Merkinch LNR are **localised**, **temporary**, and **negligible**, hence the impact on these receptors are **minor: non-significant** and **negligible: non-significant** respectively.

5.9.2.3 Release of Hazardous Substances

The accidental release of oil and other marine pollutants is an extremely unlikely event during construction provided the mitigation laid out in Section 5.13 is followed. However, should such an event occur, depending on the quantities accidentally released, there could be lethal and sub-lethal effects on otters, including both direct immediate impacts on their health, and indirect longer-term impacts to their lifecycle and behaviour:

- Direct effects include:
    - Contamination of their fur leading to a loss of water proofing, and displacing air in the fur, affecting the animal's thermoregulation and buoyancy. This can lead to death through hypothermia, and the inability to swim, or forage; and
    - Poisoning resulting in sickness or death, through the ingestion or inhalation of the contaminants. Ingestion occurs through preening and foraging in contaminated areas.
- Indirect effects include:
    - Displacement from foraging areas if species avoid the contaminated area;
    - A reduction in prey availability if prey species are affected by the contamination event; and
    - Long-term accumulation of contaminants such as poly aromatic hydrocarbons, through foraging on contaminated prey items, leading to illness, reduction in reproductive success, and increased mortality rates.

The magnitude of potential impacts arising from a release of contaminants would depend on the nature and quantity of material released into the environment. However, the adoption of the mitigation measures identified in Section 15.3, effctively removes the risk of a large scale

spill occurring. As such, it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact otters or the Merkinch LNR will occur; therefore, the potential effects on both receptors are assessed as **negligible, short term,** and **reversible,** and the resulting impacts are **minor: non-significant** and **negligible: non-significant** respectively**.**

5.9.2.4 Injury and Entrapment

The increased levels of human activity, plant movements and other factors as detailed above, in the vicinity of construction make it extremely unlikely that an otter would enter an area where it is at risk of being injured through a direct interaction with site equipment while construction works are ongoing. It is however possible that otters may enter the construction site during periods when construction works are not ongoing. In this event, otters may seek shelter in stored materials, or items of plant or equipment. This will result in an increased risk of injury or accidental mortality, if equipment or materials are moved while an otter is still in-situ. Furthermore, otters may become trapped in excavations or pipes, resulting in increased stress, and potentially injury through starvation and dehydration. Considering the lack of evidence of otter presence at Shore Street Quay, this **temporary** impact is assessed as having a magnitude of **negligible**, resulting in a **minor: non-significant** effect to the local otter population, and a **negligible: non-significant** impact on the Merkinch LNR.

5.9.2.5 Habitat Loss and Fragmentation

The construction of the revised flood wall will effectively prevent otters utilising Shore Street Quay. However, considering the lack of otter activity in the area, this is no considered to be a substantive deviation from baseline, hence the effect on all receptors is assessed as **no-change**.

5.9.3 Mitigation

No significant effects on otters or the Merkinch LNR have been identified, hence no specific mitigation is required. However, the following best measures will be implemented as a matter of best practice:

- All Site Operatives will be briefed on the ecology and field signs of otter through an Otter Toolbox Talk. Briefings will be clear and unambiguous ensuring that all works are stopped, and advice sought from a suitably experience ecologist where any concerns are identified;
- If otters' approach closer than 50m to ongoing works, either on land or within the marine environment, then works should cease until such time that the otter(s) has moved further than 50m away from works; and
- All machinery, material, or equipment stored on site will be subject to checks for otter prior to work commencing each day to ensure otters are not present.

5.10 Atlantic Salmon

5.10.1 Baseline

Atlantic salmon are widely distributed in Scotland's river systems, and are present across the temperate and polar regions of the northern hemisphere. The fish are anadromous (migrate from sea but spawn in freshwater), living in freshwater as juveniles prior to migrating to sea as post-smolts where they mature. Once sexual maturity is reached, they return to their native rivers to spawn (Godfrey et al., 2014). Migration of salmon to the wider River Ness catchment

area by sexually mature salmon will occur from the Moray Firth, and past the proposed development along the River Ness, as this is the only route from the wider North Sea. Similarly, all seaward post-smolt runs will occur via that route.

Monitoring of post-smolt runs in the Cromarty Firth determined that they occur from late April to late June, with a peak in May (Cromarty Firth Fisheries, 2008; Malcolm et al., 2010). Localised post-smolt run data for the Ness system could not be determined, although the close proximity of the Cromarty Firth make the likely migration times comparable.

Adult Atlantic salmon runs usually occur between November to December, but in larger river systems it may extend from October to late February (SNH, 2017a).

Atlantic salmon in the Ness system also acts as an essential host species during the early life cycle for the localised freshwater pearl mussels in River Moriston SAC. This is due to the fact that the pearl mussel larvae require to attach to salmon gills in order to develop (SNH, 2017b).

5.10.2 Assessment

Construction activities may result in a changes to water quality which could impact upon Atlantic salmon, specifically increased sediment loading, and possible spills of hazardous substances. The assessment of these impacts follows the methodology outlined in Section 5.5 to determine the potential effects resulting from the Shore Street Quay remedial works, as outlined in Section 2.

According to the criteria laid out in Table 5.5.1, Atlantic salmon and the River Moriston SAC are assigned the value of **International**.

5.10.2.1 Increased Sediment Loading

The rock placement to construct the rock armour bund has the potential to increase sediment loading in the water column through the release of fines. Further information is provided in Section 5.13: Water Quality.

Behavioural changes in salmon resulting from increased water column sediment loading are more likely than injury or mortality due to their ability to move away from the affected area (Wenger et al., 2017). Increased sediment loading can provoke an avoidance response, which in turn can lead to barrier effects for migrating species; preventing migrating fish passing through affected areas, thus blocking routes to and from the sea (Robertson, Scruton & Clarke, 2007; Stuart-Smith, Rhichardson & White, 2004). Multiple studies have highlighted that impacts on fish from increased sediment loading are dependent on the concentration of the sediment in the water column and exposure time, with avoidance responses unlikely, unless concentrations are relatively high (Wenger et al., 2017).

Studies in the Dutch Wadden Sea identified shifts in local abundance of salmonids associated with increased sediment loading, although these occurred when turbidity levels remained high for several years (Jonge, Essink & Boddeke, 1993). It has been shown that outward migrating smolt are particularly sensitive to increased sediment loading (Wenger, et al., 2017).

Rock placement will be conducted within the sheltered waters of the existing groyne, as detailed in Drawing 2021/105A. During migration periods, salmon are not anticipated to inhabit the sheltered waters of the existing groyne, but rather be found transiting through the main waters of River Ness. In addition, as discussed in Section 5.13 the rock fill and rock armour material will be of large grain size and clean (low fines), thus limiting the limit the introduction of sediment into the water column. Where sediment plumes arise, these are anticipated to be

small, localised and short-lived as sediments will quickly disperse/drop-out in the shallow waters (<10m). It is also noted that the location of the works behind the existing groyne will reduce the velocity of water flow at the site, further limiting the dispersal of sediments. It is therefore considered highly unlikely that areas of increase sediment loading will occlude the River Ness.

The mobile nature of salmon also means they can avoid sediment plumes if they are present in the area, and the fact that the plumes will not occlude the whole river, means that the migration route will not be blocked. This assessment therefore finds that increased sediment loading is unlikely to result in barrier effects to migrating salmon, and the River Moriston SAC are assessed as **negligible**, **short term**, and **reversible**. The resulting impacts on Atlantic salmon are therefore **minor: non-significant.**

5.10.2.2 Release of Hazardous Substances

The accidental release of hydrocarbons and other hazardous substances in the event of a loss of containment during the construction works may result in contamination of the marine environment, potentially affecting salmon (Wenger et al., 2017). Effects including physiological harm, behavioural disturbance, reduced fertility and mortality in fish have been reported after exposure to contaminants following a pollution event. The studies also identified that juveniles are more vulnerable to pollution events than adults, requiring lower dosages for effects to occur (Costa et al., 2011; Kimburgh & Waldman, 2009; Wenger et al., 2017).

Loss of chemicals and fuels may arise from onshore equipment and plant utilised during the construction phase. The assessment assumes that all equipment is well maintained, operated by suitably trained personnel and with standard pollution prevention procedures outlined in Section 5.13 in place.

The magnitude of potential impacts on salmon arising from a release of contaminants depends on the nature and quantity of material released into the environment. There is the potential for a large spill of hazardous material to have long term major impacts, leading to changes to the health and behaviour of salmon on a regional scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Section 5.13, significantly reduces or removes the risk of such an event occurring. As such it is considered extremely unlikely that release of hazardous material will occur at a scale with the potential to negatively impact Atlantic salmon. Therefore, the potential effects on Atlantic Salmon and the River Moriston SAC are assessed as **negligible, short term,** and **reversible**, and resulting impacts will be **negligible: non-significant**.

5.10.3 Mitigation

No significant effects on Atlantic salmon were identified as a result of the proposed Shore Street Quay remedial works. As such, no specific mitigation measures are required. The reason for the lack of significant impacts is in part due to the embedded mitigation, provided by the design and location of the development. Potential impacts are further reduced through the implementation of secondary mitigation identified in Section 5.13, and adhering to standard industry good practice to minimise deterioration of water quality.

5.11 Benthic Ecology

In this section the potential effects on benthic ecology are discussed and assessed. Mitigation measures required to minimise impacts are identified and residual effects are assessed where required.

5.11.1 Baseline

5.11.1.1 Environment

The proposed development site lies on east bank of the River Ness' tidal section, within an area sheltered from the wider River Ness by an existing groyne, as detailed in Drawing 2021/105A. The River Ness is approximately 10km in length including its tidal reaches, and is of a wide nature, with shallow, fast flowing waters which enters the sea in the Beauly Firth (Ness & Beauly Fisheries Trust, 2013). The waters within the sheltered area of the groyne are considered to be a backwater during most conditions, being only affected by tidal water movement and high river flow levels when the groyne is overtopped (EnviroCentre, 2001). No specific data relating to the benthic ecology of the proposed development site could be identified.

As detailed in Section 5.6.3, Table 5.6.1, Moray Firth SAC, Merkinch LNR, Beauly Firth SSSI and Inner Moray Firth Ramsar site are designated in part for benthic qualifying features, including subtidal sandbanks, saltmarsh, intertidal mudflats and sandflats. Due to highly localised nature of the potential benthic impacts and the distance between the development and the benthic qualifying features, no ecological connectivity exists, and these sites are not further considered.

5.11.2 Assessment

The assessment of potential impacts on benthic ecology resulting from the Shore Street Quay remedial works follows the methodology outlined in Section 5.5.

Potential effects on benthic ecology are anticipated to be highly localised considering the scale and nature of the proposed development. Therefore, only the lower tidal reaches of the River Ness, in the immediate vicinity of the development footprint is considered as a receptor. This area is all within the waters of the Port of Inverness, and has been extensively modified and dredged in order to maintain the required depths to accommodate the Port's vessel traffic. The regular dredging operations will have substantially degraded the benthic communities, hence an ecological value of **negligible** is assigned.

5.11.2.1 Loss of Habitat

The project description in Section 2 outlines the requirement to construct a rock armour bund in order to stabilise the existing Shore Street Quay face. As a result of the rock armour bund construction, benthic habitat will be permanently lost within the footprint of the bund. The total footprint of the bund is approximately 1,900m^2. Within this area, sessile and less mobile organisms will be destroyed, and habitat and potential foraging areas for mobile benthic species in close proximity to the proposed development will be lost.

While there will be loss of benthic habitat and organisms within the development footprint, it is not expected that this will have population level effects on the wider River Ness benthic communities. This is because the habitat loss is small in relation to the overall area of River Ness, and alternative comparable habitats are widely available locally. The nature of the works will also not result in habitat fragmentation, as the development follows the line of the shoreline. The highly localised nature of the habitat loss results in this impact being assessed

as **low** and **permanent**. The resulting impact is therefore considered to be **negligible: non-significant**.

5.11.2.2 Increased Sediment Loading

The rock armour bund construction has the potential to increase sediment loading, through the release of fines into the marine environment. Further information is provided in Section 5.13: Water Quality. Large volumes of remobilised sediments staying suspended for long periods can result in decreased primary production in the benthic environment, due to sediment plumes decreasing light penetration into the water column (Kenneth *et al*., 2002). However, small increases in turbidity over short periods can positively affect primary production through increased fluxes of nutrient, increasing availability to phytoplankton (Lohrenz *et al.,* 2004).

As discussed in Section 5.13, sediment plumes arising from the works are anticipated to be localised, hence redepositing of sediments will only occur close to the working area. Furthermore, the degree of sediment introduction into the water column is expected to be low, thus only low rates of deposition are expected. Therefore, the potential impacts resulting from sediment loading on benthic ecology are assessed as **negligible, short term** and **reversible**, constituting to a **negligible: non-significant** effect.

5.11.2.3 Release of Hazardous Substances

The accidental release of hydrocarbons and other hazardous substances in the event of a loss of containment during the construction works may result in contamination of the marine environment, with the potential to disrupt benthic ecosystems (Daly *et al*., 2016). Analysis of oil spills on benthic communities by Lee *et al* (2013), showed contamination can alter the ecological function of macrofaunal communities.

There is the potential for the release of hazardous substances to have direct effects on benthic features within the vicinity of the development. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Section 5.13 significantly reduces or removes the risk of such an event occurring. As such, it is considered extremely unlikely that the release of a hazardous material would be of a scale to negatively impact the benthic communities of River Ness. Therefore, the potential impact is assessed as **negligible, short term,** and **reversible**, constituting a **negligible: non-significant** effect.

5.11.3 Mitigation

No significant impacts on benthic ecology have been identified as a result of the proposed Shore Street Quay remedial works. As such, no specific mitigation measures are required to reduce impacts on benthic ecological receptors.

5.12 Coastal Processes and Flooding

5.12.1 Policy and Guidance

There is one general marine policy on coastal processes and flooding:

- **GEN 8: Coastal process and flooding:** *Developments and activities in the marine environment should be resilient to coastal change and flooding, and not have unacceptable adverse impact on coastal processes or contribute to coastal flooding.*

5.12.2 Baseline

River Ness Flood Alleviation Scheme flood wall is located immediately to the east of the Shore Street Quay, such that in the event of a 1 in 200 year coastal flood, the quay area would flood. The quay is of a height that a 1 in 200 year river flood would not cause flooding.

5.12.3 Assessment

5.12.3.1 Coastal Processes

The location of the planned works behind the groyne which directs the river flow away from the quay wall, means that the rock bund will make very little difference to local water movements. As such, **no changes** to coastal processes are expected.

5.12.3.2 Flooding

A Flood Risk Assessment has been completed (RPS, 2019), it considers both the installation of the rock bund and the movement of the flood wall. Flood risk in the vicinity of the proposed works is associated with coastal flood, as the I in 200 year river flood levels (3.23m OD) are below the existing quay level (3.47m OD). The 1 in 200 year coastal flood level is 3.84m OD, higher than the existing quay level.

The existing flood wall is 4.3m OD, the proposed flood wall would be constructed to the same height to provide appropriate protection. It is noted that moving the flood wall from its existing location to the quay side will reduce the extent of the coastal floodplain. The effect will have no discernible impact on coastal flood levels (RPS, 2019).

The Flood Risk Assessment concludes that the proposed works will reduce the extent of the coastal floodplain and will not result in additional flood risk elsewhere in the fluvial or coastal floodplains (RPS, 2019). Hence effects are **negligible – non-significant**.

5.13 Water Quality

To ensure that all the possible impacts on water quality are understood and hence appropriately mitigated, this section systematically reviews the aspects of the project with the potential to adversely affect water quality. Potential impacts are identified, their significance, assessed, and where necessary, appropriate mitigation measures identified.

5.13.1 Policy and Guidance

Relevant Scottish Government policy on water quality includes:

- **GEN 10 Invasive Non-Native Species:** *Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made* (Scottish Government, 2015a);
- **GEN 12 Water Quality and Resource:** *Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply* (Scottish Government, 2015a);
- **PAN 79:** Water and Drainage (Scottish Government, 2006).

5.13.2 Assessment Methodology

Potential impacts upon the water quality resulting from the Shore Street Quay remedial works have been assessed utilising the methodology below.

5.13.2.1 Impact Magnitude

To determine the impacts associated with the construction of the development with regards to water quality, a risk-based approach that uses probability and impact magnitude to determine the significance of impact has been utilised. Table 5.13.1 provides levels of impact and examples of what would constitute these levels.

Table 5.13.1: Definitions of Magnitude of Impact

Magnitude of Impacted of Impact	Examples of Impact Magnitude
High	Material change in water quality. Characteristics may include: • Significant increase/decrease in diffuse pollution levels. • Ecological impact, increase/decrease in mortality figures.
Medium	Change in water quality. Characteristics may include: • Minor increase/decrease in diffuse pollution levels. • Measurable changes in water quality. • Minor harm to the ecosystem, increase/decrease in productivity.
Low	Small changes to the water quality. Characteristics may include: • Increase/decrease in localised pollution levels. • Short term reversible impacts on water quality. • No impacts on the ecosystem.

5.13.2.2 Likelihood of Impact Occurring

The likelihood of an impact occurring is also assessed. A qualitative approach is taken to predict the likelihood of an impact, based on the probability of an impact occurring and professional judgement, rather than data frequency. The likelihood categories are displayed in Table 5.13.2 with their definitions.

Table 5.13.2: Likelihood Categories and their Definitions

Likelihood	Definition
Certain/near-Certain	> 1 in 1 year
Probable	< 1 in 1 year but > 1 in 10 years
Unlikely	< 1 in 10 years but > 1 in 100 years
Extremely Unlikely	< 1 in 100 years

5.13.2.3 Significance of Effect

The significance of an effect is derived by considering the magnitude of impact and probability of the impact occurring. Determination of whether the identified effect is categorised as significant or non-significant the matrix set out in Table 5.13.3 is utilised.

Table 5.13.3: Significance of Effects Matrix

Magnitude of Impact	Probability			
	Certain	Probable	Unlikely	Extremely Unlikely
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible

Key

	Significant Effect
	Non-Significant Effect

5.13.3 Baseline

5.13.3.1 Water Quality

The Shore Street Quay development lies within the south of the Beauly Firth water quality area (Identifier 200441) according to the River Basin Management Plan (RBMP), at the mouth of River Ness, as detailed in Drawing 59.05 The Beauly Firth covers an area of 26 km^2 (SEPA, 2017). To the west of the River Ness, the Beauly Firth transitions into the Moray Firth (Identifier 200440) and covers an area of 61.7 km^2 (SEPA, 2017); as such both have been considered in this assessment. Both water bodies are classified with an overall status of Good with Medium confidence with overall ecological status of Good and overall chemical status of Pass (SEPA, 2017).

5.13.3.2 Marine Non-Native Species

The marine non-native species (MNNS) acorn barnacle (*Semibalanus balanoides*) and Japanese skeleton shrimp (*Caprella mutica)* were identified within the Moray Firth near Fortrose. No MNNS was identified in the Beauly Firth (NBN atlas, 2019). While no MNNS were identified within the Beauly Firth, the transitional nature between the water bodies means it is likely that the acorn barnacle and Japanese skeleton shrimp are also present within the Beauly Firth.

5.13.3.3 Bathing Waters

The closest bathing water to the development is Rosemarkie, located north east of the development within the Moray Firth, approximately 16km by sea. A further two bathing waters areas called Nairn Central, and Nairn East are located approximately 29km and 30km from the proposed works by sea respectively. Given the scale and nature of the project, impacts on water quality are anticipated to be localised, hence the bathing waters are not further considered due to their distance from the development.

5.13.3.4 Shellfish Waters

No shellfish protected areas are found within the vicinity of Shore Street Quay. The closest is located in the Cromarty Firth (Identifier UKS7992317), 30km by sea north of the development site. Due to the distance from the site, shellfish waters are not considered further.

5.13.3.5 Water Dependent Designated Sites

As detailed in Section 5.6.3, Table 5.6.1, multiple water dependent designated sited are located in the vicinity of the proposed development.

5.13.4 Impact Assessment

5.13.4.1 Increased Sediment Loading from Rock Armour Bund Construction

The placement of rock and rockfill material to construct the rock armour bund will give rise to a **probable** risk of increased sediment loading in the water column, by introducing fines and disturbing the seabed. However, two of the three rock grades used will range between 0.04t and 0.6t in weight and will be low in fines, as detailed in Section 2, limiting the introduction of sediment to the water environment. Similarly, the finer rockfill we be clean with minimal fines, minimising sediment loading. The disturbance of seabed is also anticipated to be minimal, as the material will be placed and not dropped. Where sediment plumes arise, these are anticipated to be small, localised and short-lived as sediments will quickly drop-out of suspension in the shallow waters (<10m) due to the large grain sizes. Furthermore, the existing groyne (Drawing 2021/105A) will act as a barrier for any sediment plumes and limit water flow, minimising the dispersal of sediments into the wider water environment. Therefore, the

magnitude of impacts associated with material placement is assessed as **low**, giving rise to a **localised**, **short-term** and **reversible minor: non-significant** effect on water quality.

5.13.4.2 Potential Loss of Containment

A number of potential pollution sources will be present on the construction site, including:

- Fuel oil/diesel associated with construction plant and vehicles;
- Hydraulic fluids and oils associated with construction plant; and
- Cementitious materials including concrete, and concrete wash water.

Materials will be appropriately stored and handled in line with standard construction industry practice. However, if a loss of containment were to happen, then there could be harm caused to the environment. As such the risk of pollution impacts on water quality are assessed in Table 5.13.4. The assessment utilises the source-pathway-receptor model, with Beauly Firth and Moray Firth being the receptors considered in this section. Effects on ecological receptors are considered within the specific ecological assessments.

Table 5.13.4: Loss if Containment Impact Assessment

Source	Scenario	Pathway	Probability	Impact Magnitude	Impact Significance
Fuel Storage Bowser (20m^3 of Diesel)	Loss of full container	Spillage to ground with potential to reach water.	**Unlikely** Oil will be stored in line with the CAR GBR's hence loss of all 20m^3 is unlikely.	**Medium** Medium term reversible impacts on water quality.	**Minor: Non-significant**
Refuelling Activities	Loss of full container during refuelling (<20l).	Spillage to ground with potential to reach water.	**Probable** Multiple refuelling activities carried out, increasing probability of human error.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-significant**
Vehicles or Plant	Accidental damage to fuel tank, loss of contents (<100l).	Spillage to ground with potential to reach water.	**Unlikely** Appropriately trained and certified drivers / operators. Banksmen in place when reversing or carry out manoeuvres.	**Low** Short term localised reversible impacts on water quality.	**Negligible: Non-significant**
Plant – Hydraulic Fluids	Loss of hydraulic fluid, due to pipe burst.	Spillage to ground with potential to reach water.	**Probable** Hydraulic pipes fail from time to time.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-significant**
COSHH Store: Hydraulic Fluids, Maintenance Oils, Chemicals	Loss of containment during handling etc. Of hydraulic fluids, maintenance oils, chemicals, will all be small volumes 5l to 200l.	Spillage to ground with potential to reach water.	**Unlikely** Appropriate storage and usage of materials in line with COSHH assessments.	**Low** Short term localised reversible impacts on water quality.	**Negligible: Non-significant**
Concrete	Loss of in-situ concrete pour into the water environment.	Spillage directly to the water environment.	**Unlikely** All in-situ concrete pours will utilise appropriate shuttering and marine concrete.	**Low** Short term localised reversible impacts on water quality.	**Negligible: Non-significant**
Concrete Wash Water	Loss of concrete wash water into the water environment.	Spillage to ground with potential to reach water.	**Unlikely** Only chutes and tools will be washed on site. Dedicated sealed washout areas will be provided.	**Low** Short term localised reversible impacts on water quality.	**Negligible: Non-significant**

5.13.4.3 Introduction of Marine Non-Native Marine Species

The introduction of MNNS has the potential to result in severe ecological impacts which, in turn, can result in major costs due to the difficulty in trying to eradicate a species once it has been introduced. The only vector posing a risk of introducing MNNS is associated with the use of construction material and machinery. However, all building material and machinery will be clean, free of fines and of a terrestrial origin, posing no threat of MNNS introduction, hence is assessed as **no change**.

5.13.4.4 Surface Water Drainage

There is currently no surface water drainage system at Shore Street Quay, instead the quay is graded so that surface water flows over the quayside and directly into the River Ness. The installation of the new flood wall along the quay edge means that this solution is no longer viable, hence a surface water drainage system will be installed, which will discharge into the River Ness.

The drainage system will require a simple licence under the Water (Controlled Activities) Scotland Regulations 2011, as amended from SEPA. It will include a full retention class 1 oil interceptor. The interceptor will trap immiscible liquids (including oils) and fines, preventing them from being transferred from the quayside into the River Ness via the drainage system. Furthermore, a shut-off valve will be installed downstream of the interceptor. This will allow the drainage system to be isolated in the event of a spill, effectively containing any contaminants which may enter the drainage system, so that they can then be pumped out and sent for appropriate treatment.

The provision of a surface water drainage system with a class 1 interceptor and cut-off valve is a marked improvement on the current conditions. This will therefore result in a **probable** increase in water quality of **medium** magnitude, constituting a **moderate: significant** positive effect.

5.13.5 Mitigation Measures

No significant effects on water quality were identified as a result of the proposed Shore Street Quay remedial works. Therefore, no specific mitigation measures are required to reduce impacts on the water environment. However, the tertiary mitigation measures for the avoidance of water quality impacts assumed to be implemented by this assessment are detailed below:

- All rock used to construct the rock armour bund will be clean and free of fines.
- Rock will be placed to form the bund, and not dropped, to minimise disturbance of the seabed.
- The fuel bowser will be under strict management controls to prevent pollution incidents, and will comply with the requirements of the relevant GBR's of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) including:
    - It will be kept secure and locked when not in use to protect it from unauthorised use;
    - It will be double skinned;
    - It will be located in an appropriate area away from watercourses and drains; and
    - It will be protected from vehicle damage.

- Refuelling will be carried out in designated areas by trained operatives, following site refuelling procedures. The refuelling procedure will take into account best practice laid out in PPG6 (Environment Agency et al., 2012).
- All plant will be appropriately maintained and inspected for leaks prior to use.
- Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction.
- All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations 2002. All COSHH assessments will include a section on the environment to highlight any precaution or mitigation requirements.
- Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability.
- Appropriate spill plans aligned to the pollution control hierarchy and spill kits will be in place.
    - Construction operatives will be trained in the plans and in the use of spill kits to ensure that loss of containment incidents can be dealt with promptly to prevent or minimise pollution.
- Shuttering will be utilised for in-situ concrete pours.
    - Prior to any pour being undertaken, the shuttering will be checked to ensure it is sealed and in good working order.
- Concrete works underwater will only utilise appropriately formulated marine concrete.
- Cement washings will be carried out in a designated area.
    - Washing arisings will be collected for onsite settlement;
    - The liquids will be tankered off site for appropriate onward treatment, and solids will be disposed of as solid waste;
    - Only chutes and tools will be washed out onsite; and
    - Concrete trucks will not be permitted to washout their mixers on site.

5.14 Landscape and Visual

There are no National Scenic Areas, or other areas designated for their landscape value in the vicinity of the proposed works. As such the landscape value is low. The Shore Street Quay Remedial works will be visible from various residential properties including the River View Apartments to the south, and Anderson Street to the west, on the opposite side of the River Ness. Longer views are limited as the low height of the structure will be screened by the closest buildings.

The majority of rock armour bund is below MLWS, only the very top of the bund will be out of the water at low tide, and it will be entirely submerged during most tidal states. The fibre concrete pile facing will be visible primarily to receptors on the opposite side of the river. The revised flood wall being the highest part of the development will be visible from most local receptors, however this is not a feature that will draw the eye. In the context of the existing industrial nature of Shore Street Quay and its surroundings, these structures will not result in any noticeable landscape or visual impact. Therefore, landscape and visual effects resulting from the proposed works are assessed as **no-change**.

5.15 Marine Navigation

5.15.1 Policy and Guidance

The Scottish Nation Marine Plan has a section on Transport the following policies are relevant to proposed Shore Street Quay Remedial Works (Scottish Government, 2015b):

- **TRANSPORT 1:** *Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UN Convention on the Law of the Sea (UNCLOS). The following factors will be taken into account when reaching decisions regarding development and use:*
    - *The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports.*
    - *Where interference is likely, whether reasonable alternatives can be identified.*
    - *Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the International Maritime Organization can be achieved at no significant cost to the shipping or ports sector.*
- **TRANSPORT 4:** *Maintenance, repair and sustainable development of port and harbour facilities in support of other sectors should be supported in marine planning and decision making.*

5.15.2 Baseline

As detailed in Section 2: Project Description, the Shore Street Quay is in a state of disrepair and has been out of use a berth since 1998. The existing pile face is significantly corroded and being undermined. If the deterioration of the structure continues, the pile face may fail, resulting in a collapse of the quay into the River Ness. While the Shore Street Quay is out of use, the adjacent Central and South Citadel Quays are still utilised by the Port of Inverness, the latter notably as Inverness' primary bulk fuel delivery quay. If the Shore Street Quay were to collapse, the resulting debris are likely to obstruct access to these adjacent berths, with major implications for the Port of Inverness' operations, and the wider bulk fuel supply to Inverness.

Located at the southern extent of the navigable reaches of the River Ness, vessel traffic is extremely limited in the immediate vicinity of Shore Street Quay. No routine traffic passes the location, with only the commercial vessels berthing at Central or South Citadel Quays under the guidance of the Harbour Pilots likely to be present in the area. Recreational vessels are not expected to be present.

5.15.3 Assessment

The construction of the rock armour bund detailed in Section 2: Project Description will mean that Shore Street Quay cannot function as a berth for marine vessels. However, considering that the berth has been out of commission since 1998, this is not considered to be change from baseline, and hence is assessed as **no-change**.

The proposed remedial works will reinforce and stabilise the existing Shore Street Quay structure, preventing a future collapse. This will avoid the significative negative impacts on the Port of Inverness's operations and Inverness's bulk fuel supply, that would result if Shore Street

Quay were to fail. This is a **major**, positive effect on two receptors of **medium** sensitivity; hence, the impact is assessed a **moderate, significant**, and positive.

The construction of the rock bund will present a hazard to marine traffic, since the water depth will be reduced to below the charted depths. However, considering the lack of vessel traffic expected to be present, and the fact that all vessels operating in the area will be under direction of the Port of Inverness Harbour Master, or their deputies, it is considered extremely unlikely that this will adversely affect the safety of water users. This is assessed as a **negligible** effect on a **medium** sensitivity receptor, constituting a **negligible, non-significant** effect.

5.15.4 Mitigation

No adverse significant effects on marine navigation were identified, hence no specific secondary mitigation is required. However, in line with industry best practice the following measures will be implemented to further reduce the risk to water users in the area:

- In advance of the works commencing, a Notice to Mariners will be published by the Port of Inverness to inform water users of the proposed construction activities;
- Appropriate navigational lights and marks will be provided to demarcate the works; and
- On completion of the works, as built survey data will be provided to the UK Hydrographic Office to facilitate chart updates.

6 Conclusions

The Shore Street Quay sheet piles are corroded and structurally inadequate. Prompt action is required to ensure that the quay does not collapse, and to avoid potential impacts on adjacent port facilities. There is no intent to utilise the Shore Street Quay as a berth in the future, as such a rock armour bund and fibre concrete pile facing solution have been developed to stabilise the quay.

Moving the section of the River Ness Flood Alleviation Scheme flood wall which currently runs to the east of the quay to the quay edge on the west side, will allow the area to be used for activities which may be sensitive to flooding. A surface water drainage system including an oil and silt interceptor have been designed for the area, this will provide enhance water pollution prevention for the area.

A Flood Risk Assessment has been completed to ensure that the proposed changes to the flood wall are acceptable and that the rock armour bund will not affect flood risk (RPS, 2019).

An assessment of the environmental effects associated with the construction works, have identified that there are no negative significant effects. Where appropriate mitigation has been identified to minimise negative effects as far as practicable, mitigation is incorporated into the Schedule of Mitigation provided in Appendix 1.

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Appendix 1: Schedule of Mitigation

Port of Inverness
Shore Street Quay Remedial Works
Schedule of Mitigation

Date:13/08/2019

Topic	Stage	Aspect	Mitigation/Enhancement	Guidance	Source
In-Air Acoustics	Construction	Construction Noise	Site working hours will be restricted to 07:00 to 19:00 Monday-Friday, 07:00 to 13:00 on Saturdays, with no working on Sundays. Haulage vehicles will not arrive at or leave the site outwith these times.	BS EN 5228- 1:3009 + A1 2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	Section 5.1.5
			All vehicles and mechanical plant will be fitted with effective exhaust silencers and 'smart' broadband reversing alarms and be subject to programmed maintenance.	BS EN 5228- 1:3009 + A1 2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	
			Inherently quiet plant will be selected where appropriate – and all ancillary equipment such as generators will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use.	BS EN 5228- 1:3009 + A1 2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	
			Machines will be shut down between work periods or throttled down to a minimum.	BS EN 5228- 1:3009 + A1 2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	
			Regular maintenance of all equipment used on site will be conducted, including maintenance related to noise emissions.	BS EN 5228- 1:3009 + A1 2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	
			All material movements will be performed carefully, ensuring minimal drop heights.	BS EN 5228- 1:3009 + A1 2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites	
Air Quality	Construction	Dust from material storage	Rock material will be clean and low in fines.	PPG 6: Working at Construction and Demolition Sites	Section 5.3.5

Air Quality	Construction	Dust from material storage.	Material stored on site will be minimised where practicable, by utilising a just in time delivery system.	Guidance on the Assessment of Dust from Demolition and Construction	Section 5.3.5
		Dust trackout from HGV movements	HGVs will access site via the A82, and Harbour route.	Guidance on the Assessment of Dust from Demolition and Construction	Section 5.3.5
			All HGV's delivering rock material to site will be covered.	Guidance on the Assessment of Dust from Demolition and Construction	Section 5.3.5
			Good housekeeping to be employed across the site.	PPG 6: Working at Construction and Demolition Sites	Section 5.3.5
			Road sweeper will be employed as required to prevent the accumulation of dust through the site, and if needed onto the public road.	Guidance on the Assessment of Dust from Demolition and Construction	Section 5.3.5
Archaeology and Cultural Heritage	Construction	Archaeological finds.	A protocol for archaeological discoveries will be implemented.	Offshore Renewables Protocol for Archaeological Discoveries	Section 5.4.4
Otters	Construction	Disturbance or accidental injury to otter from construction works	All Site Operatives will be briefed on the ecology and field signs of otter through an Otter Toolbox Talk. Briefings will be clear and unambiguous ensuring that all works are stopped, and advice sought from a suitably experience ecologist where any concerns are identified		Section 5.9.3
			If otters' approach closer than 50m to ongoing works, either on land or within the marine environment, then works should cease until such time that the otter(s) has moved further than 50m away from works		
Otters	Construction	Disturbance, injury or entrapment of otters from machinery and	All machinery, material, or equipment stored on site will be subject to checks for otter prior to work commencing each day to ensure otters are not present		Section 5.9.3

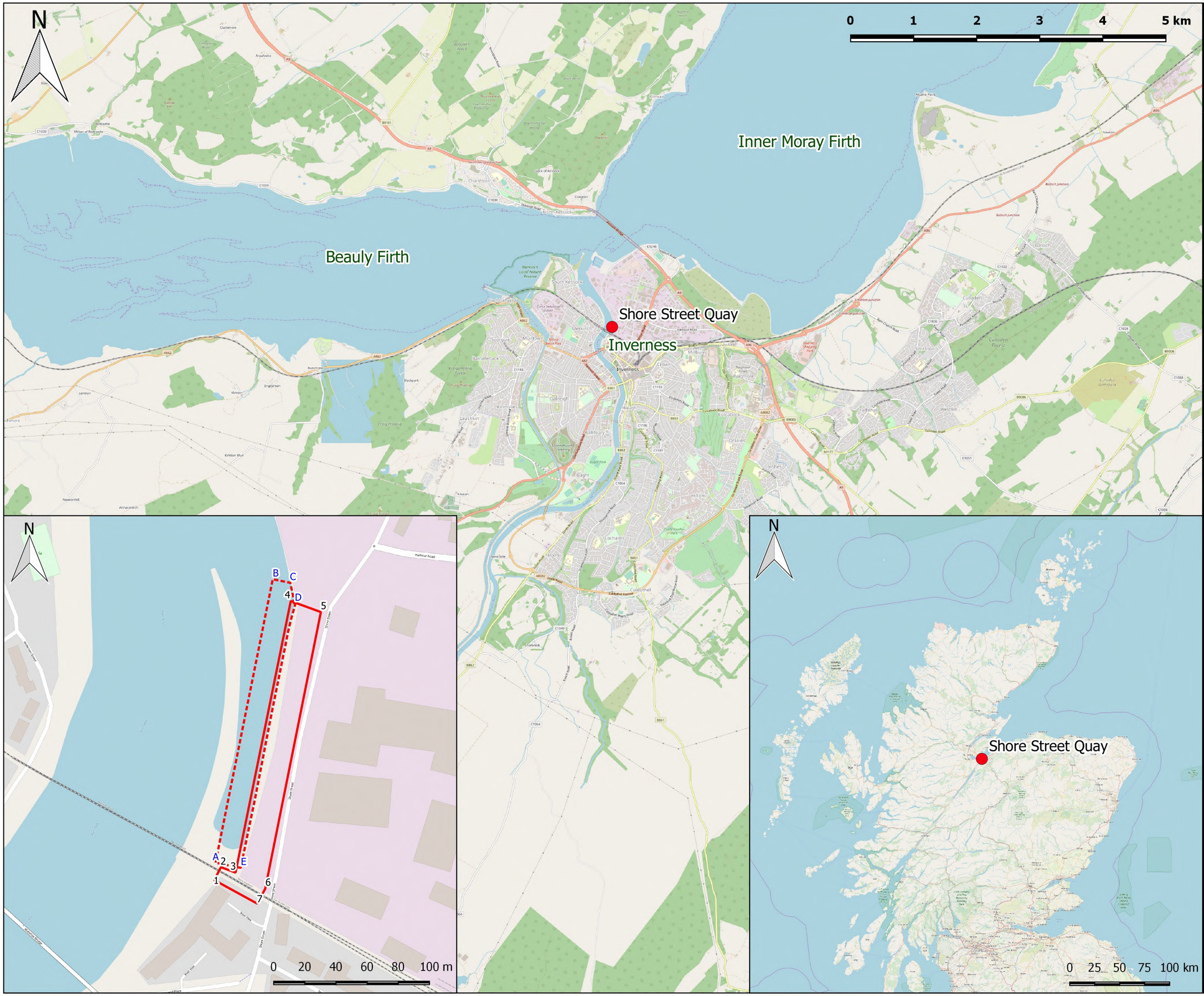
		material stored on site.			
Water Quality	Construction	Increased sediment loading from rock placement during construction	All rock used to construct the rock armour bund will be clean and free of fines.	GPP 5: Works and Maintenance In or Near Water	Section 5.13.5
			Rock will be placed to form the bund, and not dropped, to minimise disturbance of the seabed.	GPP 5: Works and Maintenance In or Near Water	
Water Quality	Construction	Loss of containment leading to pollution	The fuel bowser will be under strict management controls to prevent pollution incidents.	GPP 5: Works and Maintenance In or Near Water	Section 5.13.5
			The fuel bowser will comply with the relevant GBR's of the Water Environment (Controlled Activities) (Scotland) Regulations 2011.	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide	
			The fuel bowser will be kept secure and locked when not in use to protect it from unauthorised use.	GPP 5: Works and Maintenance In or Near Water	
			The fuel bowser will be double skinned.	GPP 5: Works and Maintenance In or Near Water	
			The fuel bowser will be located in an appropriate area away from watercourses, drains and potential vehicle damage.	GPP 5: Works and Maintenance In or Near Water	

Water Quality	Construction	Loss of containment leading to pollution .	Refuelling will be carried out in designated areas by trained operatives, following site refuelling procedures. The refuelling procedure will take into account best practice laid out in PPG6.	PPG 6: Working at Construction and Demolition Sites	Section 5.13.5
			All plant will be appropriately maintained and inspected for leaks prior to use.	PPG 6: Working at Construction and Demolition Sites	
			Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction.		
			All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations 2002.	Control of Substances Hazardous to Health (COSHH) Regulations 2002	
			All COSHH assessments will include a section on the environment to highlight any precaution or mitigation requirements.	Control of Substances Hazardous to Health (COSHH) Regulations 2002	
			Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability.	PPG 6: Working at Construction and Demolition Sites	
			Appropriate spill plans aligned to the pollution control hierarchy and spill kits will be in place.	GPP 21: Pollution Incident Planning	
			Construction operatives will be trained in the plans and in the use of spill kits .	PPG 22: Incident Response – Dealing with Spills	
Water Quality	Construction	Concrete works	Shuttering will be utilised for in-situ concrete pours.	PPG 6: Working at Construction and Demolition Sites	Section 5.13.5
			Concrete works underwater will only utilise appropriate marine concrete.	GPP 5: Works and Maintenance In or Near Water	

Water Quality	Construction	Cement washings	Cement washings will be carried out in a designated area.	PPG 6: Working at Construction and Demolition Sites	Section 5.13.5
			Cement washing arisings will be collected for onsite settlement.	PPG 6: Working at Construction and Demolition Sites	
			The cement wash will be tankered off site for appropriate onward treatment, and solids will be disposed of as solid waste.	PPG 6: Working at Construction and Demolition Sites	
			A chutes and tools only washout policy will be implemented, and concrete trucks will not be permitted to washout their mixers on site.	PPG 6: Working at Construction and Demolition Sites	
Marine Navigation	Construction	Hazards to marine traffic from construction works	In advance of the works commencing, a Notice to Mariners will be published by the Port of Inverness to inform water users of the proposed construction activities.		Section 5.15.4
			Appropriate navigational lights and marks will be provided to demarcate the works.		
Marine Navigation	Operation	Reduced water depth from construction of rock bund.	On completion of the works, as built survey data will be provided to the UK Hydrographic Office to facilitate chart updates.		Section 5.15.4

Appendix 2: Drawings

Drawing Number	Title
59.01	Shore Street Quay Location Plan
2021/105	Proposed Layout
2021/106	Proposed Bund Cross Section
59.02	Noise and Dust Receptors
59.03	Cultural Heritage Sites
59.04	Designated Sites
59.05	Waterbody Classification



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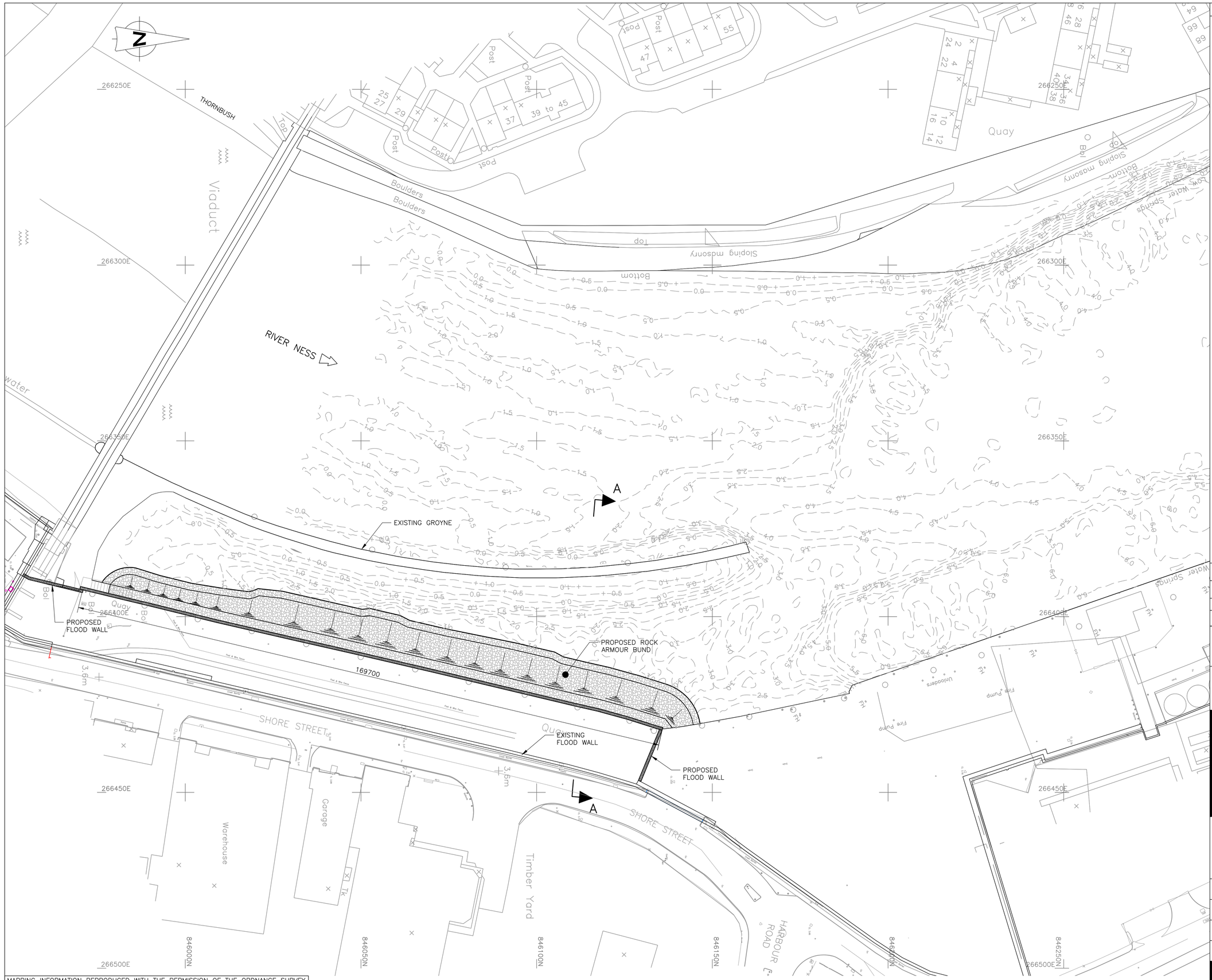
Drawing:59.01 Shore Street Quay - Location Plan

Projection: WGS84 Pseudo Mercator EPSG:3857

Page 1:	Rev No: 1	Drawing Date: 21/06/2019

Legend

- Development Location
- Planning Application RLB
- Marine Licence RLB



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GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM UNLESS NOTED OTHERWISE.
3. CHART DATUM IS 2.25m BELOW ORDNANCE DATUM.
4. EXISTING QUAY DETAILS FROM OLD HISTORICAL DRAWINGS: PILE LENGTHS UNKNOWN.
5. ROCK ARMOUR TO BE 0.4t TO 0.6t STONES, TWO LAYERS 1.2m THICK.
6. UNDER LAYER TO BE 0.04t TO 0.06t STONES, TWO LAYERS −0.5m THICK.
7. ROCK FILL TO BE CLEAN CRUSHED ROCK WITH NO FINES TO 6AP GRADING.
8. TIDE LEVELS:

HAT	5.3m	MLWN	1.7m
MHWS	4.6m	MLWS	0.8m
MHWN	3.5m	LAT	−0.1m

9. FOR SECTION REFER TO DRAWING NO. 2021/106

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D
B	17.06.19	NOTE 8 AMENDED	JHG	TR	TR
A	23.05.19	PROPOSED FLOOD WALL REVISED	JHG	TR	TR

AMENDMENTS

CLIENT

PORT OF INVERNESS

PROJECT

SHORE STREET QUAY REPAIRS

Wallace Stone
Consulting Civil Engineers

GLASGOW
0141 554 8233
glasgow@wallacestone.co.uk

DINGWALL
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HEBRIDES
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DRAWING TITLE

PROPOSED BUND LAYOUT

DRAWN	CHECKED	APPROVED
PM	TR	TR
DATE 20.03.19	DATE 22.03.19	DATE 22.03.19

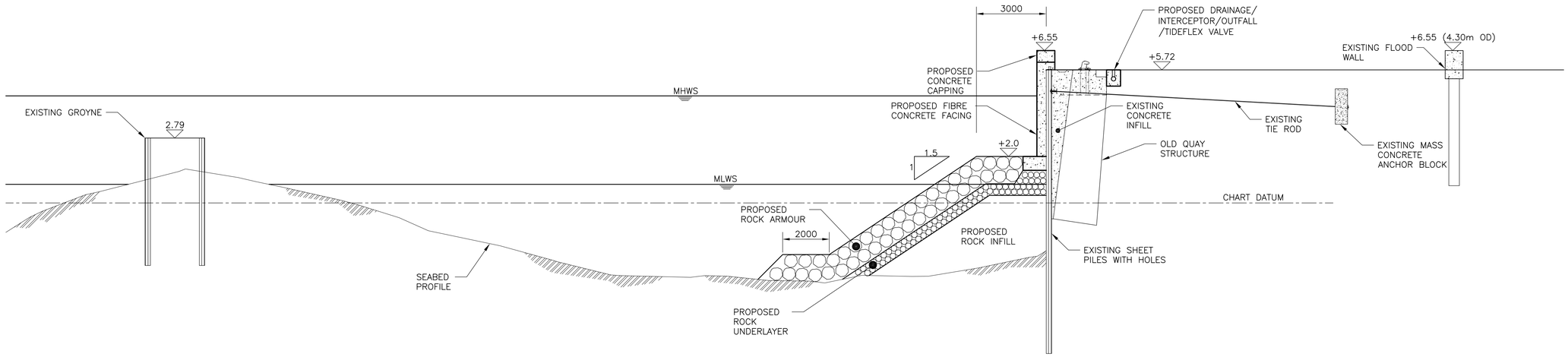
SCALE (A1) 1:500

STAGE PRELIMINARY

REVISION A B

PROJECT No. 2021

DRAWING No. 105



PROPOSED SECTION THROUGH ROCK ARMOUR BUND – SECTION A–A

SCALE 1:100

VIEW ON SHORE STREET QUAY – LOOKING UPSTREAM

GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM UNLESS NOTED OTHERWISE.
3. CHART DATUM IS 2.25m BELOW ORDNANCE DATUM.
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6. UNDER LAYER TO BE 0.04t TO 0.06t STONES, TWO LAYERS 0.5m THICK.
7. ROCK FILL TO BE CLEAN CRUSHED ROCK WITH NO FINES TO 6AP GRADING.
8. TIDE LEVELS:

HAT 5.3m	MLWN 1.7m
MHWS 4.6m	MLWS 0.8m
MHWN 3.5m	LAT −0.1m

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D

AMENDMENTS

CLIENT

PORT OF INVERNESS

PROJECT

SHORE STREET QUAY REPAIRS

Wallace Stone
Consulting Civil Engineers

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DINGWALL
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DRAWING TITLE

PROPOSED BUND
CROSS SECTION

DRAWN	CHECKED	APPROVED
PM	TR	TR
DATE 20.03.19	DATE 22.03.19	DATE 22.03.19

SCALE (A1)	STAGE
1:100	PRELIMINARY

REVISION

PROJECT No.	DRAWING No.
2021	106

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Drawing: 59.02 Shore Street Quay - Noise and Air Quality Receptors

Projection: WGS84 Pseudo Mercator EPSG:3857

Page 1:	Rev No: 1	Drawing Date: 07/05/2019

Legend

- Development Location

Buffers

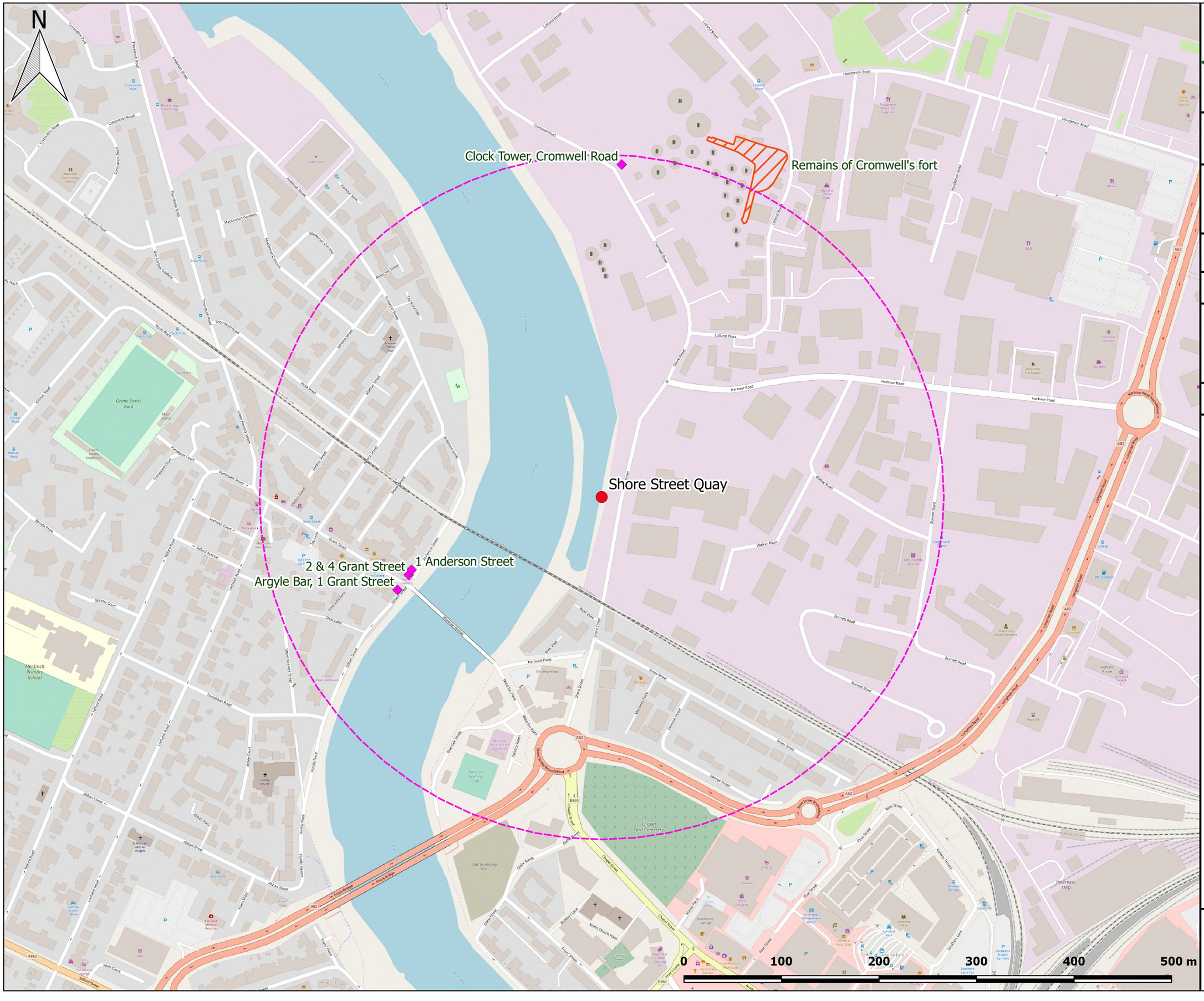
- 50m
- 100m
- 150m

Noise Monitoring Points

- Noise Monitoring Points

Air Quality Receptors

- Residential: Anderson Street
- Residential: River View Apartments
- Non-Residential: Industrial Area



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Drawing:59.03 Shore Street Quay - Cultural Heritage Sites

Projection: WGS84 Pseudo Mercator EPSG:3857

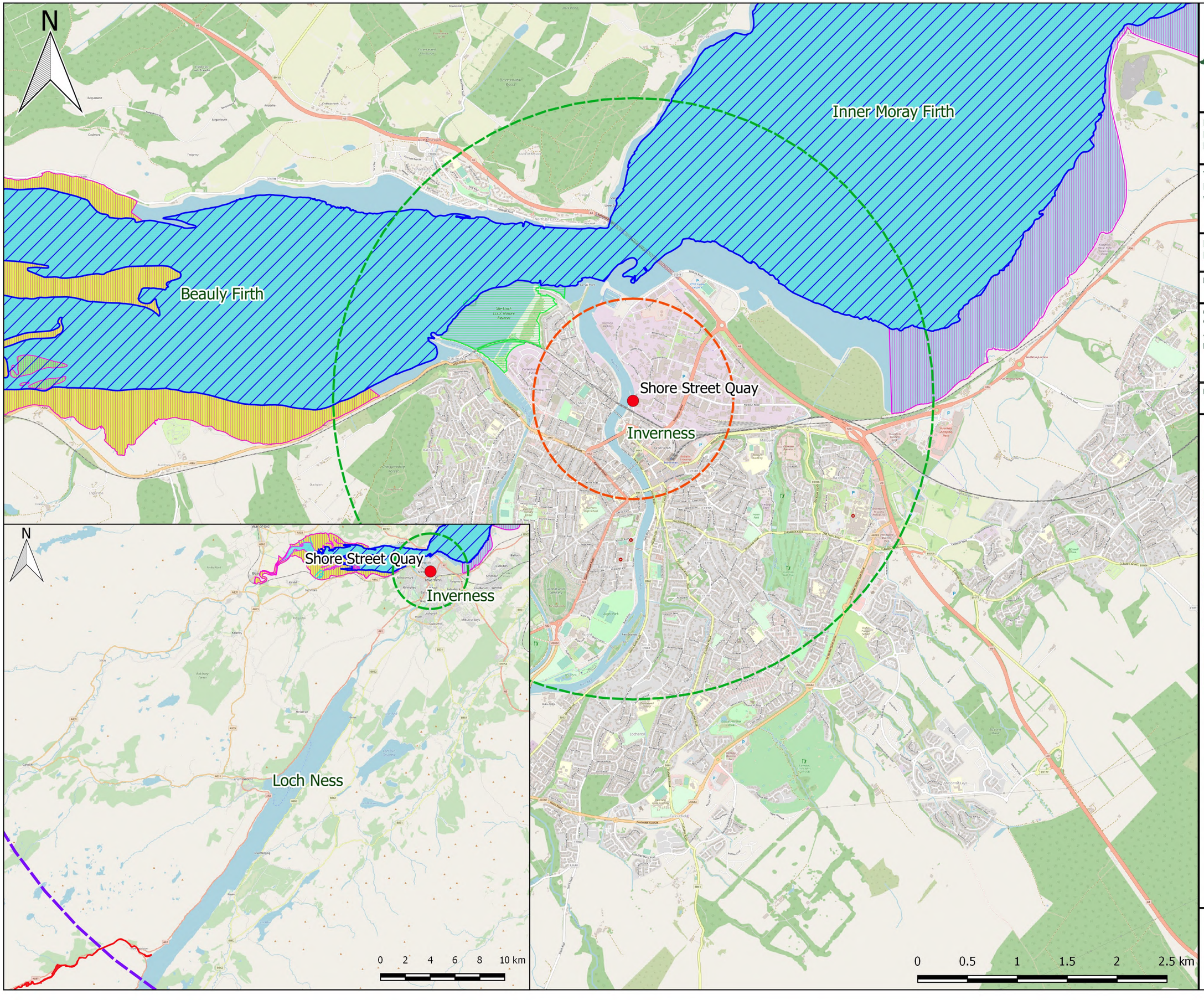
Page 1:	Rev No: 1	Drawing Date: 02/05/2019

Legend

- Development Location
- 350m Buffer

Cultural Heritage Sites

- Scheduled Monuments
- Listed Buildings



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Drawing:59.04 Shore Street Quay - Designated Sites

Projection: WGS84 Pseudo Mercator EPSG:3857

Page 1:	Rev No: 1	Drawing Date: 01/05/2019

Legend

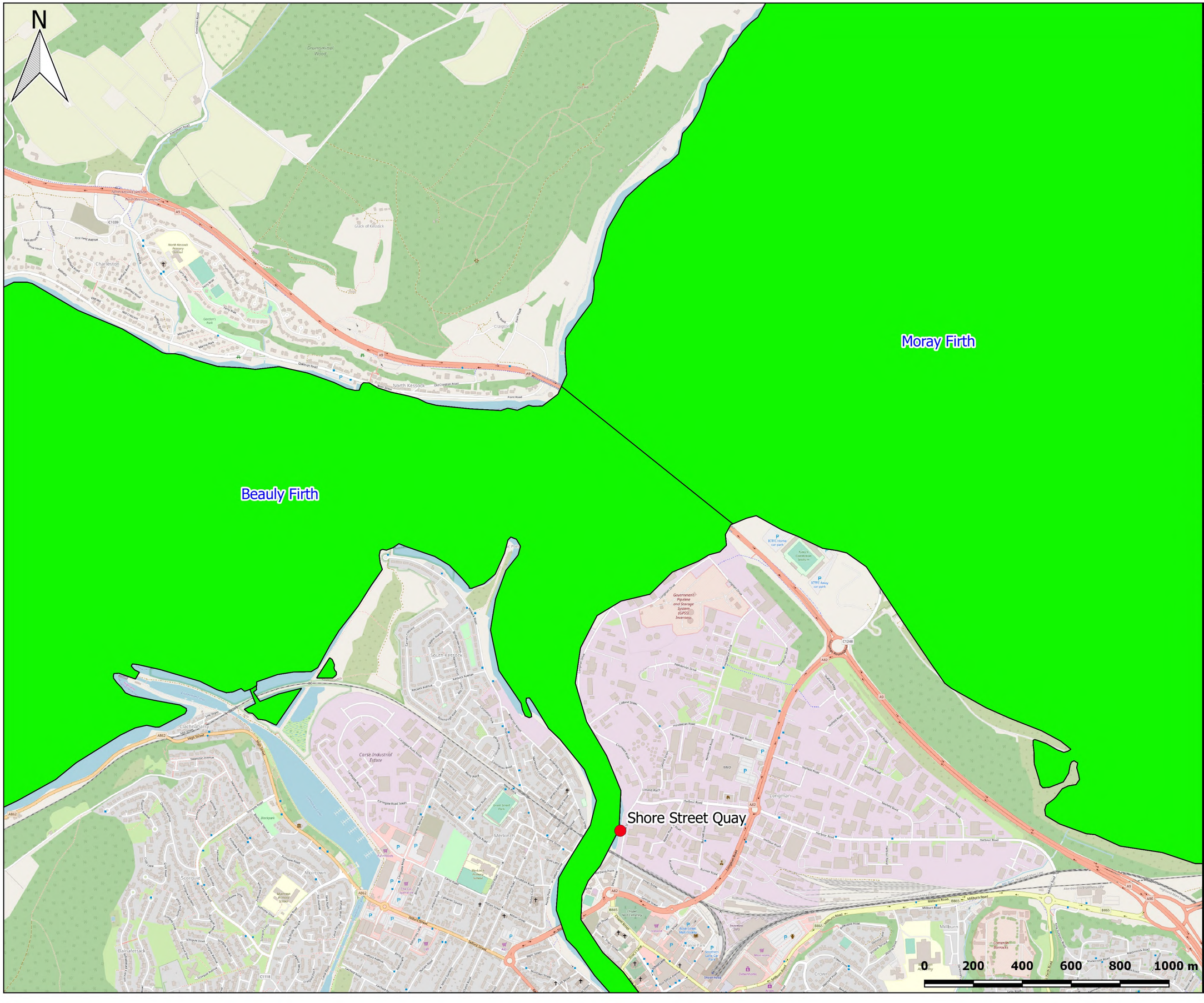
- Development Location

Buffers

- 1km
- 3km
- 40km

Designated Sites

- Moray Firth SAC
- River Moriston SAC
- Inner Moray Firth SPA/Ramsar
- Moray Firth pSPA
- Beauly Firth SSSI
- Merkinch LNR



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Drawing:59.05 Shore Street Quay - Waterbody Classifications

Projection: WGS84 Pseudo Mercator EPSG:3857

Page 1:	Rev No: 1	Drawing Date: 09/05/2019

Legend

- Development Location

WFD Waterbody Classifications

- High Potential/Status
- Good Potential/Status or Pass
- Moderate Potential/Status
- Poor Potential/Status
- Bad Potential/Status or Fail

Appendix 3: Noise Monitoring Data

In-Air Monitoring Form

Project:	*Shore Street Quay*				**Date:**	*26/03/2019*	
Location (ID, Grid Reference)	**Calibration Start At:**10:46 **To:** 93.7 **Var:** -0.28 **Calibration End At:**13.06 **To:** 93.7 **Var:** -0.33			**Start:** 10:55		**End:** 11:55	
	Start Time	**Finish Time**	**Calib. Var**	**$L_{Aeq(5min)}$dB**	**L_{A10} dB**	**L_{A90} dB**	**L_{Amax} dB**
NMP1 ***River View Apartments (Shore Street)*** ***NH 66395 45948***	10:55	11:00	-0.28	66.5	69	57.7	81.6
	11:00	11:05	-0.28	64.7	67.9	58.2	76.4
	11:05	11:10	-0.28	65.2	68.3	57	77.9
	11:10	11:15	-0.28	64.8	68	56.3	77.3
	11:15	11:20	-0.28	64.6	68.1	57.6	73.7
	11:20	11:25	-0.28	64.2	67.1	57.2	75.9
	11:25	11:30	-0.28	65.2	68.5	57.1	77.3
	11:30	11:35	-0.28	65.4	68.4	59.6	75.4
	11:35	11:40	-0.28	64.4	67.6	56.6	74.7
	11:40	11:45	-0.28	65.2	68	56.3	77.4
	11:45	11:50	-0.28	63	66.5	55.5	71.8
	11:50	11:55	-0.28	63.9	67.2	56.7	77.7
	Overall: 1hr		**-0.28**	**$L_{Aeq(1hr)}$ 64.8**	**69.0**	**59.6**	**81.6**

Weather: (Cloud Cover, Max Wind Speed , Average Wind Speed, Wind Direction, Precipitation - Roads Wet/Dry?)

Wind: Direction: *SW* Max: *4.9ms^{-1}* Average: 3.5*ms^{-1}* **Temp:** *10^{o}C* **Precipitation:** *Nil* **Cloud Cover:** *7/8* **Vis:** *Excellent*

Roads: *Dry*

Comments: (Audible sources, tonality, intermittency, road traffic frequency/composition, description of locality, meter operation: reference number of monitoring records as stored on SLM memory)

SLM Set-Up: Tripod Height: *1.3m AGL* Direction (relative to source): *Towards Site*. Sampling: *12 samples at 5 min intervals.* Weighting: *A.* Speed: *FAST*

Location Description: River View Apartments car park. Adjacent to Shore Street road, and River Ness rail bridge. Cars on Shore street passing at a rate of approximately 8 per minute, with HGVs at 2 per minute. Lot of commercial traffic, including cement trucks and aggregate trucks.

Critical Listening: Dominated by road noise from Shore Street, River Ness weir under rail bridge also audible. Occasional bird calls, most often gulls.

Surveyor:	*Jonathan Ashburner*	**Date:**	*26/03/2019*

Additional Comments:
10:58 – Train Passing on rail bridge.
11:31 – Van Parks next to SLM.
11:33 – Van departs.
11:39 – Van unloading in carpark, ~8m from SLM, people talking during unloading.
11:43 – Train passing on rail bridge.
11:50 – Van unloading complete and departs.

In-Air Monitoring Form

Project:	*Shore Street Quay*				**Date:**	*26/03/2019*	
Location (ID, Grid Reference)	**Calibration Start At:**10:46 **To:** 93.7 **Var:** -0.28 **Calibration End At:**13.06 **To:** 93.7 **Var:** -0.33			**Start:** 12:05		**End:** 13:05	
	Start Time	**Finish Time**	**Calib. Var**	**$L_{Aeq(5min)}$dB**	**L_{A10} dB**	**L_{A90} dB**	**L_{Amax} dB**
NMP2 ***Anderson Street*** ***(South Kessock)*** ***NH 66278 46086***	12:05	12:10	-0.28	56.8	57	54.7	68.3
	12:10	12:15	-0.28	55.3	56.1	54.3	61.5
	12:15	12:20	-0.28	55	56.2	53.1	66.3
	12:20	12:25	-0.28	55.8	55.9	53	70.4
	12:25	12:30	-0.28	54.8	55	51.8	69.6
	12:30	12:35	-0.28	53.8	54.1	51.3	67.6
	12:35	12:40	-0.28	51.9	53	50.6	57.9
	12:40	12:45	-0.28	51.3	52.7	49.6	60.1
	12:45	12:50	-0.28	50.8	51.9	48.8	62.8
	12:50	12:55	-0.28	51.4	52.9	48.7	66.7
	12:55	13:00	-0.28	49.6	50.9	47.7	59.3
	13:00	13:05	-0.28	51.3	51.7	47.7	67
	Overall: 1hr		**-0.28**	**$L_{Aeq(1hr)}$ 53.7**	**57.0**	**54.7**	**70.4**

Weather: (Cloud Cover, Max Wind Speed , Average Wind Speed, Wind Direction, Precipitation - Roads Wet/Dry?)

Wind: Direction: *W* Max: *4.1ms^{-1}* Average: 3.2*ms^{-1}* **Temp:** *11^{o}C* **Precipitation:** *Nil* **Cloud Cover:** *7/8* **Vis:** *Excellent*

Roads: *Dry*

Comments: (Audible sources, tonality, intermittency, road traffic frequency/composition, description of locality, meter operation: reference number of monitoring records as stored on SLM memory)

SLM Set-Up: Tripod Height: *1.3m AGL* Direction (relative to source): *Towards Site*. Sampling: *12 samples at 5 min intervals.* Weighting: *A.* Speed: *FAST*

Location Description: In front of residences on Anderson Street – a cul-de-sac with very little traffic. Adjacent to River ness, and riverside path. Shore Street is the nearest major road, on the opposite side of the River Ness. A rail bridge is located to the south, while a play park is to the north.

Critical Listening: Dominated by nose of water flow over the River Ness weir under rail bridge. Only HGV traffic is audible from Shore Street. Occasional bird calls most often gulls.

Surveyor:	*Jonathan Ashburner*	**Date:**	*26/03/2019*

Additional Comments:
12:20 – Van Passes
12:22 – Train Passes on rail bridge.
12:25 – Tide rising reducing rate of water flow over the River Ness Weir, making it less active and noise emissions reducing, River noise less dominant, and road noise from Shore Street more prominent.
12:26 – Car and van pass in quick succession.
12:29 – Weir is fully submerged, noise from rive is now barely detectable over traffic noise from Shore Street.
12:30 – Car passes.
12:41 – People in conversation get into nearby car and depart.
13:03 – Car passes.

Appendix 4: HRA Pre-Screening Report

Port of Inverness
Shore Street Quay Remedial Works
Habitat Regulation Appraisal Pre-Screening Report

Prepared by: Jon Ashburner
Date: 20th May 2019

Affric Limited

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Contents

1 Introduction

In conjunction with submitting the Port of Inverness Shore Street Quay Remedial Works Environmental Report to support a Marine Licence application, this Habitats Regulations Appraisal (HRA) Pre-Screening Report provides information required for the competent authority to carry out an HRA, and, where required, and Appropriate Assessment (AA).

This report is designed to be read in conjunction with the Environmental Report and directs the reader to the sections of the Environmental Report which are relevant to the designated site or qualifying species being discussed.

1.1 Legislative Basis

An HRA is required for this development due to its proximity to multiple Natura 2000 sites, including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). The legislative context for this requirement is based on Article 6(3) of the Habitats Directive (92/43/EEC), Article 4(4) of the Birds Directive (2009/147/EC), and is implemented in Scotland through The Conservation (Natural Habitats, &c.) Regulations 1994 (The Habitats Regulations).

In Scotland, the Scottish Planning Policy document ensures that Ramsar sites, which are normally included in an HRA assessment, overlap with Natura sites and are therefore protected under the legislation (Scottish Government, 2014). Therefore, Ramsar sites do not need considered separately as part of this HRA Screening report.

If a likely significant effect (LSE) is predicted on a Natura site at the first stage of the HRA, then an Appropriate Assessment (AA) must then be carried out. The AA must demonstrate that the proposal will not adversely affect the integrity of the site (SNH, 2017a).

It is the responsibility of the competent authority to carry out the HRA based on robust, scientific information provided by the developer about the proposed project. It is not the role of the developer to make an assessment on whether or not the proposal will have an adverse effect on any associated Natura sites.

1.2 Terminology

The terminology employed as part of the HRA process relates to likely significant effects (LSEs). Assessment of LSEs takes a precautionary approach and asks whether a project may have an effect, or have the possibility of having an effect, on a Natura site (SNH, 2017b). A project component is said to have an LSE on a designated site if "*it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site*" (European Court of Justice C-127/02, 2004). The conservation objectives of the site provide the framework for considering the potential for LSEs.

It should be noted that the terminology used as part of the ecological impact assessment in the Environmental Report refers to significance based on a matrix system. It is important, when using these documents in conjunction with one another, to be aware that the term 'significance' has different meanings in these two different contexts, in this HRA Pre-Screening report, the use of the word 'signficant' in relation to impact assessments is not employed within the pre-screening assessment, to avoid confusion.

1.3 Objectives

The objectives of this HRA Pre-Screening report are to summarise:

- The proposed development details;
- The Natura 2000 sites being considered with reference to the Shore Street Quay Remedial Works, along with these sites' qualifying features and conservation objectives; and
- Details of the qualifying features for each of the scoped-in Natura sites.

This information will aid the competent authority in carrying out and HRA. This HRA Pre-Screening Report provides a reference as to where the relevant information required to complete the HRA is located within the ER, and as such should be read in conjunction with the ER and not as a stand-alone document. An indication of whether LSEs are expected is given foe each designated site, but is ultimately up to the competent authority carrying out the HRA to ascertain whether LSEs are present, and therefore whether an AA is needed for each designated site.

2 Project Summary

3 Designated Sites

The designated sites which have designated features relevant to the Shore Street Quay Remedial Works are shown in Table 3.1. The sites, or species within the sites, are scoped in or out depending on the level of ecological connectivity to the proposed work. A rduced list of designated sites and features is then taken forward for further assessment. Explanations for why certain sites or qualifying features are excluded is laid out in Section 3.1.

Table 3.1: Relevant Designated Sites

Site	Direction & Distance	Value	Qualifying Features	Included in Further Assessment?
Moray Firth **pSPA**	1.2km N straight line	International	Great northern diver (*Gavia immer*), non-breeding Red-throated diver (*Gavia stellate*), non-breeding Slavonian grebe (*Podiceps auratus*), non-breeding Greater scaup (*Aythya marila*), non-breeding Common eider (*Somateria mollissmia*), non-breeding Long-tailed duck (*Clangula hyemalis*), non-breeding Common scoter (*Melanitta nigra*), non-breeding Velvet scoter (*Melanitta fusca*), non-breeding Common goldeneye (*Bucephala clangula*), non-breeding Red-breasted merganser (*Mergus serrator*), non-breeding European shag (*Phalacrocorax aristotelis), breeding & non-breeding*	OUT

Site	Direction & Distance	Value	Qualifying Features	Included in Further Assessment?
Moray Firth **SAC**	1.4km N by sea	International	Bottlenose dolphin (*Tursiops truncates*) Subtidal sandbanks	**IN** Bottlenose Dolphin Only
Inner Moray Firth **SPA/ Ramsar**	3.9km W & E by sea and 2.5km W & E straight line	International	**SPA** Bar-tailed godwit (*Limosa lapponica*), non-breeding; Common tern (*Sterna hirundo*), breeding; Cormorant (*Phalacrocorax carbo*), non-breeding; Curlew (*Numenius arquata*), non-breeding; Goldeneye (*Bucephala clangula*), non-breeding; Goosander (*Mergus merganser*), non-breeding; Greylag goose (*Anser anser*), non-breeding; Osprey (*Pandion haliaetus*), breeding; Osprey (*Pandion haliaetus*), foraging; Oystercatcher (*Haematopus ostralegus*), non-breeding; Red-breasted merganser (*Mergus serrator*), non-breeding); Redshank (*Tringa tetanus*), non-breeding; Scaup (*Aythya marila*), non-breeding; Teal (*Anas crecca*), non-breeding; Waterfowl assemblage, non-breeding; and Wigeon (*Anas penelope*), non-breeding.	OUT
			Ramsar Bar-tailed godwit (*Limosa lapponica*), non-breeding; Greylag goose (*Anser anser*), non-breeding; Red-breasted merganser (*Mergus serrator*), non-breeding; Redshank (*Tringa totanus*), non-breeding; Waterfowl assemblage, non-breeding; Intertidal mudflats and sandflats; Saltmarsh; Sand dunes; and Shingle.	
River Moriston **SAC**	40.1km SW by sea	International	Atlantic salmon (*Salmo salar*); and Freshwater pearl mussel (*Margarritifera margaritifera*)	**IN** Atlantic Salmon Only

3.1 Reasons for Designated Site or Species Exclusion

3.1.1 Moray Firth pSPA

The Moray Firth proposed Special Protection Area (SPA) is designated for a variety of ornithological species as detailed in Table 3.1, and covers an area of 1,762 km^2, stretching seaward from the Helmsdale coast to Portnosy and includes the outer Dornoch and Cromarty Firths, Beauly and Inverness Firths, and part of the Moray Firth (SNH, 2016).

Notable qualifying species are the great northern diver (6% of U.K. population), red-throated diver (2% of U.K. population) and Slavonian grebe (4% of U.K. population) which are all Annex 1 species. In addition, the velvet scoter has a population size of 1,490 within the pSPA, which represents 60% of the total U.K. population. The site also contains large populations of long-tailed duck, greater scaup and European shag, which represent 46%, 18% and 16% of the U.K. population respectively (SNH, 2016).

The site only contains one breeding bird species, the European shag, with an estimated population of 5,490, representing approximately 10% of the whole breeding European shag population in the UK (SNH, 2016).

As detailed in Section 5.7 of the ER, none of the qualifying bird species of this site are likely to be present within the immediate vicinity of the development, nor does the development area offer any suitable breeding or nesting habitat for these species. This combined with the distance between the development and the designated site means that no ecological connectivity exists between the Moray Firth pSPA and Shore Street Quay, hence the site is not taken forward for further assessment.

3.1.2 Inner Moray Firth SPA/ Ramsar

The Inner Moray Firth SPA is located north of Inverness, comprising of the Beauly Firth and Inverness Firth, covering 2,339ha of extensive intertrial flats and small areas of saltmarsh. Rich invertebrate fauna found within the intertidal flats supports large numbers of wintering and migrating birds, as detailed in Table 5.6.1. These habitats also provide important foraging grounds for locally breeding osprey and common tern (JNCC, 2005).

The site is also designated for its large wintering and migratory waterfowl assemblage. It had a mean number of waterfowls of 39,709 over the 5-year period 2011-2016 (BTO, 2018).

The Inner Moray Firth SPA is also designated as a Ramsar site for birds, waterfowl assemblage and costal features (saltmarsh, sand dunes, shingle, intertidal mudflats and sandflats) as detailed in Table 5.6.1 (SNH, 2019).

This site is not taken forward for further assessment due to a lack of ecological connectivity. This is stated because none of the qualifying bird species of this site are likely to be present within the immediate vicinity of the development, nor does the development area offer any suitable breeding or nesting habitat for these species, as detailed in Section 5.7 of the ER. The distance between the development and the qualifying coastal habitats of the Ramsar site mean that no direct or indirect impacts on these features are expected.

3.2 Designated Site Information

3.2.1 Moray Firth SAC

The Moray Firth Special Area of Conservation (SAC) is located in the north-east of Scotland, covering an area of 15,1274 ha. The SAC is designated for subtidal sandbanks and bottlenose dolphin. The area is of key importance to the UK east coast bottlenose dolphin population, and is regularly utilised by over 100 individuals annually, which equates >50% of the population (Cheney et al., 2018). It has been shown that the percentage of the population utilising the SAC has declined, however this is likely due to the fact that the population size is increasing, and hence the population is utilising a larger habitat area (Cheney et al., 2018).

Bottlenose dolphins are highly mobile, and are known to frequent the lower reaches of the River Ness, and hence may be present in the vicinity of the proposed works. As such this site is taken forward for assessment, with respect to the bottlenose dolphin qualifying features. Due to this distance between the proposed works and the subtidal sandbanks feature of this this, there is not potential for this feature to be affected, and it hence it shall not be considered further.

The Conservation Objectives for the Moray Firth SAC are shown in Table 3.2.1 and the qualifying features are shown in Table 3.2.2 with a summary of the assessment.

Due to the proximity of the development to areas frequented by Bottlenose dolphins, there is potential for an LSE, therefore it is likely an AA will be required.

Table 3.2.1: Moray Firth SAC Conservation Objectives

Conservation Objective of the Designated Site	Main ER Section(s) to inform assessment
Overarching Conservation Objective: **To avoid deterioration of the habitats 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.**	Section 5.8: Marine Mammals Section 5.11: Benthic Ecology
Further Conservation objectives: **To ensure for the qualifying species that the following are maintained in the long term:** • **Population of the species 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.**	Section 5.8: Marine Mammals Section 5.11: Benthic Ecology In addition: Section 5.13: Water Quality

Table 3.2.2: Moray Firth SAC Qualifying Features

Species/Feature	Relevant ER Section	Summary of Assessment
Bottlenose Dolphins (*Tursiops truncates*)	Section 5.8	Bottlenose dolphins are known to regularly frequent the wider Beauly Firth and the lower reaches of River Ness up to the southern extent of Longman Quay. Infant and juvenile animals are also often present in this area during summer months. It is very unlikely for Bottlenose dolphins to be higher up River Ness and be present within 400m of the proposed works, reducing likelihood of exposure to potential negative effects. As detailed in Section 5.8.2 of the ER, the assessment of potential impacts on Bottlenose dolphin included underwater noise, increased sediment loading of the water column and release of hazardous substances. The assessment concluded that none of the potential effects are of a scale to negatively impact on local Bottlenose dolphins, given the small nature of the development and provided industry good practice for pollution prevention is adhered to.

3.2.2 River Moriston SAC

River Moriston SAC is part of the Ness catchment and flows through Glen Moriston, entering the northern side of Loch Ness. The site covers 194 ha and is designated for Atlantic salmon and freshwater pearl mussel. The last assessment identified both designated species to be in an unfavourable condition (SNH 2019).

Salmon counts through the Dundreggan Dam located on River Moriston showed an increase in salmon from low's during the mid-1970's to the mid 1990's, with salmon count peaking at 377 fish in 2015. Although, catches since 2015 have decreased again, with only 262 fish counted in 2018 (Ness DSFB 2018).

Surveying of the freshwater pearl mussel population identified a high proportion (40%) of juveniles in River Moriston (JNCC 2019), indicating the freshwater pearl mussel population is viable.

Salmon migrating to and from the marine environment will transit past the proposed works. As such this site is taken forward for assessment, with respect to the Atlantic salmon qualifying feature. Due to the distance between the proposed works and the pearl mussel beds in the River Moriston, there is no potential for this feature to be directly affected, and hence the freshwater mussel feature is not taken forward for assessment. It is acknowledged that the larval phase of pearl mussels are reliant on the integrity of the salmon population, however, any mitigation provided to reduce impacts on salmon will also reduce impacts on larval pearl mussels, so there is no need to consider this aspect separately.

The Conservation Objectives for the River Moriston SAC are shown in Table 3.2.3 and the qualifying features shown in Table 3.2.4 with a summary of the assessment.

Connectivity has been identified between the Atlantic salmon feature of River Moriston and the proposed works due to the sites qualifying feature migrating past the development site. This, combined with the nature of the construction works of the Shore Street Quay Remedial Works, means there is the potential for the works to have a LSE on the sites qualifying feature. Therefore, it is likely an AA will be required.

Table 3.2.3: River Moriston SAC Conservation Objectives

Conservation Objective of the Designated Site	Main ER Section(s) to inform assessment
Overarching Conservation Objective: **To avoid deterioration of the habitats of the qualifying species (listed below) or signficant 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.**	Section 5.10: Atlantic Salmon Section 5.13: Water Quality
Further Conservation objectives: • **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** • **Distribution and viability of freshwater pearl mussel host species** • **Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species.**	Section 5.10: Atlantic Salmon Section 5.13: Water Quality

Table 3.2.4: River Moriston SAC Qualifying Features

Species/Feature	Relevant ER Section	Summary of Assessment
Atlantic Salmon *(Salmo salar)*	Section 5.10: Atlantic Salmon Section 5.13: Water Quality	The ER assessment identified potential impacts on Atlantic salmon relating to sediment loading and release of hazardous substance as a result of the proposed rock armour bund. Assessment of sediment loading on salmon identified the impacts to be negligible due to the large grain size and lack of fines of utilised construction material placed into the River Ness. Where sediment plumes arise, these are anticipated to be small, localised and short-lived as sediments will quickly disperse/ drop-out in the shallow waters. The mobile nature of salmon also means they can avoid sediment plumes if they are present in the area. This assessment therefore finds that increased sediment loading is unlikely to result in disturbance to salmon. There is the potential for a spill of hazardous material to have long term major impacts, leading to changes to the health and behaviour of salmon on a local scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Section 5.13.5, significantly reduces or removes the risk of such an event occurring. As such it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact Atlantic salmon.

4 Conclusion

The Environmental Report did not predict any adverse impacts on ant of the qualifying features of the designated sites assessed as part of this HRA Pre-Screening Report. Information from this report can be used by the competent authority, in conjunction with the relevant Sections of the Environmental Report as identified in this report, to carry out the HRA and any necessary AAs. It will be up to the competent authority to ascertain whether the proposal will adversely affect the integrity of the designated sites to be considered.

5 Refences

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Appendix 5: Ornithological Survey Report

Inverness Harbour Quay Extension

Bird Assessment Report

Dr Eric Donnelly and Yvonne Brown

9th May 2017

Photograph 1: location of quay extension

Table of Contents

1 Introduction

A survey, and assessment of potential impacts on birds in and around the area of the proposed Link Quay Development of the Port of Inverness is required to protect breeding and wintering birds, associated with the designated sites in the area.

This report includes an assessment of potential impacts to birds associated with the development, through desktop study, assessment of habitats, and an initial breeding bird survey on site. Proposed mitigation measures are also detailed.

2 Site Description

The location of this assessment focuses on a gap between two sections of quay in Inverness Harbour next to Longman Drive along the eastern bank of River Ness, Inverness, centred on NH 6628 4649. Longman Industrial Estate is located to east of the site.

The habitat on site is scrub (Photograph 1 and 2), including gorse (*Ulex europeaus*) and a range of grass species and common flowering plants such as dandelion (*Taraxacum officinale*) and dock (*Rumex obtusifolius*). Small trees here have been cut down outside the bird breeding season. The quay, on either side of the site, is on concrete construction and is enclosed (Photograph 3).

Photograph 2: Scrub and grass on site in foreground, with north section existing quay in background

Photograph 3: Existing quay to south of site, showing enclosed nature of concrete structure

A building is also located here, which will not be affected by the development (Photograph 4).

Photograph 4: Building located at southern edge of site

The western bank of the River Ness is sparsely vegetated, with development at its edge (Photograph 5).

Photograph 5: Western bank of river Ness in foreground

3 Survey methods

A site visit and breeding bird survey was carried out on 8th April 2017 by Eric Donnelly and Yvonne Brown, following Common Birds Census methods[1]. The surveyors were initially accompanied by the Port of Inverness Harbour Master, Captain Ken Mclean. All potential breeding birds were noted, along with all species not considered to be breeding on or in the immediate vicinity of the site. The potential for breeding birds to utilise the habitats and buildings around the site was also assessed.

A general watching brief for rare plants and European Protected Species was also carried out, but none were found.

4 Bird survey results and habitat assessments

4.2 Habitat assessment

4.2.1 Habitats on site

The habitats on site described above include scrub on the bank of the River Ness, some grass and a building. Rock armour is also located at the tide line to protect the bank.

The scrub holds few opportunities for breeding birds other than the wren, due to the size of the area and location next to the river. The removal of this habitat will reduce the nesting opportunities for wren but this is a common species and therefore will not impact upon local or national populations.

The quay itself is sealed, and so is not suitable for use as nesting habitat.

The opposite banks of River Ness do not hold many opportunities for nesting birds due to the tidal nature of the river here leading to lack of vegetation cover for nesting. The proximity of man-made

[1] https://www.bto.org/sites/default/files/u31/downloads/details/cbc.pdf

structures next to the top of the bank, and the human disturbance also reduces the suitability of this habitat for nesting.

The building on site also provides little suitable habitat for breeding birds, as there are no cracks or crevices present to allow birds to nest here.

4.2.2 Designated sites

Due to the small nature of this development, surrounded by industrial and residential buildings and associated infrastructure, works associated within this development are unlikely to impact on designated sites.

There are 3 designated sites (birds only) located in close proximity to the development area, comprising of 2 Natura sites, and a Local Nature Reserve (LNR). The closest is the Moray Firth proposed Special Protection Area (pSPA), located approximately 1km north of development area. The second Natura site is the Inner Moray Firth Special Protection Area (SPA), located approximately 3km to both east and west of the site. The Merkinch LNR is located 1km to the east. Details of the designated sites are provided in Table 1, and their locations illustrated in Appendix 1.

Table 1: Designated Site details

Site name	**Designation**	**Distance from site (km)**	**Qualifying interest or notified features**
Moray Firth	pSPA	1km North	The Moray basin is an extensive site stretching seaward from Buckie in the south to Helmsdale in the north and encompassing several different geographically separate water bodies; the Beauly Firth, the Inner Moray Firth, the Cromarty Firth, Dornoch Firth, Loch Fleet and the vast open water area in the outer Moray Firth (Figure 1). It qualifies under Article 4.1 by regularly supporting a non-breeding population of European importance of the following Annex 1 species: • Great northern diver *Gavia immer* • Red-throated diver *Gavia stellata* • Slavonian grebe *Podiceps auritus* The site further qualifies under Article 4.2 by regularly supporting populations of European importance of the following migratory species: • Greater scaup *Aythya marila* • Common eider *Somateria mollissima*, • Long-tailed duck *Clangula hyemalis*, • Common scoter *Melanitta nigra*, • Velvet scoter *Melanitta fusca*, • Common goldeneye *Bucephala clangula*, • Red-breasted merganser *Mergus serrator*, and • European shag *Phalacrocorax aristotelis*.
Inner Moray Firth	SPA/SSSI Ramsar	3km to east and west	The Inner Moray Firth SPA comprises the Beauly Firth and Inverness Firth which together form the easternmost estuarine component of the Moray Basin ecosystem. The SPA supports large intertidal flats and some saltmarsh and sand dunes. The boundary of the SPA follows those of the Beauly Firth SSSI, Munlochy Bay SSSI, Longman & Castle Stuart Bays SSSI and Whiteness Head SSSI. The SPA qualifies under Article 4.1 by regularly providing foraging grounds for nationally important numbers of breeding osprey *Pandion haliaetus* and a nationally important breeding population of common tern *Sterna hirundo* (310 pairs, 2% of GB). It also qualifies by supporting an internationally important wintering population of bar-tailed godwit *Limosa lapponica* (1992/3-96/97 winter peak mean of 1090, 2% of GB and 1% of West European population). The Inner Moray Firth SPA qualifies under Article 4.2 by regularly supporting internationally important wintering populations (1992/93-96/97 winter peak means) of greylag goose *Anser anser* (2651, 3% of total Icelandic population, all of which winter in GB), red-breasted merganser *Mergus serrator* (1,184, 1% of NW Europe, 12% of GB) and redshank *Tringa totanus* (1,621, 1% of British & East Atlantic Flyway). The SPA further qualifies under Article 4.2 by regularly supporting over 20,000 waterfowl with a 1992/93-1996/97 winter peak mean of 26,800 comprising 16,800 wildfowl and

			10,000 waders. This assemblage contains nationally important populations of 7 species (1992/93- 96/97 winter peak means): cormorant *Phalacrocorax carbo* (409, 3% of GB), wigeon *Anas penelope* (7310, 3%), teal *A. crecca* (2066, 1%), scaup *Aythya marila* (118, 1%), goldeneye *Bucephala clangula* (218, 1%), goosander *Mergus merganser* (325, 4%) and curlew *Numenius arquata* (1262, 1%).
Merkinch	LNR	1km to west	Merkinch Local Nature Reserve was designated on the 28th November 2007 after the signing of a formal agreement between the Highland Council and British Waterways on 14th November 2007. It is the only Local Nature Reserve in the Highland Council area and is the 50th Nature Reserve in Scotland. Merkinch Local Nature Reserve consists of 54.7 hectares of land and foreshore to the west of where the River Ness enters the sea. To the south it is bounded by the Caledonian Canal, where it enters the Beauly Firth; the north western boundary of the Carse Industrial Estate and to the east by the main housing area of Merkinch. The northern boundary is down to the low water (spring) mark.

This development is not considered to have the potential to result in any negative significant effects upon any designated sites. This is due to the location of built up areas between the development area and the designated sites, and due to the lack of suitable nesting or feeding habitat on or immediately adjacent to the proposed development site.

4.1 Historical data

A historic data search[2] for bird species located within 1km of the development located 118 species. This number of species is high due to the number of species that overwinter on the mudflats, and sea areas associated with the Moray Firth, and the coastal and other inland areas around the site in general (e.g. Merchinch Local Nature reserve). However, it is unlikely that any species other than the species detailed in the breeding birds survey section below might be impacted upon by the development, as discussed above.

4.2 Breeding bird survey

The following species were observed during the survey, and were found to be breeding, or have the potential to breed either in the proposed development area, or outside the site, but within a reasonable disturbance distance include:

- One suspected wren (*Troglodytes troglodytes*) nest was located in the gorse at the edge of the River Ness (Photograph 2), as the disturbed bird was noted to fly back into the nest. It was not possible to locate the nest due to safety considerations, and the possibility that the nest might be knocked in the water during the search. Wren is a Bird of Conservation Concern[3] (BOCC) Green list species.

- One pair of oystercatcher (*Haematopus ostralegus*: BOCC Amber list) were also noted on the quay to the north of the site. These were not yet breeding on site.

- One pair of common gull (*Larus canus*: BOCC Amber list) were noted to the south of the site on rubble outside the boundary.

- House sparrows (*Passer domesticus*: BOCC red list) were noted around the buildings next to the site, including around harbour buildings and Longman Industrial Estate.

- Herring gulls (*Larus argentatus*: BOCC Red list) were also noted flying around the site. These are likely to nest on buildings around Inverness.

[2] https://nbnatlas.org/

[3] Eaton et al (2015) Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108: 708–746

Wren was the only species confirmed to be breeding on site. This species is common in the UK, however all nests are protected under the Wildlife and Countryside Act 1981, and so the nest must not be destroyed, or the birds deterred from flying to and from the nest.

The other species identified that may breed within a potential disturbance range of works include oystercatcher, and common gull. Although these are not breeding on site, care should be taken to ensure that the activities associated with the works (e.g. laydown areas, vehicle parking, etc.) do not adversely impact these birds.

The other species mentioned will not be affected, due to their habit of nesting on buildings within the harbour and surrounding area, since these areas will not be impacted by the proposed development.

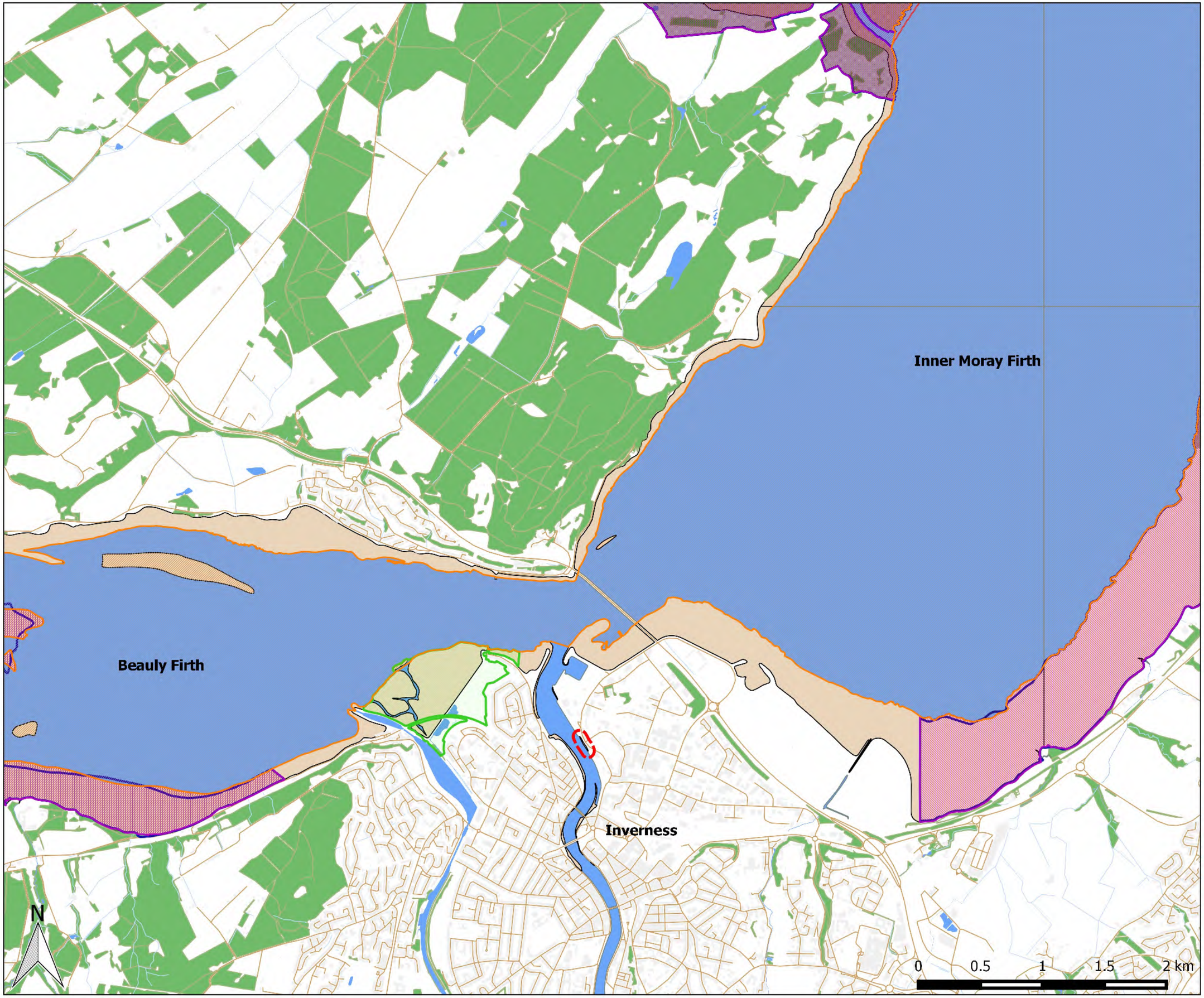
5 Summary and recommendations

As only wren was confirmed to be breeding on site, it is recommended that no further bird surveys are carried out by an ornithologist. However, as a precaution to protect these birds, and the other species with potential to breed within the proposed development and potential disturbance range, preconstruction surveys should be carried out over the site itself, plus a buffer of 20m into suitable habitat, before any works associated with the development take place.

Any bird nests located during these preconstruction surveys should have a suitable buffer installed around them. Species such as common gull and oystercatcher can stand some level of disturbance, but the buffer should be adjusted from 10-20m for any individual pairs, following observations by the ornithologist. Smaller species can be cordoned off to 5m.

All staff associated with the works should be briefed on the possibility of breeding birds during the site induction, and toolbox talk posters installed in the site offices and welfare facilities; to inform the workforce of what to do in the event they suspect breeding birds on site. If a Construction Environment Management Plan (CEMP) or Construction Method Statement (CMS) is produced; these documents should detail how the birds on site will be protected during the period of construction.

Appendix 1 – Ornithological Designated Sites Map



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Title: Inverness Link Quay - Ornithological Designated Sites

Projection: OSGB 1936/British National Grid
EPSG:27700

Page 1	Rev No: 1	Drawing Date: 05/05/2017

Legend

- Site

Ornithological Designated Sites

- pSPA
- SPA
- SSSI
- Ramsar
- Local Nature Reserve

Appendix 5: Otter Survey Report

Port of Inverness

Otter Survey March 2019

For:

Inverness Harbour Trust

Prepared by: Innes Beaton

Date:22/05/2019

Document Control

	Name	Title	Signature	Date
Author	Innes Beaton	Operations Director	[Redacted]	22/05/2019
Reviewer	Jonathan Ashburner	Senior Consultant		22/05/2019
Authoriser	Jonathan Ashburner	Senior Consultant		22/05/2019

Revision No:	Signature	Comments	Date
1	[Redacted]	Issue 1	22/05/2019

Contents

1 Introduction

Affric Limited were commissioned to undertake an ecological survey focusing on the Eurasian otter *Lutra lutra*, within the Port of Inverness and the adjacent River Ness.

The survey is required to provide information to determine the extent and nature of otter utilisation of the area. This is required in order to inform an assessment of potential impacts on otter resulting from the Shore Street Quay remedial works, and other future developments of the Port of Inverness.

1.1 Objectives of Study

This report seeks to document the likely presence or absence of otter within the survey area, and if otters are present, outline how otters are using the area. Otters are afforded some level of protection under Scottish and U.K. law.

The report details the results of the survey with the following details:

- Site description;
- Legislative context;
- Field survey methodology;
- Field survey results; and
- Discussion.

2 Legislative Context

The otter is a European Protected Species (EPS) and is protected under regulation 45 of the Conservation (Natural Habitats and Species.) Regulations 1994 (as amended) in Scotland which transpose into Scottish law the European Community's Habitats Directive (92/43/EEC). This means that it is an offence to:

- Deliberately or recklessly capture, injure or kill, harness, damage or destroy a breeding site or resting place of an otter or a group of otters;
- Disturb an otter while it is occupying a structure or place which it uses for shelter or protection;
- Disturb an otter while it is rearing or otherwise caring for its young;
- Obstruct access by an otter to a breeding or resting place;
- Disturb an otter in a manner that is, or circumstances which are, likely to significantly affect the local distribution or abundance of that species; and,
- Disturb an otter 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.

In addition to the above, otter is listed in the Scottish Biodiversity List and the UK Biodiversity Action Plan (BAP). They are also listed in the Inverness & Nairn BAP in which they are listed as an individual species.

3 Site Description

The Port of Inverness, centred on the grid reference NH66239 46662, is located within the northern seaward limits of the city of Inverness. The area is industrial in nature, and provides berthing, laydown, bunkering, and logistical facilities to commercial shipping. The laydown

areas and transport routes within the Port of Inverness area surfaced with a mixture of concrete slab, laid tarmac and block paving, with the sea facing areas constructed of sheet piled quayside, and rock armoured revetments.

An area immediately to the north of the Port is designated as the Moray Firth Special Area for Conservation and proposed Special Protected Area. 2.4km to the west lies the Beauly Firth Site of Special Scientific Interest (SSSI) and 2.8kn to the east is the Longman & Castle Stuart Bays SSSI. The SSSIs also designated as the Inner Moray Firth Special Protected Area and Ramsar site, however, none of these designations include otter as a qualifying feature. It is noted that the Merkinch Local Nature Reserve is located 1km to the west of the Port of Inverness, and this site is noted for the presence of otters.

4 Methodology

The Survey was undertaken on 20th March 2019 by Innes Beaton, a suitably qualified and experienced otter surveyor. The weather was dry, overcast, 10°C with a light westerly wind, there had been no rain for 4 days prior to survey. All accessible areas within the survey area (Drawing 59.AA), were examined during the survey.

The otter survey was undertaken in accordance with the approach detailed by Scottish Natural Heritage's Otters and Development' guidance document (SNH, 2010), together with the guidance provided in the book, 'Ecology of the European Otter' (Chanin, 2003). The survey covered the quaysides, laydown areas, rock armour revetments, and banks of the River Ness and included a thorough check all recesses for the presence of otters and their resting places including holts and couches.

Due to the often-elusive nature of otters, the survey predominantly relied on the interpretation of field signs rather than direct observation of the animals themselves. During the survey the following field signs were sought, with those which can be regarded as definitive, i.e. they provide certain confirmation of the presence of this species, marked with an asterisk:

- Spraints (faeces); *
- Feeding remains (partially eaten prey items); *
- Holts (den); *
- Footprints; *
- Couches or lay-ups (resting place above ground); and
- Pathways and slides into water.

All evidence identified during the survey was recorded using an iPhone 6S running Ordnance Survey 1:50,000 memory map software, with the features of interest marked, noted and photographed.

4.1 Limitations

The survey was completed at low tide, and in good conditions after a period of dry weather. An appropriate period of time was allowed to conduct the survey in day light hours, as such there were no time constraints on the survey.

There were no areas inaccessible to survey. It was not possible to see within all the crevice's in the rock armour, this however is not deemed to be a significant limitation in this case.

5 Results

5.1 Existing Information

It is not known when the last otter survey was carried out in this area, however otter are known to frequent the area to the west of Carnac Point, South Kessock and beyond. Otters are also regularly observed within the lower reaches of the River Ness.

The survey area borders the mouth of the River Ness where it enters the Beauly Firth and extends upstream to the south for approximately 1.3km along both banks of the river, which is tidal throughout the survey area. The Beauly Firth is a sheltered tidal inlet which will provide significant food sources for otters, and the River Ness is known for being one of the most productive trout and salmon rivers in the north of Scotland, which will provide another significant otter feeding resource.

Other than the piled quay walls of the port, the seaward edges are mainly constructed of rock armour. There is also a marina with 4 finger pontoons, installed within a pile wall basin, which has a rock armoured revetment protecting its seaward limit to the northeast of the North Longman quay. Access to the marina is restricted to its users only. The port also has restricted access; hence the only sources of disturbance is activities carried out within the port itself, very few of which require access to the rock armour.

The western shore of the river ness is of mixed terrain, with low rock revetments at Carnac point and areas of tidal foreshore, a piled quay wall at Gaelforce Marine and further rock armour placements and vegetated banks. There is the possibility of human disturbance to the north and south of Gaelforce marine's compound, and the area is popular with dog walkers and fishermen. The numerous areas of rock armour may provide opportunities for places of shelter and lay-ups.

5.2 Survey Findings

Signs of otter were evident on the rock revetment, which surrounds the Marina entrance and also on the Pilot Boat berth within the marina. Old spraints were noted on the edge of the Longman Quay and the North Citadel quay. More recent sprainting along with feeding remains were noted on the rock armour surrounding the Gaelforce Marine compound. There was no further evidence of otter identified within the survey area.

A summary of the survey results is provided in Table 1 below, and shown on Drawing 59.AA. Photos of the otter signs are provided in Appendix A.

Table 1: Grid Locations of Otter Signs Port of Inverness

Location	Sign	Appendix A Photo No's.	Comments
NH 66174 46641	Old Spraint	1	Longman Quay
NH 66151 47057	Feeding Remains	2, 3, 4	P6 Pilot Boat Pontoon
NH 66359 46354	Spraint	5	North Citadel Quay
NH 66130 47154	Spraint	6	Rock Armour Marina
NH 66138 47209	Spraint	7	Rock Armour Marina
NH 66166 47220	Spraint	8, 9	Rock Armour Marina
NH 66224 47259	Spraint	10, 11	Rock Armour Marina
NH 66187 47244	Spraint & Feeding Remains	12, 13	Rock Armour Marina
NH 66070 46533	Spraint & Feeding Remains	14, 15, 16	Rock Armour Gaelforce
NH 66098 46509	Spraint	17	Spraint on Flood wall

6 Discussion

The survey identified 2 locations within the survey area that appear to be frequently and recently utilised by otters, these are:

- The rock armoured revetment to the north east of the marina; and
- The rock armoured area immediately south of the Gaelforce Marine compound on the western bank of the River Ness.

The rock armour to the northeast of the marina entrance had numerous new and old spraints, together with feeding remains suggesting that it is often used by otters. The area provides good habitat for sheltering or feeding and is free from human disturbance.

The area to the south of the Gaeforce Marine compound had several fresh spraints and feeding remains. The rock armour in this area also provides suitable habitat for sheltering or feeding otters. There is more possibility of human disturbance in this area, due to ongoing activities within the Gaelforce compound, however, some protection is provided by the 1m flood wall which extents along the top of the riverbank.

Further old spraints were observed on the Longman and South Citadel Quays, suggesting that otters do frequent these area, but do not utilise them regularly. No evidence of otter presence was recorded on either bank of the River Ness in the immediate vicinity of Shore Street Quay.

No evidence of couches, layups or holts was found within the survey area, suggesting that while otters are certainly present thin the lower reaches of the River Ness, they do not use the area for breeding or long term resting or sheltering.

7 References

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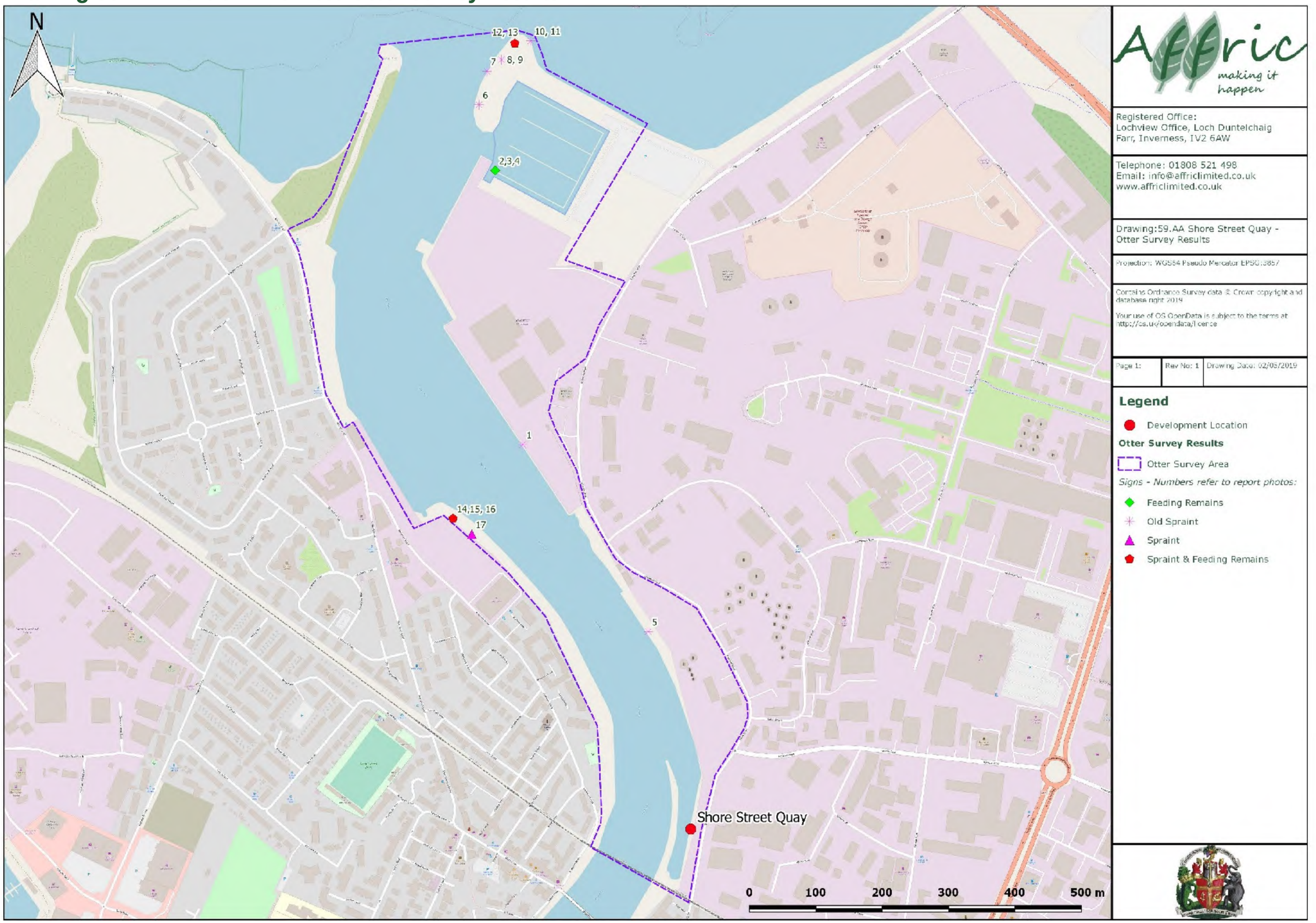
The 'UK Post-2010 Biodiversity Framework' (July 2012)

Drawing 59.AA: Port of Inverness Otter Survey Results



Appendix A: Survey Photos

Photo 1

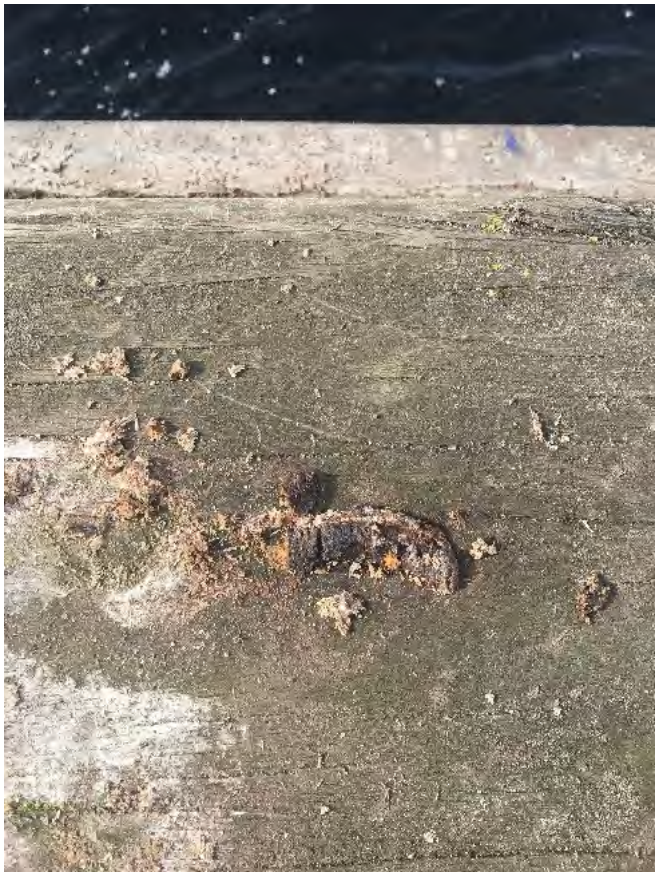


Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Appendix 6: Flood Risk Assessment

Document No. 1146

INVERNESS HARBOUR TRUST

INVERNESS HARBOUR: SHORE STREET QUAY FLOOD RISK ASSESSMENT

Project Director	[Redacted]
Sector Manager	

Status: Final

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Job No: 11019j
Copy No: 01
Rev. No: 01

March 2002

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1. INTRODUCTION

1.1 Terms of Reference

EnviroCentre were commissioned by A. F. Cruden, Harbour Engineer on behalf of the Inverness Harbour Trust, proposal reference Ref: 11019p/letters/001, to undertake an investigation into assessing the flood risk associated with infilling Shore Street Quay at Inverness Harbour.

1.2 Scope of Report

This report aims to provide background information to allow informed decisions to be made as to the most appropriate means of the future operation of Shore Street Quay. One of the options at present is to infill the area in front of the Quay. This report examines how the effects of infilling the Quay would impact the flood risk of the area for different development scenarios.

2. EXISTING CONDITIONS

2.1 Introduction

Shore Street Quay is located directly downstream of the railway viaduct on the River Ness at an elevation of 3.47m above Ordnance Datum (AOD). The key features of interest to this investigation are outlined in Figure 2.1 and a more detailed survey of the site is included in Figure 2.2. A groyne exists on this stretch of the river creating a backwater area between the groyne and the quay wall itself. The top of the groyne is at a level of 0.54m AOD and is overtopped by the tide. Between Waterloo Bridge and the railway viaduct, the area upstream of groyne is semi natural, filled with a mixture of river sands and gravels with some larger armour rocks, sloping downwards to timber batons that confine the river channel.

2.2 Assessing the Flood Risk

The flood risk at Inverness Harbour will be influenced by two main factors:

- Fluvial flood risk from the River Ness
- Tidal flood risk from the Beauly Firth

This study will focus on these two main areas of flood risk with due consideration also be given to the effect of storm surges and the potential impacts of predicted sea level rise, in line with accepted climate change scenarios.

2.3 Climate Change

The global climate has been relatively stable since the last Ice Age, approximately 10,000 years ago, but in the last century global temperatures have risen by between 0.4 and 0.8°C and the last two decades were the hottest in the 20th Century. This has a knock on effect on sea levels and rainfall patterns.

In order to quantify the potential impacts of climate change the UK Climate Impacts Program (UKCIP) run numerical models. These models run several scenarios based on projected levels of greenhouse gases in the 21st century and the related warming effects. These scenarios range from a low level of warming (Low) right through to a steep rise in temperatures (High). The long term temperature trend and divergence of these scenarios are shown in Figure 2.3 (for the Central England Temperature Series), low rates of warming illustrated by blue and faster rises by red.

Figure 2.4 shows the predicted changes in rainfall based on the four commonly used UKCIP scenarios (Low, Medium-Low, Medium-High, High). The large differences in rainfall between scenarios emphasise the uncertainty associated with predictions of climate change (i.e. which scenario is most likely to occur?) and also provide a background against which to assess and quantify the potential impacts.

These UKCIP scenarios are used throughout this report when referring to the impacts of climate change.

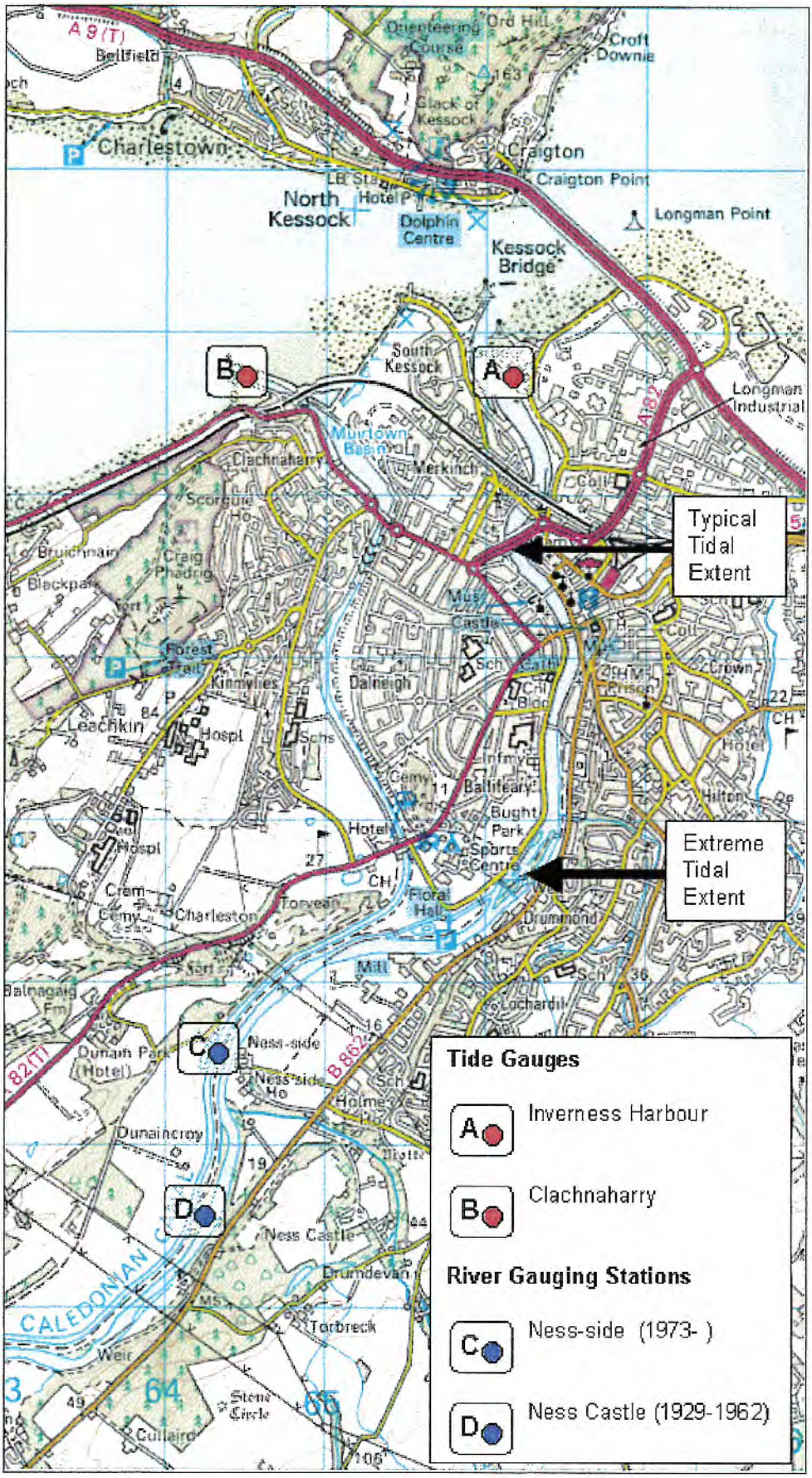

Figure 2.1: Measurement Locations

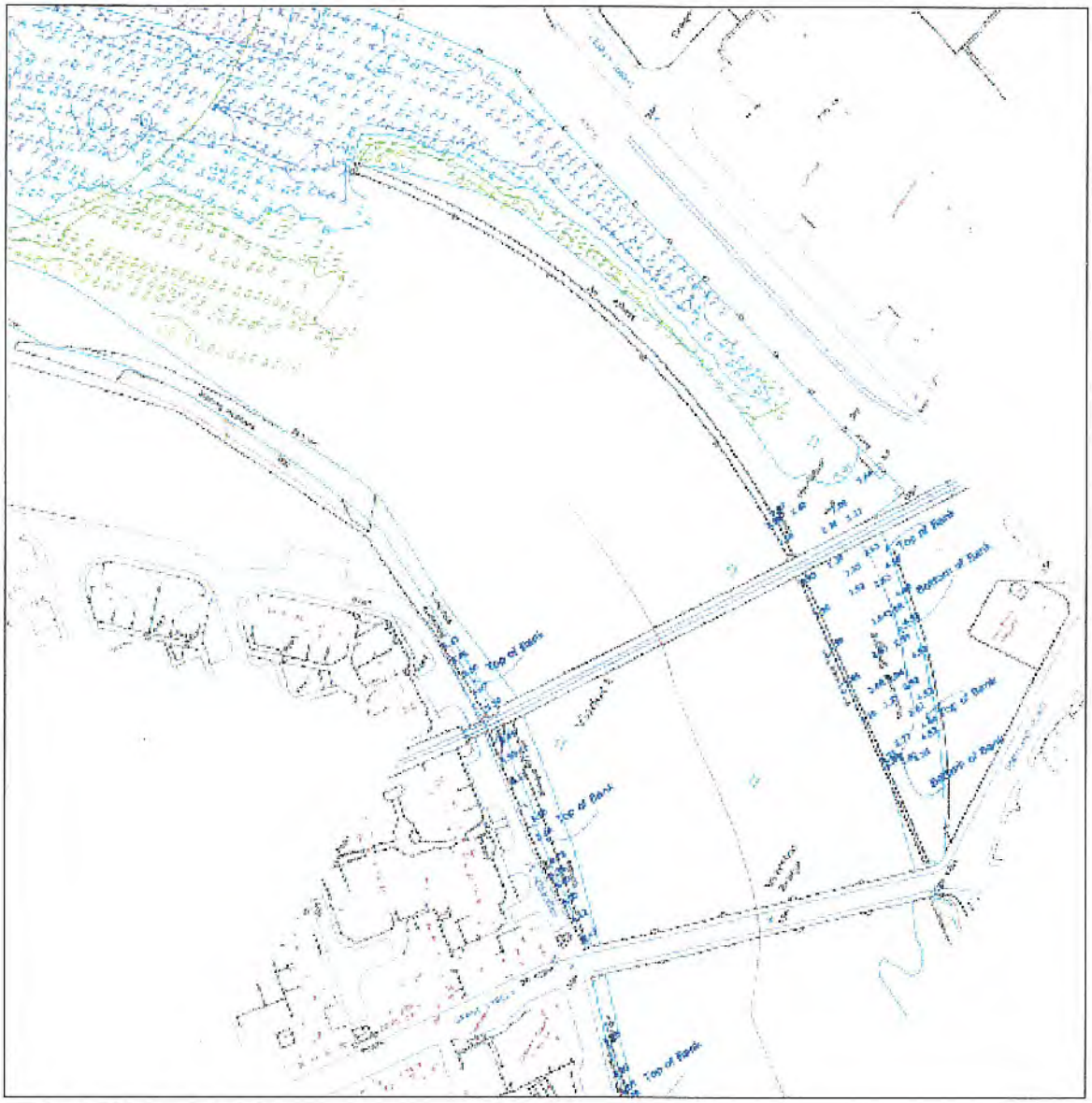

Figure 2.2: Survey of Site

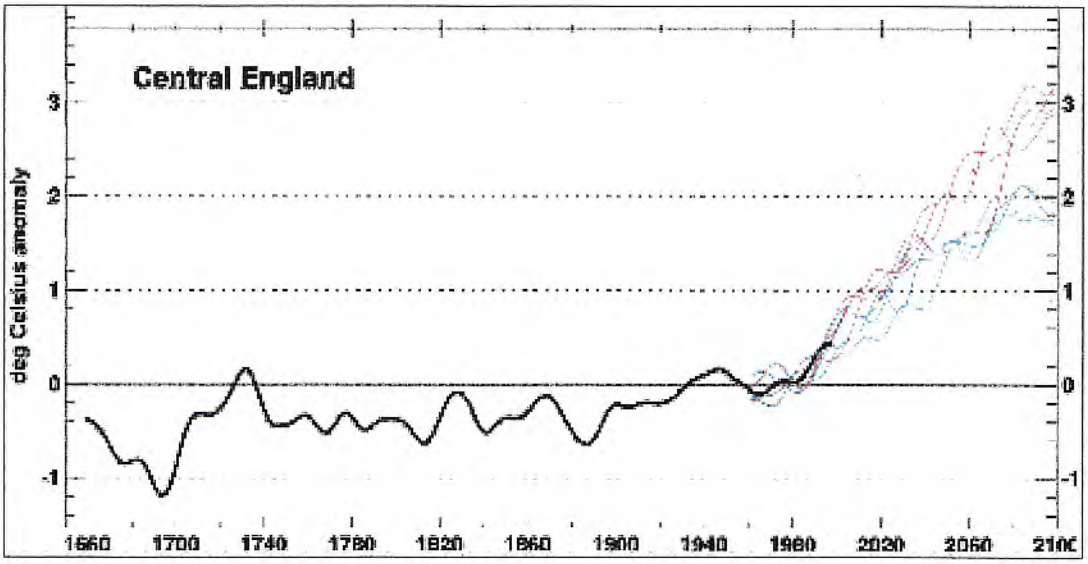

Figure 2.3: Trend in Mean Temperature and Future Predictions

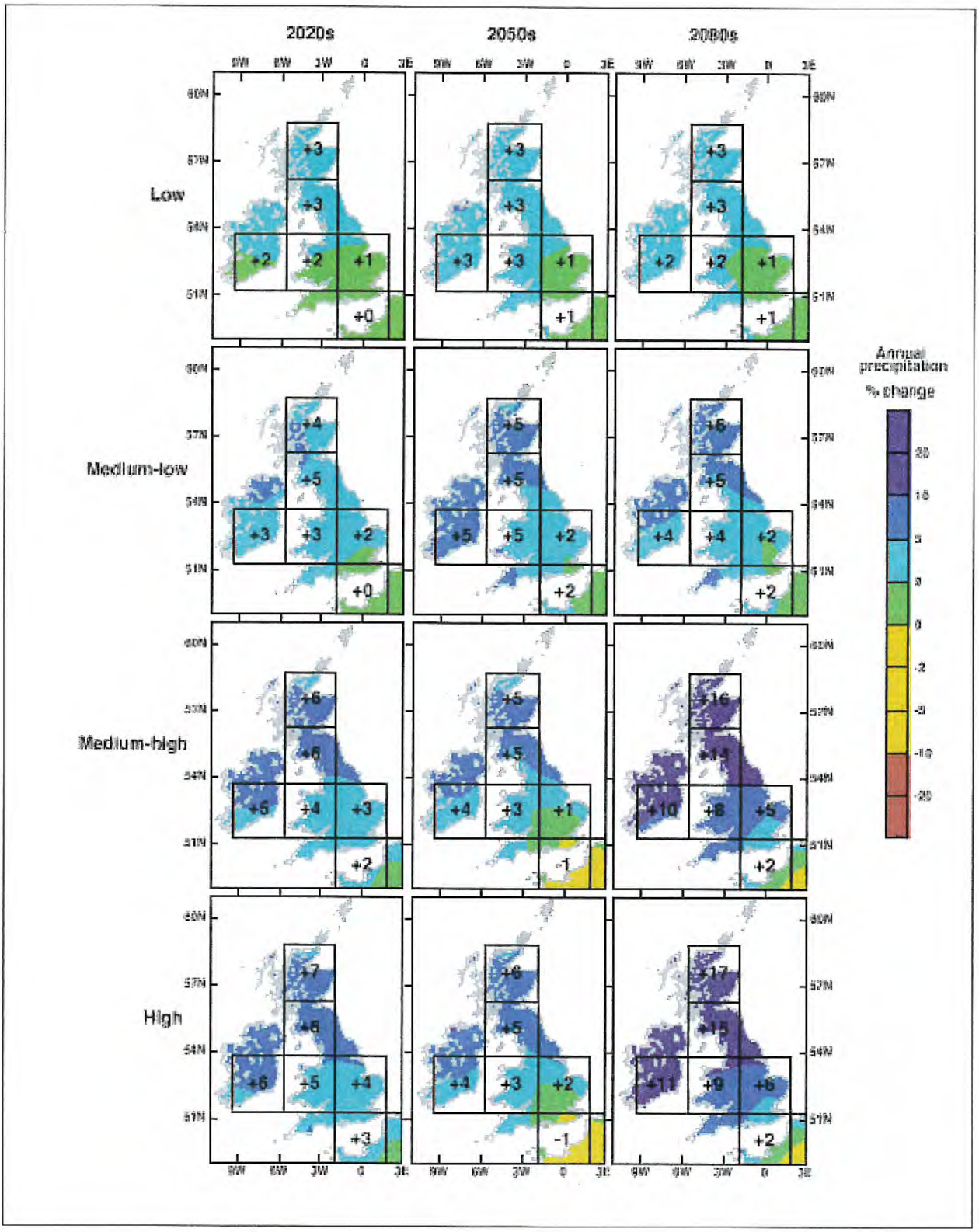

Figure 2.4: UKCIP Predicted Percentage Change in Annual Precipitation for Climate Change Scenarios

2.4 Review of Available Background Information

A review of available information relating to the site with regard to physical layout of harbour, flooding, river flows, and tidal information has been undertaken. This has allowed the present conditions and relevant site information to be established. The background review involved consultations with various organisations and review of known information sources, which are detailed as follows:

Several organisations were contacted to identify any information they may hold, or be aware of, which may be of relevance to the present study, with the responses received summarised in the following sections:

Highland Council

No information was available directly from Highland Council. They were aware of a report produced on flooding following the 1989 and 1990 floods in Inverness, although they did not know its whereabouts and could not provide a copy.

Scottish Environment Protection Agency

SEPA provided useful information in the form of raw data and they also had one copy of the report which Highland Council were aware of. This report "*Highland Region Flooding Incidents: Great Glen/ Loch Ness/ Inverness: Final Report*" produced by Mott MacDonald (1991) was reviewed at their Dingwall office. They only had one copy and were not prepared to let it leave the office. Daily flow rates at Ness-side were provided by SEPA, and tidal data for the Beauly Firth was also provided.

British Waterways Board

Information from British Waterways Board indicated that there are no inputs from the Caledonian Canal to the River Ness between Loch Ness and the Beauly Firth. A weir near Dochgarroch exists, which will collapse in case of flooding, diverting water from the canal into the River. However, no input from this weir has been made to date.

University of Strathclyde

A physical model of part of the River Ness was constructed in the Civil Engineering Department of the University of Strathclyde in the 1990's following the collapse of the Ness Railway Viaduct. The model did not extend as far downstream to cover all the present study area. The available data from the former physical model comprised of some river flow information.

Inverness Harbour Trust

Tidal data was made available from the Harbour Office. This, along with Harbour drawings and level survey information for both the Harbour and upstream, provided a good basis for establishing the physical characteristics of the lower part of the River Ness.

3. FLUVIAL FLOOD RISK

3.1 Introduction to Fluvial Flood Risk

This section will assess the flood risk from the River Ness. The methodology adopted will be to examine the catchment, then analyse the available flow records to determine the frequency and magnitude of fluvial flood events.

3.2 Catchment Details

The River Ness is an unusual river in that although it has the third greatest mean annual discharge of all the UK rivers, it only flows a relatively short distance to the sea. This is because it flows out of Loch Ness, which contains the largest volume of fresh water in Scotland. The presence of Loch Ness not only affects the flow regime of the River Ness, but also the sediment regime.

The entire Ness catchment extends to an area of approximately 1,860 km^2, and is illustrated in Figure 3.1, which is an output map of the catchment from the Flood Estimation Handbook CD-ROM.

Source: FEH CD-ROM, Centre for Ecology & Hydrology

Figure 3.1: Ness Catchment

3.3 Flows in the River Ness

There is a river flow gauging station on the River Ness at Ness-side (NGR NH 645 427) approximately 5km upstream of Shore Street Quay. The daily flows recorded at this flow gauging station were obtained for 21 years over the period January 1980 to December 2000.

The flows have been gauged at this site since 1973, although only the data since 1980 has been used in the daily flow analysis. The variations in trends between the two data sets can be observed by comparing exceedance flows for the two data sets as in Table 3.1. From this it can be seen that the data since 1980 shows slightly higher flows.

Flow Data Set	Mean Flow (m^3s^{-1})	95% exceedance flow - Q_{95} (m^3s^{-1})	10% exceedance flow - Q_{10} (m^3s^{-1})	5% exceedance flow - Q_5 (m^3s^{-1})
1973 - 2000	88.97	19.58	182.5	-
1980 - 2000	93.30	20.00	191.0	255.0

Table 3.1: Flow characteristics

The daily flows in the River Ness are shown in Figure 3.2. The largest peak occurred in 1989 and is the flood event that resulted in the collapse of the Ness Railway Viaduct. The seasonal pattern of flows can be easily identified, with high flow events occurring during the winter period.

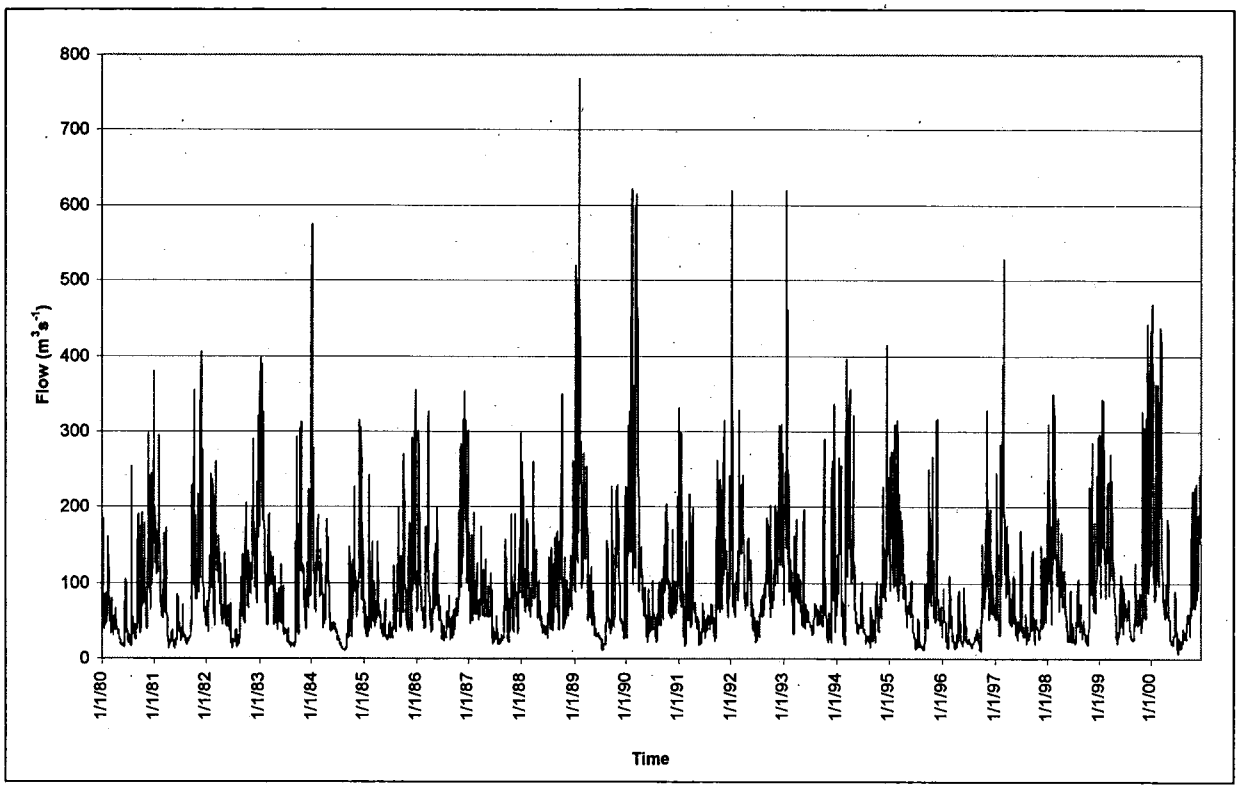

Figure 3.2: Daily Mean flows for the Ness at Ness-side

The range of gauged flows based on the analysed data produces a flow duration curve which is presented in Figure 3.3 using a logarithmic scale.

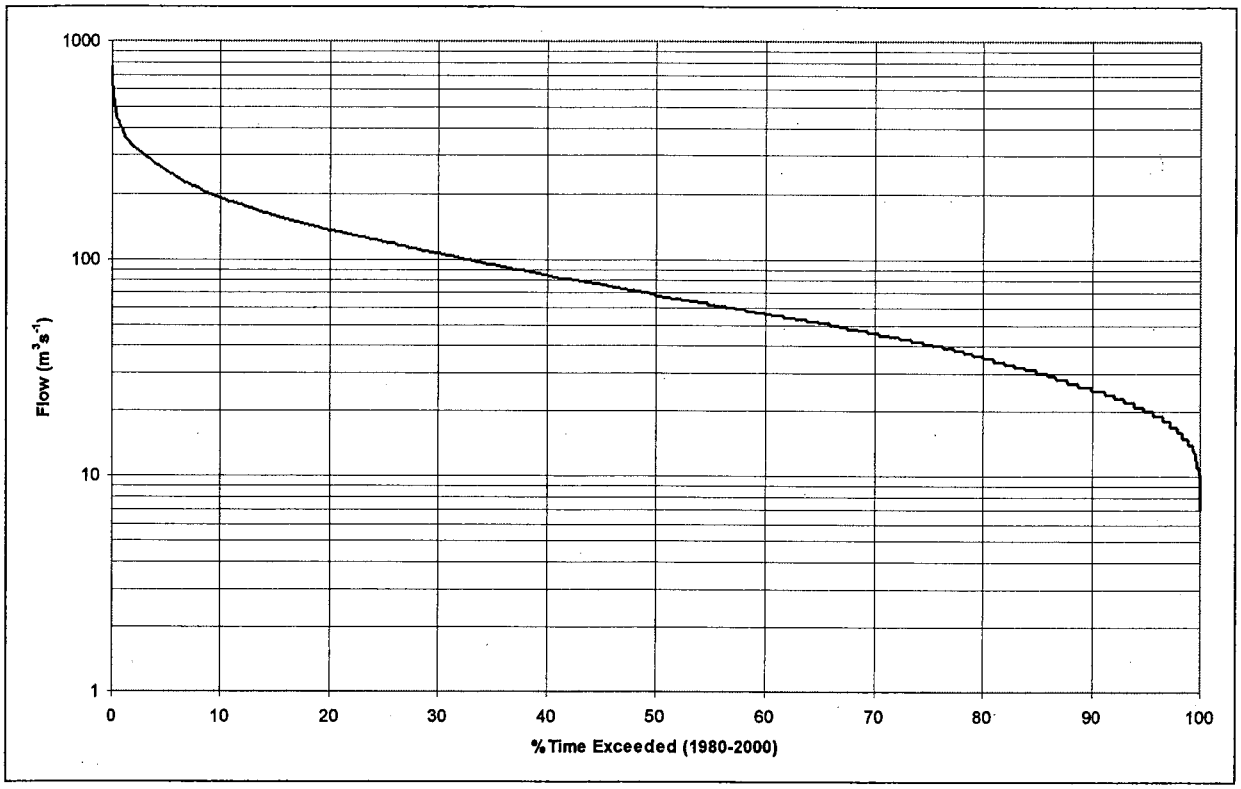

Figure 3.3: Logarithmic Flow Duration curve

3.4 Flood Frequency Analysis of Annual Maximum Flows

Annual maxima flows are available for the Ness-side gauging station period 1973-2001. Earlier data exists for the Ness at Ness Castle, located slightly upstream of Ness-side. Annual maximum data is available for Ness Castle from 1929 to 1962. This data has been scaled up using an areal factor to allow for the slightly larger catchment at Ness-side. Thus a longer series of annual maxima flow data is formed and can be used for extreme value analysis to calculate the flood frequency curve for the Ness.

The flood frequency curve has been calculated in accordance with guidance published within the Flood Estimation Handbook (FEH)[1]. This method uses an L-moment approach to fit a General Logistic distribution to the data. This distribution is deemed most suitable for UK flood frequency analysis. A growth curve is generated and then scaled up to produce a flood frequency curve using the median flow, Q_{med}, as presented in Figure 3.4.

[1] NERC (1999) – The Flood Estimation Handbook

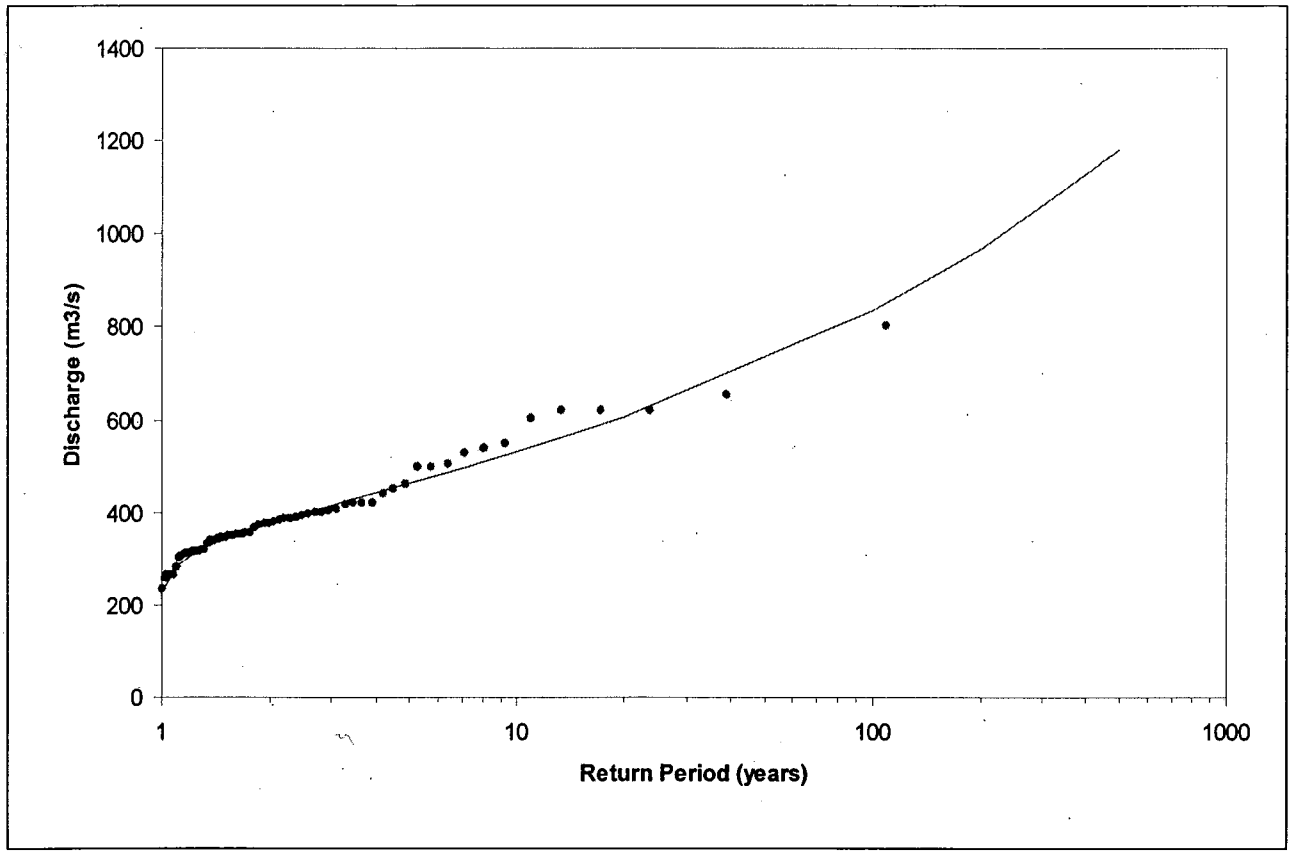

Figure 3.4: Flood Frequency Curve for the Ness at Ness-side

The magnitude of various return period flows have been extracted from the curve and are presented in Table 3.2 below.

Return Period (years)	Annual Probability of Occurrence	Flow (m^3s^{-1})
10	0.1	525
20	0.05	585
50	0.02	725
100	0.01	840
200	0.005	970

Table 3.2: Magnitude and Frequency of Selected Flood Flows

3.5 Effects of Climate Change

River flooding is primarily a function of rainfall, in addition to the antecedent catchment wetness. During the next century the effects of climate change will continue to cause an increase in global temperature and the result will be a change in weather patterns. While little detailed data is available on the predicted change in rainfall patterns for the UK it is generally accepted that the frequency of extreme rainfall events will increase during the next century[2]. This in turn will result in an increased frequency of flood events. UKCIP suggest, based on a Medium-High climate change scenario that present day 100 year return period floods may become equivalent to:

- 65-70 year floods by the 2020's
- 60-65 year floods by the 2050's
- 40-60 year floods by the 2080's

These are provisional estimates published by the Scottish Executive[3] but provide an indication of the increased risk of flooding that may be faced in the future. The 1989 flood that resulted in the collapse of the railway bridge had an estimated return period of 120 years. Based on these climate change predictions the probability of such an event occurring will increase and we can expect the frequency of present extreme flood events to increase.

[2] Hulme, M. and Jenkins, G.J. (1998) Climate Change Scenarios for the UK; UKCIP Technical Report 1, Climate Research Unit, Norwich.

[3] Scottish Executive Central Research Unit (2001) Climate Change: Review of Levels of Protection offered by Flood Prevention Systems

4. TIDAL FLOOD RISK

4.1 Introduction to Tidal Flood Risk

Shore Street Quay is subject to tidal influence and the risk of flooding is increased during periods of high tides, generally associated with spring tides or surge tides associated with storm related high winds and waves. Low pressure systems moving across the North Sea exert less force on the sea surface and high sea levels result.

Tidal flooding occurs during periods of high tide, and are thus events which will only occur over a short period of time around the peak of the tide.

4.2 Tidal Regime

The tidal influence on the River Ness extends up to the main road bridge however during high tides can extend as far inland as the islands by the sports centre (See Figure 2.1).

Inverness Harbour Trust operate a tide gauge within the harbour area at Longman Quay with data available from 1985, although the data provided does have prolonged periods of missing data. A further tide gauge is located in the Beauly Firth at Clachnaharry Point. Good correlation was found between the two gauges so data from the Clachnaharry Point has been used to infill the harbour series where necessary.

4.3 Frequency Analysis of Tidal Annual Maxima

Extreme value analysis can be used to produce a level frequency curve for Inverness Harbour, using only the maximum recorded tidal level from each year. As previously discussed, data for Inverness itself is only available from 1985 onwards, a relatively short record from which to construct a level frequency curve. However the tidal gauge at Aberdeen Harbour has a much longer historic record, and this has been used as a benchmark to verify that the curve produced from Inverness data is realistic.

$$F(X)=\exp\left[-e^{-b(X-a)}\right]$$

Where $a = \mu_x - \gamma/b$

$b = \pi / \sigma_x \sqrt{6}$

$\gamma = 0.5772$

An Extreme Value 1 type distribution, as described above, was fitted and the resulting level-frequency curves are illustrated in Figure 4.1.

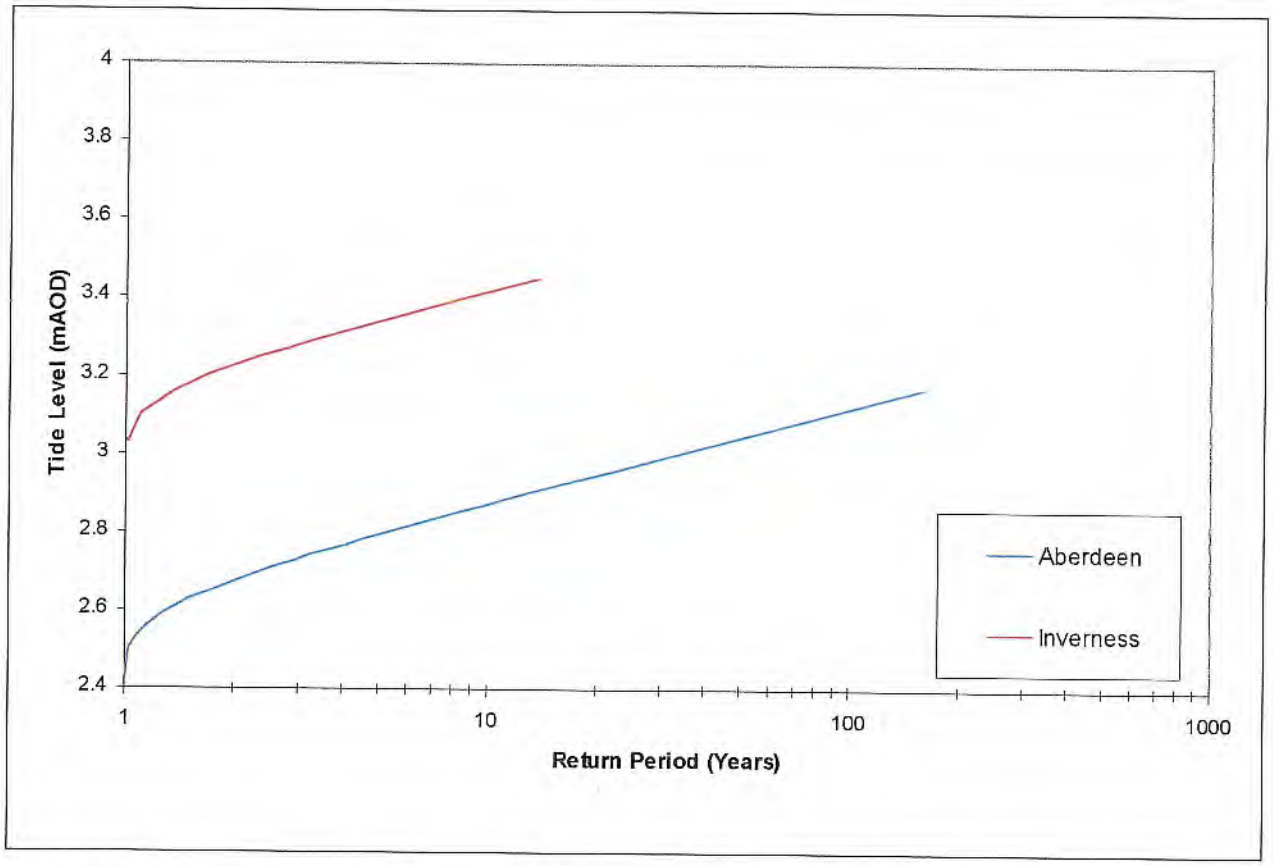

Figure 4.1: Level-Frequency Curves for Inverness and Aberdeen

As illustrated by Figure 4.1 the level-frequency curve for Inverness Harbour has a similar profile to that calculated for Aberdeen. Given the good agreement in profiles the Inverness curve can be extrapolated to include less frequent events, although care should be taken when interpreting extrapolated data due to the uncertainty introduced. The Aberdeen curve is a more accurate interpretation of the data as it has been derived from a longer record covering a wider range of extremes. Extreme tidal levels and their associated frequencies are presented in Table 4.1.

These levels have been calculated on a purely theoretical basis using statistical methods, and there is good agreement with the values previously published in the Mott Macdonald report, with the newly calculated values being generally lower than those previously predicted. However these statistical levels suggest that Shore Street Quay would be overtopped by a 1 in 20 year extreme tide, however historic records only detail two occurrences of extreme tides.

- 1868 - Tidal event on 7th February. High Wharf at Anderson Street submerged, directly opposite Shore Street Quay.
- 1977 - Tidal event on 12th November. Levels rose to within ~300mm of crest of tidal defences.

SEPA
Scottish Environment Protection Agency

Our Ref: JM/FJV/
EA/2004/0425/3
(HA/2004/0116)
Your Ref: 2SPP/002/018

F.A.O. C F Smith

If telephoning ask for:
Jim Mackay

Scottish Executive
Enterprise, Transport & Lifelong Learning Department
Transport Division 4
Victoria Quay
Edinburgh
EH6 6QQ

31 January 2005

Dear Sir

PROPOSED INVERNESS HARBOUR REVISION ORDER
HARBOUR WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 1999
INVERNESS HARBOUR LONGMAN EXTENSION

Thank you for consulting SEPA on the Environmental Statement (ES) relating to the above. SEPA comments as follows.

1. Additional correspondence

1.1 Please note that SEPA has received additional information from the applicant by letters dated 21 January 2005 and 27 January 2005 (as attached). SEPA has on request also provided the applicant with a specification for an intertidal survey (Annexe: Inverness Harbour Development Baseline Survey Monitoring Protocol) initially by letter of 3 December 2004, but subsequently revised following a meeting between SEPA and the applicant to discuss this issue; the revised protocol despatched to the applicant by e-mail of 10 January 2005 is attached.

2. Outstanding information

2.1 Many of the issues raised by SEPA at the Environmental Impact Assessment (EIA) scoping stage in its letter to you dated 8 March 2004 have now been satisfactorily addressed. However, SEPA is obliged to **object** to this proposal until sufficient information has been submitted in order to assess the coastal impact within a Water Framework Directive context – it is understood that this information is to be submitted within the next few weeks, and SEPA would be pleased to review its position when this information is received. SEPA has consistently raised the need to address this issue throughout the development of the project.

3. Work method statement

3.1 If this were a conventional planning application, SEPA would request a condition requiring a detailed work method statement setting out the different operations, the pollution risks associated with each, mitigation measures, and contingency measures for the satisfaction of the planning authority in consultation with SEPA. The mitigation measures identified within the ES would be a useful basis for a more detailed construction method statement.

3.2 SEPA would/...

Dingwall Office
Graesser House, Fodderty Way
Dingwall Business Park, Dingwall IV15 9XB
tel 01349 862021 fax 01349 863987
www.sepa.org.uk

3.2 SEPA would also request that works would be carried out in accordance with SEPA's Pollution Prevention Guidelines, available on SEPA's website www.sepa.org.uk , and with close adherence to CIRIA C584 "Coastal and marine environmental site guide" is closely adhered to at all times. SEPA would request that the applicant's and their contractor's attention should be brought to the appropriate checklists and good practice advice generally in this document and in particular to: Section 4.2 of the guide entitled "Dredging", Section 4.3 of the guide entitled "Excavation", Section 4.6 of the guide entitled "Nourishment and reclamation", 4.8 of the guide entitled "Rock works and placement of concrete units", Section 4.10 of the guide entitled "Piling", Section 4.11 of the guide entitled "Masonry" and Section 4.14 of the guide entitled "Concrete pours and aftercare".

3.3 However, in this case, where the Harbour Revision Order gives deemed planning permission it is not clear how a) measures to avoid/prevent pollution or b) enforcement measures to ensure that such measures are complied with (other than *post facto* action through the Control of Pollution Act 1974 (as amended) are to be achieved. SEPA therefore requests advice on how these measures can be addressed.

4. Water Framework Directive

4.1 SEPA has raised in its previous correspondence the need for the proposal to be considered within the context of the Water Framework Directive. The ES did not address this aspect but following discussion between the applicant and SEPA, the applicant has agreed to provide information in the form of a benthic invertebrate survey of the mudflats in the area earmarked for development, to assess the invertebrate biodiversity and biomass of the mudflats and the potential impact of the development upon this. An assessment is to be made of the relevance of the loss of taxa and food resource to the feeding ecology of both avian and fish populations, with particular reference to the fish detailed in the Local Biodiversity Action Plan. Opportunities for mitigation of loss of habitat (through, for example, environment enhancement elsewhere in the firth such as managed realignment, saltmarsh restoration, clean-up of foreshore etc.) should be explored.

4.2 Further information is expected on this aspect within the next few weeks.

4.3 SEPA initially was also concerned regarding bathymetry and sedimentation within the Inverness Firth, but as stated in SEPA's letter of 3 December 2004 to the applicant (attached) and within the letter from the Trustees of the Harbour of Inverness to SEPA dated 21 January 2005 (attached), it was considered that the Wallingford modelling Report, incorporated within the ES, addressed this issue.

5. Flood risk

5.1 SEPA requested that the applicant to demonstrate fully that the option selected for the site would not significantly exacerbate flood risk upstream or downstream of the site. In the letter from Trustees of the Harbour of Inverness to SEPA dated 27 January 2005 (attached) the applicant confirmed that the Shore Street Quay Flood Risk Assessment included within the ES only to provide information relating to River Ness flows and no work on Shore Street Quay is included within this Harbour Revision Order. SEPA therefore accepts that flood risk within this context is not relevant.

5.2 SEPA has recently/...

5.2 SEPA has recently requested from the applicant confirmation of whether or not the proposed Longman site will be protected from a flood level of circa 3.75 mAOD (the 1 in 200 year tidal flood level estimated using a Generalised Logistic distribution in the Mott MacDonald report "River Ness Flooding Review, January 2004", produced for the Highland Council's TEC Services department). SEPA will respond further when confirmation on this has been received.

6. Discharges

6.1 SEPA sought clarification that the proposals would not have an impact on dilution and dispersion of existing discharges, such as the storm overflow from the Longman pumping station which serves the greater part of the City of Inverness. In the letter from Trustees of the Harbour of Inverness to SEPA dated 27 January 2005 (attached) the applicant confirmed that the reclamation works do not affect the existing flows in and around the storm water overflow discharge area.

7. Waste management

7.1 For your information, Section 7.10 of the ES details the treatment of excavated material by grading to produce aggregate with the finer particles (<2mm) being taken to a landfill facility. Such treatment requires an exemption from waste management licensing and is most probably covered under the exemption detailed in part 1(a) of paragraph 13, Schedule 3 of the Waste Management Licensing Regulations 1994. The applicant will have to register this exemption, free of charge, with SEPA before treatment operations can commence.

7.2 It is likely that some of the excavations mentioned in Section 7.21 of the ES would be above the low water mark and thus subject to waste management licensing regulations. The ES states that this material is to be deposited at sea at an approved licensed location. SEPA presumes that in this instance, "licensed location" means that the activity is to be regulated by a licence issued under the Food and Environment Protection Act 1985 as regulated by the Scottish Office. According to Circular 10/94 produced by the Scottish Office Environment Department, any waste activities carried on above the low water mark which are subject to a licence granted under the Food and Environment Protection Act 1985 are exempt from the requirements of waste management licensing regulations. SEPA thus requires clarification that the applicant is intending to apply for a FEPA licence and furthermore, requests to be furnished with a copy when the FEPA licence is issued as SEPA is assuming that the FEPA licence will regulate any storage of excavated waste on land prior to off-shore disposal.

8. Waste minimisation and sustainable development

8.1 SEPA is disappointed that much of the infill for this major reclamation project may consist of primary excavated materials (the ES (page 15) states "It will be the contractor's responsibility to identify sources of supply for construction materials.") It is noted that material from excavations to form the new Marina and other operations will be utilised as part of the reclamation project, but this still leaves significant amounts of material to be imported (net imported fill of 83,000 cubic metres) which could have been sourced from secondary sources. SEPA prefers that clean material is used in land reclamation and sea defence works, and scope for use of clean secondary aggregates in appropriate elements of the reclamation works could have been explored in the ES.

9. Foul drainage/...

9. Foul drainage

9.1 It is noted that foul drainage is to be directed to foul sewer and SEPA has no objections to this element of the proposal.

10. Surface water drainage

10.1 SEPA is disappointed that Sustainable Drainage Systems (SuDS) proposals for surface water drainage have not been developed at all within the ES. In the letter from Trustees of the Harbour of Inverness to SEPA dated 27 January 2005 (attached) the applicant states that it is difficult to develop an onsite infrastructure system as the layout of the laydown areas, roads and buildings have not been identified. It is stated that "As the use of the newly reclaimed area becomes more defined, a proper road and infrastructure layout will be prepared and the Harbour Trust will liaise directly with both SEPA and Highland Council Planning to develop the layout and comply with the necessary legislation."

10.2 Provided there is a regulatory mechanism whereby surface water drainage of the site can be addressed at a later date, then SEPA would not object to surface water drainage consideration being deferred, but confirmation of the regulatory mechanism to address this issue is requested. Will this aspect be subject to planning permission?

11. Inverness Harbour Revision Order

11.1 It is noted that the ES appears to refer to a considerably larger area of reclamation than that addressed by the draft Harbour Revision Order on which there was consultation in February 2004. This referred to a reclamation area of 6.9 ha of foreshore and other works, while the ES refers to a reclamation of 9.78 ha "or thereby." Presumably areas will be clarified when re-consultation on the Harbour Revision Order occurs.

Should you wish to discuss the above I can be contacted on 01349 860315.

Yours faithfully
[Redacted]

JIMI MACRAE
PLANNING CO-ORDINATOR

Attachments:
Letter to applicant from SEPA dated 3 December 2004; letters from applicant to SEPA dated 21 January 2005 and 27 January 2005; Inverness Harbour Development Baseline Survey Monitoring Protocol and covering e-mail from SEPA of 10 January 2005.

Copy to:
Ben Leyshon, SNH, Dingwall
Alan F. Cruden, 24 Bank Street, Inverness IV1 1QU
Allan Todd, THC, Planning, Glenurquhart Road, Inverness
Peter Hayes, Marine Laboratory, Aberdeen

Electronic copy to: Mark Williams, Richard Fyfe, David Cameron, Richard Parks, Calum Findlay

Return Period	Extreme Tide Level (mAOD)		
	Aberdeen	Inverness	Inverness (Mott Macdonald, 1991)
2	2.68	3.22	-
5	2.79	3.34	3.39
10	2.88	3.4	3.46
20	2.96	3.47	3.53
50	3.03	3.57	3.58
100	3.11	3.66	3.62

3.62 at Shore St

Table 4.1: Extreme Tidal Levels and Return Periods

Given that there is no historic evidence of flooding at Shore Street Quay this suggests that the statistically based extreme tides presented in Table 4.1 are overestimated. The highest event recorded in the relatively short Inverness series is approximately equivalent to a 20 year event and extrapolating to more extreme events incurs a large degree of uncertainty. Similarly the merging of the Inverness Harbour annual maxima series with data from Clachnaharry also introduces potential errors into the series.

This analysis is based on a limited dataset, and should a longer time series be available, the analysis should be refined. Collection of such additional data was outwith the scope of this investigation.

4.4 Effects of Climate Change

While the potential impacts of climate change on fluvial flooding are not widely understood except in terms of increased frequency of intense rainfall events the impacts of climate change on sea level are better quantified. The recent Scottish Executive publication on climate change and flood risk [3] included predictions of mean sea level rise in the east of Scotland based on the various risk scenarios for climate change, as shown in Table 4.2. The climate change scenarios used are those presented by UKCIP.

Climate Change Scenario	Low		Medium-Low		Medium-High		High	
Effect*	Climate	Net	Climate	Net	Climate	Net	Climate	Net
Sea Level Rise (m)	0.13	0.08	0.20	0.15	0.28	0.23	0.74	0.69

* **Climate**- effect of climatic change only; **Net** - net effect of climatic change and land movement

Table 4.2: Predicted Rises in Sea level for the East of Scotland (2050s)

The effects of sea level rise are being offset by the natural vertical uplift of land occurring in Scotland as a result of isostatic adjustment. This is a long term geological effect caused by the movement of the Earth's tectonic plates. In this case the plate is rising as a result of the melting of ice at the end of the last Ice Age. The net level of sea rise after adjustment for isostatic uplift is also included in Table 4.2.

However while sea level rise around Scotland is relatively uniform, the level of isostatic adjustment is more variable (Figure 4.2) and Inverness is likely to have experienced an uplift of approximately between 50 and 99mm by 2050. When these figures are applied to the Medium-High UKCIP98 scenario, Inverness can expect a net mean sea level rise of between 111 and 150mm by 2050.

This takes no account of any potential increase in storminess and therefore represents a conservative estimate of potential sea level rise. High winds can influence the characteristics of tidal surges and wave behaviour causing abnormally high tides.

Based on data published by the Government (www.sustainable-development.gov.uk) mean sea level at Aberdeen has risen by 0.7mm/year over the last century (See Figure 4.3) and a rise of similar magnitude would be expected at Inverness. The tidal range will remain approximately the same as this is controlled by the proximity of the moon, however the baseline from which tidal extremes are calculated has risen by around 70mm in the last century and the equivalent magnitude tidal event to that occurring in 1868 would now result in a peak water level 70mm higher and cause more severe inundation.

Predictions of tidal extremes under climate change scenarios can be made by offsetting the present day tidal extremes curve by the predicted rise in mean sea level rise. However this has not been included in this report due to the discrepancy between the statistical tidal extremes curve and observed flood events.

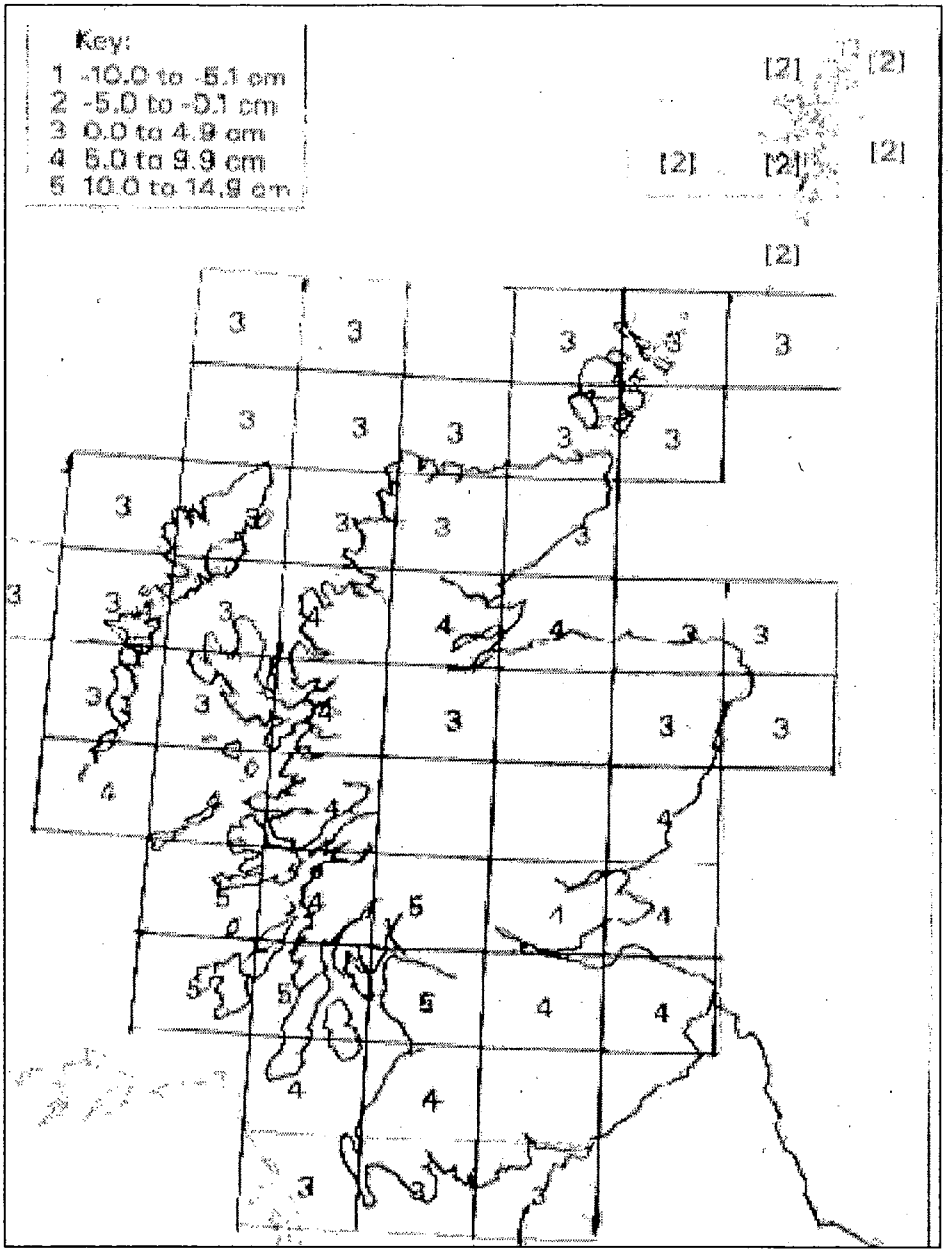

Figure 4.2: Vertical Land Movement by 2050 (from Scottish Executive)

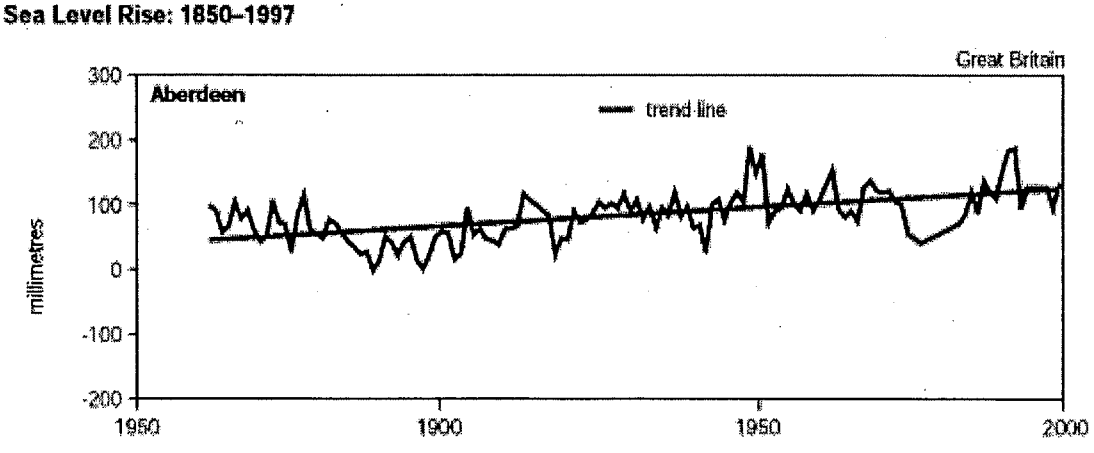

Figure 4.3: Mean Sea Level rise at Aberdeen

5. EFFECTS OF INFILLING AT SHORE STREET QUAY

5.1 Baseline Assumptions

To enable assessment of the effects of infilling, a model has been developed which simplifies the real conditions and is based upon the following assumptions:

1. All measurements have been based on the survey data shown in Figure 2.2.
2. The channel has been simplified to a rectangular profile in the vicinity of Shore Street Quay.
3. The average bed depth is assumed to be approximately 1m below Chart Datum (CD), which is equivalent to -3.25m AOD.
4. The channel is taken to have total width of 105m, with the groyne located 25m from the quay wall at Shore Street Quay.
5. The groyne has a height of 0.54m AOD while the Shore Street Quay is at a height of 3.47m AOD.
6. Based on a rectangular profile of the existing channel the maximum cross sectional area to contain flows is 105m x (3.25 + 3.47)m giving a cross sectional area of 705 m^2.

5.2 Existing Conditions

The river channel immediately upstream of Shore Street Quay is currently undeveloped and is in a semi-natural state with a relatively shallow gradient to the river compared to the surrounding riverbanks on both sides up- and downstream. A groyne runs parallel to the quay wall creating a back water during low river flows and providing extra channel capacity during high flows when the groyne is overtopped.

Based on current conditions, assuming that fluvial and tidal effects are independent

- Based on statistical estimates inundation of the Quay area from tidal flooding will be caused by a 1 in 20 year return period tidal event, or a 0.05 annual probability of occurrence. (See 4.1). However, as previously discussed, no such inundation has been recorded and a return period of around 100 years may be more realistic for such an event.
- During the 1989 floods estimated to have a return period of 120 years, no overtopping of the banks occurred in the quay area. However the frequency of occurrence of such extreme events is likely to increase due to climate change.
- If no channel development takes place and assuming a Medium-High climate change scenario is assumed then by 2050 the mean sea level will have risen by 0.23m. If a similar rise in maximum tide level is seen the associated return period will reduce significantly and tidal inundation of Shore Street Quay may become a relatively common place event.

5.3 Options for Development of Shore Street Quay

There are four main development options proposed for Shore Street Quay:

- Infilling to height of quay wall (A)
- Infilling to height of groyne (B)
- Infilling to create a sloped profile to the height of the quay wall (C)
- Infilling to create a sloped profile to just below the height of the groyne (D)
- Raising the groyne to create a marina area (E)

Options A to D are illustrated in Figure 5.1 which shows the simplified representation of the channel cross sectional area used in the risk analysis.

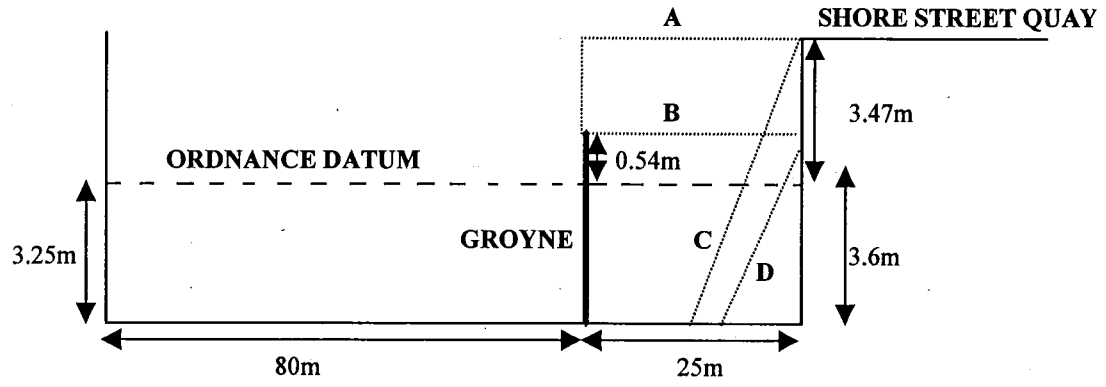

Figure 5.1: Simplified Cross Section and Development Options

Option A effectively reduces the channel width to 80m.

Option B creates a stepped channel profile. At low flows the river will be constrained within the main channel but once the water level exceeds 0.54m AOD the groyne area will provide additional channel capacity.

Option C creates a sloping bank, sloping downwards from the quay wall from the quay wall to approximately halfway between Shore Street Quay and the groyne. Additional but reduced capacity will still be available behind the groyne in the case of high flows.

Option D also creates a sloping bank, this time starting just below the height of the groyne (0.35mAOD) and ending approximately 10 metres out from the quay wall. Additional but reduced capacity will still be available behind the groyne in the case of high flows.

Option E involves raising the height of the groyne to create a marina area. By doing this the river channel would be restricted over a greater range of flows, until levels rise to the extent that the groyne will be overtopped and water will flow into the marina. Information on the proposed height of groyne would be required to quantify the exact effects on the fluvial regime.

5.4 Localised Effects of Development

The loss of storage due to infilling behind the groyne would have minimal effects on the tidal range in the river as the tidal bulge is spread over a large area and the loss of a tiny fraction of storage will be negligible in comparison. Thus the risk of flooding due to tidal effects would be as discussed in Section 5.1 for existing conditions.

However in terms of high fluvial conditions the reduction in cross sectional area of the channel, due to removing or reducing the additional storage behind the groyne is of importance. The result of the reduction will be that water levels in the main channel will be higher and the flow more concentrated and focussed, particularly on the quay side of the bend. This can lead to localised flooding and also to a tendency for scour to occur. Table 5.1 quantifies the effects of each development option in terms of cross sectional channel area.

Development Option	Reduction in Channel Cross Sectional Area (%)
A. Infilling to height of quay wall	24.0
B. Infilling to height of groyne	13.5
C. Infilling to create slope to height of quay wall	6.0
D. Infilling to create slope to just below groyne level	2.5
E. Raising groyne to create marina area	0-24 depending on height raised.

Table 5.1: Changes in Channel Cross Sectional Area

Option A has the most severe impact on the channel capacity as the entire area behind the groyne is reclaimed leaving no additional channel capacity during high flow events.

Option B, infilling to the height of the groyne also significantly reduces the channel cross sectional area but does provide an additional channel for fluvial flow assuming water levels are in excess of 0.54m AOD. However the tidal extent of the Ness in Inverness Harbour typically ranges from – 1.25m AOD to 2.75m AOD and the infilled area behind the groyne would be regularly inundated by high tides, limiting development potential.

Options C and D have similar but not so pronounced effects as Option B. Inundation would occur regularly as the groyne overtops but additional quay protection would be provided by the new infill.

Option E, the creation of a marina area behind a raised groyne will also restrict the channel capacity until water levels are high enough to overtop the groyne. At present water flows in and out of the back water area with the rise and fall of the tide and in order to prevent the water level dropping some form of control e.g. a lock, would be necessary to maintain the water level in the marina area at the required level. The effects of this proposal on tidal flooding would be negligible as the loss of storage would be minimal however overtopping of the groyne may cause problems within the marina area itself.

For all the options climate change is predicted to cause a rise in mean sea levels increasing the risk and frequency of tidal inundation. Similarly the return periods of extreme fluvial events will be reduced by varying degrees according to the severity of climate change.

5.5 Upstream and Downstream Effects

The tidal bulge created by the moon's gravitational pull extends over a large area and the loss of storage resulting from any of the development options presented will have minimal effects on the tidal levels both up and down stream.

In terms of fluvial flows, reducing the channel capacity will impact flows in the Shore Street Quay area and lead to an increased risk of water backing up in high flow conditions. Given the relatively wide nature of the channel, the options providing a low reduction in channel capacity will have a minimal impact, however, the risk of overtopping, as previously witnessed will still remain from extreme flows and high tides.

The main effect on the area downstream of Shore Street Quay is likely to be in terms of the pattern rather than quantity of flow. The restriction created by the removal of the additional capacity behind the groyne will concentrate the flow of water along the edge of the groyne and in the centre of the channel at the toe of the groyne. This concentrated flow will be faster and carry more energy and could result in areas of scour downstream. Additionally the increased velocity of the flow will increase the river's ability to dislodge and transport sediment. This sediment load will be deposited downstream when the flow slows down and can no longer sustain its load. Again, options providing a low reduction in channel capacity will have the least impact, as will the options having a rough surface which will slow down the flow near the Quay wall.

5.6 Occurrence of Extreme Events

Fluvial and tidal extremes are independent however they are not mutually exclusive and may occur simultaneously. If these high tide events coincide with high fluvial flows the water levels within the harbour will be high and flooding may result.

It is unlikely that extreme high tides and flows would occur at Inverness. Extreme tides are associated with storm surges, produced by low pressure systems to the east of Scotland in the North Sea, while high river flows are generally produced by heavy rainfall associated with slow moving low pressure systems moving across Scotland from the west. The River Ness drains a catchment with a relatively quick runoff, hence the conditions required for the two most likely scenarios are unlikely to occur together.

For comparative purposes, the tidal range experience on the two most recent large flood events in Inverness were examined, and shown below. This illustrates the fact that although there were higher tides in 1989, they were still not exceptionally high tides.

1989 flood	$Q_{max} = 800\ m^3s^{-1}$	tidal range: +2.8m → -1.8m
1990 flood	$Q_{max} = 650\ m^3s^{-1}$	tidal range: +1.9m → -0.8m

The five highest tides have been extracted from the Inverness Harbour tidal series for 1999 and 2000 and are presented in Table 5.2 along with river flows for the same days. The 10% exceedance flow for the Ness at Ness-side is approximately 180 m^3s^{-1} and it can be seen from the table that the majority of extreme tidal events within the harbour coincide with high river flows. The reason for this is that the tidal gauge in the harbour is recording the effects of the fluvial regime in addition to the tidal variation.

The tidal gauge records levels range from approximately 1m Above CD to 5.5m Above CD (–1.25 - 3.25m AOD) however the majority of measurements in excess of 5m Above CD are related to fluvial extremes and the independent tidal range is around 4m, from –1.25m AOD to 2.75m AOD, other high values are likely to be influenced by storm surges. This leaves a freeboard of approximately 1 metre to contain fluvial flows and tidal extremes at Shore Street Quay before the quay walls are breached. Any reduction in channel width will reduce the available freeboard and increase the risk of flooding.

Maximum Tidal Level (m AOD)	Date	Daily Mean Flow (m^3s^{-1})
3.29	12/12/00	161
3.06	13/12/00	191
2.89	1/9/00	30
2.87	28/9/00	30
2.87	30/10/00	217
3.45	25/12/99	429
3.11	22/12/99	234
3.11	24/12/99	433
3.01	27/11/99	238
3.00	24/11/99	129

Table 5.2: Occurrence of Extreme High Tides and Corresponding River Flows

6. CONCLUSIONS

A summary of the main findings of this investigation are as follows:

- Shore Street Quay is presently at greater risk from tidal flooding than fluvial flooding.
- Developments requiring infilling at Shore Street Quay will result in an increased risk of fluvial flooding due to a reduction in the flow capacity of the channel.
- Climate change predictions indicate that there will be an increasing risk of overtopping at Shore Street Quay from tidal flooding (based on analysis of the limited dataset available).
- Infilling of Shore Street Quay should be kept to a minimum if required as the risk of flooding increases with the reduction in channel capacity. The development options examined rank as follows, beginning with the least impact upon flood risk, with the first three considered to be the most viable options:
    - Existing conditions
    - Infill to create a sloped profile to just below the height of the groyne
    - Infilling to create a sloped profile to the height of the quay wall
    - Infill to level of groyne
    - Raise groyne to create marina
    - Infill to level of quay
- Statistical analysis of available annual maximum tides for Inverness appear to overestimate the severity of extreme events as no inundation at Shore Street Quay had been recorded since 1868.
- Currently it is estimated a 1 in 100 year tidal event is required before flooding will occur at Shore Street Quay. Should the predicted climate change scenarios be realised, then the return periods of extreme tidal events will reduce significantly, and events now considered rare will become more common place.

With regard to future monitoring and assessment of tidal flood risk we would recommend the following:

- The available historic chart records should be converted to an electronic format to facilitate easier and more detailed analysis in the future. This investigation only examined the observed annual maxima from the available chart records and electronic data from the past three years.
- Tidal series should be examined on a routine basis to detect any changes in trends, and predictions should be updated following any extreme events.