Grangemouth Flood Protection Scheme

Basis of Design Flo Gas Site

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Falkirk Council

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Grangemouth Flood Protection Scheme

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Contents

1. Introduction

This technical note has been requested by Forth Ports to provide evidence of factors that have been considered in the development of the design of flood defences.

The purpose of this technical note is to outline the basis of design for the proposed flood defences around the Flo Gas site and the area of land between the locks (referred to as 'Locks').

1.1 Flo Gas site

The Flo Gas site is located to the east of South Shore Road towards the northern end of the port, close to the port entrance lock. All the land in this area has been reclaimed, historically from the Forth Estuary as part of the Port of Grangemouth. The land directly to the east of the Flo Gas site, is currently un-developed land that is naturally vegetated. Some marshy/wet areas currently exist at this location, but these are not thought to be directly linked to the estuary.

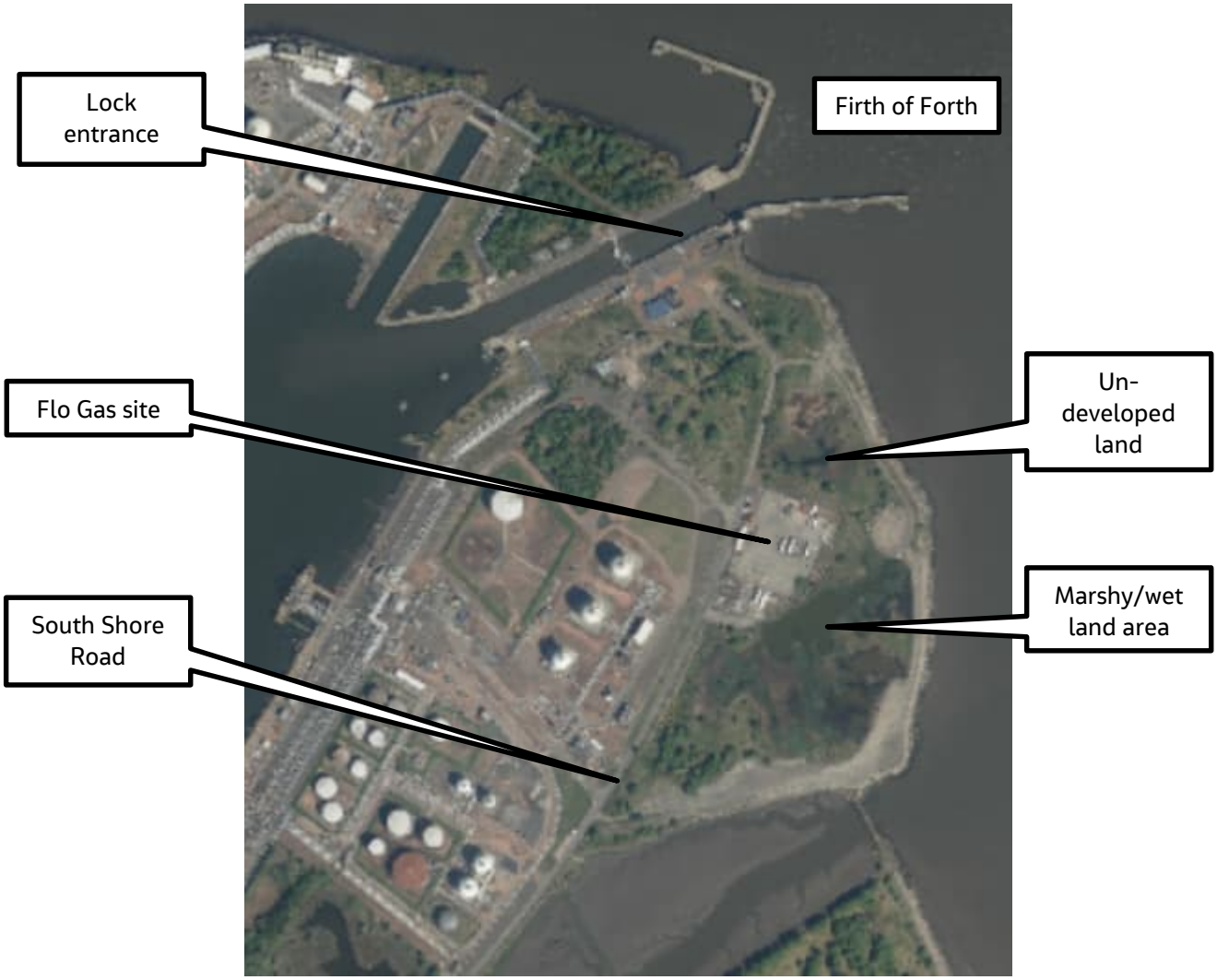

Figure 1 Image showing the location of the Flo Gas site

The land generally comprises made ground with a variety of different materials including concrete/brick. The Firth of Forth Special Protection Area (SPA) and Ramsar site bounds the land to the east. Figure 2 shows the location of the SPA/ RAMSAR designations relative to the site.

Figure 2 Location of the SPA/ RAMSAR Designations (in magenta)

1.2 Locks

There is an area of land between the entrance lock and the old lock channel that has been reclaimed from the Firth of Forth when the locks were constructed in the early 20th century. The area of land is currently vegetated with self-seeded trees/scrubs. Vehicular access to the land is only possible from the west via a bridge across the old entrance lock accessed through the Ineos FPS site.

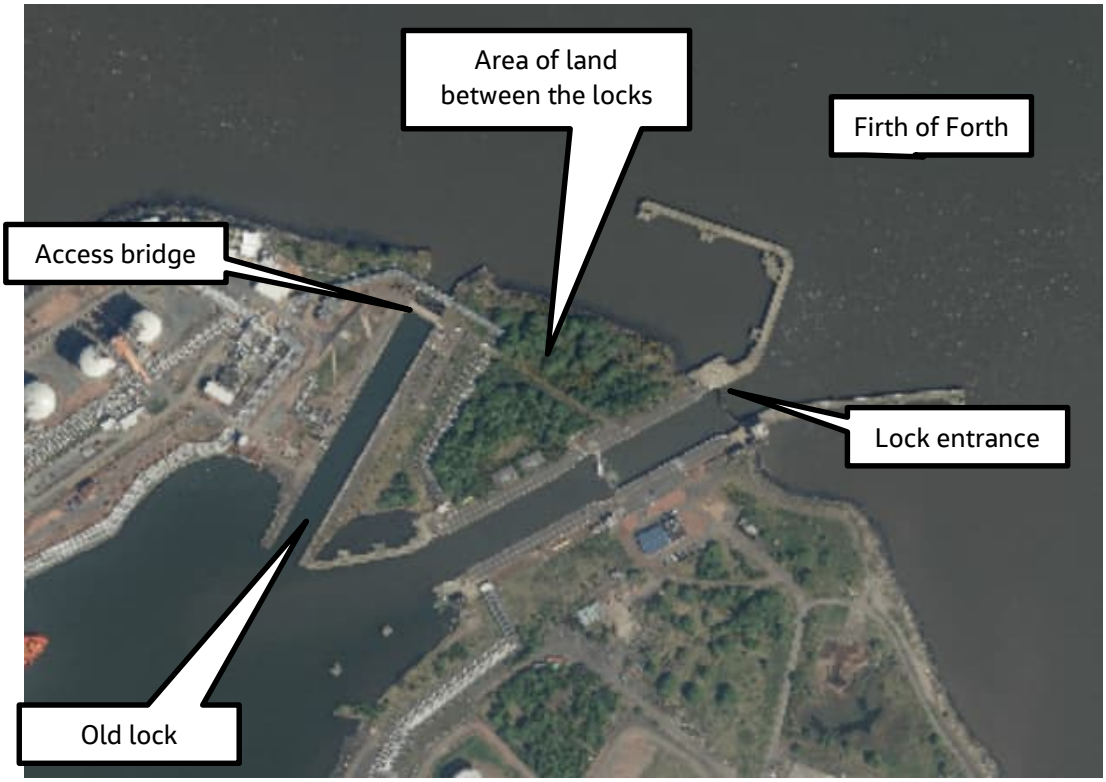

Figure 3 Location of land between the locks

2. Proposed Flood Defences

2.1 Flo Gas Site

Figure 4 outlines the proposed flood defences around the Flo Gas site. The flood defences will comprise of bare sheet piles, with flood gates at multiple locations.

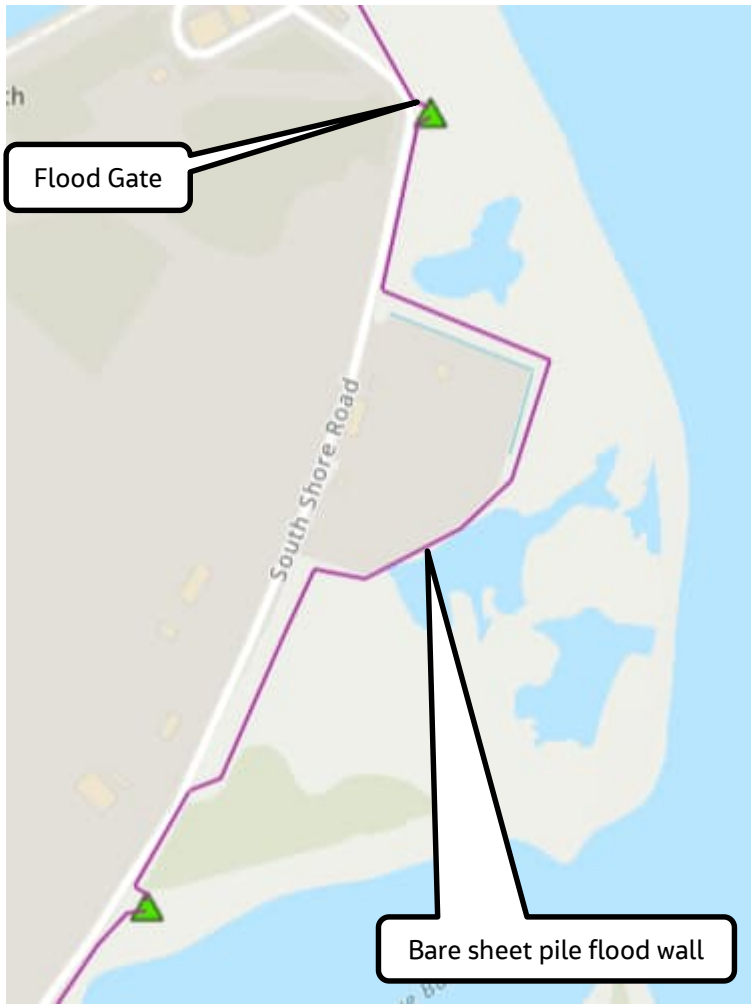

Figure 4 Location of proposed flood defences (magenta line) at the Flo Gas site

The location of the proposed flood defences has been based mainly on the following principals:

- There is no development currently, on land to the north, east and south of the Flo Gas site.
- Minimise disturbance to coastline.
- Flood defences are located as far back from the Firth of Forth SPA as possible. See below for more details on the requirement for protecting this site.

The SPA forms part of a European site network of nature protection areas, which are classified under Article 4 of the Birds Directive (Directive 2009/147/EC on the conservation of wild birds (codified version of Directive 79/409/EEC)). The Habitats Directive provides protection for SPAs (and also Special Areas of Conservation) from degradation and damaging activities through a hierarchical system of assessment. A precautionary approach is embedded within the Habitats Directive and where there is any uncertainty of potential adverse effects, measures must be implemented to ensure that the conservation objectives of European sites are

maintained. In Scotland, the Habitats Directive is translated into specific legal obligations by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). This piece of legislation (generally referred to as the Habitats Regulations) requires that an Appropriate Assessment (part of the Habitats Regulations Appraisal (HRA)) be conducted to help the Competent Authority determine if the scheme is likely to have an adverse effect on site integrity (AESI) of the SPA. With respect to the scheme, the Competent Authority will be Falkirk Council, or Scottish Ministers should a public local inquiry be held under the Flood Risk Management (Scotland) Act 2009.

The project team has liaised with NatureScot on the design and reducing potential impacts to the SPA since 2019. The HRA for the scheme has identified a potential adverse effect on disturbance to high tide roosting birds during construction at key areas along the estuary edge. Through the iterative design process, the defences have been moved as far back from the SPA as possible, but the potential for an adverse effect remains.

The current design in the vicinity of the Flo Gas site broadly follows the design outlined in 2020, with the defences are set back from the estuary, reducing the potential of an adverse effect on the SPA as far as possible. The location of these defences with respect to the SPA has been assessed within the draft HRA and reviewed by NatureScot and Marine Scotland (both statutory consultees). Without any engineering justification for pushing the defences to the edge of the available land directly adjacent to the SPA, this change in design would undermine the precautionary principle within the HRA and is highly likely to raise issues with the statutory consultees and the Competent Authority.

It is also worth noting that the proposed alignment of flood defences would not preclude Forth Ports from developing the land on the seaward side of the defences subject to securing the relevant permissions.

2.2 Locks

Figure 5 outlines

the proposed form of the flood defences between the locks. The flood defences in this area are mixture of:

- Flood walls – a mixture of bare exposed sheet piles above ground and reinforced concrete walls.
- Demountable flood defences – temporary flood defences that can be manually erected.
- Flood gates – a gate that can be closed during a flood event.

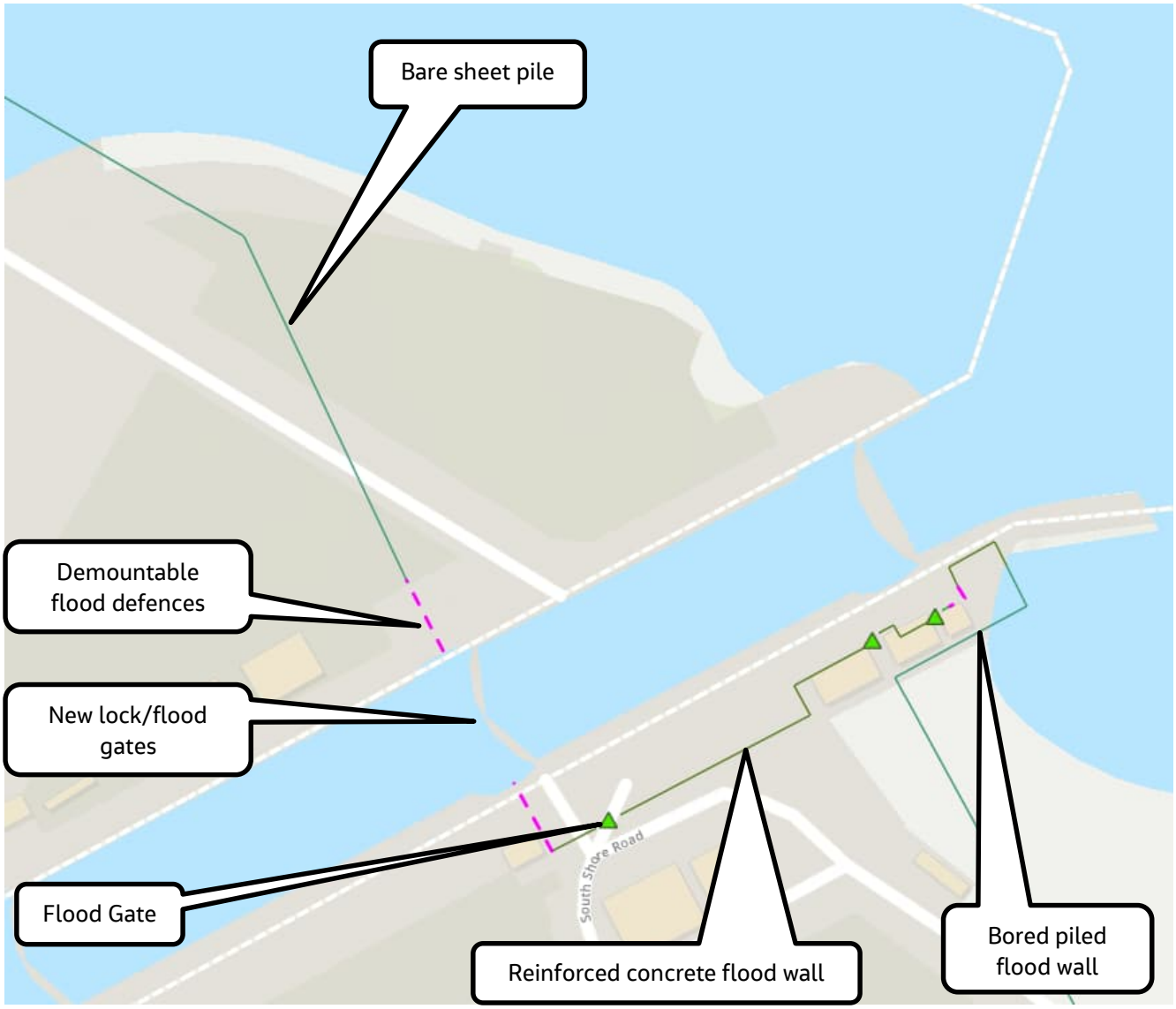

Figure 5 Location of flood defences between the locks

The location of the flood defences in this area have been determined by:

- Positioning flood defences away from the Firth of Forth:
    - to reduce the potential impact on the SPA – see section 2.1 which outlines the rational for positioning flood defence away from the SPA. It is acknowledged that the SPA designation does not extent directly the area between the locks but locating the flood defences further away from the Firth of Forth will reduce the potential for an adverse impact on bird using the Firth of Forth. The potential for visual disturbance would be greater if the flood defences are located at the bank edge. The current position utilises the existing vegetation as a screen to reduce the visual impact and potentially buffer some of the noise
    - to reduce the length of construction work required near the estuary frontage – taking the shortest route will reduce the volume of material and time taken to construct the flood defences. When designing flood defences, it is important to consider the straightest and shortest length of flood defences where possible;

    - to reduce the number of changes in direction of the wall – this may seem a minor factor but changes in direction of the flood wall will take more time to construct and cost more;

- Incorporating ramps (passive structure) over the flood defence rather than having flood gates/ demountable defences – a passive structure does not rely on human or mechanical intervention to ensure it works correctly and maintains the level of protection afforded by the surrounding flood defences. A passive structure usually has minimum (or no) moving parts and does require any parts/components to be erected which would require more regular maintenance.

- Retain existing undeveloped land/ floodplains – where land is undeveloped and is part of the functioning floodplain, flood defences have been set back from the bank crest to allow the floodplain to function and diffuse wave action.

- Minimise disturbance of existing riverbanks and coastline – where possible the flood defences have been located away from the riverbanks and the coastline to reduce the potential for: disturbance to the SPA and destabilisation to the existing bank which could result in the need for an engineered solution being required to re-stabilise the banking. Within the Port area, a significant length of the existing bank comprises of large concrete blocks and other material, disturbing this ground would potentially result in large sections of the existing bank needing to be replaced as construction works would potentially destabilise the existing bank. Testing would be required on any excavated material to determine its waste classification with additional processing work possibly required to ensure the material could be re-used within the scheme extents or removed from site.

3. Potential Future Development

3.1 Flo Gas Site

To maintain access to the land to the east of the proposed flood defences, Flood gates have been incorporated into the design of the flood defences. The gates would normally be in the closed position and only opened if access was needed into the undeveloped land. This is preferable to leaving the gates open and needing to deploy resources to close them in the event of a flood.

The currently undeveloped land could be developed by Forth Ports in the future subject to the necessary consents being obtained. Depending on the nature of the development and need to construct flood defences/ raise the ground to protect the development, the flood defences proposed as part of the scheme may become redundant and could be removed, subject to agreement with the council, as damaging a constructed flood protection scheme is an offence.

3.2 Locks

Similar to the Flo Gas site, the provision of flood defences as part of the scheme would not preclude development of the site. It is likely that any new development would require some form of flood defence and this could be integrated with the scheme defences, with parts of the scheme defences becoming redundant and could be removed by agreement with the council.

It is envisaged that spare gate leaves would be stored somewhere within this land in order that they can readily be accessed/ used should there be a need t replace a damaged set of gates.