Edinburgh Marina Granton Harbour Ltd

Edinburgh Marina
Volume 3: Technical Appendices

September 2018

Contents

Technical Appendix 1.1: Pre-Application Consultation Report

Technical Appendix 1-2: Planning Statement

Technical Appendix 2-1: Civil Engineering Method Statement

Technical Appendix 3.1: Scoping Opinion

Technical Appendix 4.1: Bathymetric Survey

Technical Appendix 4.2: Wave Disturbance Modelling

Technical Appendix 4-3: BPEO

Technical Appendix 5-1: Otter Survey

Technical Appendix 5-2: Marine Mammal Protection Plan

Technical Appendix 5-3: Marine Non-native Species Survey

Technical Appendix 5-4: Habitats Regulations Appraisal

Technical Appendix 5-5: Underwater Noise, Qualitative Assessment

Technical Appendix 1.1: Pre-Application Consultation Report

Cameron Planning

EDINBURGH MARINA
EST. 1836

Pre-Application Consultation Report under Regulation 7(b) of the Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013

Marine Licence Application for Construction Works Proposed Marina Development, Edinburgh Marina, Granton, Edinburgh

Contents

1. Introduction 3

2. Pre-Application Consultation Report 6

Appendices

1. Copy of advert for pre-application consultation event placed in Edinburgh Evening News, 7 h September, 2017.

Rev A – minor corrections – 28th September, 2018

1 Introduction

1.1 Introduction

1.1.1 The Marine Scotland Act 2010 allowed for legislation to be introduced in respect of pre-application consultation requirements relating to applications for licenses for Marine Construction Works. The Subsequent Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013, laid down the legislative requirements for such consultation. The Regulations came into force on the 1st January, 2014, requiring any application made after the 6th April, 2014 to, where required to be so under the Regulations, be accompanied by a Pre-Application Consultation Report.

1.1.2 In effect, the Regulations require that pre-application consultation is undertaken in advance of an application being submitted for Marine Construction Works. This Statement outlines the steps taken by the applicants, Edinburgh Marina Granton Harbour Ltd., in order to meet the legislative requirements pertaining to the proposed works at Granton Harbour which are a subject to the supported Marine Licence application.

1.1.3 The Regulations define works under Regulation 4 that are prescribed as licensable marine activities for the purposes of the Regulations, including:

a) the construction of any works (with the exception of a renewable energy structure) within the Scottish marine area either in or over the sea or on or under the seabed, but only where the total area in which such works are to be located exceeds 1000 square metres in extent;

b) the alteration or improvement of any works (with the exception of a renewable energy structure) within the Scottish marine area either in or over the sea or on or under the seabed by extending such works, but only where the total area in which such works, as extended, are to be located exceeds 1000 square metres in extent;

c) the construction of a bridge, causeway or walkway within the Scottish marine area either in or over the sea or on or under the seabed, but only where such bridge, causeway or walkway exceeds 50 metres in length

1.1.4 The proposed development of the new marina is a key part of the Granton Harbour regeneration development. This development was granted Outline Planning Permission (now Planning Permission in Principle) by City of Edinburgh Council in 2003 under planning application reference 01/00802/OUT. The development approved in 2003 is in relation to:

> *mixed use development; comprising residential units, hotel + serviced apartments , shops + retail/services, restaurants/cafes , public houses, general business, leisure facilities + marina*

1.1.5 With regards to the terrestrial planning regime, MSC planning permission was granted under the original 2003 planning permission, under reference 16/04409/AMC on 21st April 2017, for, *"the formation of a new Marina Office with associated retail and café space, and new community boat yard with associated dry stack".*

1.1.6 Collectively, the marina and its associated works, both land and marine based, were approved under the Planning regime in 2003 with subsequent detailed 'matters specified in conditions' approvals being granted for different elements. As the marina includes works that fall under the Marine Licensing regime, applications for Marine Licences are required to ensure all consenting matter are addressed.

1.1.7 Regulation 6 of the 2013 Regulations states that the prospective applicant for a marine licence must give notification that an application for a marine licence is to be submitted and a pre-application consultation event is to be held, to—

a) the Commissioners of Northern Lighthouses;

b) the Maritime and Coastguard Agency;

c) the Scottish Environment Protection Agency;

d) Scottish Natural Heritage; and

e) any delegate for a marine region where the application for a marine licence is for an activity which is to be carried out wholly or partly in that region.

1.1.8 Regulation 7 of the 2013 Regulations introduces the following requirements:

1) The prospective applicant for a marine licence must –

(a) hold at least one pre-application consultation event at which those persons mentioned in regulation 6(2), and members of the public, may provide comments to the prospective applicant as regards the licensable marine activity to which the application for a marine licence is to relate; and

(b) publish in a local newspaper a notice containing –

(i) a description, including the location of, the licensable marine activity for which the marine licence is to be sought;

(ii) details as to where further information may be obtained concerning the proposed licensable marine activity;

(iii) the date and place of the pre-application consultation event;

(iv) a statement explaining how persons wishing to provide comments to the prospective applicant relating to the proposed licensable marine activity may do so, and the date by which this must be done; and

(v) a statement that comments made to the prospective applicant are not representations to the Scottish Ministers and that if the prospective applicant makes an application for a marine licence that there will be an opportunity for representations to be made to the Scottish Ministers on the application.

2) A pre-application consultation event must be held no earlier than six weeks after the later of –

(a) the date on which notification of such event is given in accordance with paragraph (1)(b); and

(b) the date of notification that an application for a marine licence is to be submitted is given in accordance with regulation 6(2).

3) Paragraph (1) does not apply where –

(a) a pre-application consultation event in respect of the licensable marine activity for which a marine licence is sought has been held in relation to that activity within one year of the date on which the application for a marine licence is received by the Scottish Ministers;

(b) that pre-application consultation event has been held in a suitably accessible venue; and

(c) that pre-application consultation event has been advertised at least six weeks prior to the event in a manner likely to bring the application to the attention of persons likely to be interested in it.

1.1.9 Regulation 8 of the 2013 Regulations requires that a Pre-Application Report is prepared following the pre-application consultation as required by Section 24 of the 2010 Act and which must follow the requirements as so prescribed in the Schedule. Accordingly, this statement sets out the steps taken to comply with the said Regulations and Schedule.

1.1.10 A copy of the public advertisement displayed in the Evening News on 7th September, 2017 and advertising the public consultation event is included as Appendix 1. The consultation event was held on the 19th October, 2017.

1.1.11 It is confirmed that the aforementioned statutory consultees in para 1.1.7 were all notified of the applicants intention to submit applications for Marine Licences in accordance with the requirements of Regulation 6(2) of the 2013 Regulations in August 2017, with the exception of the marine region delegate as there is currently no Regional Marine Plan in operation. All parties were notified of the public consultation event and invited to attend, as were Marine Scotland.

1.1.12 The proposed development was subject to an EIA and Pre-Application Consultation Screening request, dated 17th August 2017 submitted to Marine Scotland under Regulation 5 of the 2013 Regulations. Marine Scotland confirmed by email dated 31st August 2017 that the works fell to be considered under the Pre-Application Consultation (Scotland) Regulations 2013 and detailed those parties to be consulted under the pre-application stage. These requirements have been met.

2 Pre-Application Consultation Report

PRE-APPLICATION CONSULTATION REPORT
Marine (Scotland) Act 2010: Section 24(1)

The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013

1. Proposed Licensable Marine Activity – *please describe below or, where there is insufficient space, in a document attached to this form the proposed licensable marine activity, including its location*

The proposed marine project is the formation of a new marina within Granton Harbour, Granton, Edinburgh, comprising of both marine construction works and dredging and disposal at sea. The dredging works comprise dredging of the existing harbour to allow construction of the marina; part of the dredged material is to be disposed of at sea and part on land. The marine construction works comprise formation of a new harbour wall in two sections, being stone revetment of 225m length and vertical sheet pile length of 110m; c.5000sqm of reclamation behind the proposed revetment and 1050sqm reclamation behind the quay wall; extension to north mole at 50m length and formation of 340 berth marina, including pontoon piles.

2. Applicant Details

Edinburgh Marina Granton Harbour Ltd., c/o PIP Asset Management LLP, 43-45 Portman Square, London W1H 6HN

Contact: [Redacted]

Tel:

Company Registration Number: 11033709

Is the Prospective Applicant the Proposed Licensee: **YES**

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3. Proposed Licensee Details

Edinburgh Marina Granton Harbour Ltd., c/o PIP Asset Management LLP, 43-45 Portman Square, London, W1H 6HN

Contact: [Redacted]

Tel:

Company Registration Number: 11033709

Email: [Redacted]

4. Pre-application Consultation Event

Please describe below or, where there is insufficient space, in a document attached to this form the pre-application consultation event.

The pre-application consultation event was held at the Granton Youth Centre, 3-11 West Granton Road, Edinburgh EH5 1HG. The venue is close to the development site and is a recognised and appropriate venue for such events. The event was held as a drop-in event allowing interested parties flexible opportunity to discuss the content of the proposals; the event ran during the hours, 14.30 – 19.30. Representatives from the client and Cameron Planning were in attendance.

The relevant statutory consultees defined within the Regulations were invited to attend the consultation event.

The expiry date for submission of comments was the 26th October, 2017.

5. Information provided by the Prospective Applicant at the Pre-application

Consultation Event
Please provide below or, where there is insufficient space, in a document attached to this form, details of any information provided by the prospective applicant for a marine licence at the pre-application consultation event

The Event comprised display boards containing information on detailed, scaled plans in relation to the proposed development, focusing on the marine works. The plans available for review included details of the north mole extension, the marina layout and details of the new quay wall works, including indicative cross sections. Information was also provided on the developing marina layout and in addition details of the proposed dredging arrangements were made available.

The event was advertised in the Edinburgh Evening News of the 7th September, 2017 (see attached appendix 1) and the relevant statutory consultees were made aware of the event taking place by way of explicit invitation.

6. Information received by the Prospective Applicant at the Pre-application Consultation Event

Please provide below or, where there is insufficient space, in a document attached to this form, details of any comments and objections received by the prospective applicant for a marine licence at the pre-application consultation event

See Below:

A total of 28 attendees were recorded visiting the event, having signed the attendance register. A Comments Sheet was made available with different response options clearly identified, namely, by email, post, phone or completion of comments sheets at the event,
Only one comments sheet was completed and left at the event, the only comment being a *'request for pdf copies of the proposed plans'.*
One subsequent response was received by email after the event, from George Brown; the comments made as follows (*with brief responses*):

- Great to see the development moving forward for the water users - *noted*
- Concerned that the extension to the West Breakwater (North Mole) will deflect waves into the East Harbour whilst making the entrance untenable in an onshore storm. Deflected waves running into the East Harbour will cause problems to the Pilot boat operators and other users. The waves will build up over the shallows and boats taking the mud will be damaged. Existing bird feeding habitat, mussel beds will be disturbed. – *the eastern breakwater is not in the applicants' control; the issue of breeding birds and wave action is discussed and addressed in the Environmental Impact Assessment Report (EIAR)*
- Should, therefore, this planned extension not be on the East Breakwater thus preventing the above problems and providing a protected leeward entrance when the harbour is being used as a harbour of refuge? – *as above*
- No parking for marina users – *the parking arrangements are addressed in he terrestrial planning applications however the spread of boat parking has changed since the initial plans with boats now being partially stored on the mid pier as well as adjacent the marina office, this spreads the parking requirements across a wider area as well*.

In addition to the above specific comments, the following points were raised in discussion throughout the event (*with comments in response*):

- Information provided is classed as illustrative only, this could be construed as misleading – *the plans are illustrative as they would be subject to pre-application consultation and could change;*
- Is the length of the mole extension accurate, will it do the job intended – *the mole design in the Licence application results from detailed wave modelling;*
- Shouldn't the harbour extension protection be to the east breakwater – *this is outwith the applicants' ownership and control*;
- Is the scheme informed by wave modelling – *yes, and has been subject to further modelling to ensure the design is correct;*
- Will the works, through wave deflection etc, impact on the SSSI to the east or on other marine life – *the issue of coastal processes is addressed in more detail in the Environmental Impact Assessment Report;*
- No demand for a dry stack system – *this is a commercial decision;*
- How will the marina be served, in terms of power, water, waste etc – *this is addressed in detailed design;*
- Who is the marina for, private club, visitors, general public – *it is a combination of users, the terms of which have still to be agreed; in principle there is a link between the new residential development taking place, including hotel and visitor accommodation and the availability of marina berths;*
- How will the marina operate, in terms of access – *an Operational Management Plan will be developed by all interested stakeholder parties;*
- Has the dredging been agreed with Marine Scotland – *it is subject to a Marine Licence Application; and*
- Have we discussed the proposals with Marine Scotland – *yes, at length*.

In summary, by far the majority of visitors were from the Royal Forth Yacht Club and the Forth Corinthian Yacht Club and their concerns were more related to how the new marina would operate and what the impact would be on the existing clubs and their use of the harbour. Issues were raised around wave modelling and whether the design was the correct design and whether the eastern breakwater should be extended to ensure even better harbour protection.

7. Amendments made, or to be made, to the Application for a Marine Licence by the Prospective Applicant following their Consideration of Comments and/or Objections received at the Pre-application Consultation Event

Where any amendments are made, or are to be made, by the prospective applicant for a marine licence to the marine licence application as a direct result of their consideration of comments and/or objections received at the pre-application consultation event, please provide below or, where there is insufficient space, in a document attached to this form details of such amendments

A number of changes were made to the scheme following the initial pre-application consultation event and also through subsequent discussions with the different user groups. More specifically, the marina layout has changed with a slight re-alignment of the proposed harbour wall and change in number of berths to 340. Some of the boat park space has been moved to the existing mid pier; no marine works impacts arise from this change. The mole extension and the revetment wall have been redesigned following further design reviews. A further detailed wave modelling exercise has also informed the mole extension design and is a direct response to comments received. It has also been agreed to work closely with all stakeholders in a Stakeholder Agreement and through an Operational Management Plan to ensure that specific comments around the different user groups interests are taken into account at the outset of development during the construction phase but also through the operational phase..

8. Explanation of Approach taken by the Prospective Applicant where, following Relevant Comments and/or Objections being received by the Prospective Applicant at the Pre-application Consultation Event, no Relevant Amendment is made to the Application for a Marine Licence

Where, following comments and/or objections having been received by the prospective applicant for a marine licence at the pre-application consultation event, no relevant amendment is made to the application for a marine licence by the prospective applicant, then please provide below or, where there is insufficient space, in a document attached to this form an explanation for the approach taken

Not Applicable as changes were made as discussed in point 7, above.

CERTIFICATION

Insert name: [Redacted] **on behalf of Edinburgh Marina Granton Harbour Ltd.**
Insert Address: **Cameron Planning, 29 East Argyle Street,**
Town: **Helensburgh**
County: **Argyll and Bute**
Postcode **G84 7EJ**

I certify that I have complied with the legislative requirements relating to pre-application consultation and that the pre-application consultation has been undertaken in accordance with the statutory requirements.

[Redacted]

Signature Date: 19th September, 2018

Appendix 1

Edinburgh Evening News Advert 7th September, 2017


between 14.30 and 19.30 on 19th
at Granton Youth Centre, 3-11 Wes
Road, Edinburgh EH5 1HG.
Further information may be obtaine
agent: Cameron Planning, 29 East
Helensburgh, G84 7EJ.
E-mail: steven@cameronplanning.
Anyone wishing to make comment
proposal should do so in writing to
agent, no later than 25th October,
Please note, any comments made
prospective applicant are not repr
the Scottish Ministers and that if t
applicant makes an application fo
licence, that there will be an oppo
representations to be made to the
Ministers on the application.
TO ADVER

Technical Appendix 1.2: Planning Statement

Cameron Planning

EDINBURGH MARINA
EST. 1836

Marine Licence for Construction Works and Dredging with Sea Disposal

Proposed Marina Development,
Edinburgh Marina, Granton, Edinburgh

Planning Statement

21 September 2018

Contents

1.	Introduction	3
2.	Planning Statement	6
3.	Pre-Application Community and Stakeholder Consultation	11
4.	Summary	13

Rev A – minor corrections – 28th September, 2019

1. Introduction

1.1 Edinburgh Marina Granton Harbour Limited seek Marine Works Licences from Marine Scotland in respect of both construction works and dredging operations within the existing Granton Harbour, Granton, Edinburgh. This Planning Statement discusses the planning history to the development and considers the proposed marine works in respect of the National Marine Plan.

1.2 The proposed development of a new Edinburgh Marina enjoys support from the adopted Edinburgh Local Development Plan (LDP) (2016), which recognises that north Edinburgh has been witness to over 40 years of decline in industrial activity and port-related use of land and, which regards the redevelopment of the Edinburgh Waterfront as a strategy that will accommodate the city's wider regeneration ambitions and which will specifically support economic growth through the provision of new housing and ancillary uses. To this end, the Granton Harbour development has been designated within the LDP as a housing-led mixed-use development on land previously owned by Forth Ports and other parties.

1.3 The proposed development of the new marina is a key part of the Granton Harbour regeneration development. This development was granted Outline Planning Permission (now Planning Permission in Principle) by City of Edinburgh Council in 2003 under planning application reference 01/00802/OUT. The development approved in 2003 is in relation to:

> *mixed use development; comprising residential units, hotel + serviced apartments , shops + retail/services, restaurants/cafes , public houses, general business, leisure facilities + marina*

1.4 The original planning application was supported by an Environmental Statement (ES) produced by Robert Turley Associates on behalf of Forth Properties Ltd. The application was granted permission subject to a number of planning conditions; these conditions in part provide mitigation with regard to the potential environmental effects of the new development. Since the original planning permission was granted there have been a series of revisions to the proposed site layout; these have been addressed through a number of 'matters specified in condition' (MSC) approvals under the original planning permission. The MSC approvals relate to a number of different development plots, some of these plots have subsequently been built out.

1.5 The proposed development works are considered to be development which will fall under the Environmental Impact Assessment Regulations, 2017. The process leading to preparation of the required Environmental Impact Assessment Report (EIAR) is outlined within that document,

suffice to say however that it follows on from formal EIA Screening and Scoping stages and the EIAR has been prepared specifically in response to the EIA Scoping Opinion issued by Marine Scotland and dated 14th June, 2018.

1.6 In summary, the proposed marine works as defined below fall under paragraphs 1(e), 10(m), and 12(a) of Schedule 2 of the 2017 EIA Regulations and as such are subject to EIA.

1.7 The proposed marine works relate to the following aspects

Construction works – formation of new stone revetment harbour wall, length of sheet pile quay wall, reclamation of land to the rear of the new quay walls, provision of 340 berth marina within the existing harbour, extension to the existing north mole breakwater; and

Dredging – dredging of the existing harbour to appropriate levels to accommodate the new marina and partial disposal of dredge sediment at sea with remainder disposed of on land.

1.8 This statement relates to the two separate marine works licence applications that are required to secure consent from Marine Scotland to permit the works to take place.

1.9 In terms of the EIA process, it was intended that the appropriate Marine Licence Application for the Dredging Works would be submitted prior to the Marine Licence Application for Construction Projects submission on the basis that the dredging works of themselves did not constitute EIA development. Marine Scotland has advised however that the project development should be viewed as a single project and that consequently both the dredging and construction works will be subject to the same EIA process. The submission of the Licence relative to the proposed Dredging Works has consequently been held back until completion of this EIAR.

1.10 With regards to the terrestrial planning regime, MSC planning permission was granted under the original 2003 planning permission, under reference 16/04409/AMC on 21st April 2017, for, *"the formation of a new Marina Office with associated retail and café space, and new community boat yard with associated dry stack"*.

1.11 In addition, the applicants have submitted further MSC applications to City of Edinburgh Council in respect of the terrestrial work along the western harbour edge, and have sought permission to extend the life of the original planning permission, as follows:

- 17/05306/AMC - Granton Harbour plots 29 and 35: Housing, hotel and serviced flats development. Application for approval of matters conditioned regarding the erection of buildings containing residential flats, hotel and serviced apartments; formation of road access, parking, and open space (as amended)

- 18/01428/PPP - Extension of time limit of the existing outline planning approval to extend the duration of the permission for five years to 20th June 2023

- 18/02833/AMC - Proposed marina office with associated retail, cafe space and community boat yard (amended layout)

1.12 All of the above applications are currently pending determination. In summary, the terrestrial planning aspects of the development are addressed in a number of applications that have been submitted to the planning authority and have either been approved or are currently pending.

1.13 Marine Scotland determined that the dredging works, although not in themselves EIA development, were an integral element to the delivery of the marina and the marina project. On this basis there was no opportunity to submit the dredging works licence application in advance of the main construction works licence application as both elements, construction works and dredging, would fall to be considered under the EIA Regulations. Being elements of the same project, the dredging and construction works are subject to the same EIA process and consequently a single EIA Report has been prepared to cover both licence submissions. This Planning Statement and accompanying EIA Report therefore support the following licence applications:

- Marine Licence Application for Construction Works, comprising:
    - Formation of new quay wall in two sections, sloping revetment and vertical sheet pile;
    - Formation of extension to existing north mole
    - Formation of 340 berth marina, including pontoons and

- Marine Licence Application for Dredging and Sea Disposal, comprising
    - Capital dredging of existing harbour basis
    - Disposal of 86,980 m3 of dredged material to sea location, remaining dredged material to be disposed of on land

2. Planning Statement

Scotland's National Marine Plan, 2015

2.1 The National Marine Plan was published in 2015 and sets out strategic policies for the sustainable development of Scotland's marine resources to a distance out to 200 nautical miles. Further Regional Marine Plans are to be implemented at a local level within Scottish Marine Regions, extending out to 12 nautical miles. The National Marine Plan advises that the boundaries of these regions are required to be set by secondary legislation. Within the defined regions, regional marine plans will be developed by Marine Planning Partnerships to take account of local circumstances and smaller ecosystem units; they will accord with the National Marine Plan.

2.2 It is acknowledged that Regional Plans will take some time to develop, with the first Marine Planning Partnerships being established for Shetland and Clyde regions. The proposed development site at Granton Harbour will fall within the Forth and Tay Region. At this time consequently, there is no Forth and Tay Marine Planning Partnership Regional Plan that is referenceable and in the interim period, prior to the region developing its regional plan, the Marine Policy Statement and the National Marine Plan will apply.

2.3 It is also a requirement of the Marine Licence application process that the National Marine Plan and future Regional Plans are taken into account in consideration of licensing applications. The National Marine Plan contains a chapter on general policies; whilst the whole Plan is applicable as policy the most relevant policies contained in the document are as follows, with commentary as necessary:

2.4 ***GEN 1 General planning principle***: There is a presumption in favour of sustainable development relative to the use of the marine environment when development proposals are consistent with the policies and objectives of this Plan –

Comment: the proposed marina development and associated works are compatible with the National Marine Plan as discussed in the assessment contained herein;

2.5 ***GEN 2 Economic benefit***: Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan –

Comment: the proposed marina is a critical element to ensuring the economic success of the regeneration ambitions for Granton Harbour. The marina will be the focal point for the new developments being undertaken on the previously reclaimed harbour site which has already seen early commitments through the delivery of residential development. More recently, the detailed applications for the development plots at Granton Harbour have been brought forward by the applicants and other developer interests, committing to a wide mixed-use regeneration project. Delivery of the marina is not only critical to the economic success of the development, the works are also essential to ensure that the public realm and setting of the regeneration scheme is delivered at the highest standard;

2.6 ***GEN 4 Co-existence***: Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of this Plan –

Comment: the proposed marina development is a critical component to the wider Granton Harbour regeneration scheme and will co-exist with the different uses that are being developed within the scheme. The marina utilises the existing water body of the western harbour and in that sense shares the harbour entrance with two existing yacht clubs and the Pilot Boat that operates from Granton Pilot Boat Station; there are also other water user groups that operate in the area, including Sea Cadets and local rowers. The applicants have engaged with the Royal Yacht Association, Marine Coastguard Agency and Forth Ports and discussed mutual interests with a view to developing an Operational Management Plan and a Stakeholder Agreement to ensure that all interests are taken into account as the new marina development is taken forward. The introduction of the marina environment already benefits from planning permission and there is not considered to be any conflict in user group interests. The provision of the new harbour breakwater and proposed dredging work will ensure through engagement with local stakeholders that other interests are taken into account by ensuring there is no conflict with other users. The proposed development will also co-exist with the existing Granton Harbour residential development that currently looks out to a redundant harbour environment as well as with the proposed new uses. The entire Granton regeneration scheme has been conceives as a coherent mixed-use development of complementary uses.

2.7 ***GEN 7 Landscape/seascape***: Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account.

Comment: the project has already been through the Planning process and has been previously subject to an Environmental Impact Assessment including consideration of landscape and visual impact. The marina development is self-contained within the existing harbour environment and

will consequently have marginal visual impact. A marina development within an existing harbour environment is consistent with the landscape/seascape that would be expected within an urban location.

2.8 ***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.

Comment: these matters are addressed more specifically through the EIA Report where coastal processes is one of the topics under consideration. The submission is supported by wave modelling with regard to the breakwater extension to demonstrate the impact of the physical development on wave movement;

2.9 ***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.

Comment: These matters are addressed more specifically within the EIA Report and the Habitats Regulations Assessment that support these submissions for marine works licenses. There are no residual impacts arising from the development.

2.10 ***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.

Comment: this is addressed within the EIA Report.

2.11 ***GEN 13 Noise***: Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.

Comment: Noise Impact is considered in the EIA Report, more specifically the matter of underground noise during the construction phase and the potential for low frequency noise generation impacting on marine life.

2.12 ***GEN 18 Engagement***: Early and effective engagement should be undertaken with the general public and all interested stakeholders to facilitate planning and consenting processes.

Comment: the proposed Marine Works Licence applications were subject to statutory pre-application consultation and a public consultation event was held on the 19th October 2017 in Granton Community Centre through a drop-in event advertised in the local press. In addition, as noted above, specific consultation has been held with key stakeholders, RYA, MCA and Forth Ports. Presentations have also been made to inform existing local stakeholders of progress on the wider development and the terrestrial planning applications have where necessary been subject to community engagement. The applicants are also committed to development of a Stakeholder Agreement in terms of user group interests and further information events will be held to ensure the local community is kept informed of work coming forward, more specifically the existing residents that live within the wider Harbour regeneration scheme.

2.13 The Marine Plan includes a specific Chapter on Recreation and Tourism uses within the marine environment. The Plan sets out as one of the key objectives under this sector to:

Position Scotland as a world class sustainable coastal and marine tourism and recreation destination through the sustainable development of coastal and marine recreation activities and industries in Scotland.

2.14 The Plan also recognises that:

Many social benefits are closely linked to the economic return of marine recreational and tourism activities, and in some cases community regeneration has been focused on developments, such as marinas.

2.15 In addition,

Marine planning can support sustainable development of marine recreation and tourism by ensuring facilities and access to coastal and intertidal areas are protected or improved, whilst ensuring any development or activity is sensitive to the marine environment. An aligned approach between terrestrial and marine planning is also necessary to facilitate the provision of appropriate coastal infrastructure required by a range of activities and facilitate shared use of such infrastructure for example: car parking, toilets, jetties, piers, slipways and marinas.

2.16 It is also recognised in the Marine Plan that the east coast is an area where sailing activity can grow:

whilst developments will be primarily influenced by the local Scottish domestic market, recent developments mean that it is now as well served as any part of the Scottish coastline with the development of new marinas and improvements to existing harbours. Continued development and provision of facilities in these areas could help to further attract visitors sailing up from north east of England and across the North Sea.

2.17 The proposed development is wholly consistent with the above requirements. The marina development and its associated works have previously been supported through the granting of the original planning permission in 2003, which was subject to an EIA at that time and which resulted in some of the planning conditions attached to that permission as a means of mitigating any potential residual environmental effects. The terrestrial/marine planning interface has been carefully considered in the previous applications. Subsequently, there has been considerable investment and commitment to the scheme's regeneration ambitions by taking forward the individual development plots through the Planning system. The focus of this regeneration, and critical to its success, is the delivery of the harbour regeneration and the new marina development. The marina development in itself necessitates the breakwater extension and the harbour dredging works.

2.18 The National Marine Plan includes the following Recreation and Tourism policies that are relevant to the proposed marina development:

REC & TOURISM 1: Opportunities to promote sustainable development of marine recreation and tourism should be supported.

REC & TOURISM 2: The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on recreation and tourism:

- The extent to which the proposal is likely to adversely affect the qualities important to recreational users, including the extent to which proposals may interfere with the physical infrastructure that underpins a recreational activity
- The extent to which any proposal interferes with access to and along the shore, to the water, use of the resource for recreation or tourism purposes and existing navigational routes or navigational safety
- Where significant impacts are likely, whether reasonable alternatives can be identified for the proposed activity or development.
- Where significant impacts are likely and there are no reasonable alternatives, whether mitigation, through recognised and effective measures, can be achieved at no significant cost to the marine recreation or tourism sector interests.

2.18 In summary, the proposed marine works do not conflict with the Marine Plan and the Plan provides support for marine recreation and tourism development; the proposed development provides a facility for visiting sailors as well as providing berths for potential residents of the new residential development being built at Granton Harbour.

3 Pre-Application Community and Stakeholder Consultation

3.1 The proposed works have been subject to pre-application consultation under the Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013. The proposed works were first of all subject to a combined pre-application and EIA Screening process in August 2017. The response from Marine Scotland was that the works were prescribed works requiring formal public consultation. The statutory pre-application consultation event was subsequently programmed for 19th October 2017 with a view to submission of the Works Licence application by December 2017. The works however were subject to a further EIA Screening process and EIA Scoping; this process took longer than anticipated with the Scoping Opinion issued by Marine Scotland necessary to complete the supporting EIAR not finally issued by Marine Scotland until the 14th June, 2018. This additional Screening and subsequent Scoping process explains the time that has elapsed between the public consultation event and the submission of the Marine Works applications.

3.2 The statutory public consultation event was held in the Granton Youth Centre, 2 – 11 West Granton Road, Granton on 19th October, 2017, having previously been advertised in the Edinburgh Evening News on the 4th September, 2017. The event was held as a drop-in event, running between 14.30 and 19.30 on the day; notices of the event were issued to potential key stakeholders and consultees. The consultation event was attended by 28 individuals, being a mix of parties with a specific interest in the harbour environment, the clear majority being members of the two sailing clubs located at Granton, although there were representatives of Forth Ports and Northern Lighthouse Board who attended as well as a small number of local visitors identified as interested parties.

3.3 The Statutory Pre-Application Consultation Report, required under the aforementioned Regulations, accompanies the Marine Licence Application for Construction Works. The following statutory consultees were consulted in accordance with Regulation 6(2) of the Pre-Application Consultation (Scotland) Regulations 2013.

- Northern Lighthouse Board
- Scottish Environmental Protection Agency
- Scottish Natural Heritage
- Marine Coastguard Agency

3.4 As discussed with Marine Scotland in August 2017 it was noted that there is no Marine Regional Plan for the area and no marine regional delegate to engage with.

3.5 As the marine works are integrated with the main terrestrial works for the regeneration of Granton Harbour there has been wider community and stakeholder consultation undertaken by the applicants over a number of years, including information events designed to keep the local community appraised of progress on the whole development. The wider consultation and management regime is one that is continuous and ongoing.

3.6 The EIA Scoping Opinion highlighted a need to provide consideration of navigational risk with a request that the applicants engage with a number of defined stakeholders to ensure that all relevant marine interests are considered in the application process. To this end a navigation workshop was hosted by Forth Ports on 22nd August, 2018 and was attended in addition to the applicants, Forth Ports and representatives of the RYA representing local yacht club interests.

3.7 A number of actions were agreed and minuted, including setting up a Stakeholder Agreement to ensure all party interests in navigating the channel to the harbour are considered and taken into account. In addition, it was agreed that an Operational Management Plan would be established by the Marina operator and that this would be prepared in discussion with the different stakeholder groups.

3.8 Some matters included in the stakeholder engagement workshop and to be addressed through the Stakeholder Agreement/Operational Management Plan include the following:

- Introduction of safe speed limit
- Production of Marine Handbook for marina users to address navigational conflict issues
- Boats under sail – prohibition on harbour entry, except under exception

- Adherence to Collision Regulations
- Water quality monitoring regime
- Silt monitoring – to inform dredging regime
- Access route – South Channel > Landfall Buoy at Leith Roads
- Compliance with the Port Marine Safety Code and 2018 Guide to Good Practice on Port Marine Operations

3.9 It is considered that the statutory requirement relating to pre-application consultation have been met. The relevant statutory consultees have been kept informed of the process of the proposed Licence applications through initial invitation to the public consultation event and subsequently through the EIA Screening and EIA Scoping processes. The main parties with an interest in the marine environment locally, i.e. Forth Ports, the Port Pilot and the local yacht clubs have all engaged in the pre-application process. The RYA, representing specifically the local yacht clubs interests have requested that further consultation takes place with regard to the Stakeholder Agreement and Operational Management Plan to be developed by the Marina operator. The applicants have provided a commitment to ongoing consultation in this matter. The immediate concerns from these parties has however in our view been addressed through the EIA Report, the DHI Wave Modelling Report and the design changes to the marina and north mole extension.

4 Summary

4.1 In summary, this Planning Statement accompanies the two connected applications for Marine Licenses in respect of Construction Works and the associated Dredging and Disposal at Sea works. The Statement sets out the relationship between the marine and terrestrial consenting regimes and notes that the original planning permission, although approved in 2003, was subject to an Environmental Impact Assessment under the relevant Regulations in force at that time. The original conditions attached to that planning permission were imposed in part to address potential environmental effects from the development.

4.2 Notwithstanding the original permission and the relevant environmental planning conditions Marine Scotland determined that the proposed marine works element of the development should be subject to a further EIA process. The main focus of that process has been in relation to coastal processes and sediment transportation as well as the impact on marine life from construction processes.

4.3 The conclusion of the EIA Report is that there will be no residual environmental effects arising from the proposed development.

4.4 Current Regulations relating to the Marine Licence Application process require consideration of Scotland's National Marine Plan and any subsequent Regional Marine Plans that have been developed. At the time of writing, there is no Regional Marine Plan available for the Forth and Tay Region and consequently consideration needs to be given to the National Marine Plan and is pertinent polices. This Planning Statement has assessed the National Marine Plan and identified those policies that are considered relevant to the proposed development. It is clear from the National Marine Plan that there is support in principle for leisure based and marina focused developments along the coast of Scotland and it is noted that there is specific reference to the east coast of Scotland as an area where measure marina development can be focused. The support for development is of course tempered by the need to ensure that development is inherently sustainable and that there are no residual environmental effects arising from the development. The EIA process that the applicants have gone through, from the original EIA in support of the 2001 planning application to the recent EIA Screening and Scoping exercises have informed the Environmental Impact Assessment Report that accompanies this application.

4.5 In conclusion, it is asserted that the requirements of the Marine Licence Application process have been met.

Technical Appendix 2-1: Civil Engineering Method Statement

Edinburgh Marina

Civil Engineering Method Statement
North Mole Extension, Inner Revetment and Quay Wall

14th September 2018

FAIRHURST

CONTROL SHEET

CLIENT: **Edinburgh Marina**

PROJECT TITLE: **Edinburgh Marina, Granton**

REPORT TITLE: **Civil Engineering Method Statement**

PROJECT REFERENCE: **115875**

DOCUMENT NUMBER:

Issue & Approval Schedule	ISSUE 1 DRAFT	Name	Signature	Date
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	Checked by	[Redacted]	[Red	09/05/17
	Approved by			

Revision Record	Rev.	Date	Status	Description	Signature	
	1	07 Sept 18	Updated	To reflect revised layout of breakwater	By	[Re
					Checked	[R
					Approved	[Re
	2	14 sept 18	Expanded	To include quay wall and internal revetment construction	By	[Re
					Checked	[R
					Approved	[Re

This document has been prepared in accordance with procedure OP/P02 of the *Fairhurst Quality and Environmental Management System*

Contents

1 Introduction 11

2 Assumptions 11

3 North Mole 11

3.1 Form of Construction 11

3.2 Construction methodology 11

4 Quay Wall 13

4.1 Description 13

4.2 Construction Methodology 14

5 Marina revetment 14

5.1 Description 14

5.2 Construction methodology 14

Appendix: Drawings

1 Introduction

Fairhurst have been commissioned by Edinburgh Marina Ltd to prepare a high level method statement setting out the likely method of construction various aspects of civil engineering works to support the development and provide protection for Edinburgh Marina and Granton Harbour. These comprise an extension to the North Mole breakwater, an internal quay wall and an internal harbour revetment.

2 Assumptions

Typical geology of Granton Harbour consists of soft alluvial silts overlying stiff glacial till which overlies bedrock comprising inter-bedded strata of sandstone and mudstone. Detailed Geotechnical Investigation is required to inform the detailed design. This will be provided to the Contractor to inform the Temporary Works design as required.

A Bathymetric Survey of the current bed levels has been carried out to inform the design, identify the current extent of dredging and inform the construction methodology. The methodology may vary depending on the preferred approach of the Contractor, the availability of marine plant and the comparative cost of temporary works. However, this statement is considered to be a reasonable and practical approach to the Works that highlights the likely interface with the Forth.

3 North Mole Extension

3.1 Form of Construction

The North Mole extension requires a vertical internal face for a length of 50m to maximise space available for the marina. An inclined seaward face of rock armour will provide protection from wave action. Several forms of construction are possible for this structural layout but it is anticipated that a reinforced concrete wall would be formed, resting on the seabed with a natural rock faced revetment to the seaward side. The Reinforced concrete wall would be assembled from hollow pre-cast concrete boxes that can be filled on site with concrete and or ballast rock. The concrete wall will extend for 50m, beyond which a 25m rock revetment will provide additional protection.

3.2 Construction methodology

For the purposes of this method statement, it is assumed that all works will be carried out using marine based plant. However, subject to an assessment of the existing Esparto Wharf and North Mole it may be possible to create an access to allow some of the work to be undertaken by land, reducing marine based activity.

The overall steps in the construction process are

i. Locally reduce the level of the seabed to design dredge level
ii. Excavate further to the design formation level for the concrete wall
iii. Place a regulating layer of stone to land the concrete units on
iv. Place precast concrete foundation blocks
v. Build up the precast concrete wall units, sealing the joints as they are placed to control subsequent wet concrete placement

vi. Place any binding reinforcement and drop in pre-formed reinforcement cages
vii. Fill concrete units with underwater mix concrete
viii. Backfill around concrete wall externally to revetment founding level, internally to bed level.
ix. Construct revetment on outer face of concrete wall, and for an additional 25m along the line of the wall.

3.2.1 Local Dredging

The area of the Western Harbour will be dredged to a finished dredge level sufficient for the planned operation of the marina. The depth varies across the marina with shallower waters for smaller craft closed to the shore.

Dredging in advance of the north mole is likely to be by backhoe dredger. Sediment testing has been undertaken across the marina site with some material identified as suitable for disposal at sea site at an approved site and the remainder brought ashore for disposed or treatment and reuse.

3.2.2 Base Formation

The wall of the breakwater is expected to be founded approximately 4.5m below final dredge level subject to geotechnical investigation and design. A trench will be excavated from the dredge level to the base formation level with sloped sides of a gradient dependent on the geotechnical properties of the bed material. The figure below represents this construction phase.

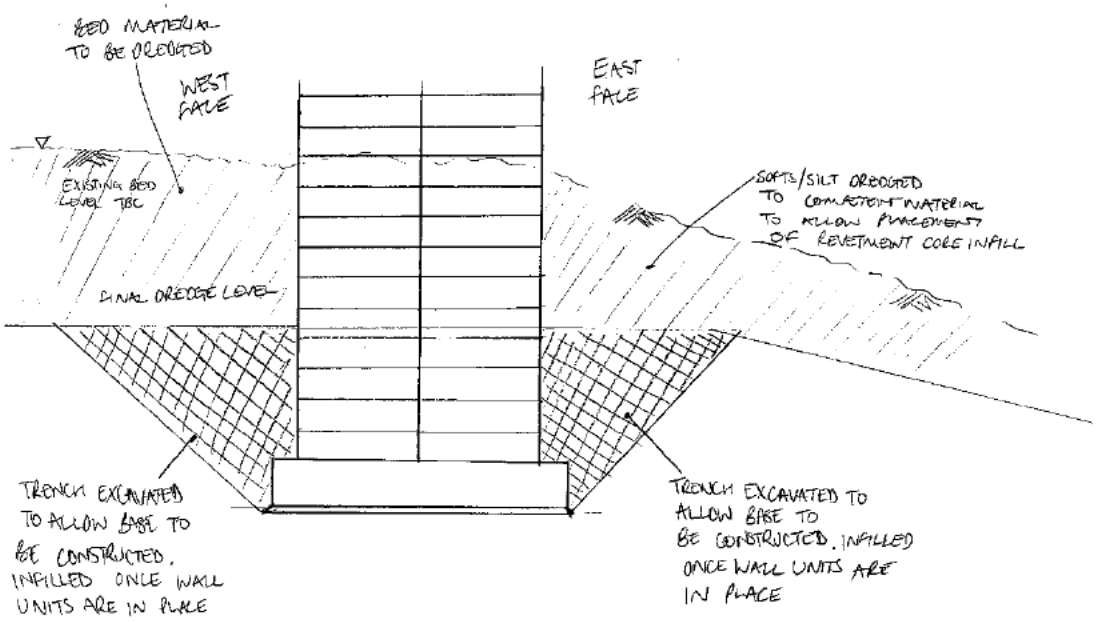

Figure 1: Potential construction within a trench to sound formation

A 250mm thick layer of Type 1 material will be placed on the base of the excavation and then levelled to allow placement of the reinforced concrete foundation units. These solid units provide a solid and stable foundation from which the wall can be supported. Divers will be employed to direct the placement and levelling of the units.

Once placed, a local bathymetric survey will be undertaken to confirm the base is at the correct level to receive the precast units making up the wall.

3.2.3 Precast Unit Construction and Placement

In order to minimise the time of construction on site and the associated cost of marine based plant, the wall will be constructed from precast units, which can be fabricated off site. The units will be transported to site by road or sea, depending on the location of the fabrication site.

The wall consists a reinforced concrete foundation approximately 7.5m wide and totalling a length of 50m. This will be made up of individual precast units sized to suit placement by crane from a barge and will be keyed together. Hollow units to form the bulk of the wall will be lifted and placed by crane from a barge with divers directing placement of the units, which lock together. This will form a sealed cofferdam into which concrete will be pumped in lifts.

3.2.4 Breakwater Construction

Following the construction of the breakwater wall, the rock infill forming the core of the revetment to the east of the wall will be placed using a long reach excavator from a barge. Some reinstatement of bed material may be possible if material properties permit prior to build up of the core of the breakwater.

Prior to placement of the secondary rock layer, consisting typically 300kg sized rock, divers will place a layer of geotextile to prevent material washout. The larger primary rock armour will then be placed on top to provide the full level of wave protection. The rock will be placed using a barge mounted long reach excavator. It is assumed that all rock will be delivered to site by sea and will be placed directly from the delivery barge to the revetment.

3.2.5 Wave Wall

In order to provide additional protection along the top of the structure, a precast reinforced concrete wave wall will be placed. The wave wall units will be lifted into place by barge mounted crane or telehandler and secure in place.

3.2.6 Finished Walkway

Behind the wave wall, a paved surface will be installed to form the walkway. Fixtures such as lighting can be installed, with service ducts having been cast into the final lift of precast concrete boxes.

4 Quay Wall

4.1 Description

On the west side of the marina basin, a quay wall is to be formed. This will be a continuation of the existing quay wall along the south boundary. The proposed form of construction is a tied sheet pile wall with insitu reinforced concrete capping beam with metal parapet. The form of construction will be similar to the existing.

4.2 Construction Methodology

The wall is formed from driven sheet piles. The existing sheet pile wall was installed from a barge and it is likely that the same methodology would be used for the additional length of wall. A barge would be positioned at high water and stabilised on jack up legs. From this platform, the sheet pile wall can be installed tying into the existing wall. Individual sheet pile sections are lowered vertically into the sea bed, interlocked with the adjacent pile sections. Piles are usually driven to staged depths to maintain the continuity and allow adjustments. After being driven to full depth, the top of the piles are cut off to the design level. At this stage, the piles will be free standing but not capable of being backfilled. Ties will be installed between the piles and a secure anchorage point on shore. These will be buried reinforced concrete blocks that will resist the thrust from the wall when it is backfilled.

The wall will be backfilled with suitable material available from elsewhere on the site. The top of the wall is completed by a reinforced concrete capping beam that is cast in-situ to tie the top of the piels together. It will also support to the metal pedestrian parapet that will provide edge protection.

5 Marina revetment

5.1 Description

The west boundary of the marina basin is formed with a natural stone faced revetment that will enclose and protect an area of reclaimed land. The core of the revetment is expected to be a combination of material recovered from elsewhere on the site and imported structural fill. The facing rocks will be imported to site by road. Along the top of the revetment, a concrete capping detail with integral channel for planting and parapet along the top provides the transition

5.2 Construction Methodology

The revetment can be constructed using land based plant and machinery working progressively along the line of the revetment until completed. The fill behind the revetment can be placed behind once the revetment is structurally sufficient to protect the infill.

The revetment needs to be founded on a sound strata and so the first operation will be excavation of the bed sediments down to a suitable formation level. The core can then be built up in layers before being sealed behind within a geotextile. This will protect the integrity of the core and prevent future washout of material. The rock armour facing will then be placed on the outer face of the revetment and if the bed was excavated below dredge level, some bed material can be reinstated up to this level. Infill behind the revetment will comprise material from elsewhere on the site that has been tested for suitability. The reclaimed area will be suitable for car parking and landscaping.

Appendix A: Drawings

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Aberdeen
Bristol
Dundee
Edinburgh
Elgin
Glasgow
Inverness

Leeds
London
Manchester
Newcastle upon Tyne
Sheffield
Watford
Wellesbourne

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FAIRHURST

Technical Appendix 3.1: Scoping Opinion

marinescotland

Scottish Government
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Marine Scotland - Licensing Operations Team Scoping Opinion

Granton Central Developments Limited (per Cameron Planning), Re-development of Granton Harbour

THE MARINE WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017 (AS AMENDED)

SCOPING OPINION FOR THE PROPOSED MARINE LICENCE APPLICATIONS TO CONSTRUCT WORKS, TO CARRY OUT DREDGING AND TO DEPOSIT DREDGE SPOIL WITHIN THE SCOTTISH MARINE AREA.

Contents

1. Executive Summary 3
2. Introduction 6
2.1 Background to scoping opinion 6
2.2 The requirement for Environmental Impact Assessment 6
2.3 The content of the scoping opinion 6
3. Description of works 7
3.1 Background to the works 7
4. Aim of this scoping opinion 8
4.1 The scoping process 8
5. Consultation 9
5.1 The consultation process 9
5.2 Responses received 9
6. Contents of the EIA report 11
6.1 Requirements of the 2017 MW Regulations 11
6.2 Non-Technical Summary 11
6.3 EU Guidance 11
6.4 Mitigation 12
6.5 Design Envelope 13
7. Interests to be considered within the EIA report 14
7.1 Introduction 14
7.2 Marine Ecology - Ornithology 14
7.3 Marine Ecology – Mammals & Non-Native Species 15
7.4 Marine Ecology - Fish 15
7.5 Water Environment & Coastal Processes - Tides 16
7.6 Water Environment & Coastal Processes – Waves 16
7.7 Water Environment & Coastal Processes – Sediment Transport 16
7.8 Water Environment & Coastal Processes - Flooding 17
7.9 Water Environment & Coastal Processes – Water Quality 17
7.10 Landscape & Visual 17
7.11 Noise 18
7.12 Air Quality 18

7.13 Cultural Heritage & Archaeology 19
7.14 Climate Change 19
7.15 Natural Disasters 20
7.16 Major Accidents 20
7.17 Population & Human Health 20
7.18 Cumulative Assessment 20
7.19 Navigation 21
8. Marine Planning 22
8.1 Background 22
8.2 The UK Marine Policy Statement 2011 22
8.3 Scotland's NMP 2015 22
8.4 Application and EIA Report 22
9. Multi-Stage Regulatory Approval 23
9.1 Background 23
10. Judicial review 24
11. Gaelic Language 24
Appendix I: Consultee Responses 25
Edinburgh City Council 26
Forth Ports 28
Historic Environment Scotland 30
Maritime and Coastguard Agency 33
Ministry of Defence 36
Northern Lighthouse Board 38
Royal Society for the Protection of Birds 40
Royal Yachting Association 43
Scottish Environment Protection Agency 51
Scottish Natural Heritage 54
Transport Scotland 58
Whale and Dolphin Conservation 61
Appendix II: Licensing Process 63
Appendix III: Gap Analysis 66

1. Executive Summary

This is the scoping opinion adopted by the Scottish Ministers, under regulation 14 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ("the 2017 MW Regulations"), as to the scope and level of detail of information to be provided in the Environmental Impact Assessment report ("EIA report") for the proposed re-development of Granton Harbour, Firth of Forth ("the proposed works"). The scoping opinion has been requested by Cameron Planning on behalf of the applicant, Granton Central Developments Limited ("the applicant").

This scoping opinion is based on the information provided in the applicant's request, dated 10 April 2018, for the Scottish Ministers to adopt a scoping opinion. The request included the submission of a scoping report. The Scottish Ministers have consulted on the scoping report and the responses received have been taken into account in adopting this scoping opinion. The matters addressed by the applicant in the scoping report have been carefully considered and use has been made of professional judgement (based on expert advice from stakeholders and Marine Scotland in-house expertise) and experience in order to adopt this opinion.

Detailed information is provided in the specialist topic sections. Matters are not scoped out unless specifically addressed and justified by the applicant and confirmed as being scoped out by the Scottish Ministers. Table 1 summarises the Scottish Ministers' advice on whether topics are to be scoped in or out.

Table 1: The Scottish Ministers' opinion as to whether topics are to be scoped in or out.

Topic	Reason for scoping in / out
Marine Ecology - Ornithology	Scoped IN. Insufficient details about the potential impact of the proposed works and possible mitigation measures for breeding and non-breeding birds have been provided.
Marine Ecology – Mammals & Non-Native Species	Scoped IN. Disturbance could be caused to marine mammals and insufficient detail has been provided about potential mitigation measures. No assessment of invasive non-native species has been provided.
Marine Ecology - Fish	Scoped OUT. Nearest protected site for fish is 65km from the proposed development.
Water Environment & Coastal Processes - Tides	Scoped OUT. Assessment of existing baseline conditions and the wave modelling study undertaken indicates that the proposed development will not have a significant effect on tidal currents.
Water Environment &	Scoped IN. Consideration of waves from a NW

Coastal Processes - Waves	direction and wave attenuation in the eastern harbour have not been satisfactorily assessed by the wave modelling study.
Water Environment & Coastal Processes – Sediment Transport	Scoped IN. Fundamental issue that has not been sufficiently addressed, in particular in relation to increased sedimentation and the effect of this on navigation and nearby geodiversity features.
Water Environment & Coastal Processes - Flooding	Scoped OUT. SEPA confirmed that the works will not increase the flood risk in the area.
Water Environment & Coastal Processes – Water Quality	Scoped IN. Sediment risk assessment is required due to contamination identified in pre-dredge sampling.
Landscape & Visual	Scoped OUT. Insufficient concerns regarding this receptor to warrant further assessment.
Noise	Scoped IN. The scoping report does not address marine noise and in particular underwater noise produced by the piling works.
Air Quality	Scoped OUT. No concerns raised by consultees regarding this receptor.
Cultural Heritage & Archaeology	Scoped OUT. Assessed as part of planning application and appropriate mitigation measures agreed.
Climate Change	Scoped OUT. Pollution and emission control measures to be included in CEMP.
Natural Disasters	Scoped OUT. The Scottish Ministers agree that there is a low risk from natural disasters.
Major Accidents	Scoped IN. No evidence has been provided in the scoping report to conclude no risk.
Population & Human Health	Scoped OUT. Risks covered by noise and air quality receptors.
Cumulative Assessment	Scoped IN. Insufficient information provided in scoping report.
Navigation	Scoped IN. Not addressed by applicant. Concerns raised by consultees about reduced visibility from the western breakwater extension.

For the avoidance of doubt, the adoption of this scoping opinion by the Scottish Ministers does not preclude the Scottish Ministers from requiring the applicant to submit additional information in connection with any EIA report submitted with their application for a marine licence relative to the proposed works.

In the event that an application is not submitted by the applicant for the proposed works within 12 months of the date of this scoping opinion, the Scottish Ministers

recommend that the applicant seeks further advice from them regarding the potential to update the scoping opinion.

2. Introduction

2.1 Background to scoping opinion

2.1.1 We refer to your email of 10 April 2018 requesting a scoping opinion from the Scottish Ministers, under Regulation 14 of the 2017 MW Regulations. Your request included a scoping report, which contained a description of the location of the works, including a plan sufficient to identify the area in which the works are proposed to be sited, and a description of the nature and purpose of the proposed works and their likely impact on the environment. The Scottish Ministers consider that they have been provided with sufficient information to adopt a scoping opinion.

2.2 The requirement for Environmental Impact Assessment

2.2.1 Under the 2017 MW Regulations, the Scottish Ministers, as the consenting authority, must not grant a regulatory approval for an EIA project unless an environmental impact assessment has been carried out in respect of that project and in carrying out such assessment the Scottish Ministers must take the environmental information into account. The works described in your scoping report fall under Schedule 2, paragraphs 12(a), 1(e) and 10(m) of the 2017 MW Regulations. A screening opinion was issued on 05 February 2018 which found that the works exceeded the corresponding threshold described in column 2 of schedule 2 of the MW Regulations. On consideration of the selection criteria set out in schedule 3 of the MW Regulations it was determined that the environmental effects of the works was likely to be significant and thus should be subjected to an EIA.

2.3 The content of the scoping opinion

2.3.1 In regards to your request for a scoping opinion on the proposed content of the required EIA report, the Scottish Ministers have, in accordance with the 2017 MW Regulations, considered the documentation provided to date and consulted with the appropriate consultation bodies (see Appendix I) in reaching their scoping opinion.

2.3.2 The EIA process is vital in generating an understanding of the biological, chemical and physical processes operating in and around the proposed works' location and those that may be impacted by the proposed activities. We would however state that references made within the scoping opinion with regard to the significance of impacts should not prejudice the outcome of the EIA process. It is therefore expected that these processes will be fully assessed in the EIA report unless scoped out.

3. Description of works

3.1 Background to the works

3.1.1 The proposal by the applicant to construct a new marina within Granton Harbour is part of the regeneration plan for the area which is part of the wider re-development of the Edinburgh waterfront. The project comprises of the following main components:

- Construction of a harbour wall
- Extension to existing quay wall
- Laying out of a 315 berth marina
- Extension to the existing north mole
- Harbour dredging
- Deposit of dredge spoil

4. Aim of this scoping opinion

4.1 The scoping process

4.1.1 Scoping provides the first identification, and likely significance, of the environmental impacts of the proposal and the information needed to enable their assessment. The scoping process is designed to identify which impacts will or will not need to be addressed in the EIA report. This includes the scope of impacts to be addressed and the method of assessment to be used. The scoping process also allows consultees to have early input into the EIA process, to specify their concerns and to supply information that could be pertinent to the EIA process. In association with any comments herein, full regard has been given to the information contained within the documentation submitted with the scoping opinion request.

4.1.2 The Scottish Ministers have also used this opportunity to provide advice in relation to the licensing requirements, in addition to the EIA requirements (see Appendix II).

5. Consultation

5.1 The consultation process

5.1.1 On receipt of the scoping opinion request documentation, the Scottish Ministers, in accordance with the 2017 MW Regulations, initiated a 30 day consultation process, which commenced on 12 April 2018. The following bodies were consulted:

- Association of Salmon Fishery Boards
- Edinburgh City Council
- Executive Health and Safety ("HSE")
- Eyemouth Fishery Office
- Forth District Salmon Fishery Board
- Forth Ports
- Granton and District Community Council
- Historic Environment Scotland ("HES")
- Marine Safety Forum
- Marine Planning and Policy
- Maritime and Coastguard Agency ("MCA")
- Ministry of Defence ("MOD")
- North and East Coast Inshore Fisheries Group
- Northern Lighthouse Board ("NLB")
- Royal Forth Yacht Club
- Royal Society for the Protection of Birds Scotland ("RSPB")
- Royal Yachting Association Scotland ("RYA")
- Scottish Environment Protection Agency ("SEPA")
- Scottish Fishermen's Federation
- Scottish Fishermen's Organisation
- Scottish Natural Heritage
- Scottish Water
- Scottish Wildlife Trust
- The Crown Estate
- Transport Scotland
- UK Chamber of Shipping
- Visit Scotland
- Whale and Dolphin Conservation ("WDC")

5.2 Responses received

5.2.1 From the list above a total of 12 responses were received. In addition, relevant advice was sought from Marine Scotland Science. The purpose of the

consultation was to obtain advice and guidance from each consultee or advisor as to which potential effects should be scoped in or out of the EIA.

5.2.2 The Scottish Ministers are satisfied that the requirements for consultation have been met in accordance with the 2017 MW Regulations. The sections below highlight issues which are of particular importance with regards to the EIA report and any marine licence application. Full consultation responses are attached in Appendix I and each should be read in full for detailed requirements from individual consultees. The Scottish Ministers expect all consultee concerns to be addressed in the EIA report unless otherwise stated.

6. Contents of the EIA report

6.1 Requirements of the 2017 MW Regulations

6.1.1 An EIA report must be prepared in accordance with regulation 6 of the 2017 MW Regulations.

6.1.2 The 2017 MW Regulations require that the EIA report is prepared by competent experts and must be accompanied by a statement from the applicant outlining the relevant expertise or qualifications of those experts.

6.1.3 The EIA report must be based on this scoping opinion and must include the information that may be reasonably required for reaching a reasoned conclusion, which is up to date, on the significant effects of the works on the environment, taking into account current knowledge and methods of assessment.

6.1.4 A gap analysis template is attached at Appendix III to record the environmental concerns identified during the scoping process. This template should be completed and used to inform the preparation of the EIA report.

6.2 Non-Technical Summary

6.2.1 The EIA report must contain a Non-Technical Summary ("NTS") which should be concise and written in a manner that is appealing to read and easily understood. The NTS should highlight key points set out in the EIA report and must include (at least) the following:

- a description of the works comprising information on the site, design, size and other relevant features of the works;
- a description of the likely significant effects of the works on the environment;
- a description of the features of the works and any measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
- a description of the reasonable alternatives studied by the applicant, which are relevant to the works and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the works on the environment; and
- a summary of the information provided under paragraphs 1 to 9 of Schedule 4 of the 2017 MW Regulations.

6.3 EU Guidance

6.3.1 EU guidance on the preparation of an EIA Report identifies the following qualities of a good EIA report:

- A clear structure with a logical sequence, for example describing existing baseline conditions, predicted impacts (nature, extent and magnitude), scope for mitigation, agreed mitigation measures, significance of unavoidable/residual impacts for each environmental topic.
- A table of contents at the beginning of the document.
- A description of the consent procedure for the works and how EIA fits within it.
- Reads as a single document with appropriate cross-referencing.
- Is concise, comprehensive and objective.
- Is written in an impartial manner without bias.
- Includes a full description and comparison of the alternatives studied.
- Makes effective use of diagrams, illustrations, photographs and other graphics to support the text.
- Uses consistent terminology with a glossary.
- References all information sources used.
- Has a clear explanation of complex issues.
- Contains a good description of the methods used for the studies of each environmental topic.
- Covers each environmental topic in a way which is proportionate to its importance.
- Provides evidence of effective consultations (if some consultations have already taken place).
- Provides basis for effective consultations to come.
- Makes a commitment to mitigation (with a programme) and to monitoring.
- Has a NTS which does not contain technical jargon.
- Contains, where relevant, a reference list detailing the sources used for the description and assessments included in the report.

6.4 Mitigation

6.4.1 Within the EIA report it is important that all mitigating measures are:

- clearly stated;
- accurate;
- assessed for their environmental effects;
- assessed for their effectiveness;
- fully described with regards to their implementation and monitoring, and;
- described in relation to any consents or conditions.

6.4.2 The EIA report should contain a mitigation table providing details of all proposed mitigation discussed in the various chapters. Refer to Appendix I for consultee comments on specific baseline assessment and mitigation.

6.4.3 Where potential environmental impacts have been fully investigated but found to be of little or no significance, it is sufficient to validate that part of the assessment by detailing in the EIA report:

- the work that has been undertaken;
- what this has shown i.e. what impact, if any, has been identified; and
- why it is not significant.

6.5 Design Envelope

6.5.1 The exact nature of the work that is needed to inform the EIA may vary depending on the design choices. Where flexibility in the design envelope is required, this must be defined within the EIA report and the reasons for requiring such flexibility clearly stated. To address any uncertainty the EIA report must consider the potential impacts associated with each of the different scenarios. The criteria for selecting the worst case, and the most likely scenario, along with the potential impacts arising from these, must also be described. The Scottish Ministers will determine the application based on the worst case scenario. The EIA will reduce the degree of design flexibility required and the detail will be further refined in a Construction Method Statement ("CMS") to be submitted to the Scottish Ministers, for their approval, before works commence. Please note however, the information provided in Section 10 below regarding multi-stage regulatory consent. The CMS will freeze the design of the project and will be reviewed by the Scottish Ministers to ensure that the worst case scenario described in the EIA report is not exceeded.

7. Interests to be considered within the EIA report

7.1 Introduction

7.1.1 The scoping report considered the likely impacts on the environment under the headings and topics addressed below. This section also contains a summary of the main points raised by consultees and the Scottish Ministers' opinion on whether EIA topics should be scoped in or out. The consultation responses are contained in Appendix I and the applicant is advised to carefully consider these responses and use the advice and guidance contained within them to inform the EIA report.

7.2 Marine Ecology - Ornithology

7.2.1 The applicant proposes that ornithology is scoped out of the EIA report on the basis that once the bird data has been collated and appropriate mitigation measures have been implemented, any significant effects on bird populations will be unlikely. They propose carrying out monthly bird counts during the works by a suitably qualified Ecological Clerk of Works ("ECoW") who can advise staff accordingly. In addition, an updated Habitats Regulations Appraisal ("HRA") would ensure that no designated sites would be negatively impacted by the proposed development. The applicant subsequently proposes that marine ecology should be included within the other issues chapter of the EIA report, thus scoping it in however they do not provide clarification of which elements this will include.

7.2.2 Edinburgh City Council are concerned that breeding birds would not be covered by the HRA. It is possible that consideration of the methods and timing of the works could be used to mitigate the impact of the works and these could form part of Construction Environmental Management Plans ("CEMP") however in the absence of further information regarding mitigation, ornithology should be scoped in. The RSPB suggest that the scoping report lacks the evidence to support claims that any impacts on birds are unlikely to be significant. They support the need for a HRA and for the implementation of suitable mitigation. However, they are concerned that the temporal scale of monthly bird counts would be insufficient to identify short-term disruptive changes that may occur as a result of the construction works. SNH also support the need for HRA however, they also identify that the scoping report makes no mention of breeding birds and does not assess the impact on non-SPA bird species which may breed on the land and sea structures around the proposed works.

7.2.3 The Scottish Ministers agree with the consultees that insufficient details about the potential impact of the proposed works and possible mitigation measures for breeding and non-breeding birds have been included in the scoping report and thus ornithology should be scoped in to the EIA report.

7.3 Marine Ecology – Mammals & Non-Native Species

7.3.1 The applicant acknowledges that marine mammals are present in the area around the proposed works and that they have the potential to be affected directly by the piling activities and indirectly by the dredging works. However, they propose that marine ecology is scoped out of the EIA report on the basis that a marine mammal protection plan will be produced which details appropriate mitigation measures. They have suggested that providing these measures are enacted prior to and during the construction phases, there are unlikely to be any significant effects on marine mammal populations. The applicant subsequently proposes that marine ecology should be included within the other issues chapter of the EIA report, thus scoping it in however they do not provide clarification of which elements this will include.

7.3.2 SNH have said that without further details about the marine mammal protection plan the impacts on EPS cannot be fully considered. The applicant has also provided insufficient information to determine whether or not an EPS licence would be required. The RYA also highlighted the need for appropriate biosecurity measures to be implemented due to the risk of Invasive Non-Native Species. This is especially relevant given the recent infestation of Undaria seaweed at Port Edgar.

7.3.3 The Scottish Ministers agree with the opinion of SNH that marine ecology should be scoped in to the EIA report on the basis that disturbance could be caused to marine mammals and insufficient detail has been provided about potential mitigation measures.

7.4 Marine Ecology - Fish

7.4.1 The applicant proposes that if appropriate mitigation measures in relation to pollution prevention, noise monitoring and sediment dispersal containment are implemented, it is unlikely that there would be any significant impact on migratory and pelagic fish populations. This is due to the distance from the development site to the home rivers for migratory salmonids, containment of the works within the natural bund of Granton harbour and the width of the adjacent Firth of Forth. The applicant subsequently proposes that marine ecology should be included within the other issues chapter of the EIA report, thus scoping it in however they do not provide clarification of which elements this will include.

7.4.2 The consultation response received from SNH did not raise any concerns about fish species. The River Teith SAC, designated for migratory fish lies 65km upstream of the proposed development.

7.4.3 The Scottish Ministers concur with the view of SNH and thus conclude that fish can be scoped out of the EIA report.

7.5 Water Environment & Coastal Processes - Tides

7.5.1 The applicant proposes that tidal currents be scoped out of the EIA process on the basis that the assessment of existing baseline conditions and the wave modelling study undertaken indicates that the proposed development will not have a significant effect on tidal currents.

7.5.2 No comments were made about tidal currents in any of the consultation responses.

7.5.3 The Scottish Ministers have concluded that tides can be scoped out of the EIA report on the basis of the assessment provided in the scoping report and the wave modelling study.

7.6 Water Environment & Coastal Processes – Waves

7.6.1 The applicant proposes that based on the output of the wave modelling study already undertaken, waves are scoped out of the EIA report.

7.6.2 In their consultation response, Forth Ports have raised a potential oversight in the wave modelling study in that it focuses on swell and wind waves from a NE direction. They have concerns about the effect of shallow water on waves from a NW direction and also about the reflection of waves on the location of the pilot vessels on the centre pier. SNH have also highlight that the study only looks at the effect of wave attenuation in the western harbour and does not assess effects in the eastern harbour.

7.6.3 The Scottish Ministers support the work which has already been done with the wave modelling study however waves have been scoped in to consider the additional potential impacts that should be considered, as highlighted in the consultation responses.

7.7 Water Environment & Coastal Processes – Sediment Transport

7.7.1 The applicant proposes that sediment transport is scoped out of the EIA on the basis of the wave modelling study which found that there would be no significant effects of the proposed development on tidal currents, wave action and associated sediment transport processes. In the absence of changes to the above processes, they have concluded that there would be no significant impact on the geodiversity features of the Firth of Forth SSSI. In addition, they propose using a silt curtain during the dredging works to prevent suspended sediment leaving the western

harbour.

7.7.2 Forth Ports have said that coastal changes and sedimentation as a result of the western breakwater extension is a fundamental issue and they do not believe that this has been sufficiently studied. Any potential increase in sedimentation rates in areas could cause issues for safety of navigation. The RYA concur with the opinion that the evidence presented is not sufficient to demonstrate that there will be no increase in sedimentation in the eastern harbour as a result of the proposed works. They are also concerned about the closure of the western harbour that would result from the use of a silt curtain and the impact this would have on existing users. SNH also raised concerns that sediment transport has not been adequately assessed in the wave modelling study and that further consideration is required in relation to nearby geodiversity features.

7.7.3 The Scottish Ministers have concluded that sediment transport and potential effects on the Firth of Forth SSSI have not been adequately addressed by the study already undertaken and thus sediment transport should be scoped in to the EIA report.

7.8 Water Environment & Coastal Processes - Flooding

7.8.1 The applicant proposes that as the works are to construct a marina within an existing harbour, both similar uses, the works will not alter the existing flood risk and thus flooding can be scoped out of the EIA report.

7.8.2 SEPA have confirmed in their consultation response that their previous advice still stands, i.e. that they have no concerns regarding increased flood risk.

7.8.3 The Scottish Ministers concur with the applicant and the consultees that the proposed works are unlikely to alter the flood risk and thus flooding can be scoped out of the EIA report.

7.9 Water Environment & Coastal Processes – Water Quality

7.9.1 The applicant proposes that water quality is scoped in to the EIA report due to the potential for particulate and chemical contamination of the water during the dredging element of the proposed works.

7.9.2 On the basis of the pre-dredge sample analysis carried out by the applicant, the Scottish Ministers concur with the applicant that water quality should be scoped in to the EIA report which should include the sediment risk assessment.

7.10 Landscape & Visual

7.10.1 The applicant has concluded that because the development is set within an existing harbour, the proposed works will not appear out of place in terms of their location, mass or height. They discuss the design of the hard landscaping which will be in keeping with the dockside tradition of the area. On this basis, they have suggested that landscape and visual is scoped out of the EIA report. However, the applicant subsequently proposes that landscape and visual should be included within the other issues chapter of the EIA report, thus scoping it in.

7.10.2 In their consultation response, SNH have suggested that the EIA report should include an assessment of and/or mitigation measures relating to landscape and visual impacts as there is a lack of consistency and accuracy in relation to this aspect in the scoping report.

The Scottish Ministers have concluded that although there is a lack of clarity in the scoping report, the concerns around this receptor are insufficient to warrant further consideration in the EIA report. On this basis, landscape and visual is scoped out.

7.11 Noise

7.11.1 The applicant proposes that noise is scoped out of the EIA report based on the findings of noise assessment reports carried out for land based works in Granton Harbour and the subsequently proposed mitigation measures. They have acknowledged that during the construction phase, short-term additional noise sources would be introduced to the area however they plan to minimise these as far as possible through the use of temporary barriers, ‘quiet’ plant and acoustic double glazing. These measure will be incorporated in the CEMP. However, the applicant subsequently proposes that noise would form part of the other issues chapter of the EIA report, thus scoping it in.

7.11.2 None of the consultees made reference to noise in their responses including Edinburgh City Council.

7.11.3 In addition to the lack of clarity on the applicant’s perspective, the scoping report does not assess marine noise and in particular the production of underwater noise. On this basis, the Scottish Ministers have determined that noise should be scoped in to the EIA report.

7.12 Air Quality

7.12.1 The applicant proposes that procedures to minimise dust arising from the construction phase will be addressed within the construction environment management plan. The other additional impact on air quality would be from increased road traffic. The applicant predicts that this will have a negligible impact on air quality however undertakes to consult with Edinburgh City Council should this

change. On this basis, the applicant has scoped air quality out of the EIA report. However, in a later section of the scoping report, the applicant then state that air quality with particular reference to dust will be included in the other issues chapter of the EIA report, thus scoping it in.

7.12.2 The issue of air quality was not raised by any of the consultees in their responses including Edinburgh City Council.

7.12.3 Although the applicant has proposed scoping air quality in to the EIA report, the Scottish Ministers have concluded that it should be scoped out. This view is supported by the fact that no concerns were highlighted in any of the consultation responses.

7.13 Cultural Heritage & Archaeology

7.13.1 The applicant notes that the mid-pier of the harbour is a category A listed building however states that mitigation measures identified as part of the original planning application are considered appropriate to ensure the integrity of the feature. On this basis, the applicant has scoped cultural heritage and archaeology out of the EIA report. However, the applicant later states that cultural heritage and archaeology would form part of the other issues chapter of the EIA report, thus scoping it in.

7.13.2 Historic Environment Scotland confirmed in their consultation response that there is a potential impact on both the site and setting of the category A listed mid pier however they are content that significant impacts can be effectively mitigated and do not require inclusion in the EIA report.

7.13.3 The Scottish Ministers are satisfied that any impacts on the mid-pier can be mitigated through the measures detailed in the planning application and thus cultural heritage and archaeology can be scoped out of the EIA report. We would however encourage the applicant to include the schedule of mitigation in the CEMP.

7.14 Climate Change

7.14.1 The applicant has proposed that pollution and emissions control will be included within the CEMP and these would be the main factors that could contribute to climate change, although any effects are likely to be negligible. The vulnerability of the project to climate change is primarily through flood risk which has been separately scoped out of the EIA report. On this basis, climate change has also been scoped out by the applicant.

7.14.2 Climate change has not been raised by any of the consultees in their responses including Edinburgh City Council.

7.14.3 On this basis, the Scottish Ministers agree that climate change should be scoped out of the EIA report providing pollution and emissions control measures are included in the CEMP.

7.15 Natural Disasters

7.15.1 The applicant has stated that the development is not located within an area of significant seismic activity nor are tsunamis, hurricanes or floods regularly experienced. On this basis, they have determined that natural disasters can be scoped out of the EIA report.

7.15.2 The consultation responses received did not make reference to natural disasters and no concerns were presented to the Scottish Ministers. The Scottish Ministers agree that natural disasters can be scoped out of the EIA report.

7.16 Major Accidents

7.16.1 Section 4 of the 2017 MW Regulations requires an assessment of the risks from major accidents. The scoping report submitted by the applicant does not consider this risk.

7.16.2 On the basis that the Scottish Ministers have no evidence on which to scope major accidents out of the EIA report, they have concluded that it should be scoped in.

7.17 Population & Human Health

7.17.1 The applicant has identified that the main effects on population and human health will be caused by noise and vibration, and air quality. These have been separately assessed within the scoping report and scoped out of the EIA report. Thus the applicant has concluded that the population and human health should be scoped out of the EIA report.

7.17.2 Population and human health was not referred to in any of the consultation responses and no concerns were presented to the Scottish Ministers. The Scottish Ministers concur with the applicants view that population and human health can be scoped out of the EIA report.

7.18 Cumulative Assessment

7.18.1 The applicant proposes that cumulative assessment will be considered between this project and other marine developments where concurrent environmental effects are apparent. However, they propose to address this under each of the relevant receptors and have determined that cumulative assessment

should be scoped out of the EIA report.

7.18.2 In the absence of any consideration of other projects which could have a cumulative impact on any of the sensitive receptors, the Scottish Ministers have determined that cumulative assessment should be scoped in to the EIA report.

7.19 Navigation

7.19.1 The applicant has not considered navigation in their scoping report. However it has been raised by Forth Ports, the RYA and the MCA in their consultation responses.

7.19.2 Forth Ports have commented that the increased traffic density combined with the reduction in visibility of incoming and outgoing traffic due to the breakwater extension should be considered from a navigational safety perspective. The same concern was raised by the RYA who also considered that navigation should be scoped in to the EIA report. They are also concerned about the impact of the breakwater extension on boats which rely purely on sail to enter the harbour as it would affect the winds which may reduce the boats' ability to manoeuvre against the tide. In addition the RYA understand that the harbour entrance will be narrowed near low water thus increasing the likely interaction between anglers and boats. The MCA have stated that they would expect a full navigational risk assessment to be undertaken including consideration of the impacts of the potential increase in marine traffic.

7.19.3 On the basis of the consultation responses and the lack of information provided by the applicant, the Scottish Ministers have scoped navigation in to the EIA report.

8. Marine Planning

8.1 Background

8.1.1 The development of projects subject to EIA should be in accordance with the UK Marine Policy Statement and the National Marine Plan ("NMP").

8.2 The UK Marine Policy Statement 2011

8.2.1 The UK Administrations share a common vision of having clean, healthy, safe, productive and biologically diverse oceans and seas. Joint adoption of a UK-wide Marine Policy Statement provides a consistent high-level policy context for the development of marine plans across the UK to achieve this vision. It also sets out the interrelationship between marine and terrestrial planning regimes. It requires that when the Scottish Ministers make decisions that affect, or might affect, the marine area they must do so in accordance with the Statement.

8.3 Scotland's NMP 2015

8.3.1 Developed in accordance with the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 (as amended), the NMP provides a comprehensive statutory planning framework for all activities out to 200 nautical miles. This includes policies for the sustainable management of a wide range of marine industries. The Scottish Ministers must make authorisation and enforcement decisions, or any other decision that affects the marine environment, in accordance with the NMP. The NMP sets out a presumption in favour of sustainable development and use of the marine environment when consistent with the policies and objectives of the Plan.

8.4 Application and EIA Report

8.4.1 It should be noted that any changes produced after the EIA report is submitted may require further environmental assessment and public consultation.

9. Multi-Stage Regulatory Approval

9.1 Background

9.1.1 The 2017 MW Regulations contain provisions regulating the assessment of environmental impacts. A multi-stage approval process arises where an approval procedure comprises more than one stage, one stage involving a principal decision and one or more other stages involving an implementing decision(s) within the parameters set by the principal decision. While the effects which works may have on the environment must be identified and assessed at the time of the procedure relating to the principal decision, if those effects are not identified or identifiable at the time of the principle decision, assessment must be undertaken at the subsequent stage.

9.1.2 The definition in the 2017 MW Regulations is as follows: "*application for multi-stage regulatory approval" means an application for approval, consent or agreement required by a condition included in a regulatory approval where (in terms of the condition) that approval, consent or agreement must be obtained from the Scottish Ministers before all or part of the works permitted by the regulatory approval may be begun*".

9.1.3 A marine licence, if granted, by the Scottish Ministers for your works at Granton Harbour, Firth of Forth, may have several conditions attached requiring approvals etc. which fall under this definition, for example the approval of a CMS.

9.1.4 When making an application for multi-stage approval the applicant must satisfy the Scottish Ministers that no significant effects have been identified in addition to those already assessed in the EIA report. In doing so, the applicant must account for current (meaning at the time of the multi-stage application) knowledge and methods of assessment which address the likely significant effects of the works on the environment so to enable the Scottish Ministers to reach a reasoned conclusion which is up to date.

9.1.5 If during the consideration of information provided in support of an application for multi-stage regulatory approval the Scottish Ministers consider that the works may have significant environmental effects which have not previously been identified in the EIA report (perhaps due to revised construction methods or updated survey information), then information on such effects and their impacts will be required. This information will fall to be dealt with as additional information under the 2017 MW Regulations, and procedures for consultation, public participation, public notice and decision notice of additional information will apply.

10. Judicial review

All decisions may be subject to judicial review. A judicial review statement should be made available to the public.

11. Gaelic Language

If the proposed works are located in an area where Gaelic is spoken, the applicant is encouraged to adopt best practice by publicising details of the proposed works in both English and Gaelic.

Signed

[Redacted]

14 June 2018
Authorised by the Scottish Ministers to sign in that behalf.

Appendix I: Consultee Responses

Edinburgh City Council

From: [Redacte
To: MS Major Projects
Subject: [PROTECT] FW: Granton Harbour - Edinburgh Marina - Scoping Consultation
Date: 11 May 2018 10:48:19
Attachments: image003.png

Dear [Red

Thank you for your consultation on the above EIA scoping report. The following comments are provide in respect of ecology.

Ecology

It is noted that in section 4.2.5 of the scoping report, terrestrial ecology has been scoped out of the EIA. This is partly due to the fact that many issues concerning ecology have been scoped into the Habitat Regulation Appraisal (HRA) which is required to support the EIA of the harbour development. The overall assessment of ecology to be scoped in to the HRA is comprehensive. However out with the scope of the HRA, some elements of terrestrial ecology, namely otters, a European protected species (EPS) and breeding birds, do still need to be assessed to fully understand the impacts of this development on ecology.

When considering impacts of development, the LPA must fully understands any implications for an EPS and whether any license would be required. Therefore, we would expect that surveys for otters and consideration of breeding birds would be included as part the EIA and included in the scoping report under section 4.8, Other Issues, specifically 4.8.5, Marine and Terrestrial Ecology.

-

Mitigation

It is stated that at this stage, methods of construction and timing are not formulated in detail. By fully understanding the ecology of the site, assurances can be given that methods and timing of works will be appropriate and can be detailed with appropriate mitigation. These may form part of construction environmental management plans.

-

Cumulative Impacts

Cumulative impacts are expected to be dealt with in the HRA, which is appropriate.

For information in terms of cumulative impacts, Granton Central Development Ltd has recently submitted a planning application (reference 18/01428/PPP) under section 42 of the Planning Act 1997 to amend condition 1 of outline permission 01/00802/OUT. The applicant wishes to extend the time period for submitting applications for the approval of matters specified in conditions by 5 years to 23 June 2023. The Council is currently screening this proposal in accordance with the Town and Country Planning EIA Regulations 2017 to determine whether EIA is required.

I hope this is of assistance. If you require anything further, please get in touch.

Regards

[Red

[Redacted] / Majors Waterfront Team Manager / Planning and Transport / Place Directorate / The City of Edinburgh Council / Level G3 Waverley Court / 4 East Market Street / Edinburgh / EH8 8BG / [Redacted]
[Redacted] / www.edinburgh.gov.uk

Forth Ports

From: [Redact
To: MS Major Projects
Cc: [Redact
Subject: RE: Granton Harbour - Edinburgh Marina - Scoping Consultation-Additional information
Date: 04 May 2018 07:54:30

I refer to the below response from my colleague.
For the avoidance of doubt, please can you advise the applicant that a marine works licence will also be required from Fort Ports as the harbour authority. The application and supporting paperwork should be submitted to me at the address noted below.
Regards

[Red
acted
]

General Counsel and Company Secretary
FORTH PORTS LIMITED
1 PRINCE OF WALES DOCK,
EDINBURGH EH6 7DX
Telephone 0131 555 8700

[Redacted]

From: [Redacted]
Sent: 25 April 2018 16:58
To: 'ms.majorprojects@gov.scot' <ms.majorprojects@gov.scot>
Subject: Granton Harbour - Edinburgh Marina - Scoping Consultation-Additional information

Good afternoon,

With reference to the Granton Marina Development, I have the following observations and points from Forth Ports.

Coastal changes and sedimentation as a result of the Western breakwater extension-the documentation makes no reference to any study other than to say there will not be any changes to the sedimentation rates as a result of the works. This is a fundamental issue for Forth Ports in relation to any potential increase to areas where other craft navigate in the Eastern Harbour and potential issues for the safety of navigation. A full and thorough study of the impact of his development on the sedimentation rates needs to be done.

Visibility/Safety of Navigation-increased traffic density coupled with the reduction in visibility of incoming/outgoing traffic due to the breakwater extension needs to be considered and what mitigation is required. For example, this could either be by creating a traffic management plan or procedures and /or installation of buoyage or traffic signals.

Proposed Helipad-details on how this will be managed in accordance with CAA guidance needs to be given, especially with regards to vessel traffic and masts/obstructions etc.

Wave report-Whilst the DHI wave report is very thorough, it does appear to focus on swell and wind waves from a NE direction. Consideration should be made for all wind and wave directions and the effect of shallow water, especially from a NW direction with a short steep and more frequent wave pattern. There are also concerns that there will be reflection of waves on the location of the Pilot vessels on the centre pier which are not fully addressed in the report.

[Redacted]

Forth Ports

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Historic Environment Scotland

HISTORIC ENVIRONMENT SCOTLAND | ÀRAINNEACHD EACHDRAIDHEIL ALBA

Longmore House
Salisbury Place
Edinburgh
EH9 1SH

Enquiry Line: 0131-668-8716
HMConsultations@hes.scot

By email to: MS.majorprojects@gov.scot

Marine Scotland (Aberdeen Office)
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

Our ref: AMN/16/LA
Our case ID: 300025365

09 May 2018

Dear [Redacted]

The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017
Granton Harbour Development
Scoping Report

Thank you for your consultation which we received on 12 April 2018 about the above scoping report. We have reviewed the details in terms of our historic environment interests. This covers world heritage sites, scheduled monuments and their settings, category A-listed buildings and their settings, inventory gardens and designed landscapes, inventory battlefields and historic marine protected areas (HMPAs).

The relevant local authority archaeological and cultural heritage advisors will also be able to offer advice on the scope of the cultural heritage assessment. This may include heritage assets not covered by our interests, such as unscheduled archaeology, and category B- and C-listed buildings.

Proposed Development
I understand that the proposed development IS associated with the proposed marina element of the Granton Harbour Regeneration Scheme. It comprises the construction of a harbour wall, incorporating a 239m length of sloping masonry revetment wall and a 108m length of vertical sheet extension to existing quay wall and backfilling; the laying out of a 315 berth marina; construction of an extension to existing north mole and harbour dredging.

Scope of assessment
Our key interest in this case is the potential impact on the category A listed mid pier (Granton Harbour, Mid Pier Including Slipways, Wharves and Lamp Standards, LB 30216). We consider there to be the potential for impacts on both the site and setting of this heritage asset.

As identified in the scoping report, we are content that significant impacts on the mid pier can be effectively mitigated. We are therefore content for our interests to be scoped out of the EIA process. We would advise, however, that the schedule of mitigation should include those factors which are considered to mitigate impacts on the pier.

Further information
Guidance about national policy can be found in our 'Managing Change in the Historic Environment' series available online at www.historicenvironment.scot/advice-and-support/planning-and-guidance/legislation-and-guidance/managing-change-in-the-historic-environment-guidance-notes. Technical advice is available on our Technical Conservation website at http://conservation.historic-scotland.gov.uk/.

We hope this is helpful. Please contact us if you have any questions about this response. The officer managing this case is Ruth Cameron, who can be contacted by phone on 0131 668 8657 or by email on Ruth.Cameron@hes.scot.

Yours sincerely

Historic Environment Scotland

Maritime and Coastguard Agency

Dear Marine Scotland,

Thank you for the opportunity to consult on this Scoping Request for the proposals at Granton Harbour, Edinburgh.

We would expect the developers to conduct a full Navigational Risk Assessment, with particular consideration to the potential increase in recreational marine traffic and how this may impact existing operations at the Port of Leith and the surrounding area, before during and post construction.

This Assessment should be undertaken in conjunction with the Harbour Master at the Port of Leith (Currently Forth Ports Plc), and we would request that they be engaged with at an early stage so that any impacts on navigation safety – and appropriate mitigation measures – can be considered. The MCA is a statutory consultee to Marine Scotland and will also consider the potential impact by the works at the full marine licencing stage.

We would also expect the developers to notify local HM Coastguard and the MCA Marine Office in Glasgow of the proposed works.

We would also like to point the developers in the direction of the Port Marine Safety Code (and it's Guide to Good Practice) which will require local consultation to develop a robust Safety Management System (SMS) for the marina expansion.

These publications can be found on the MCA section of GOV.uk here:
https://www.gov.uk/government/publications/port-marine-safety-code

In addition we would like to highlight the following sections, which we feel cover navigation safety:

From the Guide to Good Practice, section 7 Conservancy, a Harbour Authority has a duty to conserve the harbour so that it is fit for use as a port, and a duty of reasonable care to see that the harbour is in a fit condition for a vessel to be able to use it safely. Section 7.7 Regulating harbour works covers this in more detail and have copied the extract below from the Guide to Good Practice.

7.7 Regulating harbour works

7.7.1 Some harbour authorities have the powers to license works where they extend below the high watermark, and are thus liable to have an effect on navigation. Such powers do not, however, usually extend to developments on the foreshore.

7.7.2 Some harbour authorities are statutory consultees for planning applications, as a function of owning the seabed, and thus being the adjacent landowner. Where this is not the case, harbour authorities should be alert to developments on shore that could adversely affect the safety of navigation. Where necessary, consideration should be

given to requiring the planning applicants to conduct a risk assessment in order to establish that the safety of navigation is not about to be put at risk. Examples of where navigation could be so affected include:

- high constructions, which inhibit line of sight of microwave transmissions, or the performance of port radar, or interfere with the line of sight of aids to navigation;
- high constructions, which potentially affect wind patterns; and
- lighting of a shore development in such a manner that the night vision of mariners is impeded, or that navigation lights, either ashore and onboard vessels are masked, or made less conspicuous.

There is a British Standards Institution publication on Road Lighting, BS5489. Part 8 relates to a code of practice for lighting which may affect the safe use of aerodromes, railways, harbours and navigable Inland waterways.

We would also like to remind developers of any legal obligations, under part 9 of the Merchant Shipping Act 1995, to report all recoveries of wreck material to the Receiver of Wreck. Further guidance can be found at www.gov.uk/guidance/wreck-and-salvage-law.

Ministry of Defence

From: [Redacted]
To: MS Major Projects
Subject: RE: 20180418-Granton Harbour - Edinburgh Marina - Scoping Consultation-DIO 10043072
Date: 18 April 2018 11:01:23
Attachments: image001.png

Good Morning [Redacted]

Further to your e-mail below regarding the Scoping Report for Granton Harbour and after our investigation, I can confirm that the MOD has No Objection to this activity in the location specified. I hope this information is sufficient for your purposes.

Regards

[Redacted]
Safeguarding Assistant- Environment & Planning Support – Safeguarding
DIO Safety Environment & Engineering
Defence Infrastructure Organisation
Kingston Road, Sutton Coldfield, West Midlands, B75 7RL

[Redacted]

[Redacted]

uk**Website:** https://www.gov.uk/government/publications/wind-farms-ministry-of-defence-safeguarding
Release-Authorised:
Recipient(s):

Northern Lighthouse Board

Northern Lighthouse Board

84 George Street
Edinburgh EH2 3DA
Switchboard: 0131 473 3100
Fax: 0131 220 2093
Website: www.nlb.org.uk
Email: enquiries@nlb.org.uk

Your Ref: EIA email from [Redacted]
Our Ref: GB/OPS/ML/PJMS_013_18

[Redacted]
Marine Licensing Casework Officer
Marine Scotland – Marine Planning & Policy
Scottish Government
Marine Laboratory
375 Victoria Road
ABERDEEN
AB11 9DB

08 May 2018

Dear [Redac

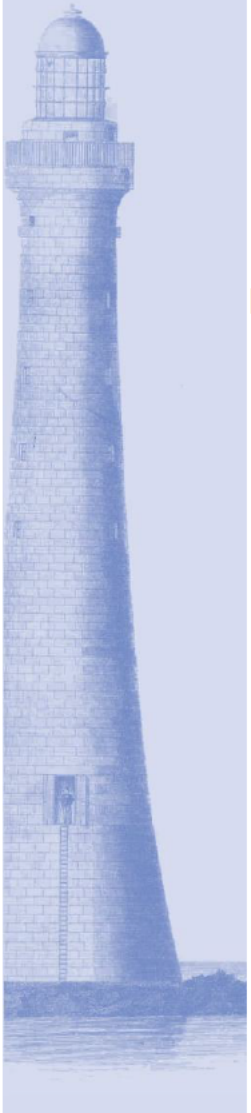
PART 4, REGULATION 14(2) OF THE MARINE WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017 (AS AMENDED) ('THE EIA REGULATIONS') – GRANTON CENTRAL DEVELOPMENT LTD (PER CAMERON PLANNING) – HARBOUR REDEVELOPMENT – GRANTON HARBOUR, EDINBURGH

Thank you for your e-mail correspondence dated 12 April 2018 regarding the Environmental Impact Assessment scoping report from **Granton Central Development Ltd (per Cameron Planning)** for the proposed harbour redevelopment at Granton Harbour, Edinburgh.

Northern Lighthouse Board has no objections to the proposed harbour redevelopment and will advise marking and lighting requirements in response to a Marine Licence application.

Yours sincerely
[Redacted]

Navigation Manager



Royal Society for the Protection of Birds

giving nature a home

rspb Scotland

RSPB Scotland

Scottish Government
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

11 May 2018

ms.majorprojects@gov.scot

Dear Sir/Madam

Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended). Granton Harbour marina scoping report.

Thank you for consulting RSPB Scotland in regard to the above.

The proposed marine component of the Granton harbour development comprises the construction of a harbour wall, the laying out of a 315 berth marina, the construction of an extension to existing north mole, and harbour dredging. We have the following general and more specific observations to make, without prejudice, on the scoping report:

The application site is directly adjacent to the Firth of Forth Special Protection Area (SPA), designated under European legislation as a site of international importance for birds. On this basis, the development must ensure that it has no negative impact on the qualifying features of the SPA. We note that this has been addressed in section 5 of the scoping report.

4.2.2.3 The Isle of May lies 48 km north east of the development site. The Berwickshire and North Northumberland Special Area of Conservation (SAC) is some 100 km from Granton.

4.2.3.1 The developer recognises the potential for disturbance and/or displacement of birds during the construction phase. The scoping report goes on to say, however, that any impacts are unlikely to be significant. Evidence for this opinion will be required.

4.2.4.1 The developer concludes that there will be no significant impact on the birds of the SPA after construction of the marina is complete. It is recognised that there may be some level of disturbance during peak activity by users of the marina. Such usage will most probably be in summer when there are relatively few birds present. The impact on birds from post-construction usage is likely to be low in winter and, as the Firth of Forth SPA is designated for its wintering species, then there will likely be no significant disturbance to the designated features of the SPA.

4.2.5.1 The presumption that the proposed development will have no significant impact on the designated features of the SPA is not supported by quantitative evidence at this stage. The developer does recognise (para 2), however, that that the proximity of the development (100 m) to

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Studio 2
Lindean Mill
Galashiels
TD1 3PE

Tel 01750 725 323

rspb.org.uk

BirdLife INTERNATIONAL

the SPA will require a Habitats Regulation Appraisal (HRA) to be undertaken. We concur with this, and also the requirement for an appropriate assessment (AA) to be undertaken by the City of Edinburgh Council, as the competent authority, to determine if the proposed development is likely to have a significant impact on the designated features of the SPA. We note that an HRA is in progress and that an AA will be undertaken (Section 5.1).

4.2.6.1 We agree that the timing of works should be scheduled such that disturbance to birds by major operations, such as piling and dredging, is minimised. The birds most at risk are the wintering species that qualify as designating features of the SPA. These generally arrive in September/October and leave in March/April. Before any of these works commence, the ecological clerk of works should determine if the distribution and abundance of these species near the development site will render significant numbers of them susceptible to disturbance. It would not be sufficient to undertake monthly bird counts (although these should be carried out systematically as well) because that temporal scale would be too crude to identify any short-term disruptive changes that might result from construction works.

Post-construction mitigation should be explored as to how the development might benefit birds in the long term and that it leads to a net biodiversity gain for the SPA and the wider development area. Measures could include the provision of islands or rafts to provide secure and undisturbed roosting areas for birds. In general, the opportunity should be taken to demonstrate good practice and to increase the value of the area to wildlife and, as such, to be accessible to and enjoyed by the public. We would be happy to provide further suggestions and advice on how to maximise the biodiversity benefits of the site.

Please contact me if you require any further information.

Yours faithfully

[*submitted electronically*]

[Redacted]
Conservation Officer

Royal Yachting Association

RYA Scotland

Royal Yachting Association Scotland

Caledonia House
1 Redheughs Rigg
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Edinburgh
EH12 9DQ

T +44 (0)131 317 7388
E admin@ryascotland.org.uk
W www.ryascotland.org.uk

8 May 2018

[Redacted]

Marine Scotland Licensing Operations Team
Scottish Government
Marine Laboratory,
375 Victoria Road,
Aberdeen,
AB11 9DB

ms.majorprojects@gov.scot

Dear [Redacted]

Granton Harbour - Edinburgh Marina - Scoping Consultation

The response to the above scoping request was originally compiled by [Redacted] the RYA Scotland Planning and Environment Officer. However, as he is a member of one of the Granton Yacht Clubs and chairs the management committee of the Edinburgh Trinity Sea Cadets, he has asked me to review and sign the letter to avoid any perception of a conflict of interest.

RYA Scotland represents the Royal Forth Yacht Club and the Forth Corinthian Yacht Club which are based at Granton as well as the Sea Cadets, of which the Edinburgh Trinity and Leith units operate from Granton. The Edinburgh Trinity Sea Cadets are in the course of becoming an RYA Training Centre. RYA Scotland also represents the visitors who make use of the existing pontoons of the Edinburgh Marina Company operated by the two clubs.

Appropriate marina development of the harbour is welcomed as the area has suffered from dereliction and provides a poor welcome to Scotland's capital city. The development is consistent with the Scottish Marine Tourism Strategy. We welcome the commitment of the marina operator to meet and exceed the five gold anchor standard set by The Yacht Harbour Association.

It may well be the case that sedimentation will not increase in the East Harbour during construction or long term. However, I do not consider that the evidence presented here is sufficient to demonstrate that will be the case. Increased dredging would have adverse financial implications for the two clubs. For that reason **coastal processes** should not be scoped out of the EIA although the section should be short. Mitigation should involve developing working practices that minimise sedimentation during construction and making a commitment to work jointly with the clubs and Forth Ports on an overall dredging strategy for the whole harbour.

Shipping and Navigation was not mentioned in the scoping report. However, it should be scoped into the EIA. A useful way forward might be to discuss these matters at a Navigational Risk Assessment workshop involving representatives of all harbour users, presumably chaired by Forth Ports as the statutory Harbour Authority. A workshop like this would get over the problem that what is considered mitigation for one sector might make things worse for another group.

Consideration must be given as to whether the proposal will make entering or leaving the harbour by all users of the harbour less safe and, if so, what mitigation can be put in place.

A successful marina will lead to more traffic entering the harbour while the breakwater extension may reduce lines of visibility and will result in a change to the approach into the harbour. The Forth Yacht Clubs Association Pilot Handbook (2009, now out of print) notes that 'approach from seaward is straightforward, the only hazards being traffic concealed behind the breakwaters and sheds'. Visibility is much less of a problem near high water. However, high water spring tides occur in the early afternoon so boats often leave as soon as they lift from the mud and return several hours after high water.

The harbour entrance is used by some vessels that rely on oars or sail and are unable to carry auxiliary power, and the impact of the breakwater extension on their safety needs to be considered. One risk is for a small vessel low in the water being set onto the breakwater extension by the passage of a larger powered vessel. This will be exacerbated if the breakwater extension shelters vessels from the wind so they are unable to manoeuvre effectively against the tide. A vessel coming into harbour under sail in a south-westerly wind is struck by a gust when the end of the West breakwater is passed. There is a back eddy in the lee of the outer part of the Middle Breakwater which mainly affects sailing boats with short masts.

The harbour entrance will be effectively narrowed particularly near low water. Sea anglers sometimes cast their lines from the end of the East Breakwater into the northern part of the harbour and this represents a risk to crew members.

Consideration needs to be given to the ability of the Forth Corinthian Yacht Club to lift boats from their yard on the Middle Pier into the West Harbour in April and out again in October, the whole process taking about eight hours.

It is presumably the intention to place the silt curtain across the mouth of the West Harbour although this is unclear from the text. Closure of the harbour mouth would have serious consequences for its existing users.

Socio-economic issues should also be included within the EIA for completeness. There would be many benefits from developing a marina here. Some members of the Granton Clubs, particularly those with larger boats may well wish to take advantage of marina berths. There may also be an opportunity to host major yachting events. The Helgoland race, which is run every two years by the Royal Forth Yacht Club, brings a fleet of German yachts to Granton, some of which are too large to berth at the existing facilities. However, any potential impact on the facilities at Port Edgar should also be considered.

Many issues, once recognised, can be resolved by appropriate mitigation. There may also be a possibility of collaboration with existing stakeholders in areas such as waste recycling, fuel provision, antifouling and dredging to the benefit of all.

Yours sincerely,

[Redacted]

CEO, RYA Scotland

Comments on the Scoping Report and associated appendices

1.7 Consultation and stakeholders

RYA Scotland was not invited to take part in the pre-consultation meeting although I know that the clubs were invited. The list of stakeholders is incomplete. The most notable omission is Forth Ports who are the Statutory Harbour Authority. The Royal Firth Yacht Club should be the Royal Forth Yacht Club (RFYC) and is one of the three RYA affiliated organisations that use Granton Harbour, the other two being the Forth Corinthian Yacht Club (FCYC) and the Sea Cadets (the Edinburgh Trinity and Leith Units are hosted by the two yacht clubs and use Granton harbour for their boating activities). The RFYC and FCYC jointly own Edinburgh Marina Ltd which operates the pontoons in the East harbour for club members and visitors. The Newhaven Coastal Rowing Club also uses the harbour. The jurisdiction of Crown Estate Scotland does not extend to Granton Harbour.

2.1 Site and the surrounding area

2.1.1 The general area

As mentioned above, the harbour is used by more groups than the RFYC. There is no coastguard station at Granton. It is the members of the Association of Forth Pilots who are based on the Middle Pier. The RFYC is celebrating its 150th anniversary in 2018 although its predecessor the Royal Eastern Yacht Club held its first regatta at Granton in 1836. The Forth Corinthian Yacht Club was founded in 1880.

2.2 The proposed development

There should be consistency used in describing the features of the site. The terms ‘Northern breakwater’ and ‘North Mole’ seem to be used interchangeably for the Western Breakwater, which has been the name of this feature since it was built. The Esparto Wharf used to be situated on the inside of the Western Breakwater but it was demolished.

4.2 Marine and Terrestrial Ecology

RYA Scotland normally restricts its comments to those directly affecting boating. However, members have much experience of Granton harbour at all times of year and all states of tide. SNH have published *Habitats Regulations Appraisal (HRA) on the Firth of Forth A Guide for developers and regulators.*

4.2.2.1 Ornithology

Wintering waders co-exist with harbour users. Most boats are lifted out of the water in winter leaving the mud flats clear. Eider duck raise a brood in the harbour in most years although it is not known where they nest. Common, and sometimes sandwich terns dive for fish in the East and West harbours. They use any mastheads unencumbered with aerials and other gear as vantage points and seem not to be disturbed by boating activities.

4.2.2.2 Terrestrial Ecology

Although otters have been recorded in the Water of Leith and the River Almond I am unaware of any records from Granton. Foxes used to be seen quite frequently on the Middle Pier but that is no longer the case.

4.2.2.3 Marine Ecology

The Isle of May SAC is nearer 50 km than 8 km from Granton. There seems to have been confusion in the report between the May and Inchkeith, which also has a population of grey seals. Harbour seals haul out onto the bird pontoons in the East Harbour. Harbour porpoises are rarely seen upriver of Inchkeith. Humpback whales were recorded in the Forth near Granton this winter. However, the shallowness of the waters offshore from Granton mean that large cetaceans are normally sighted on the north side of the Firth near the main shipping channel.

Mention needs to be made of the biosecurity measures to be put into place to counter the threat of Invasive Non-Native Species. Port Edgar marina had an infestation of *Undaria* (Wakame) seaweed recently.

4.3.2 Baseline conditions

4.3.2.1 Site description

The1860 Admiralty Chart, *Fisherrow to Queensferry* (http://maps.nls.uk/geo/explore/#zoom=15&lat=55.9860&lon=-3.2244&layers=101942630&b=1) shows the extent of the harbour and its bathymetry 25 years after the harbour was built.

4.3.2.2 Tidal levels

While Table 4.3 is correct, more information can be found on the website of the National Tidal and Sea Level Facility which includes data from the Leith tide gauge, which is located less than 3 km from the mouth of Granton Harbour. The highest recorded tide since 1979 was 6.54 m on 9 February 1997. The ten highest tides were all recorded between September and March. The site also includes an archive of differences between the astronomical and actual tide heights showing that storm surges can lead to an increase in tidal height of more than 1.0 m above the astronomical prediction.

4.3.2.3 Tidal currents

Tidal currents are not well charted outside the Forth shipping channels. The Forth Yacht Clubs Association Pilot Handbook (2009, now out of print) states that in the Forth 'the strongest flows of up to 4½ knots [2.3 ms^{-1}] at springs occur between the islands, in the narrows at the bridges, and above Kincardine Bridge.' The handbook also states that 'A strongish tide can run out [of Granton] through the harbour mouth and across the entrance.

Skippers used to racing in Wardie Bay know that there is a back eddy in Wardie Bay and that the main flood tide stream is directly from the entrance to Leith docks to the mouth of Granton Harbour. At peak tidal rates, which are probably about 2 knots (1 ms^{-1}) vessels coming into Granton have to aim off to avoid being swept beyond the entrance.

4.3.2.4 Waves

The most damaging wave conditions are indeed when the wind comes from the North Channel between Inchkeith and Kinghorn. It is thought that locally derived wind waves are superimposed on a strong swell generated in the North Sea. There can be strong wave action in the East Harbour near high water when waves break over the top of the East Breakwater. The consultants are advised to talk to the Pilots and other commercial users of the harbour for an insight into the conditions that can be experienced within the harbour. The 1860 Admiralty Chart mentioned earlier shows the bathymetry at that time and the report of Robert Stevenson and Son, civil engineers, proposing an earlier design of the harbour shows the bathymetry of the area before the harbour was constructed. There is a copy of the report in the University of Edinburgh library. Old editions of the relevant Admiralty North Sea Pilot provide depths in the western harbour when it was used for commercial shipping.

4.3.2.6 Sediment transport

Sediment also settles out in the Western Harbour although the greater depth means it is less visible. Due to the fineness of the silt the surface layers are re-suspended at each tide. The coastline in the vicinity is only stable due to the hard coastal defences. The small beach immediately west of General's Rock, which was the original landing for Caroline Park House, shows signs of erosion.

4.3.2.7 Flooding

Estimates of coastal flooding are currently being revised to take account of the effect of overtopping by waves. Some researchers feel that we are underestimating the risk of extreme sea level events (See https://www.nature.com/articles/d41586-018-02745-0).

4.3.3.2 Waves

See comments on the wave study.

4.3.3.3 Sediment transport

The EIA should examine the risk of adverse sedimentation patterns in the East Harbour in more detail. It is possible that the proposed changes might reduce sedimentation in the East Harbour. The two sailing clubs at Granton have spent considerable money over the years on dredging the area round the existing pontoons to ensure they can be used at all states of tide and any adverse change to the sedimentation regime would have implications for them. Consideration should also be given to the risk of a failure of the silt curtain. If the silt curtain is to be installed across the mouth of the harbour then the sediment is likely to find its way into the East Harbour. Previous dredging has been carried out in both harbours without a silt curtain. When carried out on an ebb tide any sediment not removed from the water is washed out to sea.

4.3.5 Inclusion or exclusion from EIA

For the reasons mentioned above I disagree that coastal processes can be scoped out of the EIA. It may well be that there will be no adverse impact. However, I do not consider that that has been demonstrated here.

4.4 Landscape and visual

4.4.3 Potentially significant effects during construction

Although the boatyard is correctly identified as a visual receptor, the proposed works are not considered to pose a visual problem.

North Breakwater Method Statement

2 Assumptions

An annual figure for annual sedimentation of 0.75 m is difficult to reconcile with the amount of dredging that has been carried out in recent years considering that much of the East Harbour has not been dredged in that time.

3.1 Dredging

The EIA will need to consider how to retain access to the East Harbour during the works. It would be extremely helpful if the depth of silt and the nature of the substrate could be established before the EIA is completed so that the nature of mitigation can be established. In 1935 there was a claimed depth of -7.0m off the eastern part of the Esparto wharf. There is reputed to be a rock ledge under the main harbour entrance which trawlers used to hit occasionally and the shore side of the Middle Pier was built on an islet. The seabed in the vicinity of the harbour entrance slopes gently downward to the north and there are no records of any rocky outcrops on the nautical charts. The British Geological Survey may be able to advise on the substrate in this area.

3.4 Breakwater construction

The degree to which the rock armour takes energy out of waves breaking on it depends on the nature of the rock armour, as mentioned in the wave study.

4 Method statement –alternative 2

It should perhaps be noted that during a previous episode of West Harbour infilling, a sheet piling wall collapsed due to adverse weather conditions.

Consideration should perhaps also be given to whether the East Breakwater might be extended to the derelict wooden pier works. There are already some large boulders and pieces of concrete in the channel between the end of the stone breakwater and the wooden pier, presumably from when the pier was hit. Forth Ports are expecting delivery of a new survey vessel equipped with high resolution multibeam sonar and LIDAR and this should be able to ascertain how much additional material would be needed to extend the East Breakwater in this way

There is no description of the silt curtain mentioned elsewhere in the scoping report.

DHI wave modelling study

With some modifications as mentioned below this approach will provide robust assessments of the swell to be encountered..

1.2.2 Granton Harbour wave disturbance model (Boussinesq Wave Model)

The highest high waters at Granton are caused more by storm surge and prolonged periods of easterly winds than by low atmospheric pressure. Actual tide heights at Leith as recorded by the National Sea Level and Tidal Facility can be one metre greater than the calculated astronomical tide. A useful way of developing a suitable scenario would be to consider the storm of 24/25 September 2012 (http://www.rfyc.org/2012/uncategorized/storm-force-winds-2425-september-2012/) which caused serious damage to boats and facilities. This storm could also be used to validate the model for the current harbour configuration (e.g. Fig. 3.6), which would give greater confidence in the predictions for the breakwater extension. The damage caused by the 2012 storm to boats seems not to have been due to moorings being broken but rather by the form and size of the waves being able to lift the heavy sinkers and allow them to slide along the harbour bottom. While it is true that the prevailing worst case

NE wave conditions being tested are unlikely to be specifically coincident with the passage of low pressures, more important factors affecting high sea level are prolonged periods of onshore winds and storm surges.

2 Previous works on wave transformation and Present Conditions

It is unfortunate that there is not a good coverage of well sited anemometers in the Forth. There used to be a Dines anemometer on Inchkeith when the lighthouse was manned but it is not known whether these records were digitised.

It is unclear why only one depth of water has been considered. Events causing damage to boats or pontoons are infrequent and it is this situation that needs to be simulated. Depths of greater than 5.6 m are encountered each year. At the other extreme, swell deflected into the East Harbour near low water can cause boats on drying moorings to repeatedly strike the bottom, which is fortunately mostly, but not entirely, soft mud.

Much valuable knowledge about the wave climate in Granton harbour is possessed by the pilots, the operator of Seahunter Marine and other commercial users of the harbour.

Criteria for assessing changes in wave climate should be based on the absolute values as well as changes as a small change near a threshold for damage could have a much greater impact than a large one well below the threshold.

3 Nearshore Design Wave Condition

It is unclear how the end of the East Breakwater has been modelled

5.1 Conclusions

The impact of storm Emma on Holyhead Marina on 2 March 2018 illustrates the dangers of underestimating possible storm damage.

Scottish Environment Protection Agency

Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

Our Ref: PCS/158506
Your Ref: Granton Harbour

If telephoning ask for:
[Redacted]

02 May 2018

[Redacted]
Marine Scotland - Marine Planning & Policy
Scottish Government
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

By email only to: [Redacted]

Dear [Redacted]

The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017
Granton Harbour - Edinburgh Marina - Scoping Consultation
Granton Harbour

Thank you for consulting SEPA on the scoping opinion for the above development proposal by your email received on 12 April 2018.

Advice to Marine Scotland

We have nothing to add to our letters of 08 September 2017 (our reference PCS/154692) and 15 January 2018 (our reference PCS/156611).

We will emphasise, however, that if disposal to land is considered, at any stage, dredging materials must go to a suitably authorised facility. My colleagues in SEPA's local regulatory team in Edinburgh can advise the applicants or their agents of requirements.

Regulatory advice for the applicant

1. Regulatory requirements

1.1 Details of regulatory requirements and good practice advice for the applicant can be found on the Regulations section of our website. If you are unable to find the advice you need for a specific regulatory matter, please contact a member of the regulatory team in the local SEPA office at:

Silvan House, SEPA 3rd Floor, 231 Corstorphine Road, Edinburgh EH12 7AT.

Tel: 0131 449 7296

continued…..

If you have queries relating to this letter, please contact me by telephone on 0131 273 7334 or e-mail at planning.se@sepa.org.uk.

Yours sincerely

[Redacted]
Senior Planning Officer
Planning Service

E copy:

[Redacted]

planning@edinburgh.gov.uk

forth@snh.gov.uk

Disclaimer
This advice is given without prejudice to any decision made on elements of the proposal regulated by us, as such a decision may take into account factors not considered at this time. We prefer all the technical information required for any SEPA consents to be submitted at the same time as the planning or similar application. However, we consider it to be at the applicant's commercial risk if any significant changes required during the regulatory stage necessitate a further planning application or similar application and/or neighbour notification or advertising. We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue. For planning applications, if you did not specifically request advice on flood risk, then advice will not have been provided on this issue. Further information on our consultation arrangements generally can be found on our website planning pages.

Scottish Natural Heritage

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

[Redacted]
Marine Scotland – Marine Planning & Policy
Email: ms.marinelicensing@gov.scot

Date: 11 May 2018
Our ref: CLC150230/ A2618604

Dear [Redacted]

Consultation under Part 4, Regulation 14 (2) of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ('the EIA Regulations').

Granton Harbour Marina Development – Scoping Report

Thank you for your email of 12 April 2018 regarding the above Marine EIA Scoping Report.

Background
We responded to your screening request on 15 January 2018. In our view there may be significant effects upon the environment arising from this proposal. In that letter we described some natural heritage receptors that should be considered through Environmental Impact Assessment (EIA) and/ or Habitats Regulations Appraisal (HRA).

Summary
For some receptors, this Scoping Report takes an unusual approach of assessing impacts, applying mitigation, scoping out of full consideration in the EIA Report, but then scoping back in under an 'Other Issues' chapter.

This approach carries risks of being confusing, and potentially omitting assessment of some significant effects. In this letter we list the natural heritage receptors that we expect to be assessed within the Marine Licence application. If they are not assessed then we may have no choice but to object to the proposal.

SNH Advice - Natura
We welcome the recognition of the need for a supporting HRA, and the Scoping Report includes all Natura sites that we would expect the HRA to assess. For the avoidance of doubt we have listed these Natura sites, alongside potential impact pathways in Annex 1.

SNH Advice – ecology
As mentioned above, the Scoping Report describes several ecological receptors and potential impacts upon them, but scopes them out of full consideration. It then appears to scope them into an 'Other Issues' chapter (see section 4.8.5).

Section 4.8.5 refers the reader back to Section 4.2.5 for discussion on which ecological issues will be included in 'Other Issues' – however this discussion does not seem to exist.

Our advice is that the following receptors should be considered in the EIA Report, in 'Other Issues' or elsewhere.

Breeding birds
The Scoping Report makes no mention of breeding birds outside of the context of HRA, which will include the Forth Islands SPA, a breeding colony designation. It is possible that non-SPA bird species make use of the land and structures around the application area for breeding.

The EIA Report should include an assessment of and/ or mitigation measures relating to the possible presence of breeding birds.

Marine European Protected Species (EPS)
The Scoping Report acknowledges that a range of marine mammal species have been recorded near to Granton Harbour. However it scopes them out of a full assessment on the basis of providing a Marine Mammal Protection Plan that is not described in detail (see section 4.2.6.3).

The EIA Report or its supporting documentation should include enough detail on marine mammal mitigation measures to enable Marine Scotland to fully consider any impacts on EPS. It should also discuss whether or not a marine EPS licence may be required.

Firth of Forth SSSI – geodiversity features
Our EIA Screening response letter identified nearby designated geodiversity features. These features are considered in the Scoping Report, but scoped out of full assessment, based on the conclusions of the supporting wave modelling study.

The wave modelling study appears to solely examine the impact of a new breakwater on wave attenuation in Western Harbour. It does not appear to examine wave effects in Eastern Harbour, or changes to sediment transport at all. It is difficult therefore to understand how the conclusion in section 4.3.5 has been reached.

The EIA Report should include an assessment of and/ or mitigation measures relating to nearby geodiversity features.

Please note that as-yet unassessed potential changes to sediment transport are also relevant to the HRA. Please see Annex 1.

SNH Advice – landscape and visual
As per the ecology topics above, the Scoping Report suggest that landscape and visual impacts will fall under 'Other Issues' (section 4.8.6), and the reader is referred back to section 4.5.5 for discussion. Section 4.5.5 actually relates to noise, whereas section 4.4.5 relates to landscape and visual, but still does not appear to contain this discussion.

The EIA Report should include an assessment of and/ or mitigation measures relating to landscape and visual impacts.

I hope these comments are useful, if you would like to discuss them further you can contact me on 0131 316 2629 / malcolm.fraser@snh.gov.uk

Yours sincerely
[by email]

[Redacted]
Operations Officer, Forth

Annex 1 – further advice on Habitats Regulations Appraisal (HRA)

This proposal could affect the Natura sites listed below. Further information about these sites, and the special features they are designated to protect, can be found on the SNH SiteLink website.[1]

Birds

- Firth of Forth Special Protection Area (SPA);
- Forth Islands SPA;
- Imperial Dock Lock, Leith SPA;
- Outer Firth of Forth and St Andrews Bay Complex proposed SPA (pSPA);

Migratory fish

- River Teith Special Area of Conservation (SAC);

Marine mammals

- Isle of May SAC;
- Berwickshire and North Northumberland Coast SAC;
- Firth of Tay and Eden Estuary SAC; and
- Moray Firth SAC.

The status of these sites means that the requirements of the Conservation (Natural Habitats, &c.) Regulations 1994 as amended (the "Habitats Regulations") or, for reserved matters the Conservation of Habitats and Species Regulations 2010 as amended apply. Consequently, East Lothian Council is required to consider the effect of the proposal on these sites before it can be consented (commonly known as Habitats Regulations Appraisal). Please see our guidance note for a summary of the legislative requirements.[2]

Potential impact pathways

Birds

- construction – disturbance/ displacement – via people or machinery
- construction – temporary or permanent habitat loss/ deterioration – via sediment release affecting Granton Harbour East

- operation – disturbance – via people, machinery, increased vessel traffic
- operation – temporary or permanent habitat loss/ deterioration – via changes in coastal processes (sedimentation rates/ patterns) affecting Granton Harbour East[3]

Migratory fish

- construction – disturbance/ displacement – via people or machinery

Marine Mammals

- construction – disturbance/ displacement – via people or machinery

[1] http://gateway.snh.gov.uk/sitelink/index.jsp

[2] https://www.nature.scot/sites/default/files/2017-12/Legislative%20requirements%20for%20European%20Sites%20-%20updated%20November%2030th%202017%20%28B449621%29_1.pdf

[3] Changes to the patterns of sediment transport and deposition within Granton Harbour, arising from construction of a new section of breakwater, have not yet been assessed. This could affect the SPA supporting habitat (mudflats in Granton Harbour East).

Transport Scotland

Development Management and Strategic Road Safety
Trunk Road and Bus Operations

Buchanan House, 58 Port Dundas Road, Glasgow G4 0HF
[Redacted]

TRANSPORT SCOTLAND
CÒMHDHAIL ALBA

[Redacted]

Scottish Government
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

ms.majorprojects@gov.scot

Your ref:

Our ref:
TS00538

Date:
08/05/2018

Dear Sirs,

MARINE (SCOTLAND) ACT 2010, PART 4 MARINE LICENSING

THE MARINE WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS 2007

GRANTON HARBOUR EDINBURGH MARINA REGENERATION SCHEME

With reference to your recent correspondence on the above development, we acknowledge receipt of the Scoping Report (SR) prepared by EnviroCentre in support of the above development.

This information has been passed to SYSTRA Limited for review in their capacity as Term Consultants to Transport Scotland – Trunk Road and Bus Operations (TRBO). Based on the review undertaken, we would provide the following comments.

Proposed Development

The proposed development is part of the Granton Harbour regeneration development which was granted Outline Planning Permission (now Planning Permission in Principle) in 2003. It is located approximately 4km north of Edinburgh City Centre. The closest trunk road to the site is the A90(T), approximately 5km to the west. The A720(T) lies approximately 8km to the south.

We understand that the site comprises predominantly reclaimed land from the sea, consisting of vacant brownfield land which is scheduled for development under an approved 2003 masterplan. The proposed marine works are situated at the edge, and within the extents, of the harbour.

The SR indicates that the proposal comprises the construction of a harbour wall, incorporating a 239m length of sloping masonry revetment wall and a 108m length of vertical sheet extension to an existing quay wall and backfilling; the laying out of a 315-berth marina; construction of an extension to the existing north mole and harbour dredging.

Sediment Disposal and other Traffic Movements

We note that while much of the sediment material resulting from the harbour dredging will be disposed of at sea, the SR states that due to the nature of the sediment, it is proposed to remove a large volume of it for treatment on land. The Report states that this will be addressed within the Dredge Licence BPEO.

Transport Scotland would ask that the forthcoming Environmental Impact Assessment should include an assessment of the potential environmental impact on the Trunk Road network of the vehicle trips involved with this material disposal as well as any other HGV movements associated with the construction of the development.

Potential trunk road related impacts such as driver delay, severance, pedestrian amenity, safety etc should be considered and assessed where appropriate (i.e. where Institute of Environmental Management and Assessment (IEMA) Guidelines for further assessment are exceeded). These specify that road links should be taken forward for assessment if:

- Traffic flows will increase by more than 30%, or
- The number of HGVs will increase by more than 30%, or
- Traffic flows will increase by 10% or more in sensitive areas.

The methods adopted to assess the likely traffic and transportation impacts on traffic flows and transportation infrastructure should comprise:

- Determination of the baseline traffic and transportation conditions, and the sensitivity of the site and existence of any receptors likely to be affected in proximity of the trunk road network;
- Review of the development proposals to determine the predicted construction and operational requirements; and
- Assessment of the significance of predicted impacts from these transport requirements, taking into account impact magnitude (before and after mitigation) and baseline environmental sensitivity.

Where environmental impacts are fully investigated but found to be of little or no significance, it is sufficient to validate that part of the assessment by stating in the report:

- The work that has been undertaken;
- What this has shown i.e. what impact if any has been identified; and
- Why it is not significant.

I trust that the above is satisfactory and should you wish to discuss any issues raised in greater detail, please do not hesitate to contact [Redacted] SYSTRA's Glasgow Office on 0141 343 9636.

Yours faithfully

[Redacted]

Transport Scotland
Trunk Road and Bus Operations

cc [Redacted] SYSTRA Ltd.

Whale and Dolphin Conservation

From:	[Reda
To:	MS Major Projects
Cc:	[Redact
Subject:	RE: Granton Harbour - Edinburgh Marina - Scoping Consultation
Date:	25 April 2018 10:59:42
Attachments:	image002.png image003.png

Dear [Red

Thank you very much for including WDC in the present consultation. Due to staff and time restraints we are unable to respond to the Granton Harbour Marina consultation.

Kind regards,

[Re
dact
ed]
Policy officer
End Bycatch

Telephone: +44 (0)791 869 3023
whales.org

Appendix II: Licensing Process

Application

The application letter must detail how many licences are being sought, what marine licensable activities are proposed and what legislation the application is being made under.

Applicants are required to submit two hard copies of the EIA report together with an electronic copy in a user-friendly PDF format which will be placed on the Scottish Government website. If requested to do so by the Scottish Ministers, the applicant must send to the Scottish Ministers such further hard copies of the EIA report as requested. Applicants may be asked to issue the EIA report directly to consultees and in which case consultee address lists should be obtained from the Scottish Ministers.

Requirement for Public Pre-Application Consultation ("PAC")

From 6th April 2014, applications received for certain activities are subject to a public pre-application consultation requirement. Activities affected will be large projects with the potential for significant impacts on the environment, local communities and other legitimate uses of the sea. This requirement allows local communities, environmental groups and other interested parties to comment on proposed works in their early stages and before an application for a marine licence is submitted.

The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 can be accessed via:

http://www.legislation.gov.uk/ssi/2013/286/made

Guidance on marine licensable activities subject to Pre-application Consultation can be obtained at:

http://www.gov.scot/Topics/marine/Licensing/marine/guidance/preappconsult

The licensing authority reserves the right not to accept an application in the absence of an acceptable PAC report.

Pre-Dredge Sampling

Please note that if it is intended to dispose of any dredged material at sea, adequate pre-dredge sample analysis must be submitted in support of the EIA report and marine licence dredging application. The licensing authority reserves the right not to accept an application in the absence of acceptable sediment analysis data.

Please refer to the pre-dredge sampling guidance provided in Appendix IV.

Ordinance Survey ("OS") Mapping Records

Applicants are requested at application stage to submit a detailed OS plan showing the site boundary and location of all deposits and onshore supporting infrastructure in a format compatible with The Scottish Government's Spatial Data Management

Environment ("SDME"), along with appropriate metadata. The SDME is based around Oracle RDBMS and ESRI ArcSDE and all incoming data should be supplied in ESRI shape file format. The SDME also contains a metadata recording system based on the ISO template within ESRI ArcCatalog (agreed standard used by The Scottish Government); all metadata should be provided in this format.

Advertisement

Where the applicant has provided the Scottish Ministers with an EIA report, the applicant must publish their proposals in accordance with Regulation 16 of the 2017 MW Regulations and ensure that a reasonable number of copies of the EIA report are available for inspection at any place named in the publication. Licensing information and guidance, including the specific details of the adverts to be placed in the press, can be obtained from the Scottish Ministers. If additional information is submitted further public notices will be required.

EPS licence

European Protected Species ("EPS") are animals and plants (species listed in Annex IV of the Habitats Directive) that are afforded protection under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended). All cetacean species (whales, dolphins and porpoise) are European Protected Species. If any activity is likely to cause disturbance or injury to a European Protected Species a licence is required to undertake the activity legally.

A licence may be granted to undertake such activities if certain strict criteria are met:

- there is a licensable purpose;
- there are no satisfactory alternatives, and;
- the actions authorised will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status in their natural range.

Applicants must give consideration to the three fundamental tests and should refer to the guidance on the protection of marine European Protected Species for more detailed information in relation to Scottish Inshore Waters. Applicants may choose to apply for an EPS licence following the determination of the EIA application and once construction methods have been finalised, however it is useful to include a shadow EPS assessment within the EIA report.

Please note that basking sharks are also afforded protection under the Wildlife & Countryside Act 1981 (as Amended by the Nature Conservation (Scotland) Act 2004).

Appendix III: Gap Analysis

Applicant to complete:

Consultee	No.	Point for inclusion	EIA report Section	Justification
	1			
	2			
	3			
	4			
	5			
	6			
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	21			
	22			
	23			
	24			

Technical Appendix 4.1: Bathymetric Survey

Aspect
Land+Hydrographic Surveys
CHARTERED SURVEYORS

TEL: 01294 313 399 • WEB: WWW.ASPECTSURVEYS.COM

MULTIBEAM BATHYMETRIC SURVEY

WESTERN HARBOUR, GRANTON

MAY 2017

PROJECT REF: A6291

REV: 00

Client:

GRANTON CENTRAL DEVELOPMENTS LTD

Liberation Station

Esplanade

St Helier

Jersey

JE2 3AS

ICES Approved Development Partner

Achilles

QAS INTERNATIONAL ISO 9001:2008 REGISTERED FIRM

QAS INTERNATIONAL ISO 14001:2004 REGISTERED FIRM

QAS INTERNATIONAL BS OHSAS 18001:2007 REGISTERED FIRM

CONTENTS

1. INTRODUCTION 3
2. SCOPE OF WORKS 3
3. GEODESY AND DATUM 3
4. MULTIBEAM BATHYMETRIC SURVEY 4
4.1. EQUIPMENT & METHODS 4
4.2. RESULTS 5
5. SURVEY VESSEL 6
6. SURVEY PERSONNEL 6
7. SURVEY STANDARDS 7
ANNEX A 8
ANNEX B 9
ANNEX C 10
ANNEX D 11
ANNEX E 12

TABLE OF FIGURES

FIGURE 1: WESTERN HARBOUR, GRANTON: INDICATIVE BATHYMETRIC SURVEY EXTENTS 3
FIGURE 2: RELIEF SHADED OVERVIEW OF THE MULTIBEAM BATHYMETRIC SURVEY 5
FIGURE 3: SURVEY VESSEL COASTAL SENSOR 6

DOCUMENT ISSUE RECORD

DATE	REVISON	COMPILED	CHECKED	NOTES
25.05.2017	00	[R	[R	FIRST ISSUE

1. INTRODUCTION

On the instructions of Granton Central Developments Limited, Aspect Land & Hydrographic Surveys Ltd (herein ALHS) carried out a multibeam (MBES) bathymetric survey of an area at Western Harbour, Granton. The program of events was as follows:

DATE	ACTIVITY
19.05.2017	Hydrographic team mobilised to site. Commencement and completion of MBES. Demobilisation from site.

2. SCOPE OF WORKS

The survey was required to provide an update to the existing bathymetry data of the harbour with the survey area covered the Western inlet of the Harbour and approaches, covering an area approximately 86,000m^2.

FIGURE 1 - WESTERN HARBOUR, GRANTON: INDICATIVE BATHYMETRIC SURVEY EXTENTS

3. GEODESY & DATUM

The horizontal datum used throughout the survey data gathering was OSGB36 (OSTN15™). Data has been rendered in OSGB36 Datum, British National Grid.

OSTN15 defines OSGB36 National Grid in conjunction with the National GPS Network. In this respect OSTN15 can be considered error free (not including any GPS positional errors). The agreement between OSTN15 and the old triangulation network stations (down to 3rd order) is 0.1m rms.

The vertical datum used for all survey data is Chart Datum (CD). Chart Datum at Leith is 2.90m below Ordnance Datum. RTK GPS was used throughout the survey for both horizontal and vertical control. Trimble VRS NOW Network corrections were used to provide RTK corrections for survey operations.

4. MULTIBEAM BATHYMETRIC SURVEY

4.1. EQUIPMENT & METHODOLOGY

A summary of the equipment used for completion of the multibeam bathymetric survey can be seen in the table below:

Survey Vessel	Coastal Sensor (MCA Cat III)
Positioning System	Trimble SPS855/555 RTK GPS
GPS Correction Source	Trimble VRS NOW Network
Echosounder	R2Sonic 2022 Multibeam System 400kHz
Motion Compensator	SMC IMU 108-30

ALHS' R2Sonic 2022 multibeam sonar system was used for the bathymetric survey. This was controlled using Sonic Control software during the course of data gathering.

Very detailed data with full seafloor coverage was gathered throughout the survey area as a result of the R2Sonic 2022's narrow beam width and high ping rate and the selection of 400kHz as an operating frequency.

The system was operated at the maximum ping rate achievable throughout the survey, such that the ping rate was controlled by the depth of water.

Sound Velocity (SV) dips were carried out prior to commencing survey operations and thereafter whenever the surface sound velocity varied by more than $2ms^{-1}$. There was very little variation in surface SV observed during data gathering either temporally or geographically.

The SV dips were carried out using a Valeport MiniSVS & P dipping probe with Valeport Terminal X2 software, and the data was incorporated into the Hysweep Survey software for real-time corrections.

Positioning was achieved using a Trimble SPS855/555 system, providing horizontal and vertical positioning. This system also provided the heading. Motion compensation for the survey was provided by an SMC IMU 108-30 positioned at the sonar head.

An R2Sonic Sonar Interface Module (SIM) was used to control the sonar throughout the course of data gathering. The multibeam data was transmitted to the survey laptops running Hypack Hysweep over an Ethernet connection. Hypack Hysweep Survey was used for data gathering. Hypack MBMax software was used for post-processing. The stages of multibeam processing are detailed in Annex C.
Data was gathered to give at least 200% insonification over the survey area. This allowed full quality assurance checks to be carried out. Calibration values for the survey vessel were calculated from a patch test conducted on the day of data collection.

Details of the conduct of the patch test can be seen in Annex D. The values calculated from the patch test were:

Latency	0.05
Pitch	1.00
Roll	0.00
Yaw	4.00

4.2. SURVEY RESULTS

Depths in the area surveyed ranged from 5.12m below to 3.04m above CD. An overview of the bathymetric survey can be seen in the image below:

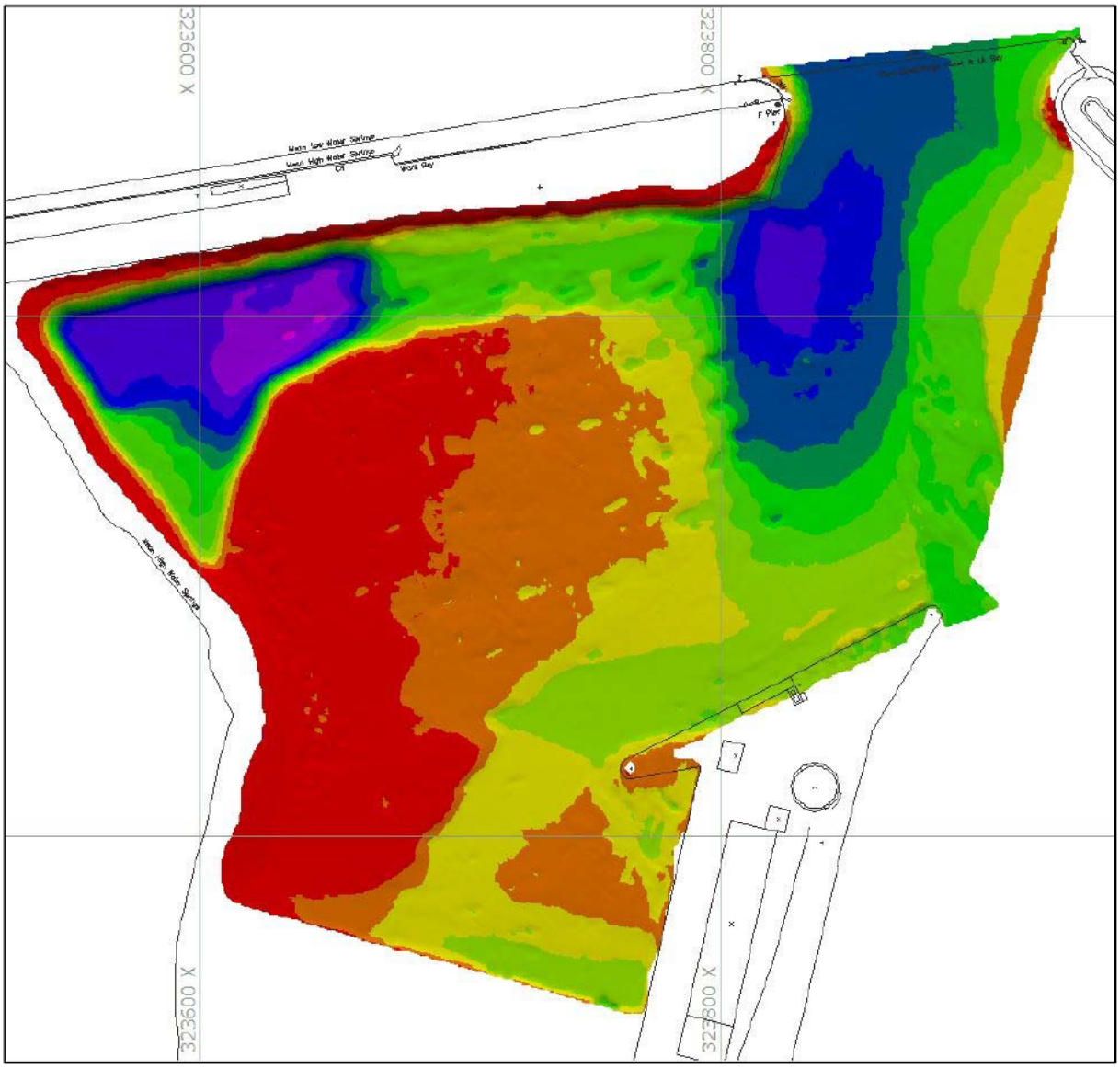


FIGURE 2 - RELIEF SHADED OVERVIEW OF THE MULTIBEAM BATHYMETRIC SURVEY

5. SURVEY VESSEL

The survey vessel *Coastal Sensor* (MCA Cat III) was used to carry out the survey.

Coastal Sensor is an MCA Cat III road transportable 6.1m fibreglass hull SPORTIS SK6100K RIB type vessel with enclosed cabin, central console, twin 60Hp outboard engine and spacious aft deck that can be used for inshore bathymetry, oceanographic or environmental projects.

FIGURE 3 - MCA CAT III VESSEL 'COASTAL SENSOR' CONDUCTING MBES SURVEY

The vessel, the first of its kind to be operated commercially in the UK, has a twin seated fully enclosed-cabin, equipped to power a laptop computer, and with ample room in the cabin for personnel and equipment survey works can continue in otherwise impossible weather conditions.

The vessel was piloted by an RYA qualified coxswain and surveyor and equipped with cm precise CODA RTK GPS (centimetric) positioning equipment.

The vessel was mobilised to and from site by road, and launched from the slipway at Port Edgar Marina, thereafter transiting the 8.6 nautical miles to site.

6. SURVEY PERSONNEL

The following personnel were involved in the planning, data capture and post-processing phase of the survey project;

NAME	POSITION
[Redacted]	QA & Data Release
[Redact	Hydrographic Surveyor
[Redacted]	Survey Coxswain

7. SURVEY STANDARDS

The Hydrographic survey is considered complete to International Hydrographic Organisation Special Order standard, with a Full Sea Floor Search being achieved as per IHO publication S44, Table 1. A representation of the section of interest within that document is shown in Table 6:

Order	Examples of Typical Areas	Horizontal Accuracy (95% Confidence Level)	Depth Accuracy for Reduced Depths (95% Confidence Level)	100% Bottom Search	System Detection Capability	Maximum Line Spacing
Special	Harbours, berthing area and associated critical channels with minimum under keel clearances	2m	a = 0.25m b = 0.0075	Compulsory	Cubic features > 1m	Not applicable as 100% search compulsory

Taken from IHO Publication S44, Table 1, Showing Requirements of a Special Order Survey

The error limits for depth accuracy are calculated by introducing the values listed in the above table for a and b into the formula $\pm\sqrt{[a^2+(b*d)^2]}$, where:

a constant depth error, i.e. the sum of all constant errors

b*d depth dependent error, i.e. the sum of all depth dependent errors

b factor of depth dependent error

d depth[1]

The multibeam system has shown during this survey to be capable of detecting objects far smaller than the 1m cubic features specified for a Special Order survey.

[1] *IHO 2005. Publication M-13 'Manual on Hydrography'. Chapter 1, Pages 9-10.*

Annex A
Drawing Register

A6291

The following drawing files and data sets are issued in relation to the project;

TITLE	CONTENT
A6291_Western Harbour_MBES_20170519.dwg	MBES Survey - AutoCAD format
A6291_Western Harbour_MBES_20170519 [PDF Layout].pdf	MBES Survey - PDF format
A6291_Granton Western Harbour_MBES_0-5m_CD_20170519.xyz	XYZ File (0.5m Grid)
A6291_Granton Western Harbour_MBES_0-5m_CD_20170519.tif	MBES Geotiff Image
A6291_Western Harbour, Granton_Report of Survey.pdf	Report of Survey

Annex B

Horizontal & Vertical Positioning System Precision

A6291

Trimble SPS855 RTK GPS Receiver, using RTK corrections.

	HORIZONTAL ACCURACY	VERTICAL ACCURACY
REAL TIME KINEMATIC	±10mm + 1ppm RMS	±20mm + 1ppm RMS

All horizontal positions in the survey are referred to OSGB and have used the OSTN 15 model to transform WGS84 positions obtained from GPS observations.

Annex C
Data Processing Procedures

A6291

Multibeam Processing Stages

Sonar Control 2000 software was used to control the MBES system during the data gathering phase.

Data was logged in HYPACK HYSWEEP software.

After data gathering the data was post processed in HYPACK MBMax where the following stages of processing were undertaken:

- Navigation data was processed.
- Motion Sensor data was examined and edited as required.
- Tidal data was examined and edited as required
- Automatic filtering of the data was carried out.
- Individual lines of MBES sounding data were manually edited.
- The data was gridded at an appropriate post spacing for the scale of plot requested by the client. This was exported to AutoCAD for presentation.
- The data was contoured at 0.5m intervals in Hypack and exported to AutoCAD.

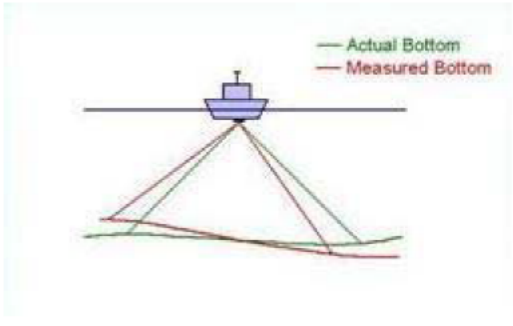
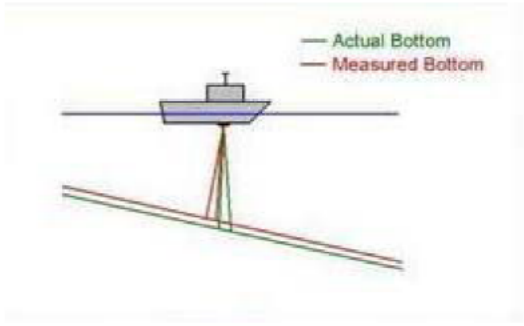
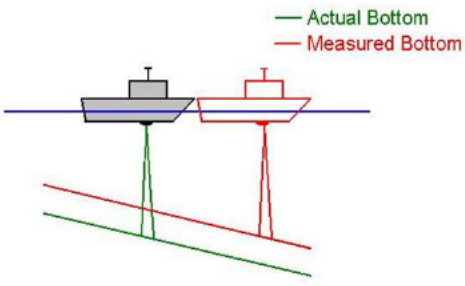
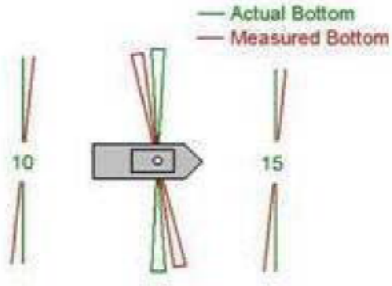
Annex D
Multibeam Echosounder Calibration

A6291

Patch tests are tests which are performed after initial equipment installation, and periodically thereafter as well as if sensors are modified, to quantify any residual biases from the initial system alignment.

During this calibration series, four separate tests must be performed to determine residual alignment biases for:

- Roll offset
- Position Time Delay (Latency)
- Pitch Offset
- Yaw (Heading) Offset

ROLL	**PITCH**
	
▪ *Sonar and Motion Reference Unit (MRU) alignment relative to vertical.* ▪ *Can cause large depth and position errors at outer beams.*	▪ *Sonar and MRU alignment relative to vertical.* ▪ *Can cause depth and position errors across the swath.*
LATENCY	**YAW (HEADING)**
	
▪ *The delay between position and fix transmission.* ▪ *Will cause positional errors.* ▪ *Error is independent of multibeam system.*	▪ *Sonar and MRU alignment relative to vertical* ▪ *Can cause depth and position errors across the swath.*

Annex E
Standard Disclaimer

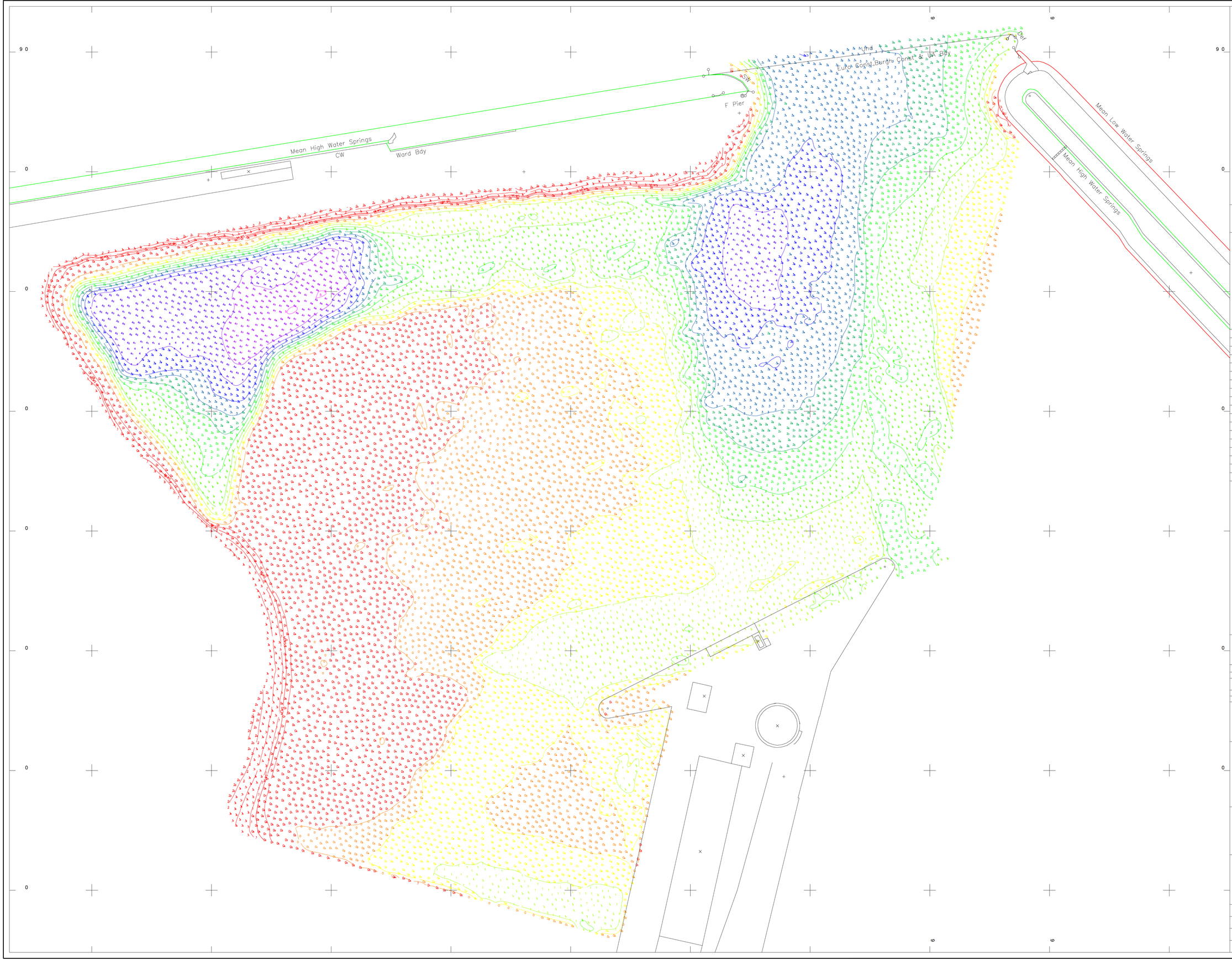
A6291

1. All client-supplied data is taken on trust as being accurate and correct, and the sub-contractor cannot be held responsible for the quality and accuracy of that data set.

2. Geophysical interpretation of bathymetry and sonar is based on an informed opinion of the supplied data, and is subject to inherent errors out with the control of the interpretational hydrographer or geophysicist, which include but are not limited to GPS positioning errors, navigation busts, data quality, assumed speed velocity sediment profiles in the absence of Geotechnical data, sub bottom profile pulse width, and induced scaling errors therein associated with seismic signature. Seabed geomorphology and sub-seabed geology should be further investigated by visual or intrusive methods.

3. The limits of this survey are defined by the data set; out with the survey limits are not covered at any level by the sub-contractor.

4. The data is accurate at the time of data acquisition, the sub-contractor cannot be held responsible for environmental changes, and the client by accepting this report accepts that the environment of the seabed is subject to continuous change, that items of debris, hard contacts etc. may move, appear, be relocated or removed, thickness of surficial sediment change out with the knowledge of the sub-contractor and they will not be held responsible for such actions at any level.



4.56 Heights relative to ORDNANCE DATUM.

12_8 Depths relative to CHART DATUM.

Sea-bed contour relative to CHART DATUM.

Mean High Water Springs

Mean Low Water Springs

S = 0

SURVEY IS ROTATED TO GRID NORTH.

	Coastal Sensor (MCA Cat III)
	Trimble SPS 855 RTK GPS
	Trimble VRS NOW Network RTK
	R2Sonic 2022 Multibeam System 400kHz
	SMC IMU 108-30
	ETRS89
	National Grid of Great Britain
	OSGM15
	OSTN02
	Airy
	6377563.396
	299.324964600
	Ordnance Datum
	Chart Datum
	Metre

The Bathymetric survey limits are MHWS, data is relative to Chart Datum.
Topographic survey data is relative to Ordnance Datum.
Horizontal and vertical datums were referenced to control stations on site.

Heights in metres above Chart Datum (Leith)

MHWS	MHWN	MLWN	MLWS

CONTROL STATION COORDINATES (OD)

STN	EASTING	NORTHING	LEVEL

pect
Land + Hydrographic Surveys
CHARTERED SURVEYORS

B R

Client :

R R P
R
R
R
R Y

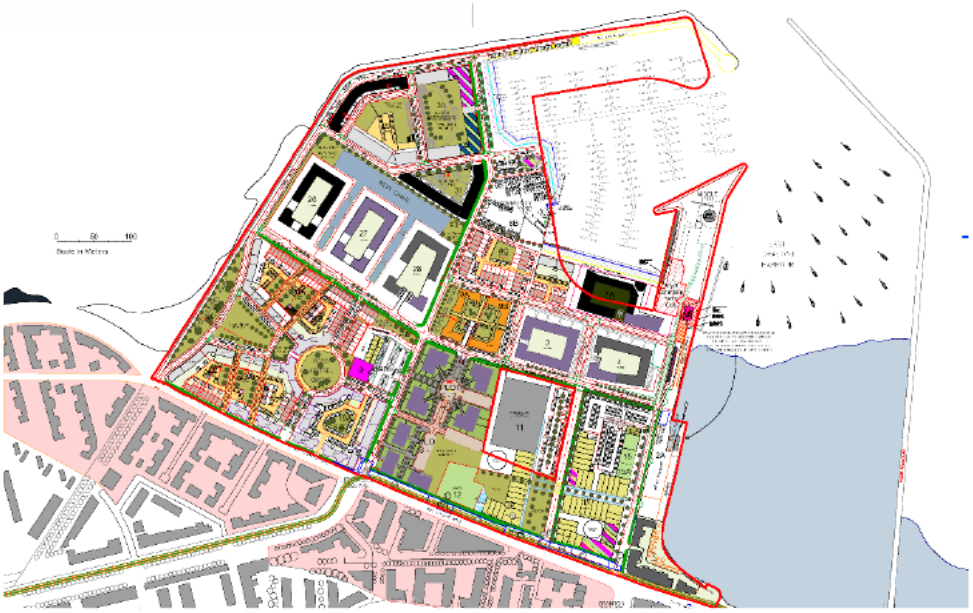
Project Title :

B B Y R R Y
W R B R
R

Project No:	Scale :
Surveyed date :	Issued date :
Surveyed by :	Checked by :
Sheet No. :	Plot Scale:

Technical Appendix 4.2: Wave Disturbance Modelling

Granton Harbour Wave Disturbance Modelling



Granton Central Developments Ltd

Report

August 2018

This report has been prepared under the DHI Business Management System certified by Bureau Veritas to comply with ISO 9001 (Quality Management)

Granton Harbour Wave Disturbance Modelling

Prepared for Granton Central Developments Ltd

Represented by [Redacted]

Granton Harbour Masterplan

Project manager	[Redacted]
Quality supervisor	[Redacte

Project number	26800670	
Approval date	7th August 2018	
Revision	**Revision History**	**Comment**
7th August 2018	Final 4.0	Update following client comment and corrections.
6th July 2018	Draft 3.0	Updated to include NW direction for wind conditions in BW model
20th July 2017	Final 2.0	Updated to include C&N option run and client feedback
13th June 2017	Draft 1.0	Draft for client comment
Classification	Public	

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CONTENTS

1 Introduction 1
1.1 Project description 1
1.2 Scope of work 2
1.2.1 Firth of Forth wave model (spectral wave model) 2
1.2.2 Granton Harbour wave disturbance model (Boussinesq Wave Model) 3

2 Previous works on wave transformation and Present Conditions 6

3 Nearshore Design Wave Condition 7
3.1 Wave transformation 9
3.2 Example of nearshore design wave conditions 10
3.3 Screening of breakwater layouts 11
3.3.1 200 YRP – Designs 01 to 05 13
3.4 Design wave conditions in the harbour - 1 in 200 year wave SW model outputs 14

4 Wave disturbance modelling 16
4.1 Description of wave disturbance model 16
4.2 Wave disturbance assessment options 17
4.3 Results of Wave disturbance analysis for Option 01 for NE wind and wave conditions 19
4.4 Results of Wave disturbance analysis for Option 02 for NE wind and wave conditions 23
4.5 Results of Wave disturbance analysis for Option 01 for NW wind and NW wave conditions 26

5 Conclusions and recommendations 29
5.1 Conclusions 29
5.2 Recommendations 30

6 References 32

7 Glossary 32

APPENDICES

A Wave energy blocking for 1 event in 100, 50, 10 and 1 year return periods and designs 01 to 05 1

B Wave energy blocking for 1 event in 200, 50 and 1 year return periods and design04 and NW wind direction (case 36, 38, 40 in [1]) 1

FIGURES

Figure 1.1 Overview of the layout master plan covering Granton Harbour and showing the western breakwater extension (yellow line).....2
Figure 3.1 Bathymetry of local model. Red line indicates the open boundaries.....8
Figure 3.2 Local bathymetry zoomed to the project site.....8
Figure 3.3 Overview (top) of 200 YRP wave transformation and the nearshore design wave conditions (bottom) with offshore mean wave direction of 45°N and wind directions of 45°N, and water level +3.97m – case 02. See also [1] for further details.....10
Figure 3.4 Example of proposed breakwater cross section (from [4]).....11
Figure 3.5 Wave transformation for 1 in 200YRP event and MHWS water level at nearshore conditions during: current state a) and differences of Hm0 vs current state for b) design_01, c) design_02 d) design_03, e) design_04 and f) design_05. Negative numbers indicate a reduction in significant wave height compared to current state of GH. Positive values are within acceptable error and due to wind stress effects with and without the presence of the structure.....13
Figure 3.6 Wave conditions for the 200YRP SW model run. Hm0 = 3.2 m and Tp =7.2 s extracted at point t1 (486200, 6204800 UTM30) are representative of wave conditions of a 200YRP event when considering rock sizing armour. Note the rapid reduction in wave height in the entrance to the harbour.....15
Figure 4.1 Example of a BW model run result for in harbour wave simulations.....16
Figure 4.2 Bathymetry used for the MHWS scenario. Orange denotes either artificial land or porosity/sponge layers used to represent edge treatments. (Upper panel) Option 01 layout (as in proposed GCDL masterplan – similar to design 03 in SW model assessment a 55m breakwater with a 20m diameter roundhead and (lower panel) Option 02 – similar to design 04 in SW model assessment) a 65m breakwater with a 20m diameter roundhead. Slope of breakwater wall for the respective examined designs remains the same.....17
Figure 4.3 Treatment of Granton Harbour's physical boundaries in the BW model porosity parameterization. Reflection parameters are computed based on design characteristics of respective reflection elements (width, diameter of stones, permeability etc.) in relation to wave parameters in front of the porous structure (wave height, period and water depth).....18
Figure 4.4 Existing wave conditions for a small wave height (estimated to be <0.5m Hm0) showing the lack of reflection from the Middle Pier. The area of interest for the proposed marina development is outlined by the grey polygon.....19
Figure 4.5 Wave disturbance plots Option 01 - (top left) Hm0 for 50yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (GCDL proposal) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.1m. (bottom left) ratio of Hm0 larger than the 0.5m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.....21
Figure 4.6 Wave disturbance plots Option 01 - (top left) Hm0 for 1yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (GCDL proposal) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.1m. (bottom left) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.3m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.....22
Figure 4.7 Wave disturbance plots Option 02 - (top left) Hm0 for 50yr return period wave conditions offshore.(top right) difference in Hm0 between breakwater extension (C&N accepted design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 10cm. (bottom left) ratio of Hm0 larger than the 0.5m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001. Note that the piled

section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution. 24
Figure 4.8 Wave disturbance plots Option 02 - (top left) Hm0 for 1yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (C&N accepted design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.1m. (bottom left) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.3m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution. 25
Figure 4.9 Wave disturbance plots Option 01 - (top left) Hm0 for 50yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (C&N proposed design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.05m. (bottom left) ratio of Hm0 larger than the 0.5m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution. 27
Figure 4.10 Wave disturbance plots Option 01 - (top left) Hm0 for 1yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (C&N proposed design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.05m. (bottom left) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001 guideline for 1YRP events; (bottom right) ratio of Hm0 larger than the 0.3m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution. 28
Figure 5.1 Comparison of the 50 year wave condition for Option 01 (left) and Option 02 (right) for the <0.4m Hm0 29
Figure 5.2 Comparison of the 1 year wave condition for Option 01 (left) and Option 02 (right) <0.3m Hm0 30
Figure A.7.1 100 YRP – Designs 01 to 05 (Case 10) (left colourbar top left panel, right colourbar rest panels). Positive areas are the result of wind stress effects on isolated cells. 2
Figure A.7.2 50 YRP – Designs 01 to 05 (Case16) 1
Figure A.7.3 10 YRP – Designs 01 to 05 (Case 23) 2
Figure A.7.4 1 YRP – Designs 01 to 05 (Case 30) 3
Figure 7.5 200, 50 and 1 YRP (top to bottom) for current state (left panels) versus proposed design (right panel – negative numbers indicate improvement in wave energy attenuation due to the proposed breakwater) for NW wind direction and NE wave direction (worst case scenario). 1

TABLES

Table 1.1 Boundary wave conditions (BW model) nearshore for 1:1, 1:50 and1 in 200 YRP (see also (DHI (UK), April 2016)) for NE wind direction (top) and NW wind direction (bottom). 3
Table 3.1 Breakwater designs examined in SW model wave energy blocking 12
Table 7.1 Abbreviations and definitions 32

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1 Introduction

Further to discussions on the proposed development plans at Granton Harbour, Granton Central Developments Ltd (GCDL) have appointed DHI Water Environments (UK) Ltd to conduct a wave disturbance study based on a proposed scheme to provide a new marina in the western basin of Granton harbour as part of a new development.

At present, the alignment of the harbour entrance to the maximum fetch in the Firth of Forth allows relatively large waves to both overtop the harbour wall and also enter through the harbour mouth. For much of the existing Granton harbour this provides no specific problem, however the western basin is subject to these waves and it is considered from previous studies that there is a need to provide additional protection to any new infrastructure.

1.1 Project description

Granton Harbour is located in the Firth of Forth, in an area identified to be affected by waves due to North to East extreme wind conditions [1]. The breakwater structures are exposed to wave attack during extreme weather conditions particularly the swell from the east that penetrates through the Firth of Forth from the North Sea, predominantly during the summer months. During the winter months, dominant stronger Westerly and weaker North-westerly winds blow over fetch lengths of 7km to 9km to reach Granton Harbour.

The area of interest for GCDL is the western part of Granton harbour where a proposal for a new marina is part of the proposed development within Granton Harbour (Figure 1.1). As noted, the present alignment of the harbour entrance to the maximum fetch in the Firth of Forth allows relatively large waves to both overtop the harbour wall and enter through the harbour mouth which leads to potential problems for the western basin. Consequently, there is a need to understand the specific requirements for adjustments to the north mole to provide adequate protection for berthed vessels in the western basin in line with international standards and guidance.

DHI has previously undertaken wave transformation modelling to inform coastal flood assessments of the area [1]. This study provided the wave conditions at the harbour entrance. The information available from that study included the wave height, period and direction for a range of extreme storm conditions ranging from a typical 1 in 1 event up to more infrequent 1 in 200yr conditions with additional provision of the associated direction and period.

Further work to define the effectiveness of the proposed adjustments to the north mole are required as the previous studies did not consider the detailed interaction of the wave conditions with the structures in the harbour, for both the existing and proposed layouts. In particular, the orientation and extent of the proposed changes to the north mole were not assessed along with the key physical processes of wave diffraction and reflection. This study seeks to provide this additional information to inform the ongoing design process, through the development of a specific wave disturbance model of Granton Harbour to test the effectiveness of the proposed protection system.

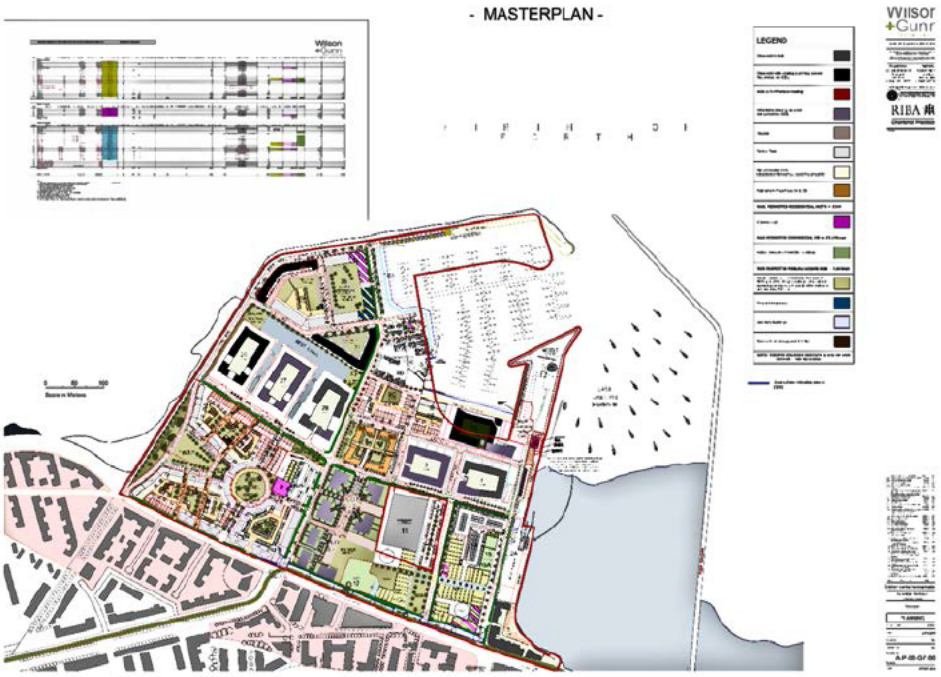

Figure 1.1 Overview of the layout master plan covering Granton Harbour and showing the western breakwater extension (yellow line).

1.2 Scope of work

DHI's approach to the wave disturbance modelling defines a suitable way of transforming a range of design wave conditions from the North Sea and the wider Firth of Forth to a point adjacent to Granton Harbour, and subsequently how these conditions then impact the proposed marina layout.

To achieve this over the distances required, a spectral wave model (MIKE 21 SW model) [2], which provides a description of the prevailing sea state rather than individual waves, is employed. From these boundary conditions, a surface resolving Boussinesq wave model (MIKE 21 BW model) [3] is utilised in order to understand the particular wave disturbance problems within Granton Harbour. More details on the scope of each stage is provided below.

1.2.1 Firth of Forth wave model (spectral wave model)

A local wave model with a higher spatial resolution has previously been setup [1] using regional hindcast wave conditions as boundary conditions for a transformation of waves to the project site. The local model has a resolution that is fine enough to resolve local bathymetrical features and therefore also many of the important wave processes for transformation to the site. The DHI MIKE 21 SW model simulates the wave propagation from deep water to near-shore areas, including the effects of:

- Shoaling
- Refraction
- Bottom dissipation
- Wave breaking

The key design wave conditions, including the 1 in 1, 10, 50, 100 and 200 year events, for locations adjacent to Granton Harbour were derived from the extremes assessment in [1].

1.2.2 Granton Harbour wave disturbance model (Boussinesq Wave Model)

The principal focus of this study is the development of a wave disturbance model. The penetration of waves into the marina requires the use of a high-resolution wave model that resolves the key wave conditions of interest including wave diffraction and reflection.

Worst case scenario, based on the spectral wave analysis results in [1], is a combination of NE wind direction with same wave direction. An additional combination of extreme wind and wave conditions was also examined for NW wind direction (direction aligned to eastern harbour) along with the NE wave direction (worst case scenario for this wind direction [1]).

As agreed in the scope, the following wave return periods will be used to assess the wave penetration into the marina basin.

- 1:1 year (annual average wave conditions)
- 1:50 year (extreme wave condition)

In addition, the following has been assessed for rock armour sizing calculations.

- 1:200 year (extreme wave condition)

Table 1.1 Boundary wave conditions (BW model) nearshore for 1:1, 1:50 and1 in 200 YRP (see also (DHI (UK), April 2016)) for NE wind direction (top) and NW wind direction (bottom).

Nearshore wave parameters at 9.4 m depth offshore of Granton Harbour for NE wind and wave directions	**1 in 1 year event**	**1 in 50 years event**	**1 in 200 years event**
Hm0 (significant wave height, *m*)	1.6	2.8	3.24
Tp (peak period, *s*)	5.34	6.9	7.23
Peak direction (coming from- *degrees from north*)	45	45	45
Spreading (Directional Standard Deviation, DSD, *in degrees*)	23	23	23

Nearshore wave parameters at 9.4 m depth offshore of Granton Harbour for NW wind and NE wave directions	**1 in 1 year event**	**1 in 50 years event**	**1 in 200 years event**
Hm0 (significant wave height, *m*)	0.71	1.01	1.22
Tp (peak period, *s*)	9.82	9.82	3.6
Peak direction (coming from - *degrees from north*)	45	45	45
Spreading (Directional Standard Deviation, DSD, *in degrees*)	23	23	23

The 1 in 1 and 1 in 50yr events include both the criteria as suggested in the Guidelines and Codes of practice on which to base “good wave climate in small craft harbours”. The 1 in 200yr event is the typical standard of protection considered in coast protection/breakwater design. It should be noted that the 1 in 200yr condition has not been assessed for wave disturbance modelling.

The water levels used to analyse the wave disturbance within the marina are based on a Mean High Water Spring (MHWS) level for each of the storm return periods and layouts. This is considered suitable as the prevailing worst case NE wave and NW wind conditions being tested are considered unlikely to be specifically coincident with the passage of low pressures.

The primary purpose of this study is to ascertain the wave conditions in the harbour for the safety and comfort in the berthing areas. Generally accepted wave heights within marinas that are allowable for comfort of the users and to limit damage to vessels, pontoons and other ancillary equipment are described in the following documents:

- Australian Standard, AS3962 - 2001 and amendment No1 2010
- The Yacht Harbour Association Ltd – A Code of Practice for the design, construction and operation of coastal and inland marinas and yacht harbours, British Marine Federation – 2007
- PIANC Report No 134 – 2013, design and operational guidelines for super yacht facilities.

The general principles taken from these documents are that good to moderate climate waves should be limited to the following:

- 1yr storm event wave height <0.3m to 0.4m
- 50yr storm event wave height <0.4m to 0.5m

These conditions will be specifically tested and reported on in this study.

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2 Previous works on wave transformation and Present Conditions

The previous study on wave conditions [1] forms the basis for deriving the boundary conditions of the works undertaken herein.

In [1], suitable data including bathymetry and offshore wave conditions to allow transformation of the wave conditions to the site were collected. The work also used hindcast wind conditions from NCEP along with a detailed assessment of the offshore extreme values. Of importance for the current study is the statistical analysis of extreme events, where it is important to consider the driving forces and the expected distribution of the investigated variables.

The site is subject to relatively persistent North-easterly and Easterly winds during summer months and Westerly winds during the winter months. Exposure to longer period waves from offshore in the North Sea is also possible. Design statistics have been estimated by analysis of extreme events.

Simplified joint probability conditions have been assessed to understand the sensitivity of the site for overtopping to cause additional problems with respect to combined wave and water level conditions. Following the initial proposal, all design scenarios in the present study are to be examined for a fixed water level of 5.6m CD, corresponding to MHWS for Port of Leith.

Considering timescales of wave climate variability with respect to climate change affected receptors, present conditions are assumed as in [1]. See section 5.3 in [1] referring to annual average wave climate conditions (1 in 1yr event).

The previous works also highlighted that directionally the extreme wave conditions for the western harbour are for waves from North-North East, which have been tested herein.

3 Nearshore Design Wave Condition

The nearshore wave modelling has been based on MIKE 21 SW [2] using the previously developed [1] high resolution local model to transform offshore wave conditions of the entrance to the Firth of Forth to a location immediately offshore of Granton Harbour.

For this present study, the spectral wave model is being used to test the sensitivity of Granton Harbour to a range of lengths and alignments of the initially proposed breakwater. This approach allows rapid testing of a range of layouts to assess their overall benefit in providing protection to the site.

It should be noted that the spectral wave model applied here considers refraction and shoaling, however does not accurately consider the diffraction through the breakwater piers. This is considered adequate for deriving and examining the wave transformation and wave energy blocking, respectively, for the range of designs under consideration.

Wave transformation characteristics from the spectral wave model are then used in the Boussinesq model, analyzing wave disturbance conditions for the proposed western marina breakwater (see Figure 1.1).

Hindcast wave modelling covering 35 years are available from the regional DHI wave model for the North Sea, but for assessment of nearshore wave conditions at Granton Harbour, a model with higher spatial resolution is required to resolve the penetration of waves towards the project site.

The local wave model with higher spatial resolution has been setup with boundary conditions prescribed by the North Sea wave model and discussed in Sections 4 and 5 in the previous reporting [1] to describe the transformation of waves towards the site. The local model that encompasses the Firth of Forth is shown in Figure 3.1. Progressively increasing spatial resolution towards the harbour and a high-resolution boundary and depth adaptive mesh allows an adequate description of the shallow water environment. For further details see [1].

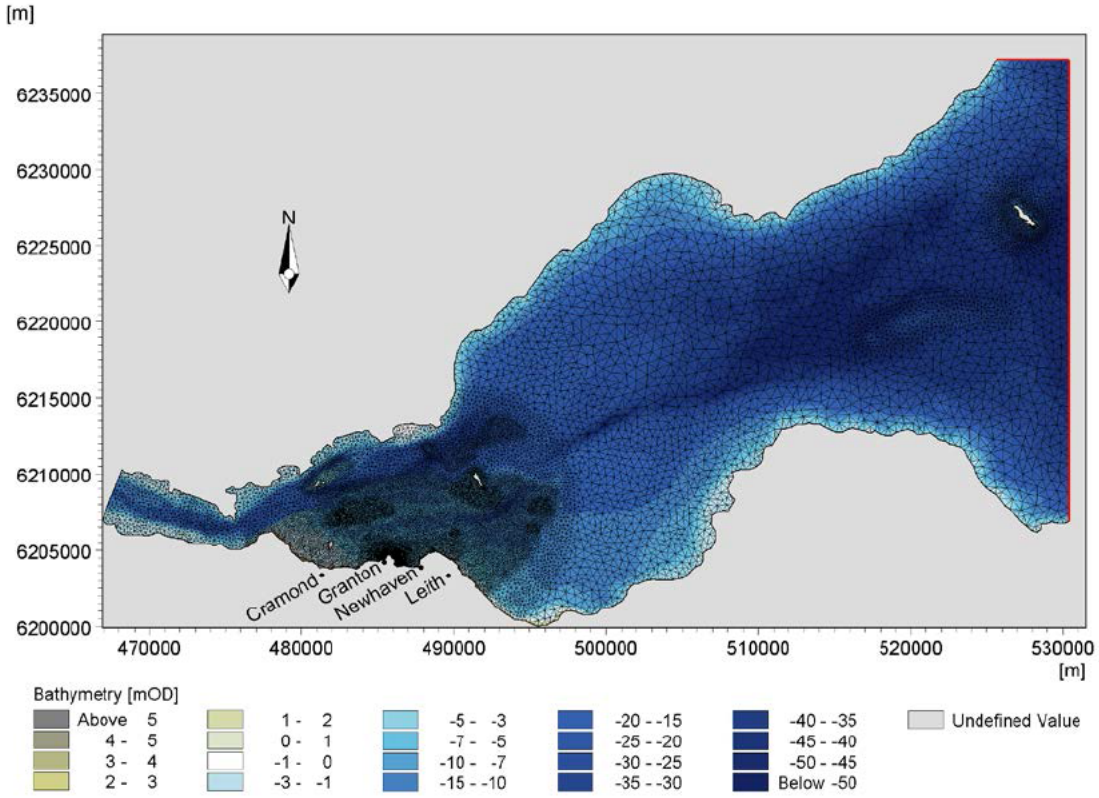


Figure 3.1 Bathymetry of local model. Red line indicates the open boundaries.

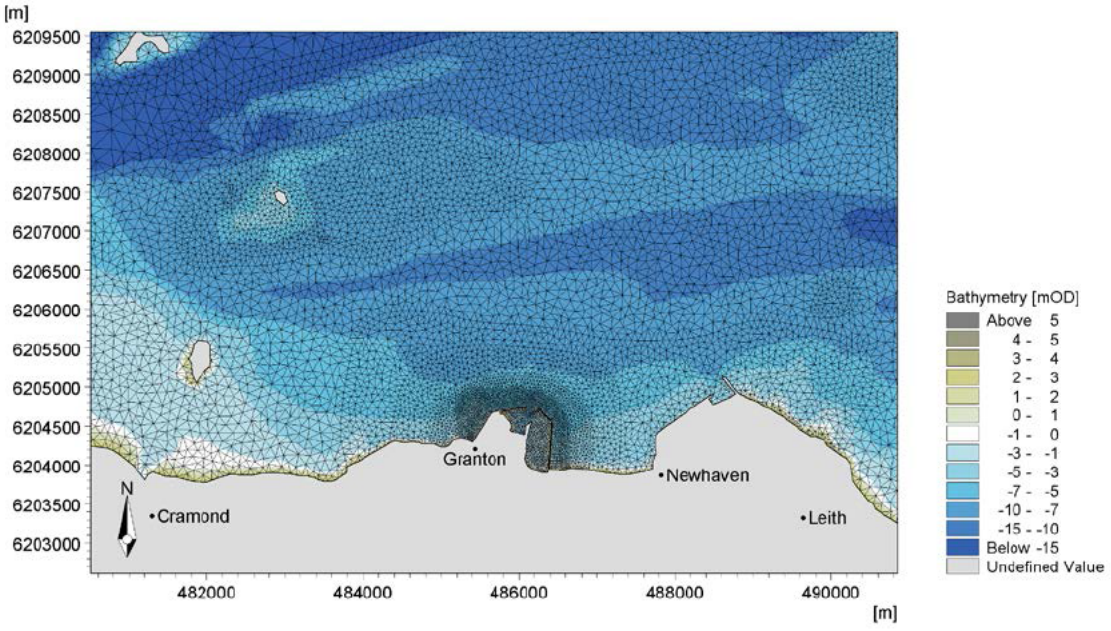


Figure 3.2 Local bathymetry zoomed to the project site.

3.1 Wave transformation

The design wave conditions have been estimated by transformation of offshore wave conditions to Granton harbour. Wave transformation has been performed for NE (coming from) offshore design wave conditions (see also Section 5.2 and Section 6 in [1]).

These specific combinations of wind and wave conditions have been suggested to constitute the most severe conditions for the western marina [1]. A NE swell is still considered most severe swell for the harbour in general [1]. The design wave conditions have been applied along the model open boundaries, design wind conditions and design water level conditions are applied over the entire model domain.

Offshore design conditions have been transformed for the combinations of wind and wave conditions and water level of 5.6 mCD for return periods of 1, 10, 50, 100 and 200 years.

The following respective Cases as in [1] have been re-examined for each of the proposed breakwater designs being tested here:

- Case 02 provides the 200 year water level with 200 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 10 provides the 100 year water level with 100 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 16 provides the 50 year water level with 50 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 23 provides the 10 year water level with 10 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 30 provides the 1 year water level with 1 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 36 (Appendix B) provides the 200 year water level with 200 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 38 (Appendix B) provides the 50 year water level with 50 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].
- Case 40 (Appendix B) provides the 1 year water level with 1 year wind and wave conditions for a range of directions based on the likely associated conditions determined in section 5.3 of [1].

The following assumptions have been made for this stage of the modelling study:

- No other direction, as for example westerly winds - fetch limited wave conditions have been assessed since the west harbour is mainly exposed to east to northeast conditions. Exception to this, is the examination of North Westerly winds and how wave generated conditions inside the harbour are affected with the proposed breakwater designs.
- No consideration of joint probability sensitivity was undertaken.
- No time varying water level was considered during the events in any of these assessments.

The approach considered, results in a simplified assessment of the wave heights at the harbour (see Table 1.1 for transformed nearshore wave conditions examined).

3.2 Example of nearshore design wave conditions

The 200yr wave transformation to the nearshore wave condition for Case 02 is presented in Figure 3.3. Plots of other cases can be found in Appendix A in the wave transformation study [1].

This condition has been used to test the overall suitability of a series of breakwater designs, with the assumption that the extreme nature of this event and in particular the amount of energy held within, would be a worst case scenario. In addition an assessment of the final option for the NW wave condition has been undertaken.

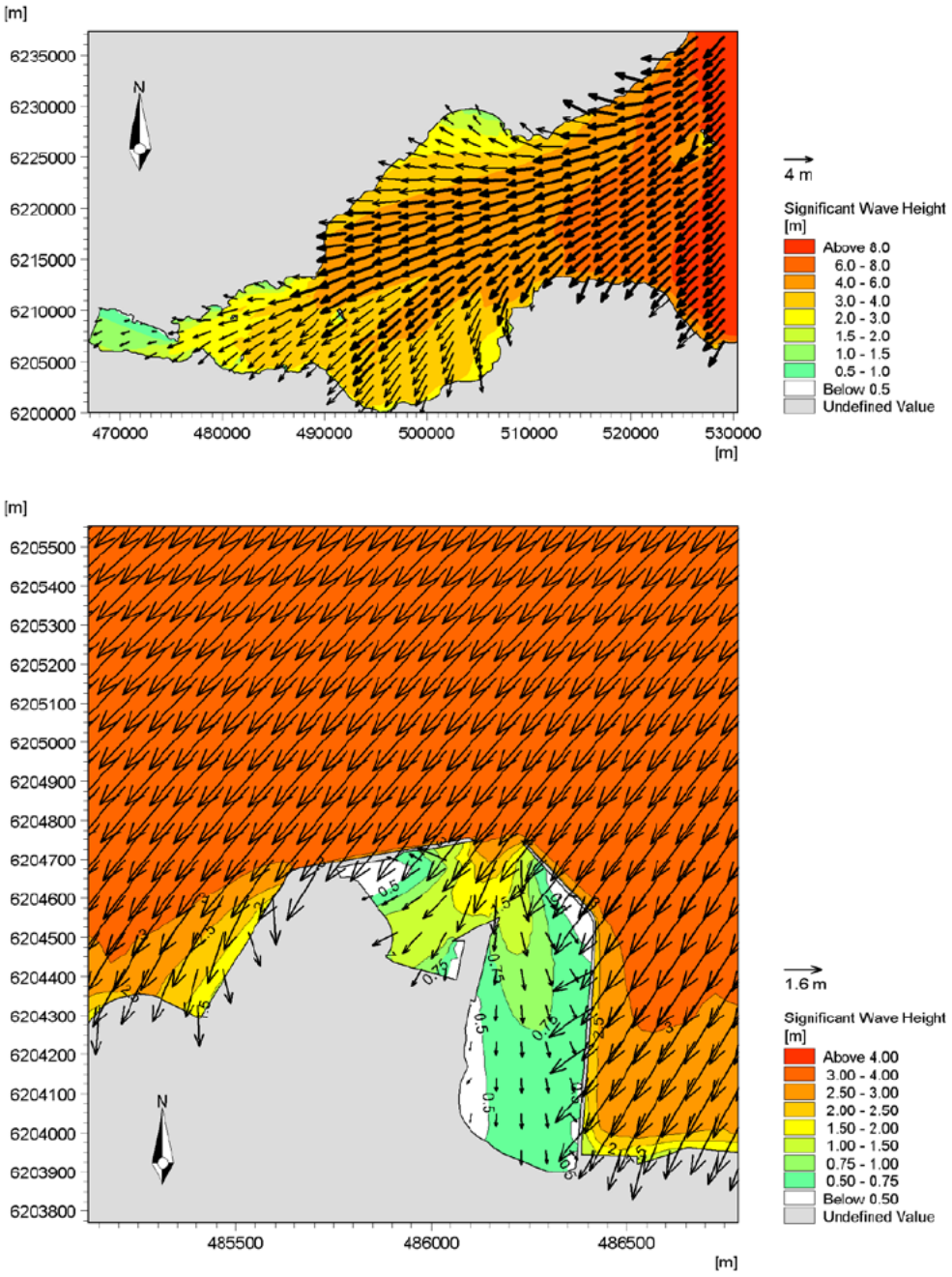


Figure 3.3 Overview (top) of 200 YRP wave transformation and the nearshore design wave conditions (bottom) with offshore mean wave direction of 45°N and wind directions of 45°N, and water level +3.97m – case 02. See also [1] for further details.

3.3 Screening of breakwater layouts

A proposed design for the breakwater to improve conditions in the western harbour can be seen in Figure 1.1. The proposed GCDL masterplan has a breakwater with a length of 55m, with an additional 20m diameter rock armour roundhead and an orientation almost parallel to the eastern breakwater. Its outer wall is proposed to be of rock armour with a 1:2 slope, backed by a concrete caisson structure. This is as outlined in the Fairhurst feasibility Study [4].

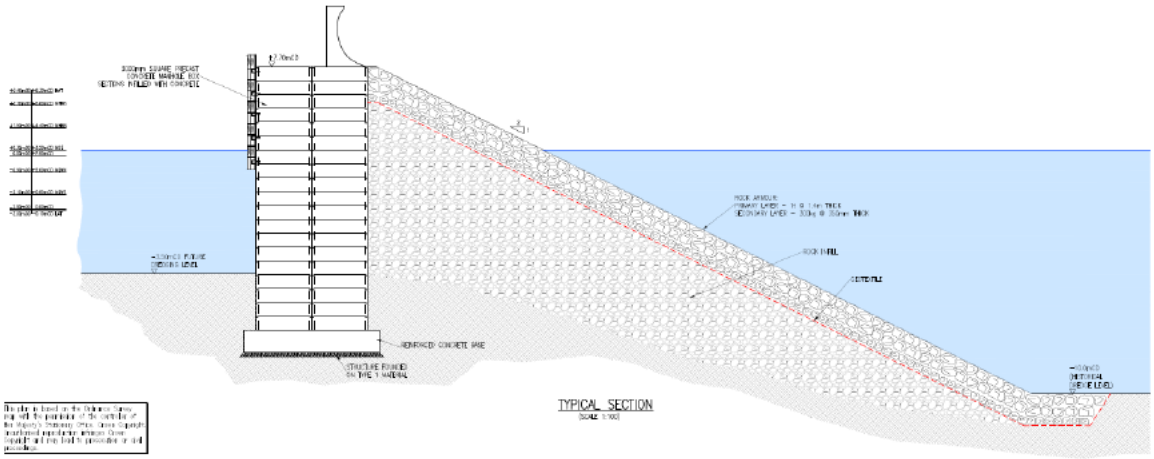


Figure 3.4 Example of proposed breakwater cross section (from [4])

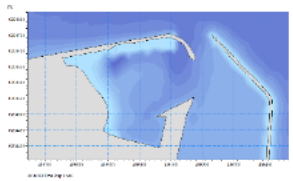
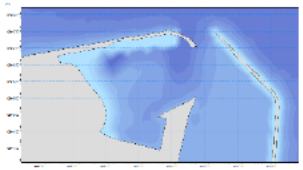
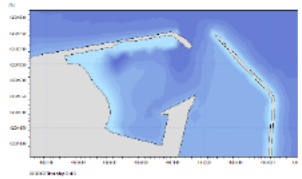
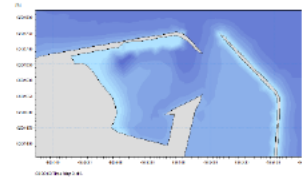
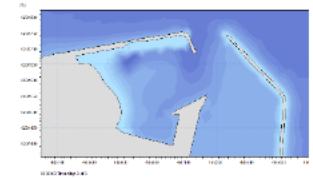
While the main scope of the breakwater extension is the protection of the proposed development on its lee side, conforming with the AS3692-2001 [5] marina guidelines wave height limits for 1 in 1yr and 1 in 50 yr events, it is important to maintain that this installation will not deteriorate wave disturbance conditions in the east harbour.

The spectral wave model simulations presented hereafter demonstrate the effectiveness of a breakwater design in terms of wave penetration into[1] the harbour. A number of alternative designs were examined in order to demonstrate alternative solutions.

The alternative breakwater examined designs and their main characteristics can be seen in Table 3.1.

[1] The MIKE 21 SW model is applied for indicative representations of the wave conditions in the harbour only. For detailed modelling of the conditions in the harbour the MIKE 21 BW model is applied as it accurately includes especially wave diffraction and wave reflection.

Table 3.1 Breakwater designs examined in SW model wave energy blocking – Note Design_03 and Design_04 was the option selected for testing in Section 4 of this report

Design	**Design_01**	**Design_02**	**Design_03 (equivalent to master plan design)**	**Design_04**	**Design_05**
Effective length (in m)	90	60	55-60	85	55
Orientation with respect to eastern breakwater	Closing out towards the end	Parallel	Parallel	Parallel	Closing out
Shape	curved	curved	straight	straight	straight
Image					
			Option 01 in BW tests	Option 02 in BW tests	

The 200 year wave energy transformation and blocking for each of the 5 examined breakwater designs for Case 02 is presented in 3.3.1. Plots of wave conditions for the 100, 50, 10 and YRP can be found in Appendix A.

3.3.1 200 YRP – Designs 01 to 05

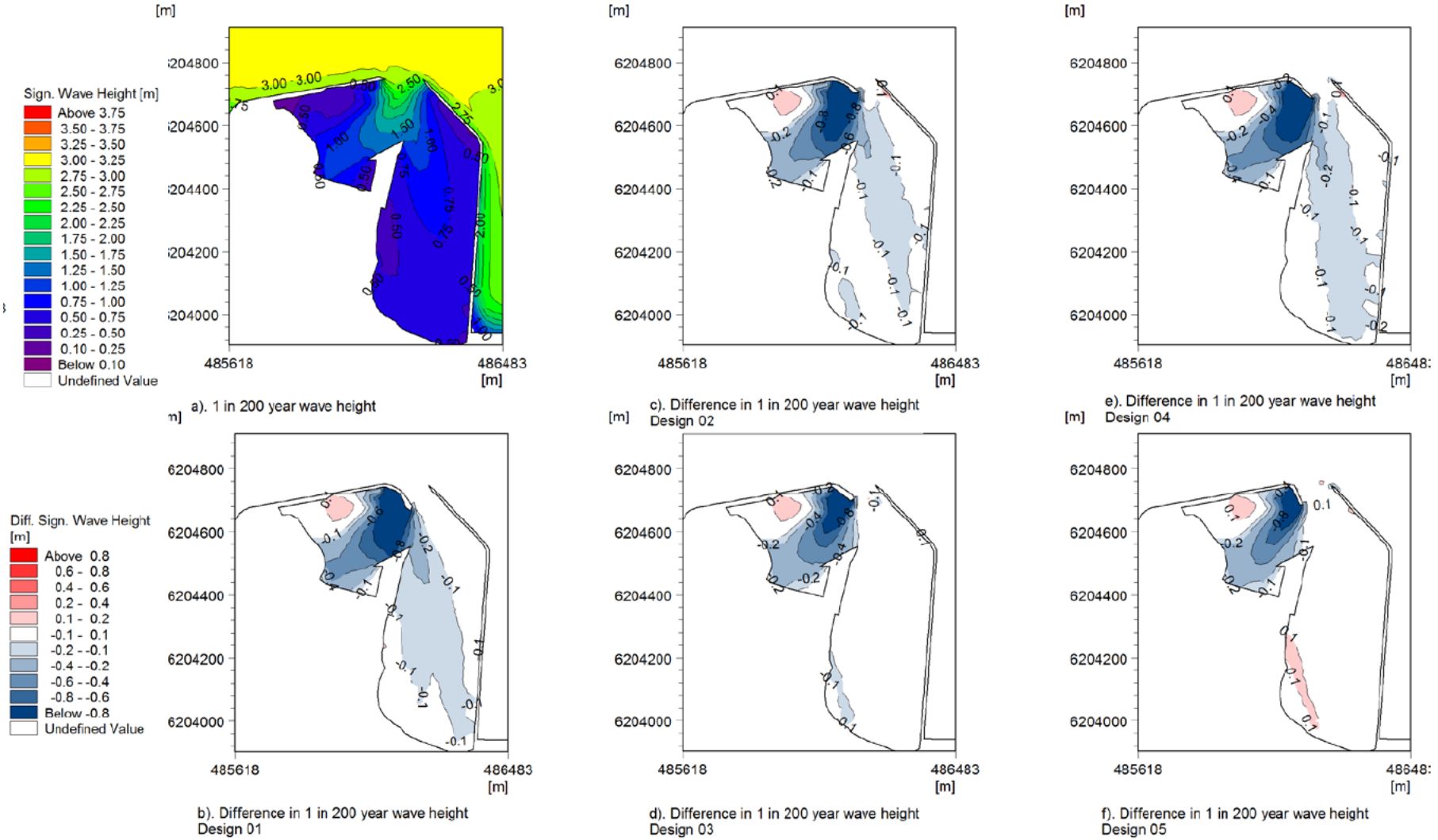


Figure 3.5 Wave transformation for 1 in 200YRP event and MHWS water level at nearshore conditions during: current state a) and differences of Hm0 vs current state for b) design_01, c) design_02 d) design_03, e) design_04 and f) design_05. Negative numbers indicate a reduction in significant wave height compared to current state of GH. Positive values are within acceptable error and due to wind stress effects with and without the presence of the structure.

None of the examined designs has a significant negative impact on the east harbour. In fact, designs 01, 02 and 04 improve conditions, in terms of reduction of wave energy, inside both of the two harbours.

Of these 5 designs, the GCDL proposed masterplan layout (considered representative to design_03 in overall length and direction) indicate a reduction of more than 0.5 m of significant wave height on their lee sides.

The spectral wave model results suggest, as expected, that all of the test options result in a reduction of NE generated wave energy entering the west marina. In general, the longer the effective length[2] of the breakwater is, the better it is in providing coverage to the west harbour. Consequently, design 01 and 04, both between 85-90m with an alignment parallel to the eastern breakwater, are optimal wave energy blocking solutions, however have cost and design constraints on the longer breakwater.

Similarly, the spectral wave model results suggest also that there is a small reduction of NW generated wave energy entering the east marina (see Appendix B) for all RYP examined. Even though, the proposed breakwater provides minimal sheltering to the east marina for NW inflicted wave conditions it attenuates incoming wave energy.

As the spectral wave model does not account for all wave processes, the proposed suitable design option, Design_03 which is equivalent to the proposed masterplan layout will be tested further in the wave disturbance modelling in Section 4.

3.4 Design wave conditions in the harbour - 1 in 200 year wave SW model outputs

A significant wave height of 3.2m with a peak period Tp of 7.2s and NE direction (see Figure 3.3) is representative of wave conditions of a 200YRP event (see also [1] for sensitivity tests on extreme water levels and wind-wave directions) to be considered in terms of rock armour sizing at the proposed breakwater. Waves up to 20% higher than incident wave height (Hm0) close to the location of the toe of the breakwater due to reflections are expected based on results from the BW runs. This should be taken into consideration since manoeuvrability at the entrance of the harbour will be affected.

[2] The effective length of breakwater is defined as the shadowing length of the breakwater to the respective direction of incident wave energy.

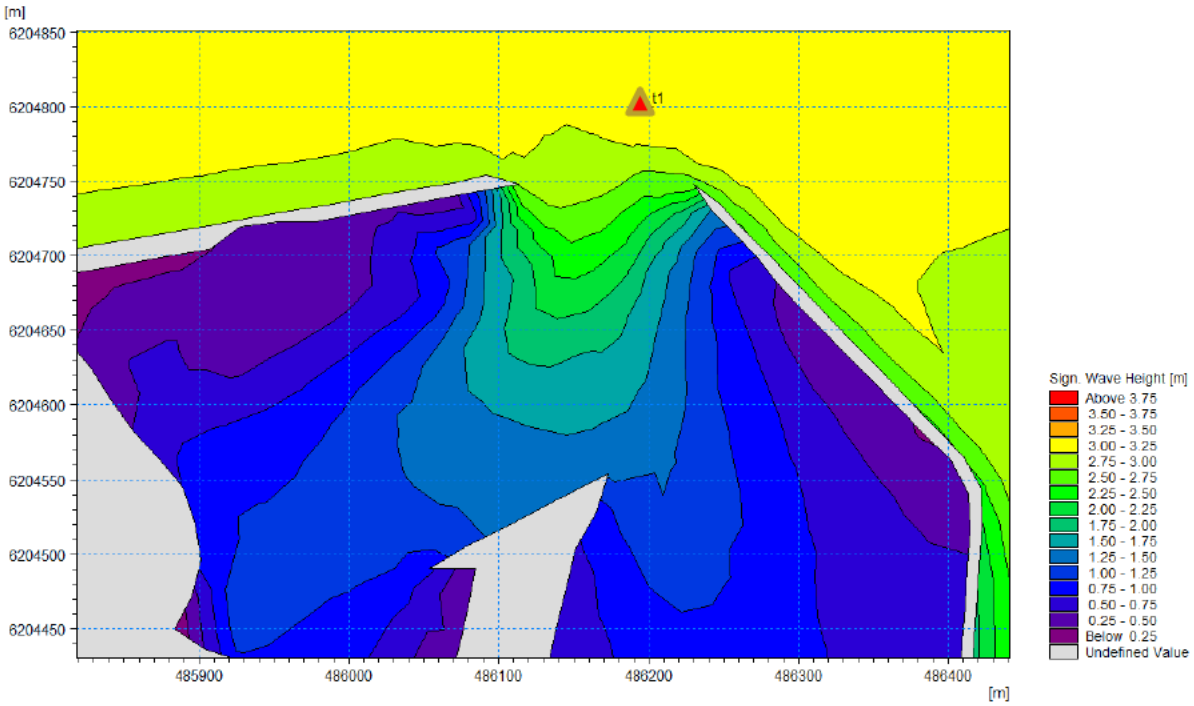


Figure 3.6 Wave conditions for the 200YRP SW model run. Hm0 = 3.2 m and Tp =7.2 s extracted at point t1 (486200, 6204800 UTM30) are representative of wave conditions of a 200YRP event when considering rock sizing armour. Note the rapid reduction in wave height in the entrance to the harbour.

4 Wave disturbance modelling

4.1 Description of wave disturbance model

The Boussinesq Wave model, MIKE 21 BW, is a state-of-the-art numerical model for calculation and analysis of short- and long-period wave disturbance in ports and harbours. MIKE 21 BW can also be used for modelling of surf zone dynamics and swash zone oscillations.

The present model is based on the numerical solution of the enhanced Boussinesq equations formulated by Madsen and Sørensen (1992).

The 2DH Boussinesq Wave module used here can reproduce the combined effects of most wave phenomena of interest in port, harbour and coastal engineering. These include shoaling, refraction, diffraction, partial reflection and transmission, non-linear wave-wave interaction, frequency spreading and directional spreading (see Figure 4.1).

Phenomena, such as wave grouping, generation of bound sub-harmonics and super-harmonics and near-resonant triad interactions, can also be modelled using MIKE 21 BW.

The flexibility of parameterizations of structures reflective characteristics allows adequate representation of different wall types that ultimately affect wave disturbance. No consideration is made however of the effect of waves overtopping and being further transmitted in the harbour.

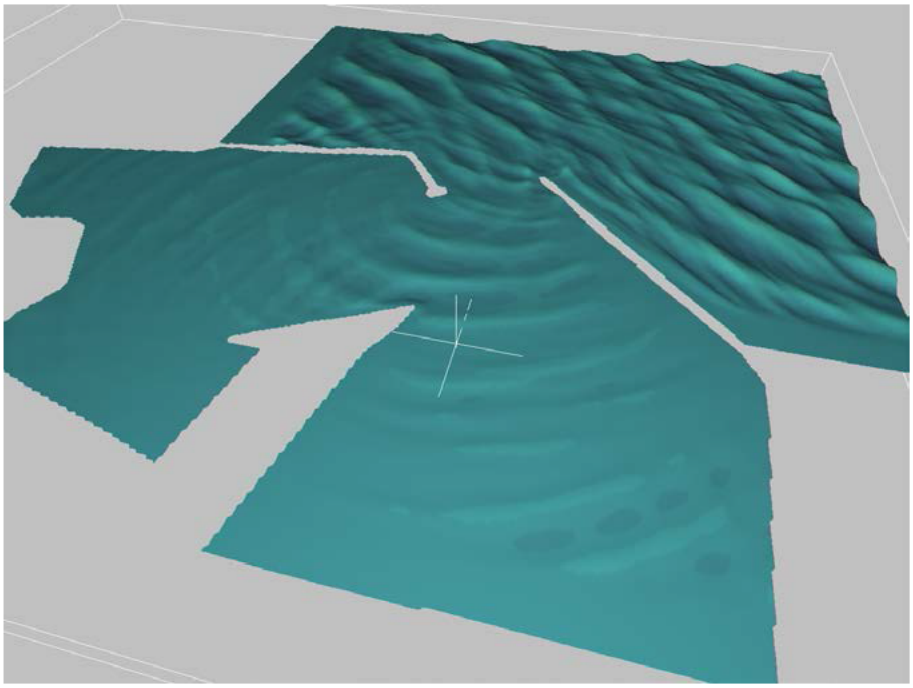


Figure 4.1 Example of a BW model run result for in harbour wave simulations.

4.2 Wave disturbance assessment options

Based on the masterplan layout provided by GCDL and the results of the spectral wave tests described in Section 3, a BW model of Granton harbour was developed to test the selected design Design_03 and hereinafter called **Option 01**. **Option 01** is based on the GCDL masterplan and consists of a ~55m long breakwater with 20m roundhead. Following discussions between GCDL and C&N, an alternative option (**Option 02**) with a 65m long breakwater with a 20m roundhead was also proposed to be tested, see Figure 4.2. Only Option 01 was tested for NW wind conditions. This is the worst-case scenario for examining wave disturbance in the east section of the harbour as a shorter breakwater will attenuate a lower amount of incoming wave energy.

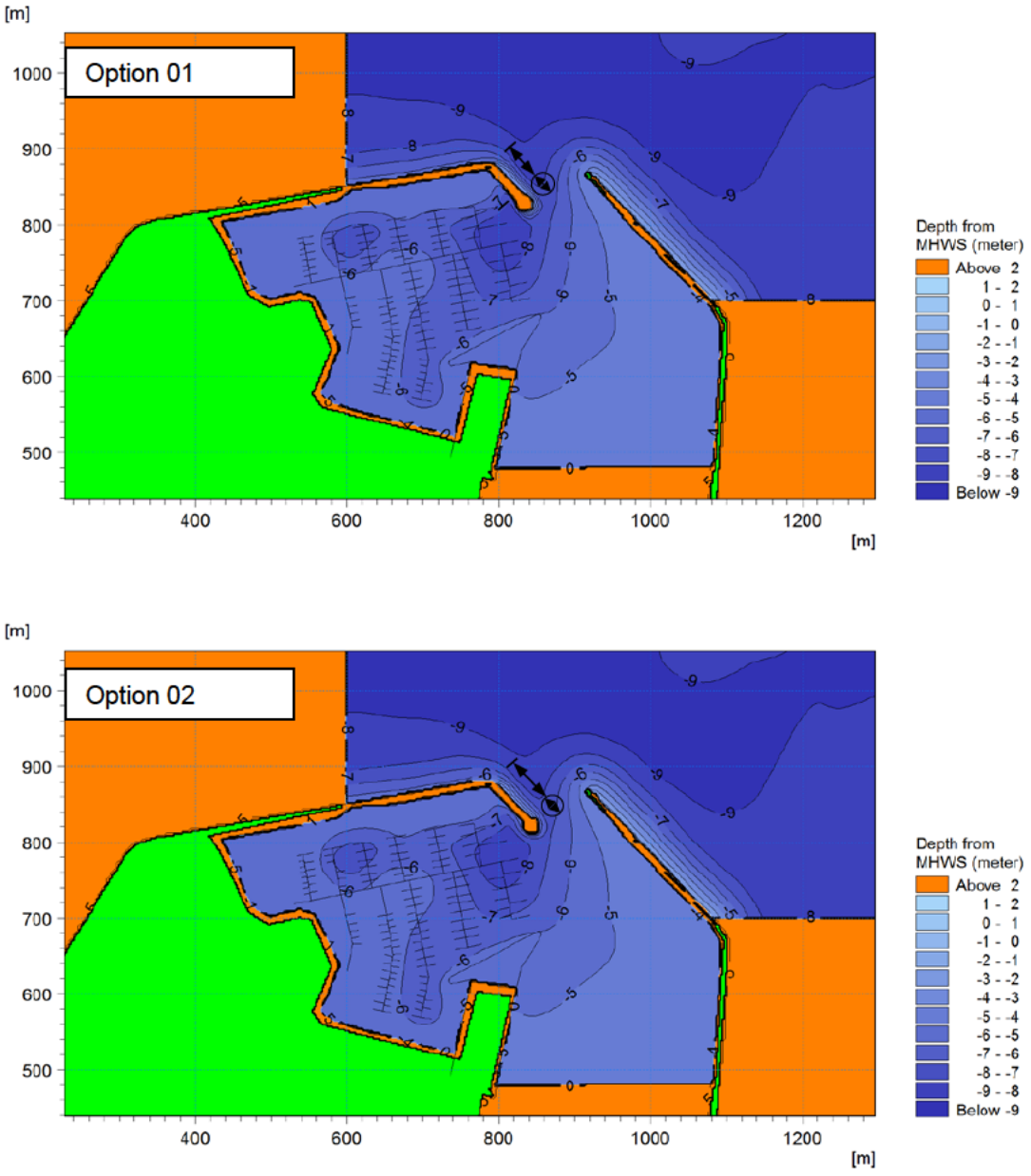


Figure 4.2 Bathymetry used for the MHWS scenario. Orange denotes either artificial land or porosity/sponge layers used to represent edge treatments. (Upper panel) Option 01 layout (as in proposed GCDL masterplan – similar to design 03 in SW model assessment a 55m breakwater with a 20m diameter roundhead and (lower panel) Option 02 – similar to design 04 in SW model assessment) a 65m breakwater with a 20m diameter roundhead. Slope of breakwater wall for the respective examined designs remains the same.

The BW model used for the assessment of wave disturbance conditions has been run under two boundary forcing conditions, representative of 1:1 and 1:50 RYP events. These conform to the AS3692-2001 marina guideline with the forcing limits regarding 'good wave climates in small craft harbours'.

The wave climates simulated represent the annual average wave conditions as a 1 in 1yr event and extreme wave conditions of a 1 in 50yr return period. Both RYP for both wave conditions, see Table 1.1, are output from the SW wave transformation runs, discussed previously and presented in detail in [1], for a nearshore point at a depth of 9.4m.

Treatment of harbour's physical boundaries

Red - vertical walls
Blue - 'pitched' stone 1:2
Green - piled pier fully permeable with vertical wall at the backend
Brown - rocky beach

Note: The rocky beach is treated as a rock armour revetment of 1:2 slope
The proposed breakwater (not shown here) is treated as a rock armour wall of 1:2 slope with a vertical wall on the back

Figure 4.3 Treatment of Granton Harbour's physical boundaries in the BW model porosity parameterization. Reflection parameters are computed based on design characteristics of respective reflection elements (width, diameter of stones, permeability etc.) in relation to wave parameters in front of the porous structure (wave height, period and water depth).

A JONSWAP spectrum of random directional incident waves was reconstructed from the SW model output in order to represent boundary wave conditions.

In order to assess wave disturbance differences between the current state and the proposed installation two BW models were set-up respectively, the harbour layout as it currently is and an updated with the respective proposed design layout.

Following further information being provided by the client, the Middle Pier has been represented as a piled structure with limited reflection as the condition survey suggested under the pier to be very open. As such, the pier itself is not shown on the BW model outputs. This assumption has been assessed based on a site visit to the area in June 2017.

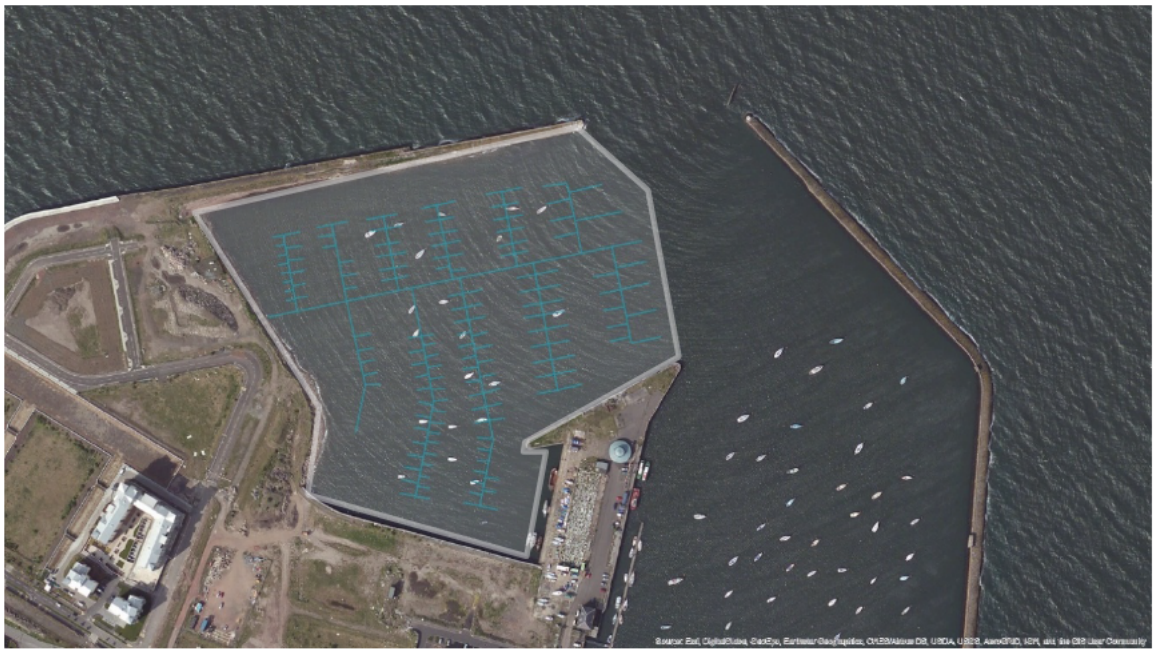


Figure 4.4 Existing wave conditions for a small wave height (estimated to be <0.5m Hm0) showing the lack of reflection from the Middle Pier. The area of interest for the proposed marina development is outlined by the grey polygon.

Results of the wave disturbance modelling are discussed hereafter.

4.3 Results of Wave disturbance analysis for Option 01 for NE wind and wave conditions

Wave disturbance analysis was conducted based on the general procedures in Australian Standard, AS3962 - 2001 (AS3692-2001) and amendment No1 2010 referring to wave heights at berthing areas.

The general principles for this assessment is that good to moderate climate waves should be limited to the following:

- 1 year storm event wave height <0.3m to 0.4m
- 50 year storm event wave height <0.4m to 0.5m

The wave disturbance statistics based on the GCDL breakwater extension as is in the provided masterplan results in:

- In 35% of the area[3] inside the interests of the proposed development in the west harbour (see Figure 4.4, grey area) Hm0 is above the 0.4 m limit for the 50YRP (bottom right panel, Figure 4.5). In approximately 56% of the **exceedance** area Hm0 is within the range of 0.4-0.6 m.

[3] The area of interest covers the entire west harbour according to the provided master plan with the outer limit defined by a straight line running for the ending tip of the proposed breakwater to the east corner of the vertical wall behind the piled section of the middle pier.

- In 19.6% of the area inside the interests of the proposed development in the west harbour Hm0 is above the 0.5 m limit for the 50YRP (bottom left panel, Figure 4.5). In 42% of the **exceedance** area Hm0 is within the range of 0.5-0.75m.
- In 19% of the area inside the interests of the proposed development in the west harbour Hm0 is above the 0.3 m limit for the 1YRP (bottom right panel, Figure 4.6). In 48% of the **exceedance** area Hm0 is within the range of 0.3-0.45m.
- In 13% of the area inside the interests of the proposed development in the west harbour Hm0 is above the 0.4 m limit for the 1YRP (bottom left panel, Figure 4.6). In 91% of the **exceedance** area Hm0 is within the range of 0.4-0.6m.

In terms of how the proposed breakwater extension affects wave conditions in the east harbour, both the 50 (top right panel, Figure 4.5) and 1 YRP (top right panel, Figure 4.6) wave disturbance simulations indicate a non-significant improvement (light red colours) of 0.01 - 0.1 m for the majority of the area.

A significant improvement of 0.1 - 0.5 m is seen for both the area in the lee side of the breakwater and in an approximate N-SSE direction in the vicinity of the middle pier and just opposite on the lee side of the eastern breakwater. The same distribution seems to follow the 1YRP result though the improvement is more spatially homogeneous and of a generally smaller magnitude.

For both the 50YRP and the 1YRP there is an area further inshore of the east harbour where an increase in Hm0 is recorded (white areas) but it is considered non-significant being in the range of 0.01 - 0.10 m.

As expected, the breakwater extension provides significant protection in the western harbour improving wave conditions by reducing Hm0 by more than 1 m compared to the current state. Conversely, the construction of the breakwater leads to an increase in wave heights in the approach channel with the presence of reflected waves in the immediate vicinity of the new breakwater.

Also of note in the results is the presence of standing waves in the southern part of the western harbour. Likely to be caused primarily by the presence of the vertical wall sheet pile wall. These are seen in both the 1YRP and 50YRP conditions.

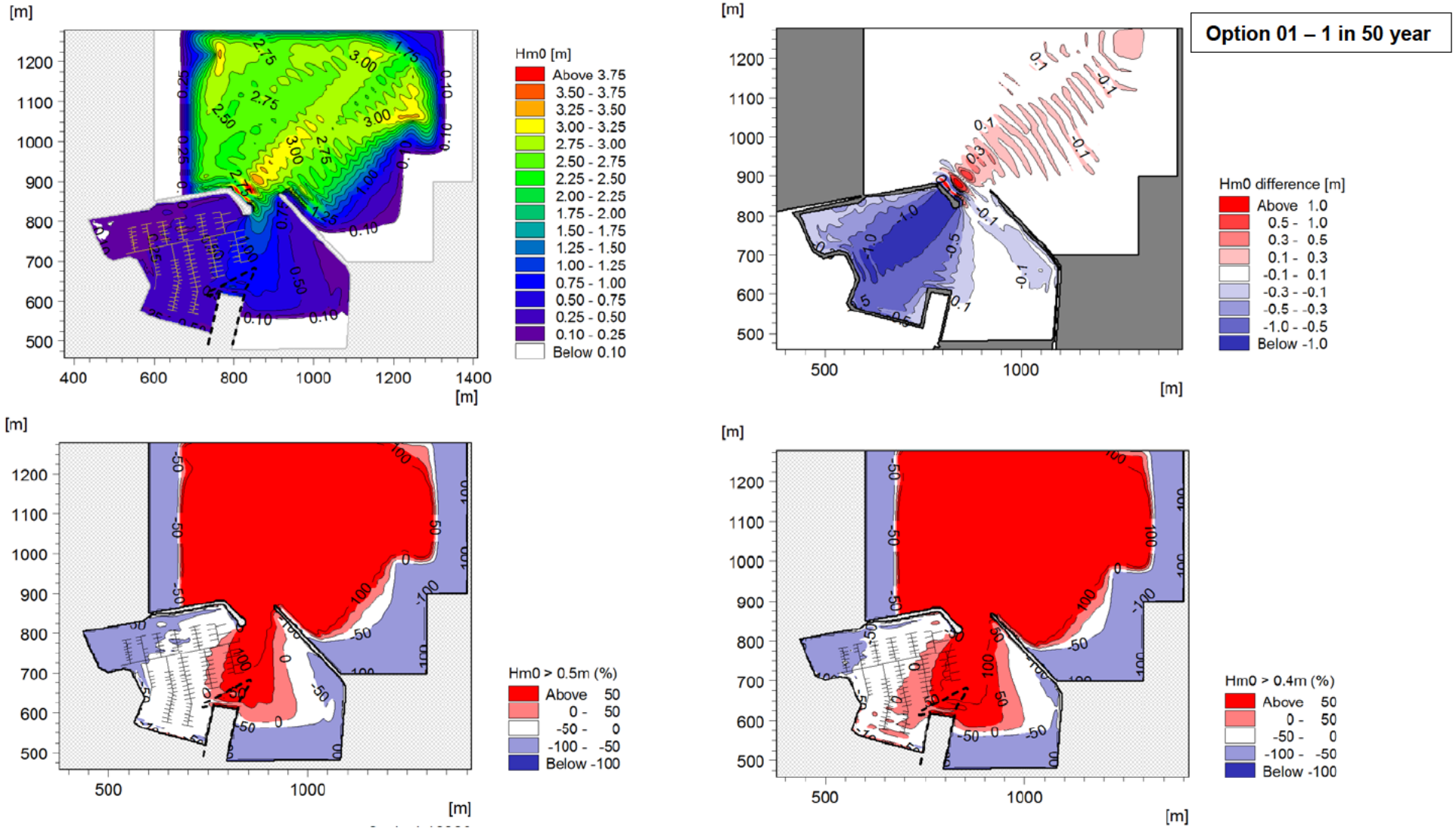


Figure 4.5 Wave disturbance plots Option 01 - (top left) Hm0 for 50yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (GCDL proposal) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.1m. (bottom left) ratio of Hm0 larger than the 0.5m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.

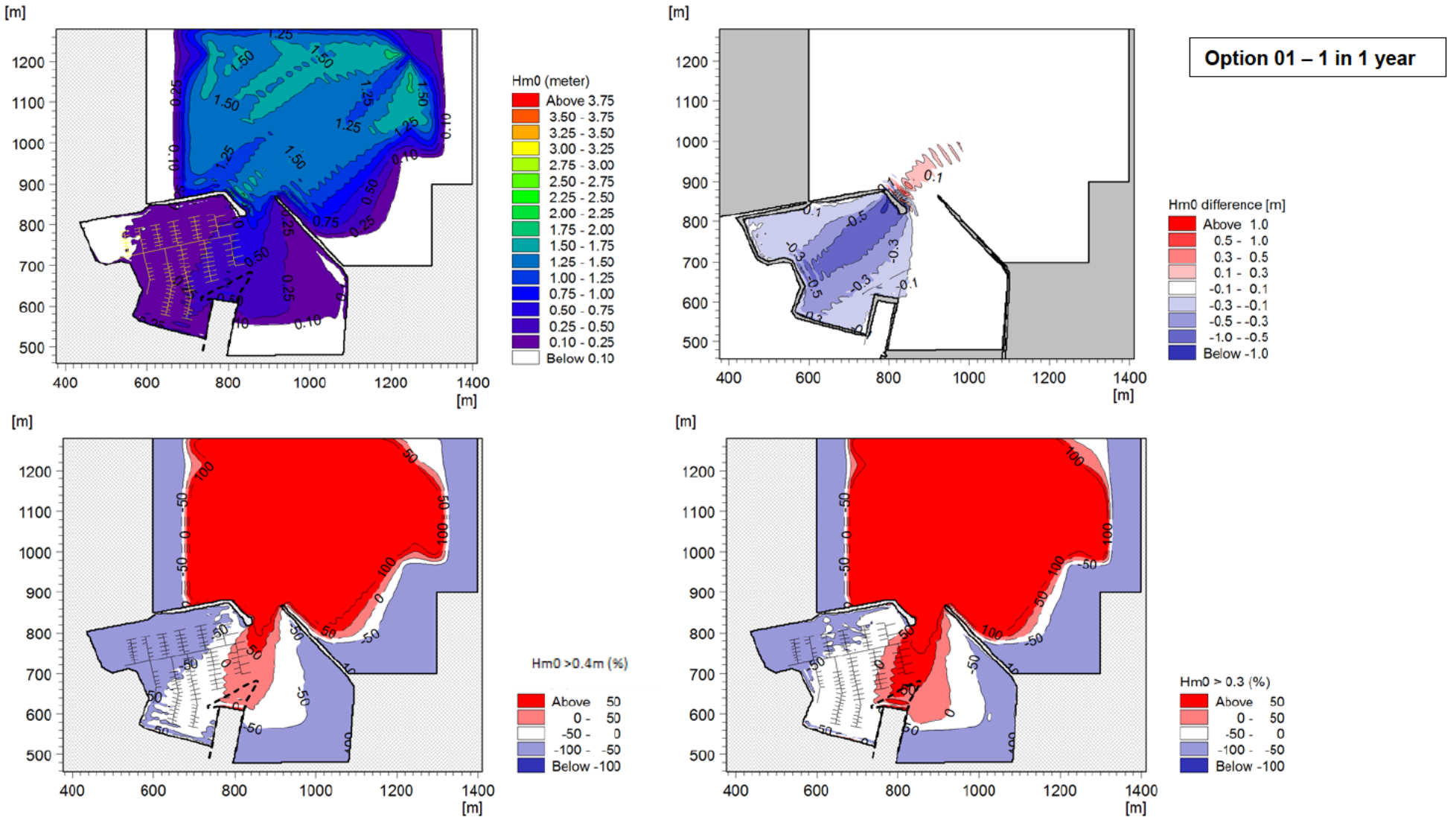


Figure 4.6 Wave disturbance plots Option 01 - (top left) Hm0 for 1yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (GCDL proposal) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.1m. (bottom left) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.3m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.

4.4 Results of Wave disturbance analysis for Option 02 for NE wind and wave conditions

As per the results in Section 4.3 the general principles for this assessment is that good to moderate climate waves should be limited to the following:

- 1 year storm event wave height <0.3m to 0.4m
- 50 year storm event wave height <0.4m to 0.5m

The wave disturbance statistics based on the optimised breakwater extension (Option 02 –similar to design_04, in Table 3.1) results in:

- In 18% of the area inside the interests of the proposed development in the west harbour (see Figure 4.7, grey area) Hm0 is above the 0.4 m limit for the 50YRP (bottom right panel, Figure 4.7). Approximately 48% of the **exceedance** area is within the range 0.4-0.6m.
- In 13% of the area inside the interests of the proposed development in the west harbour Hm0 is above the 0.5 m limit for the 50YRP (bottom left panel, Figure 4.7). 84% of the **exceedance** area is within the range 0.5-0.75m.
- In 13.7% of the area inside the interests of the proposed development in the west harbour Hm0 is above the 0.3 m limit for the 1YRP (bottom right panel, Figure 4.8). 83% of the **exceedance** area is within the range of 0.3-0.45m
- In 6% of the area inside the interests of the proposed development in the west harbour Hm0 is above the 0.4 m limit for the 1YRP (bottom left panel, Figure 4.8). 100% of the **exceedance** area is within the range of 0.4-0.6m.

In terms of how the alternative design (Option 02) affects wave conditions in the east harbour, both the 50 (top right panel, Figure 4.7) and 1 YRP (top right panel, Figure 4.8) wave disturbance simulations indicate a small improvement to no deterioration of wave conditions for all of the east harbour area.

A significant improvement of more than a 1m is seen for both the area in the lee side of the breakwater and in an approximate N-SSE direction and more than 0.5 m in the vicinity of the middle pier compared to the current state. The same distribution seems to follow the 1YRP result.

For both the 50YRP and the 1YRP there is an area further inshore of the east harbour where small variations in Hm0 in the range of -0.1 - 0.1 m (white areas) are identified; these are not significant being and are considered to be within the acceptable error margins.

As expected the breakwater extension by a further 10m compared to Option 01 provides significant protection in the western harbour, improving wave conditions by reducing Hm0 more than 1 m compared to the current state. These results are similar to Option 01 however it also shows a further reduction of ~0.2m in wave height over a greater extent. Conversely as noted also in Option 01, the construction of the breakwater leads to an increase in wave heights in the approach channel with the presence of reflected waves in the immediate vicinity of the new breakwater.

Also, of note in the results is the reduction of standing waves in the southern part of the western harbour compared to Option 01. The improvement can be seen in both the 1YRP and 50YRP conditions.

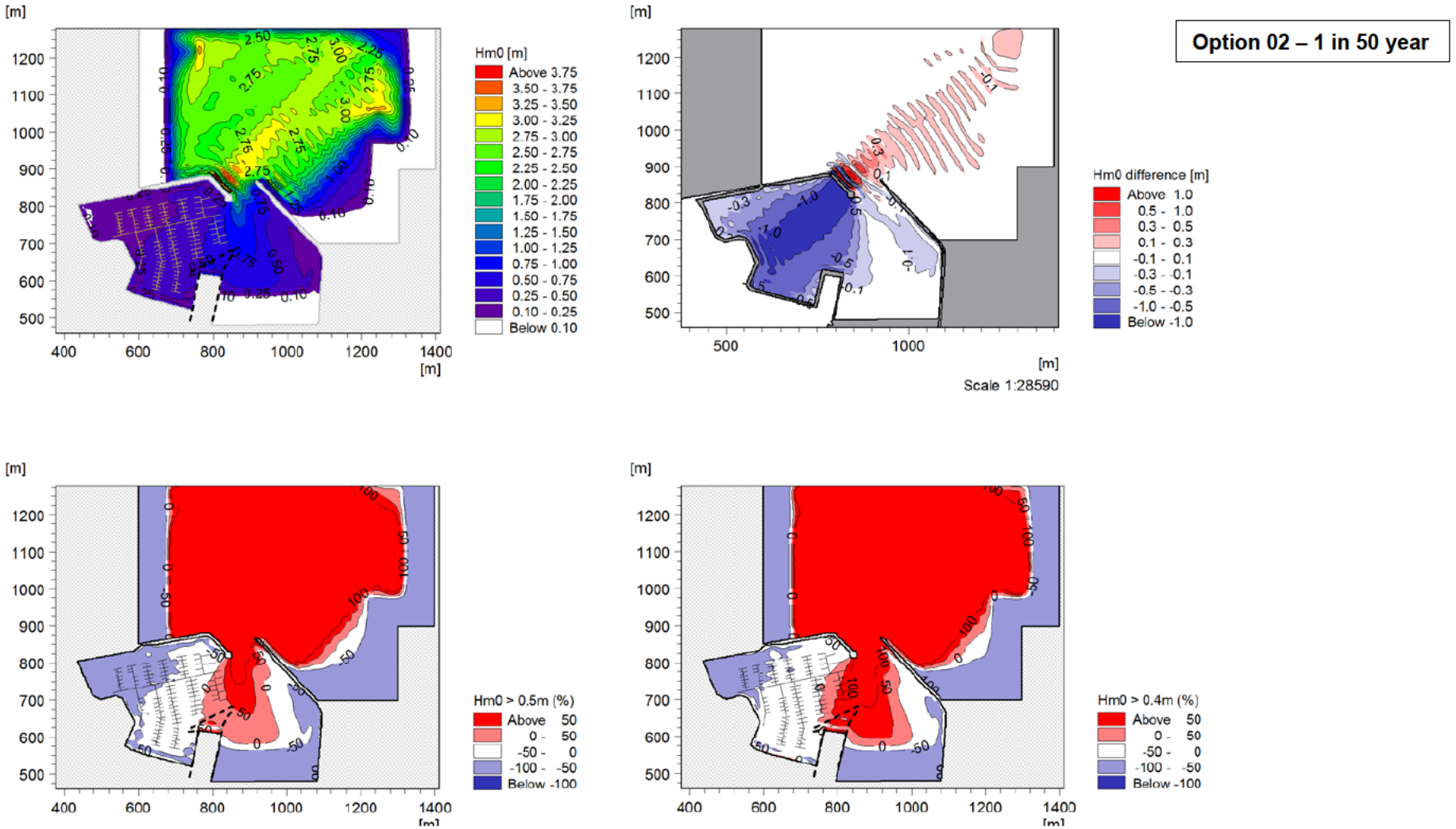


Figure 4.7 Wave disturbance plots Option 02 - (top left) Hm0 for 50yr return period wave conditions offshore.(top right) difference in Hm0 between breakwater extension (C&N accepted design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 10cm. (bottom left) ratio of Hm0 larger than the 0.5m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.

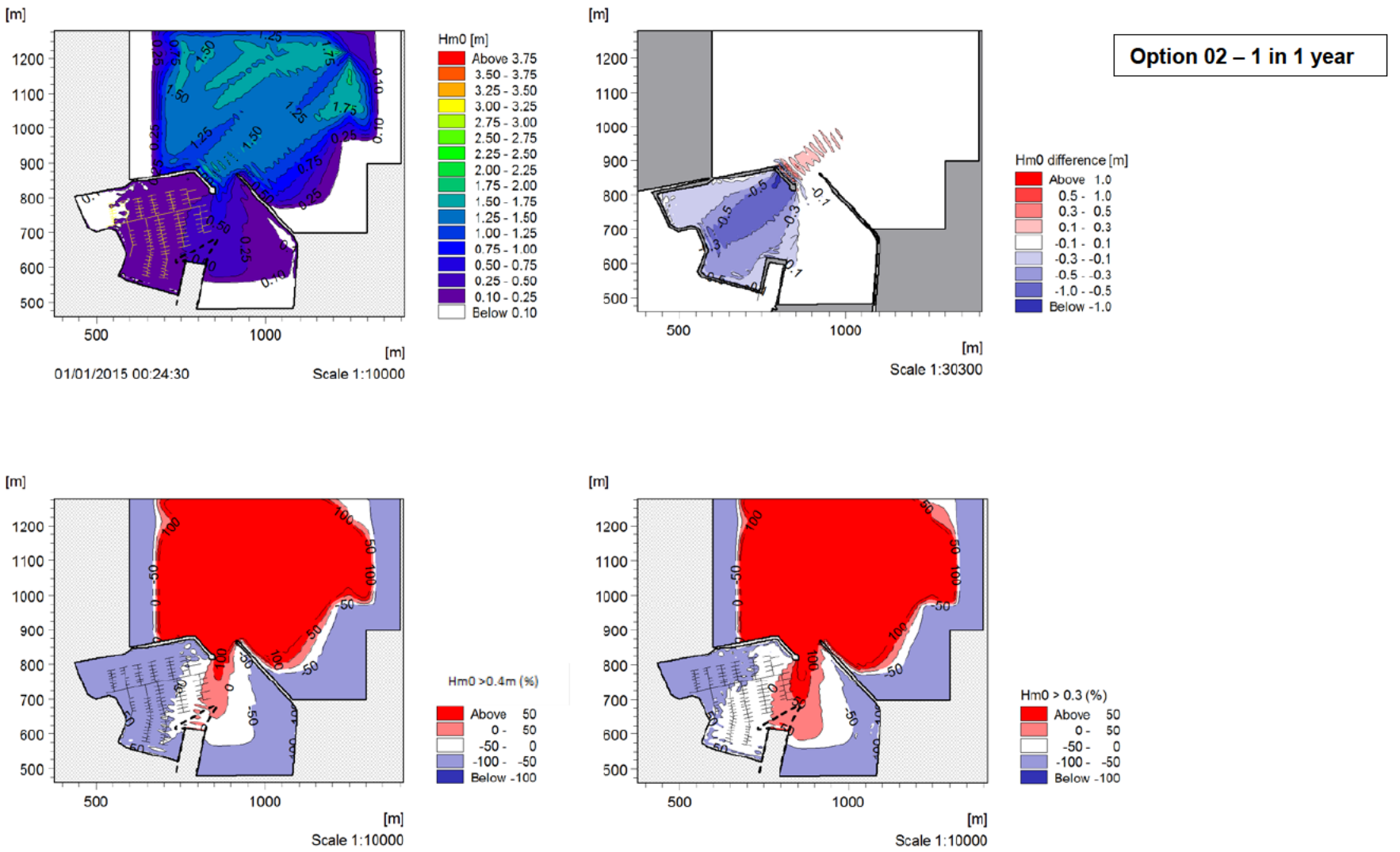


Figure 4.8 Wave disturbance plots Option 02 - (top left) Hm0 for 1yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (C&N accepted design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.1m. (bottom left) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.3m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.

4.5 Results of Wave disturbance analysis for Option 01 for NW wind and NW wave conditions

As per the results in Section 4.3 and Section 4.4 the general principles for this assessment is that good to moderate climate waves should be limited to the following:

- 1 year storm event wave height <0.3m to 0.4m
- 50 year storm event wave height <0.4m to 0.5m

The wave disturbance statistics based on the breakwater extension (Option 01) results in:

- In 100% of the area inside the interests of the proposed development in the west harbour (see Figure 4.4, grey area) Hm0 is below the 0.4 m limit for the 50YRP (bottom right panel, Figure 4.9). Subsequently, all wave height criteria, as in AS3962-2001, for 50YRP events are satisfied.
- In 100% of the area inside the interests of the proposed development in the west harbour (see Figure 4.4, grey area) Hm0 is below the 0.3 m limit for the 1YRP (bottom right panel, Figure 4.10). Subsequently, all wave height criteria, as in AS3962-2001, for 1YRP events are satisfied.

Regarding the east section of the harbour, wave height conditions show some minimal improvement of the conditions due to attenuation of wave energy from the proposed breakwater. Some slight deterioration of wave conditions (0.05m-0.10m) can be seen in the lee side of the east Granton Harbour breakwater due to reflected wave energy bouncing back off the existing eastern arm (see Figure 4.9 and Figure 4.10, top right panels). This effect is considered limited to the area 25-50m on the inside arm, an area already subject to more vigorous wave overtopping and transmission conditions during storms.

As noted in the previous section, the construction of the breakwater leads to an increase in wave heights in the approach channel with the presence of reflected waves in the immediate vicinity of the new breakwater (see Figure 4.9 and Figure 4.10, top right panels).

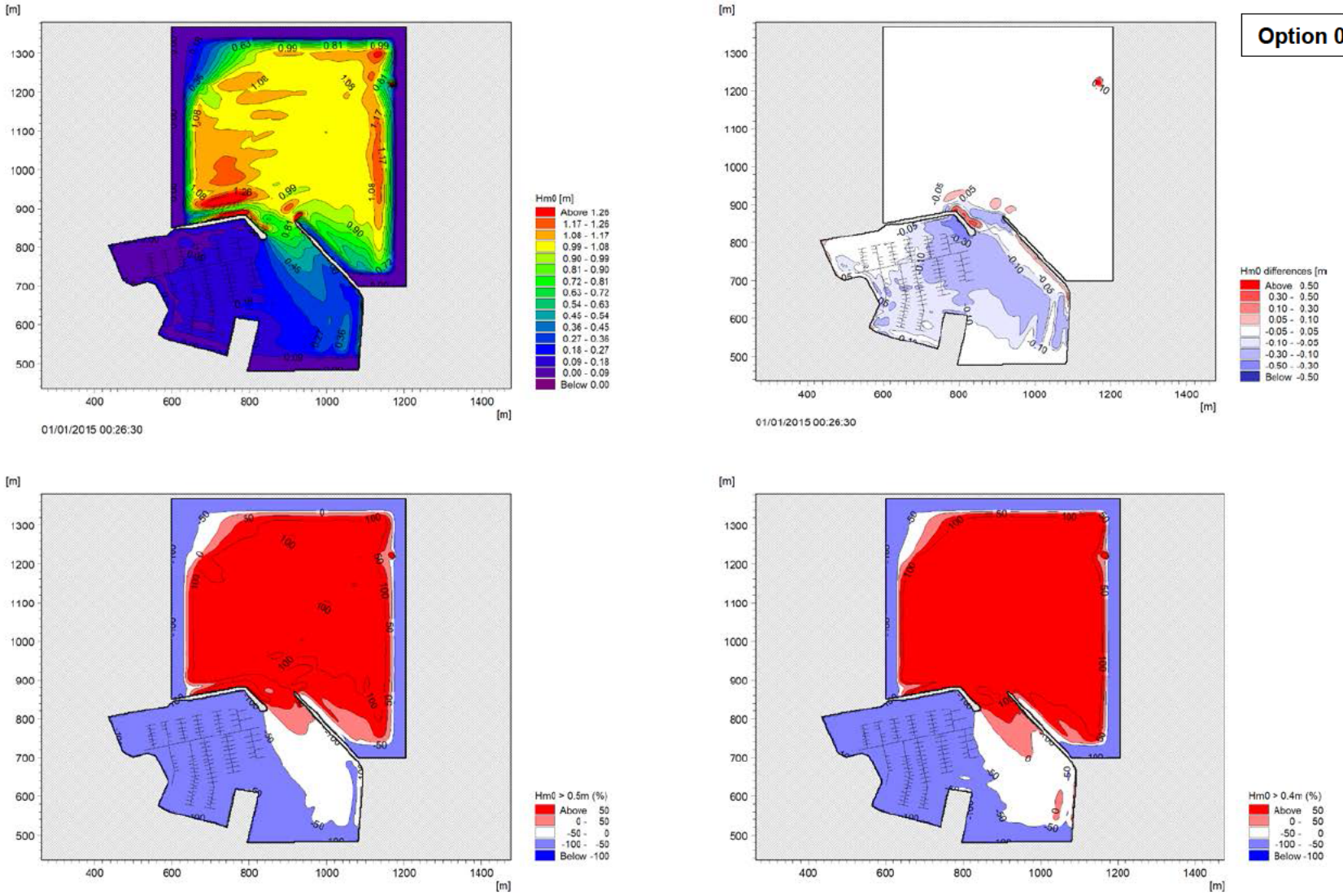


Figure 4.9 Wave disturbance plots Option 01 - (top left) Hm0 for 50yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (C&N proposed design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.05m. (bottom left) ratio of Hm0 larger than the 0.5m limit as in AS3692-2001 guideline for 50YRP events; (bottom right) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.

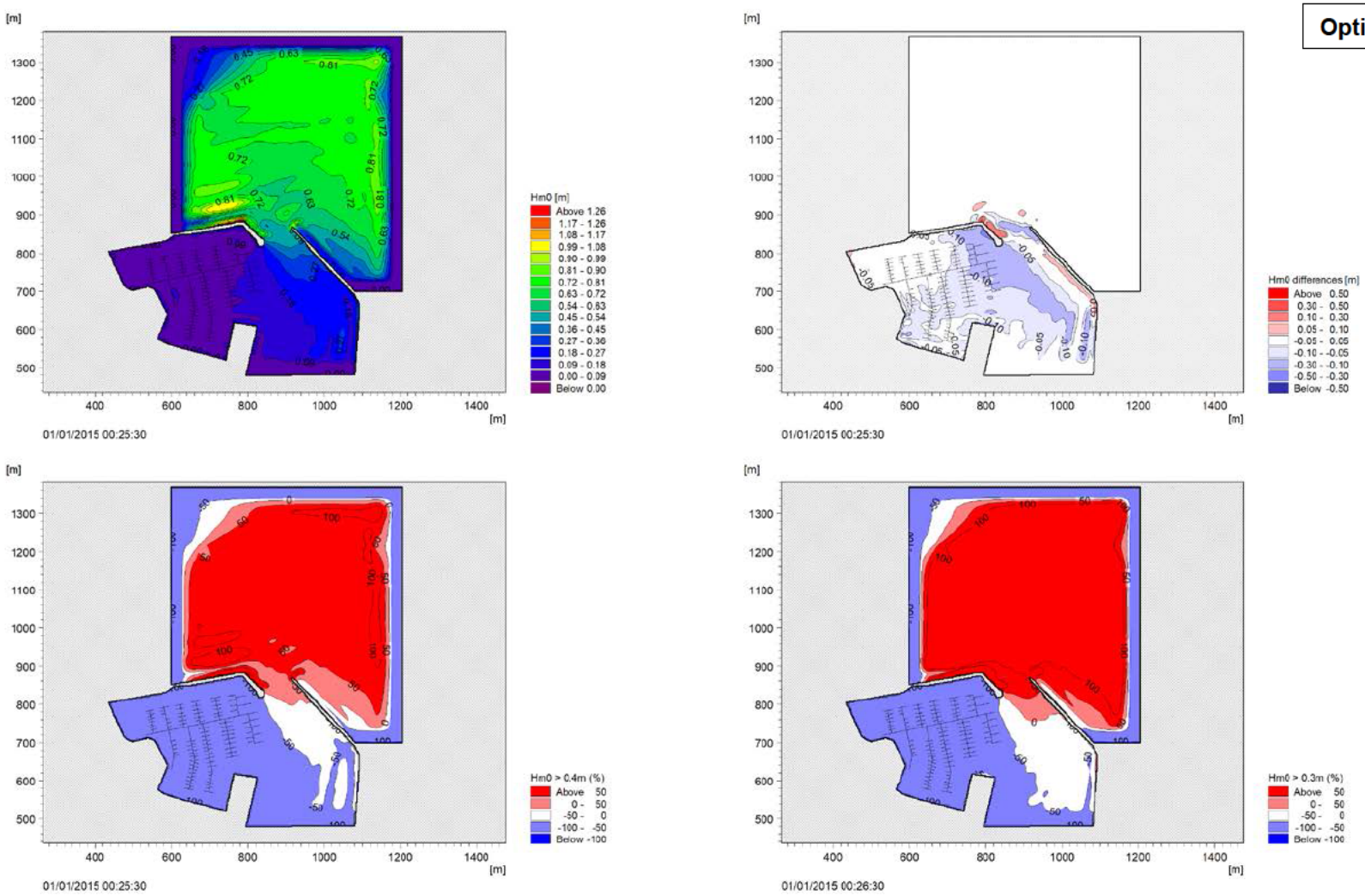


Figure 4.10 Wave disturbance plots Option 01 - (top left) Hm0 for 1yr return period wave conditions offshore; (top right) difference in Hm0 between breakwater extension (C&N proposed design) vs current state – positive (negative) numbers indicate areas where significant wave height is increased (decreased), white areas are less than 0.05m. (bottom left) ratio of Hm0 larger than the 0.4m limit as in AS3692-2001 guideline for 1YRP events; (bottom right) ratio of Hm0 larger than the 0.3m limit as in AS3692-2001. Note that the piled section of the middle pier is assumed to have no significant reflections and as such is parameterised to be excluded from the solution.

5 Conclusions and recommendations

5.1 Conclusions

A numerical wave transformation model has been developed to transform offshore wave conditions to the local area around Granton Harbour, for the purposes of understanding the local wave climate.

The modelling has quantified the magnitude of wave conditions in the area under a range of design storm conditions and has assessed the response of breakwater structures in the harbour. Specifically, the simulated worst-case scenario wave climates have been used to demonstrate wave energy blocking in the harbour entrance based on 5 different proposed breakwater layouts extending from the western harbour protection structure. While these simulations cannot resolve all processes relevant to waves inside harbours they do provide an insight as to which designs have the potential of being more effective in terms of wave energy blocking.

In order to reproduce conditions inside the harbour a high resolution (2m) Boussinesq model has been developed that allowed calculation of wave disturbance statistics representative of storm conditions.

Two wave climates were used as forcing (an extreme event 1 in 50YRP and an annual average event 1 in 1YRP) consistent with the requirements of the AS3692-2001 and amendment No1 2010 marina guidelines regarding acceptable wave height limits in berthing areas. Fixed wave periods and water levels were considered for this assessment.

Two directions, NE and NW, representing worst case scenarios for the west and east marina respectively, were examined. Hereinafter, only results for the NE direction are further addressed since the NW direction has shown to have no adverse effect on the generated wave conditions in the harbour with the exception along the back of the existing eastern arm. It is noted that there is even improvement in the berthing condition in some locations with much of the outer harbour satisfying the marina wave height exceedance berthing criteria for both 1:1 and 1:50 RYP events with the exception of a small area during the 50 year storm.

The results indicate that GCDL's proposed design of 55 m overall length with a circular roundhead at the head and a rock armour outer of 1:2 slope satisfies the good berthing criteria (wave heights of less than 0.4m) for ~65% of locations for the 50yr conditions. In the more frequent 1yr event this increases to 80% for the good criteria (<0.3m).

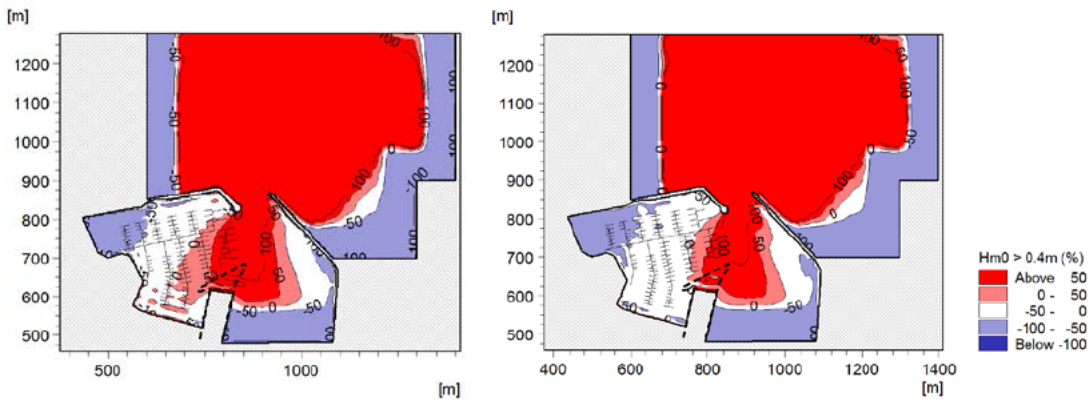


Figure 5.1 Comparison of the 50 year wave condition for Option 01 (left) and Option 02 (right) for the <0.4m Hm0

An optimised layout, herein denoted as Option 02, was based on GCDL's proposed design but with a breakwater of 65m instead of the original 55m and a parallel direction to the eastern harbour breakwater as before, Rock armour outer slope remained the same. The wave disturbance assessment for the updated design satisfies the good berthing criteria (wave heights of less than 0.4m) for 82% of locations for the 50yr conditions – an improvement of 27% compared to Option 01. In the more frequent 1yr event this increases to 86.3% for the good criteria (<0.3m) – an improvement of ~6% compared to Option 01.

Based on the present layout there will be some areas in the outer harbour that will be uncomfortable to remain berthed on a regular (annual storm) basis. It is apparent that this is currently limited to the first two outer southern pontoons immediately to the north of the Middle Pier.

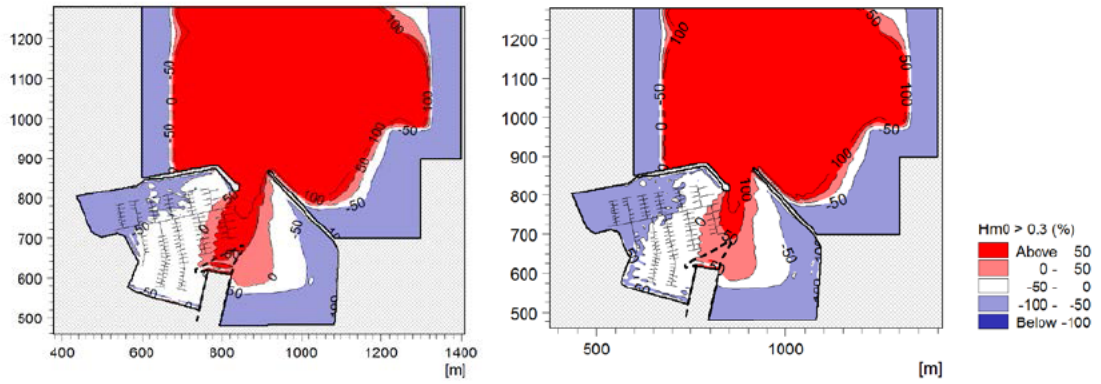


Figure 5.2 Comparison of the 1 year wave condition for Option 01 (left) and Option 02 (right) <0.3m Hm0

For the more extreme 50yr conditions, most of the southern pontoons are affected by waves exceeding 0.4m in height if Option 01 is to be adopted. The conditions are further improved for Option 02 but still some pontoons are likely to be affected (see bottom panels, Figure 4.7and Figure 4.8 for comparison).

Standing waves are seen in all model runs close to the existing sheet pile wall on the southern edge of the western harbour though these are significantly improved in Option 02. Whilst some of the standing waves are seen to be lower than the critical criteria, it is still of importance that the standing wave pattern appears as this could lead to berthing discomfort. It is also expected that in reality, the pontoons themselves could modulate standing wave modes for the better. Further analysis though is required to address the effect of specific pontoon designs and disturbance modes inside the harbour.

5.2 Recommendations

Following this study, it is assumed that the wave disturbance results will be used by others to assess the suitability of GCDL proposed designs, progress towards a detailed design and consideration will be given to amendments to the alternative solution as necessary.

In addition, the following recommendations have been provided for consideration as part of any ongoing studies:

1. It is anticipated that the presence of a floating pontoon grid will further reduce wave height in the area of interest. This is based on the fact that 19.6% (Option 01) and 8.6% (Option 02 for the 50YRP scenario exceed the prescribed (0.4m) limit by less than 0.2 m. A small portion of the pontoons are in areas exceeding the guideline wave height by more than 50%. Nonetheless, floating pontoons have not been parameterized in the current study but there is the capability to address their effect if required.

2. It needs to be noted also that any upgrades on the piled section of the middle pier should take into account the potential of introducing reflections in the proposed marina. In its current state, wave reflections are considered insignificant. There is though some uncertainty as to the exact orientation of the backend vertical wall on the Middle Pier (modelled here as facing the west harbour with a very small angle). If this angle is significantly larger, reflections will propagate in the west harbour that could deteriorate further the wave height conditions as presented herein. Confirmation of the exact position and reflection from the backend vertical wall should be considered.

3. Based on the spectral wave model, it was noted that there were designs that could further improve wave conditions in the west harbour are design_01 and 04, both with an overall length of more than 85 m. Design_02 (curved 60m breakwater) has the potential of better results but would need to be verified with detailed BW simulations for the effect of the curve. The reduced length compared to the width of the entrance of the harbour and in combination to the NE direction worst case scenario storm conditions makes this solution still prone to adverse incoming waves. Design 04 was accepted by C&N as an alternative optimised design to Option 01 and has been tested as Option 02 in the wave disturbance assessment. It should be noted that other factors such as cost and initial design constraints precluded further assessment of longer breakwater options.

4. Consideration of a rearrangement of the pontoon layout to reduce the available berthing in the new entrance of the west harbour where wave conditions are likely to be worse on a frequent basis. Consideration could be given to making the outer berths visitor pontoons and potentially of a different construction (i.e. breakwater style floating concrete pontoons) to reduce wave energy into the harbour.

6 References

[1] DHI (UK), "Wave Transformation Modelling Firth of Forth for FRA," April 2016.

[2] DHI, "MIKE 21 Spectral Wave Model, Hydrodynamic Module, Scientific Documentation," 2014.

[3] DHI, "MIKE 21 Boussinesq Wave Module, Scientific Documentation," 2016.

[4] Fairhurst, *Feasibility Study for Extension to North Revetment of Harbour - Inception Report.*, 2015.

[5] Australian Standards, "Guidelines for design of marinas (incorporating Amendment No. 1)," Sydney, Australia, 2001 (Reissued 2010).

7 Glossary

The following table provides a list of abbreviations that have been used in this study.

Table 7.1 Abbreviations and definitions

Abbreviation	Definition
GH	Granton Harbour
GCDL	Granton Central Developments Limited
C&N	Camper & Nicholsons
BW	Boussinesq model
SW	Spectral wave model
MWHS	Mean High Water Spring
MSL	Mean sea level
WL	Water level
SWL	Still water level
MWD	Mean water depth
OD	Ordnance Datum
CD	Chart datum
RYP	Return year period
Hm0	Spectral Significant Wave Height - Four times the standard deviation of seas surface elevation
Tp	Peak wave period
Tz	Zero crossing period
MWD	Mean wave direction

APPENDICES

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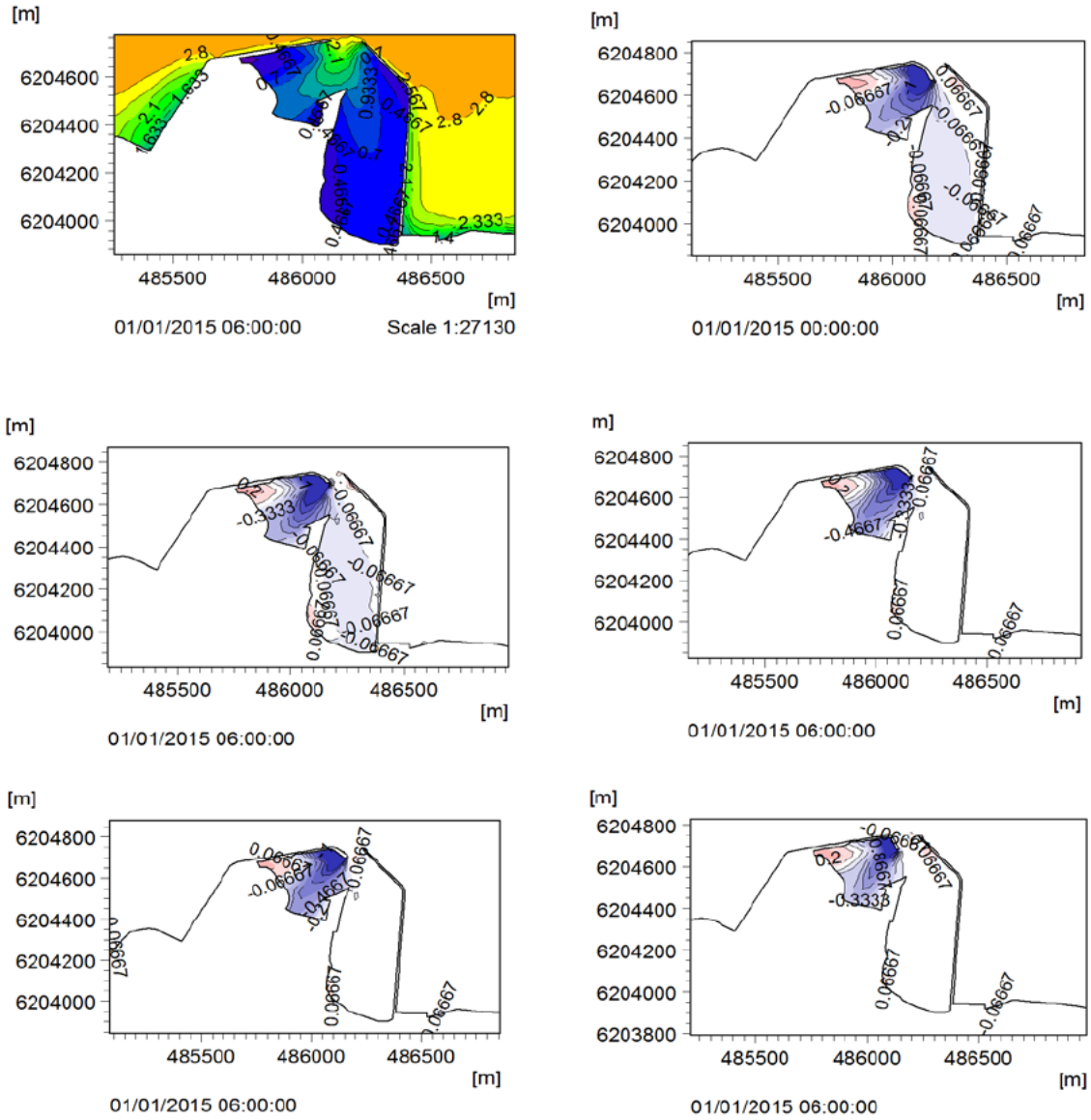
A Wave energy blocking for 1 event in 100, 50, 10 and 1 year return periods and designs 01 to 05



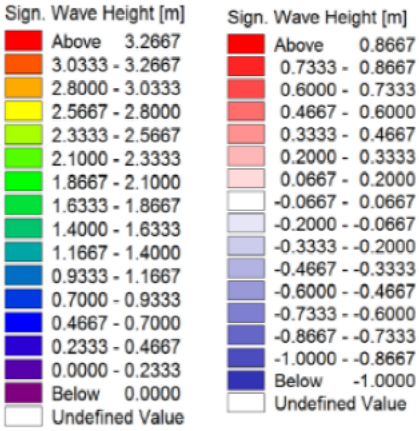


Figure A.7.1 100 YRP – Designs 01 to 05 (Case 10) (left colourbar top left panel, right colourbar rest panels). Positive areas are the result of wind stress effects on isolated cells.

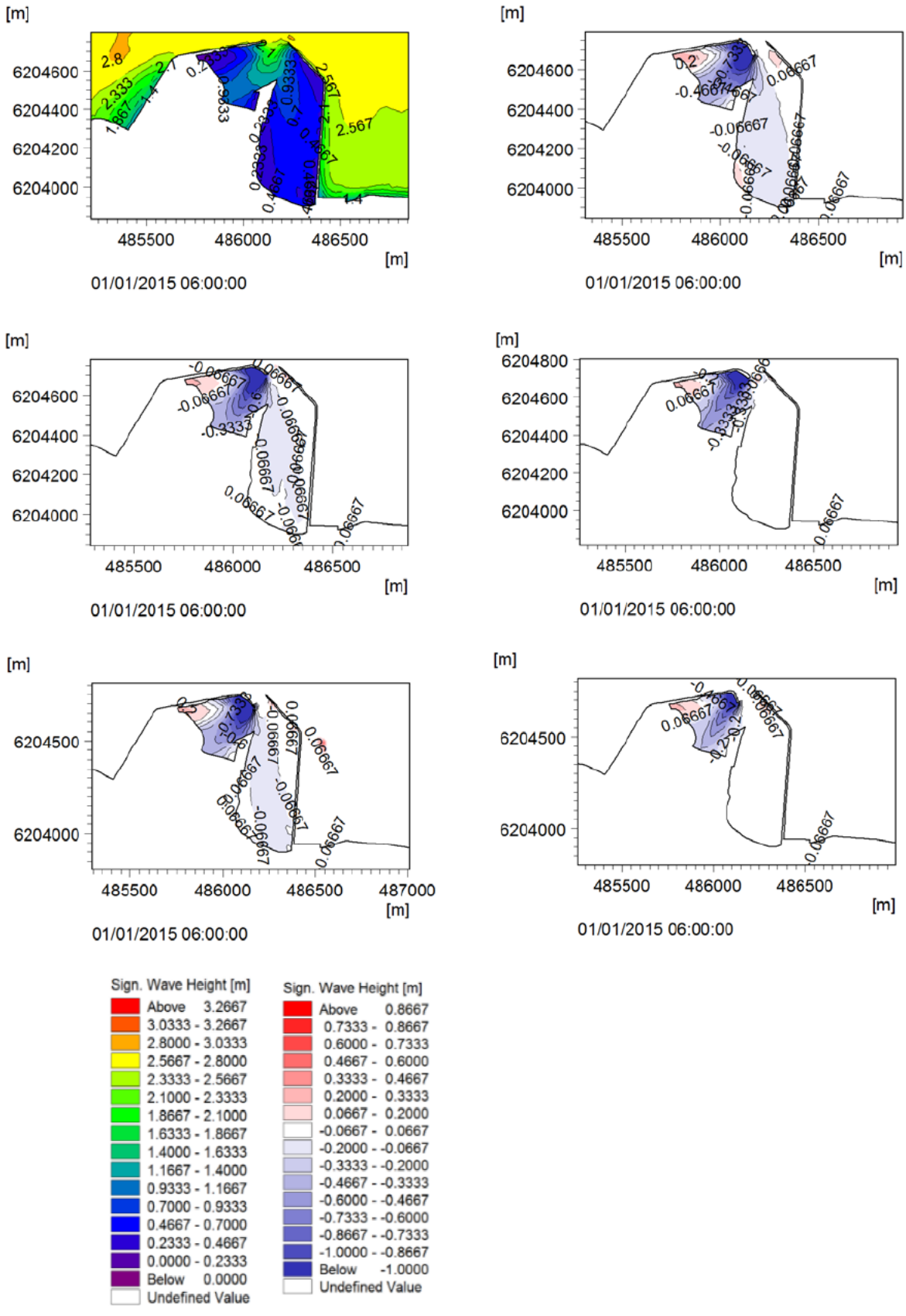


Figure A.7.2 50 YRP – Designs 01 to 05 (Case16)

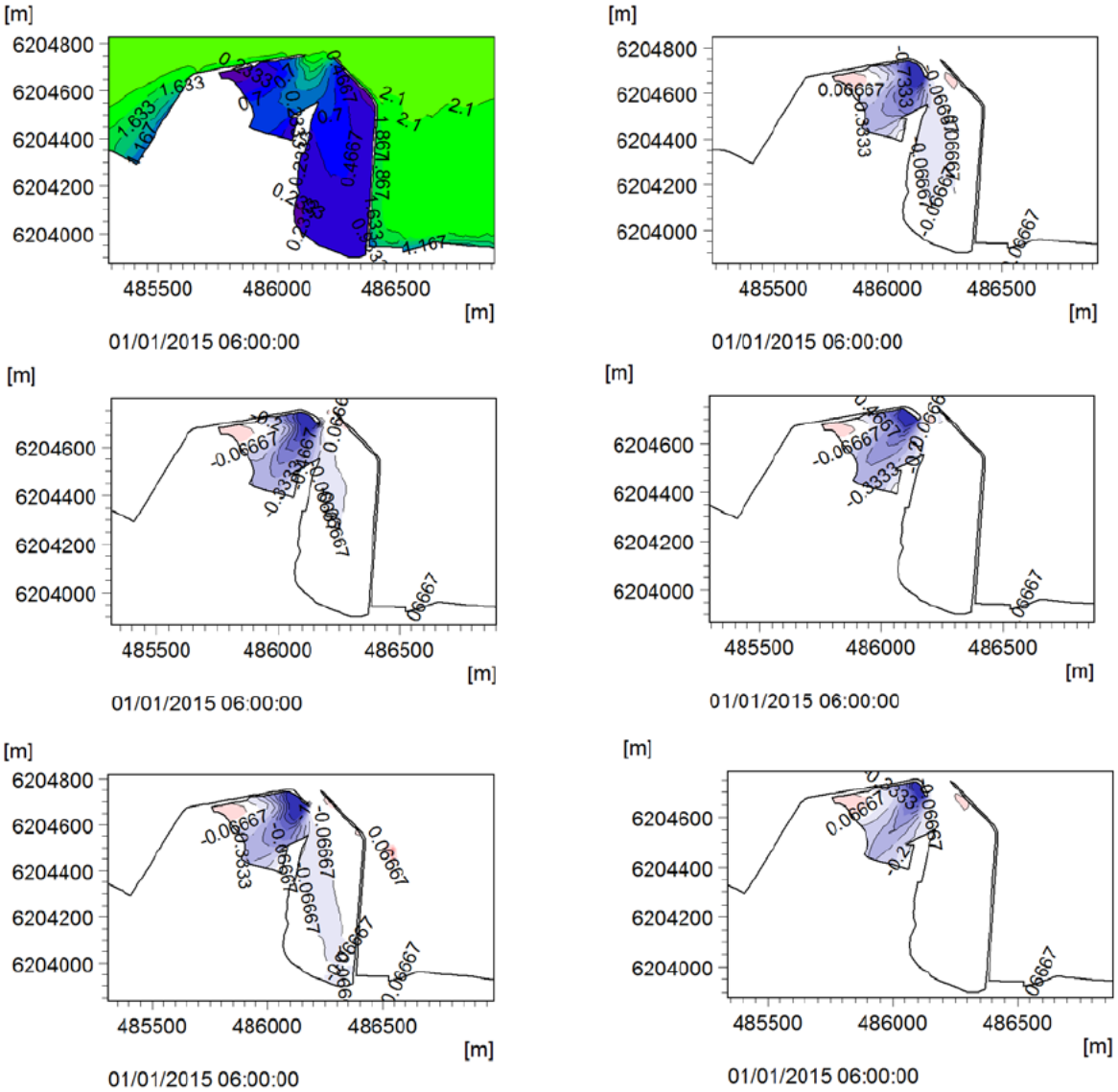


Figure A.7.3 10 YRP – Designs 01 to 05 (Case 23)

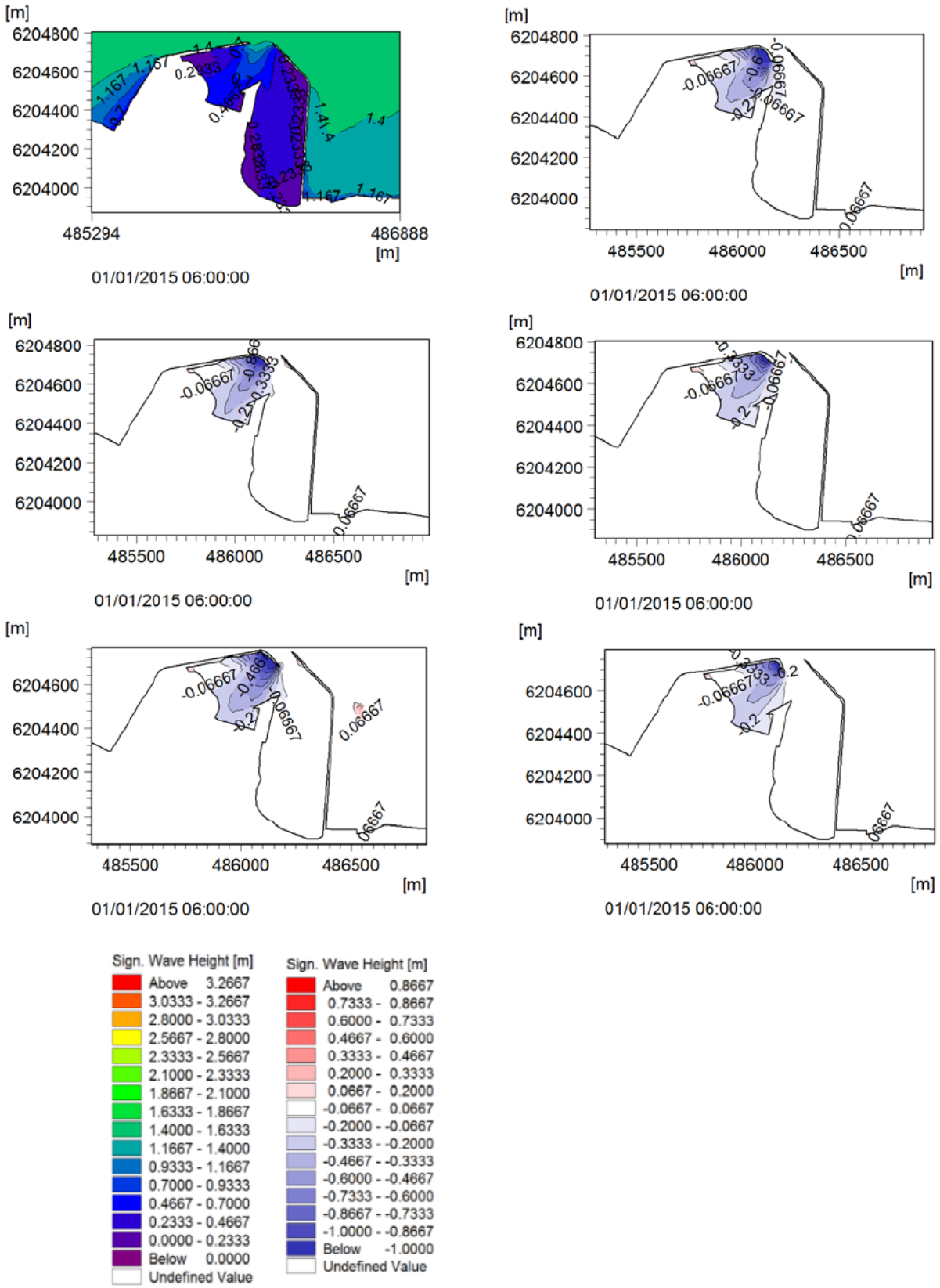


Figure A.7.4 1 YRP – Designs 01 to 05 (Case 30)

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B Wave energy blocking for 1 event in 200, 50 and 1 year return periods and design04 and NW wind direction (case 36, 38, 40 in [1])

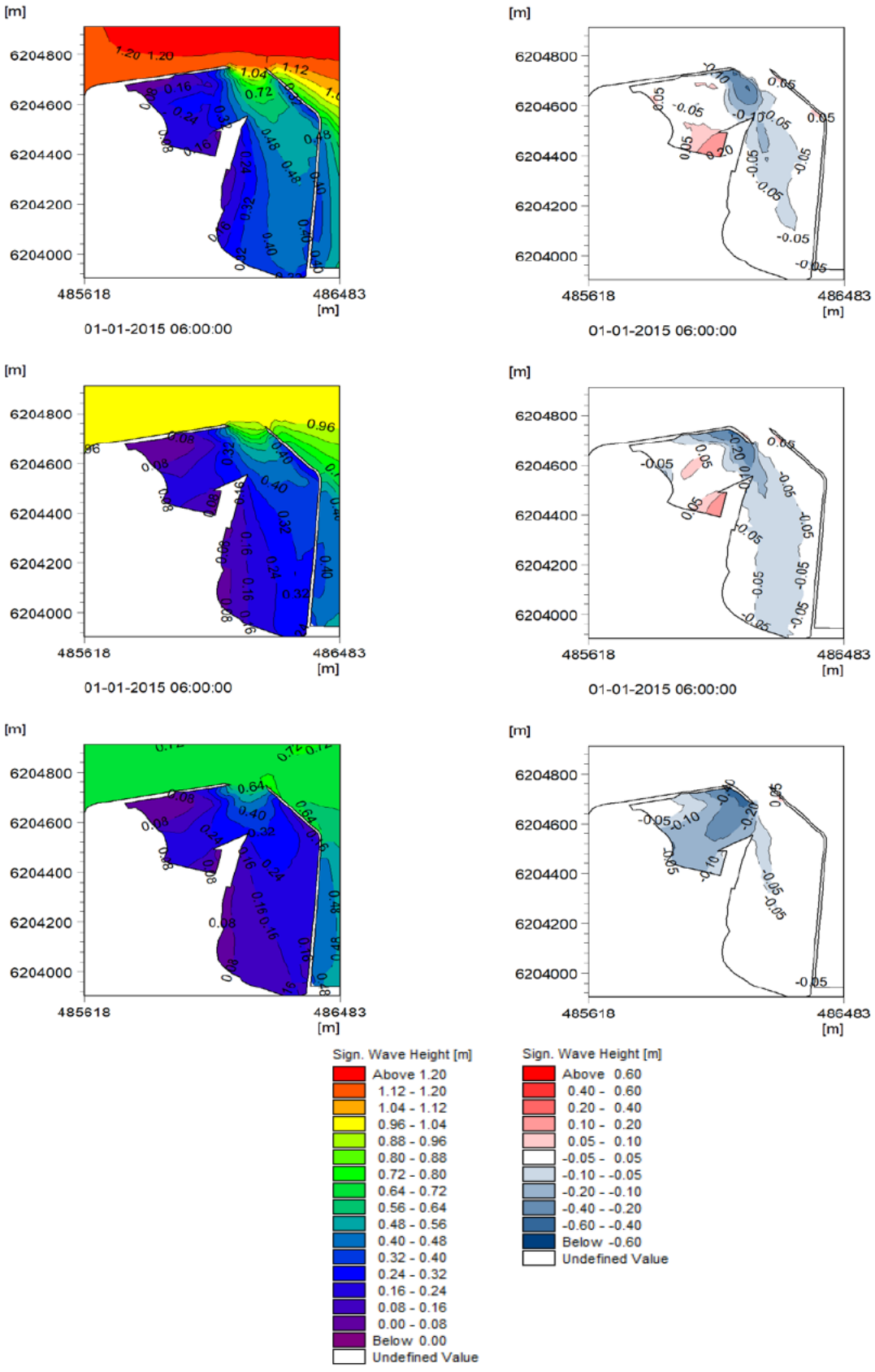

Figure 7.5 200, 50 and 1 YRP (top to bottom) for current state (left panels) versus proposed design (right panel – negative numbers indicate improvement in wave energy attenuation due to the proposed breakwater) for NW wind direction and NE wave direction (worst case scenario).

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Technical Appendix 4-3: BPEO

Granton Harbour Dredging 2018
Best Practicable Environmental Option Report

September 2018

Granton Harbour Dredging 2018
Best Practicable Environmental Option Report

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Contents

1 Introduction 1
1.1 Scope of Report 1
1.2 Background to Application 1
1.3 Source of Materials 1
1.4 Dredge Volume and Disposal Routes 2
2 Discussion of available disposal options 3
2.1 Identification and screening of Available Disposal Options 3
2.2 Summary of Identified BPEO Options 6
3 Further Assessment 7
3.1 Assessment Outline 7
3.4 Other Data 10
4 Water Framework Directive Assessment 12
4.4 Other Considerations 14
5 Conclusions 15
References 16

Appendices

A Figures
B Sampling Report
C DatA Summary Tables

Tables

Table 1.1: Dredge Volumes 2
Table 2.1: Initial Best Practicable Available Options 4
Table 3.1: Summary of Disposal Sites 8
Table 3.2: Summary of Exceedances at Disposal Sites 9
Table 4.1: Receptor Risk Assessment 12

1 INTRODUCTION

1.1 Scope of Report

Granton Central Developments/Edinburgh Marina are required to undertake a Best Practicable Environmental Option (BPEO) assessment for the disposal of dredged material from Granton Harbour to facilitate the development of a planned marina and associated commercial infrastructure.

Sediment sampling was undertaken in November 2017 and discussions have been ongoing with Marine Scotland since this time regarding the various options available due to the presence of some contaminants of concern in exceedance of Revised Action Level 2.

The purpose of this report is to review each of the available potential disposal options for the dredged materials. The options which are not considered to be practicable are rejected and the reasons for doing so are explained.

Those options which are practicable are examined in detail and further consideration given to the options in an environmental and strategic context.

The report then compares the practicable disposal options and draws a conclusion on the BPEO.

1.2 Background to Application

As outlined above, the dredging application is being submitted to enable the dredging of the western harbour. These works are required to facilitate the development of the proposed marina. The Edinburgh Marina development will provide the city with its own state of the art Marina with 315 berths with 23,500 square meters approximate prime letting space, which will enable the city to extend its maritime connections to Europe and beyond.

1.3 Source of Materials

Samples from the proposed dredge area were collected in November 2017 and submitted for analysis in line with Marine Scotland's Guidance. The associated report from this exercise is provided in Appendix B.

Sediments sampled within the proposed dredge area are reported as primarily silt.

Multiple contaminants of concern were recorded above Revised Action Level1 including

- Metals
- PAHs
- PCBs
- Petroleum Hydrocarbons

Mercury was recorded in exceedance of Revised Action Level 2 in multiple locations.

Further review of the information and discussion with a view to segregating the material with exceedances above REV AL2 was undertaken and communicated with Marine Scotland. The key points being that if all material with mercury concentrations >RAL2 are excluded for sea disposal i.e. the material is dredged to a fixed depth of 1.6m the average concentration is 1.06 mg/kg which is also <RAL 2.

On this basis, it was proposed that the upper 1.2m of material would be dredged, excluding a large buffer around VC 8 and VC9 where shallow mercury contamination was also encountered with a view to disposing this material at sea on the basis that sufficient supporting evidence could be provided to justify this in the presence of REV AL1 exceedances. All remaining material would be taken to land for a land based disposal solution. This area is represented by AREA C on Fairhurst Drawing 115875-0101 in Appendix A.

1.4 Dredge Volume and Disposal Routes

Based on a dredging plan for the harbour which is provided in Appendix 2 the volume split is as follows based on chemical quality.

Table 1.1: Dredge Volumes

Dredge	Volume (m^3)	Comment
Total Dredge Volume	241,365	Total proposed dredge volume
Dredge Volume for Areas for surface to 1.2m Dredge	86,980	Proposed for Sea Disposal
Dredge Volume from below 1.2mto base of dredge plus Area around VC8 & VC9 with Shallow Contamination	154,385	Land Based Disposal Options

2 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

The BPEO process is geared towards identifying a preferred overall strategy from the perspective of the environment as a whole, as opposed to detailed optimisation of any one selected scheme. It is a structured and systematic process to identify and compare strategic options in a transparent manner. Alternatives are evaluated in terms of their projected implications for the environment together with consideration of practicability, social and economic issues as well as within a wider strategic context.

The key stages of a BPEO are:

- Identification of options;
- Screening of options;
- Selection of assessment criteria;
- Analysis and evaluation of criteria; and
- Evaluation of BPEO.

However, due to initial discussions with Marine Scotland and the challenges associated with disposal of the material with contaminant levels >REV AL2, the selection process and discussion will be somewhat abbreviated as there is a proposed split disposal route and clearly defined disposal options. An initial screening has been undertaken for completeness and is included in the following section.

2.1 Identification and screening of Available Disposal Options

A number of options are available for disposal of dredged sediments. The options considered are provided in Table 2.1 along with justification for screening out those options which have not been taken forward for further consideration.

Table 2.1: Initial Best Practicable Available Options

Location	Options	Screening Assessment	Carry forward?
Estuary/ Riverbank	Do nothing Scenario/ Leave in situ	Not an option due to the requirement to develop a marina and associated facilities.	No
	Infilling of an existing dry dock/harbour facility	No projects have been identified which are available for utilisation.	No
	Beach Nourishment	Large areas of the Firth of Forth and Inner Estuary are designated sites (SSSI, SPA, RAMSAR) and hold both national and international importance to nature conservation. Specific beach nourishment projects would require to be supported by Environmental Assessments as a minimum to inform how the project could affect the environment as a result of disturbance to the intertidal area, changes to the sediment levels, the variable composition and quality of the material and measures devised from the assessment outcomes to minimise impacts on the environment. Considering the physical characteristics, in isolation from the chemical characteristics, silts are not typically used for beach nourishment projects. Large dredging operations undertaken at Grangemouth are typically disposed of at Bo'ness disposal ground as there is no requirement for the dredged silts in the estuary.	No
Land	Landfill Disposal	Material which is not suitable for sea disposal must be brought to land. Landfill is an option for the material which is not suitable for a sea based disposal, however it is not considered to be the most sustainable option available.	Yes
	Recycling/Re-use	Preliminary discussions have been undertaken regarding the potential for utilising the material, following suitable treatment and subject to necessary land based risk assessment and regulatory agreement.	Yes

	Land Incineration	The dredged material consists of non-combustible material (silts) with a low combustible component and very high water content.	No
	Application to Agricultural Land	The dredged material would need to be treated to reduce salt concentrations to acceptable levels. Would require detailed chemical analysis and assessment as well as a Waste Management License Exemption. Would require special precautions during spreading in relation to the risk of odour and watercourses / aquifers. The availability of land for this option will be limited within a reasonable haulage distance of the dredge arising's. Large volumes each year are unlikely to be viable to dispose of in this manner.	No
Sea	Aquatic disposal direct to seabed.	Relatively low cost, minimal transportation requirements compared to all other options and potential for low environmental risk. This option has been identified as a viable disposal route, subject to further consideration of the sediment from between surface and 1.2m below surface. Further consideration of this material is provided in Section 3.	Yes

2.2 Summary of Identified BPEO Options

Three options were identified for further assessment as follows:-

- Landfill Disposal;
- Recycling/Re-use and
- Sea Disposal.

As outline previously, the proposed disposal routes are to be split with 36% of the total volume considered for sea based disposal subject to agreement and the remaining 64% to be brought to land for a land based disposal option.

Further supporting information and detailed assessment of the sea based disposal is considered in Section 3.

Since the material below 1.2m is not considered suitable for a sea based disposal it will need to come to land for disposal. As such the material will be subject to land based re-use or disposal. These activities will be undertaken under appropriate SEPA licenses with respect to waste regulation. Initially it is proposed that the dredge arisings are brought onto the Granton development site for dewatering and stockpiling, prior to subsequent re-use and/or land based disposal.

The land based options will not be considered further in this document and the remainder of the document will focus on the material from surface to 1.2m below surface, excluding the area of shallow contamination around VC 8 & VC9, which has been identified for sea based disposal. This area is represented by AREA C on Fairhurst Drawing 115875-0101 in Appendix A.

Due to the limited disposal options available for the material with contaminants > REV AL2 no cost analysis has been undertaken as it is accepted this material must go to land it ultimately means that the cost will be the cost.

3 FURTHER ASSESSMENT

This section details the sediment quality of the material which is proposed to be disposed of at sea within one of the licensed spoil grounds. The material to be considered for disposal is the upper 1.2m from the whole harbour development excluding an area of 16,000m2 around VC8 and VC9 where mercury >REV AL2 was recorded at surface. This area was identified as the midpoint between other sample locations where mercury levels were recorded below REV AL2. Additionally, as discussed earlier, there are no exceedances of REV AL2 recorded for mercury above 1.6m, and average concentrations are below REV AL2 for all contaminants of concern.

To provide a buffer for the physical excavation of the sediment the material will be excavated to 1.2m below surface. Early discussions with dredging contractors to ascertain if segregation is possible have indicated that modern excavation methods using 3D technology and GPS can provide very accurate excavation depths.

The original chemical sampling report is provided in Appendix A, and chemical quality data summaries all relate to samples which do not record levels of mercury > REV AL2 with all of these samples removed from the data set including shallow contamination recorded around VC8 & VC9.

The following section considers the following key elements:

- The available disposal sites;
- The material for disposal; and
- Consideration of the risks.

3.1 Assessment Outline

The purpose of this assessment is to provide an overview of the proposed dredge material and the identified disposal site(s) including existing chemical monitoring data for the site where available.

Compare existing chemical data with other recognised sediment assessment criteria including those listed below.

- **Background Assessment Concentration (BAC**) - BACs were developed by the OSPAR Commission (OSPAR) for testing whether concentrations are near background levels. Mean concentrations significantly below the BAC are said to be near background. However, it should be noted that river catchments have their own unique geochemical finger prints and are also governed by the geology within the catchment, so in theory one set of background level values is not applicable to all situations;

- **Effects Range Low (ERL) -** ERLs were developed by the United States Environmental Protection Agency (USEPA) for assessing the ecological significance of sediment concentrations. Concentrations below the ERL rarely cause adverse effects in marine organisms. Concentrations above the ERM will often cause adverse effects in some marine organisms;

- **Probable Effects Level (PEL) –** PELs (Marine) have been adopted from the Canadian Environmental Quality Guidelines http://www.ccme.ca/en/resources/canadian_environmental_quality_guidelines/) If a concentration is recorded above the PEL this is the probable effect range within which adverse effects frequently occur. The Threshold Effect levels (TELs) have been included in the summary table in Appendix A, but have not been used as part of the further assessment as they typically fall below the RAL1

Review of potential risks to the list of receptors identified in "Water Framework Directive Assessment: estuarine and coastal waters (https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters).

Draw conclusions from available information and provide recommendation for proposed disposal Route(s).

3.2 Background Data – Dredge and Disposal Site

There are multiple disposal grounds in proximity to the site which are summarised below in Table 3.1. They are provided in order of distance closest to Granton Harbour. The information below was provided by Marine Scotland.

3.2.1 Disposal Volumes

Table 3.1: Summary of Disposal Sites

Site ID	2018 Licensed Capacity	2017 Deposited volumes	2016 Deposited volumes
FO038 – Narrow Deep and Narrow Deep B	No set capacity	0	0
FO041 – Oxcars Main	No set capacity	84,185 tonnes	159,057 tonnes
FO042 – Oxcars Ext A	No set capacity	87,610 tonnes	0
FO043 – Oxcars Ext B	No set capacity	407,720 tonnes	0
FO044 – Bo'Ness	No set capacity	1,074,335 tonnes	0

Source:

The closest disposal site to Granton Harbour is FO038 Narrow Deep and Narrow Deep (B).

Drawing 769967-003 in Appendix A details the location and footprint of the disposal sites.

3.2.2 Chemical Quality Screening of Dredge Material

All data are summarised in the original sampling report which is provided in Appendix B The samples with levels of mercury > REV AL2 have been removed from the data set to mimic the proposed segregation during dredging works. All data included within the assessment is summarised in Table A in Appendix C with exceedances summarised below.

Revised Action Level 1

- Up to 18 of 18 samples exceed REV AL1 for metals, PAHs and PCBs

BAC

- Up to 18 of 18 samples exceed for metals, PAHs and PCBs

ERL

- Up to 18 of 18 samples exceed ERL levels where available for metals and PAHs.

PEL

- Up to 18 of 18 samples exceed PEL levels where available for metals and PAHs. 18 samples exceed the PEL for mercury

Revised Action Level 2

- No exceedances of REV AL 2 are recorded where they are available.

3.2.3 Chemical Data at Disposal Site

The sampling data for three of the local disposal sites was provided by Marine Scotland as a means of baseline assessment. Oxcars, Narrow Deep and Bo'ness, the largest disposal site in the area were all included for the assessment. A summary of key contaminants including maximum, minimum and average concentrations is provided in Appendix C in TABLE C, Table D and Table E for the all of the sites where data was provided by Marine Scotland. All Data has been assessed as metals do not degrade and historic concentrations are of interest. Total concentrations may have altered over the time, but the data is considered useful for comparative purposes.

Data for all contaminants was not provided for each sample, so the summaries are of the data provided only and the number of data points vary accordingly.

Total PCB concentrations have been compiled by adding the ICES 7 congener concentrations as per the dredge material to enable a like for like comparison. Congeners included are PCB 28, 52, 101, 118, 138 153 and 180.

Marine Scotland noted that in Scotland the preference for disposal site selection is those which are dispersive, and as such it is assumed that all of the disposal grounds listed above are dispersive.

Table 3.2: Summary of Exceedances at Disposal Sites

Site ID	Total No. of Samples	No. of BAC Exceedances	No. of ERL Exceedances	No. of PEL Exceedances	Comments
FO038 – Narrow Deep and Narrow Deep B	68	52	52	29	Exceedances include mercury (29 samples exceed PELs) and various PAH species and 1 sample exceeds PEL for PCBs
OF041 Oxcars	66	56	56	28	Exceedances include mercury (28 samples exceed PELs) and various PAH species and 1 sample exceeds PEL for PCBs
FO044 – Bo'Ness	43	42	42	31	All 31 samples which exceed the PEL are for Mercury

Source:

In summary, the Oxcars Narrow Deep and Bo'ness disposal sites have a history of contaminants of concern exceeding the adopted PELs for metals, PAHs species and PCBs.

On average, between 42% and 72% of samples exceed the PEL for mercury. Other contaminants present include PAH species and minor PEL exceedances for PCBs.

3.3 Averages

Review of the averaged data for all the data has been undertaken i.e. considering the material as a single volume for disposal. The concentrations of the various contaminants of concern are quite variable, the review of average data against the available adopted assessment criteria are summarised in corresponding Tables B and F within Appendix C and the findings summarised below.

3.3.1 Granton Harbour

- The average concentration of mercury in the sediments exceed the PEL for mercury for Granton Harbour.
- Various PAH species average concentrations exceed the PEL for Granton Harbour

3.3.2 Disposal Sites

- All three disposal sites record average mercury concentrations above the PEL,
- Narrow deep recorded average concentrations of fluorene above the PEL
- Oxcars – recorded average concentrations of fluorene above the PEL

3.4 Other Data

Marine Scotland provided sediment quality data also for the Grangemouth (G21-27) site which is dredged on a frequent basis and is understood to constitute a large proportion of all disposed sediments in the Firth of Forth. It is noted that the samples collected share similarities to the Granton sediments (although TBT > Rev Al2 was recorded in one sample). The key point of note is that mercury is recorded above REV AL1 in all samples (and also the PEL in all samples with average mercury concentrations (0.93mg/kg) similar to those recorded in the sediments (0-1.2m) at Granton). These multiple sets of data highlighting widespread elevated mercury would suggest that mercury is a consideration in the entire estuary rather than just Granton Harbour and it either reflects natural baseline levels or anthropogenic inputs from large scale industry into the estuary.

3.5 Contaminant Sources

The contamination within the harbour is considered to be historic, with the worst noted at depth in most instances. PAHs and hydrocarbons are readily attributed to heavy industry, waste oils, with PAHs readily attributed to combustion of organic materials.

The current harbour is considered to have limited local contamination sources barring standard run-off of urban roadways. The harbour will remain open for movement of sediment from within the Firth of Forth and as such it is considered that there is not a suitable means for managing future sediment quality, barring routine maintenance dredging.

3.6 Chemical Assessment Conclusions

While exceedances of REV AL1, BAC, ERL and PEL (where available) values have been recorded for various contaminants of concern in the harbour sediments excluding all samples/depths with levels > Rev AL2.

Additionally, review of the background contaminant levels at three of the potential disposal sites has identified that there are contaminants of concern in exceedance ERL and PELs, and average concentrations of mercury in the historic data sets are recorded above the PEL value for all the sites.

On this basis, it is considered that while many contaminants are recorded above their respective REV AL1 levels within the Granton Harbour sediment identified for sea disposal, the levels at the disposal sites (FO038, FO041 & Fo044), especially mercury, are very similar in nature, and would suggest an estuary wide mercury issue.

Further consideration of the potential risks associated with the proposed disposal is considered in the following sections.

4 WATER FRAMEWORK DIRECTIVE ASSESSMENT

This section details the assessment the dredge and disposal sites within the context of the Water Framework Directive as required by Marine Scotland.

As outlined in the Water Framework Directive Assessment: estuarine and coastal waters, there are several key receptors which can be impacted upon including the following:

- Hydromorphology
- Biology – habitats
- Biology – fish
- Water quality
- Protected areas

Each of these points are considered in Table 4.5 below:

Table 4.1: Receptor Risk Assessment

Key Receptor	Brief Summary of Potential Effects on Receptor	Further Consideration Required?	Comment
Hydromorphology	Morphological conditions, for example depth variation, the seabed and intertidal zone structure tidal patterns, for example dominant currents, freshwater flow and wave exposure	No	The areas to be dredged are berths which naturally accumulate sediment , the disposal site is a sacrificial part of the Firth of Forth designated and licensed for this purpose
Biology - habitats	Included to assess potential impacts to sensitive/high value habitats.	No	Not considered to be a significant risk considering the dredge areas are historic harbour areas and the disposal site is a sacrificial disposal site which has been used for the deposition of sediments. Key contaminants of concern within the disposal ground, as well as other areas within the estuary based on data available on the Marine Scotland Interactive GIS database https://marinescotland.atkinsgeospatial.com/nmpi/ , sediments are noted to exceed PEL values for mercury.
Biology - fish	Consideration of fish both within the estuary and also potential effects on migratory fish in transit through the estuary	No	
Water Quality	Consideration must be given to water quality when contaminants are present in exceedance of CEFAS RAL1.	Yes	Contaminants noted to exceed CEFAS RAL1 within sediment samples