

Donmouth Road Coastal Embankment

Phase 1 Desk Study

16 March 2017

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1 Introduction

1.1 Background and Scope

Aberdeen City Council (ACC) have commissioned Mott MacDonald Ltd (MML) to undertake an initial assessment of the condition of a section of coastal embankment at the mouth of the River Don, Aberdeen and produce a Stage 1 Desk Study as part of an assessment of the site. This site is known as Donmouth Road Coastal Embankment. A site plan is included as Figure 1.1.

Figure 1.1: Indicative Site Boundary



Source: Contains OS Data @ Crown Copyright 2016 Licence No. 100026791

The aim of this report is to present the findings of an initial Desk Study review, including development of a ground model for the site and recommendations as to further work required.

The objectives of this Desk Study are to:

- Review readily available existing information.
- Assess the ground conditions at the site.
- Advise of requirements for further work.

1.2 Sources of Information

The following sources of information summarised below have been used to compile this Desk Study report and are summarised in Section 2.

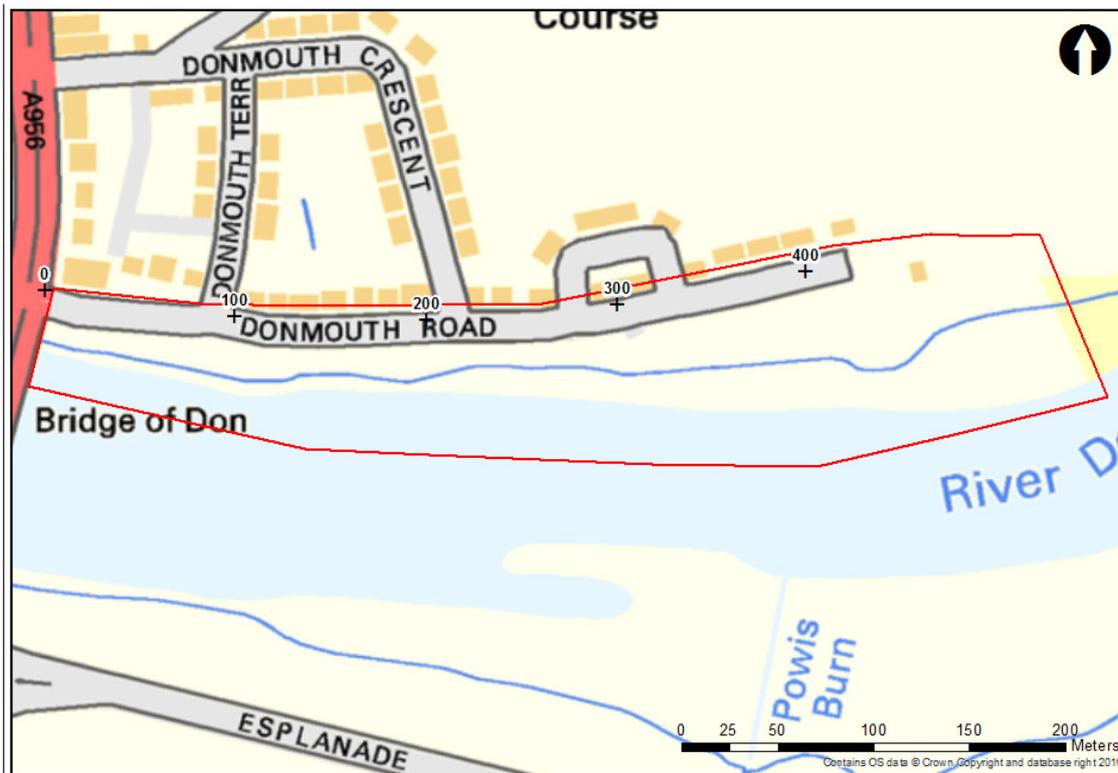
- National Library of Scotland, online historical map viewer (Ref. 1)
- British Geological Survey (BGS) Geology of Britain Online Viewer (Ref. 2)
- BGS GeoIndex Map Viewer (Ref. 3)
- BGS Hydrogeological Map of Scotland (Ref. 4)
- Scottish Environmental Protection Agency (SEPA) River and Basin Management Plan (RBMP) Online Viewer (Ref. 5)
- Coal Authority Gazetteer and Interactive Map (Refs. 6 and 7)
- BGS Non Coal Mine Plans Portal (Ref. 8)
- Zetica UXO Pre Desk Study Assessment (Ref. 9)
- ACC website, nature reserve maps (Ref. 10)
- Scottish Natural Heritage (SNH) interactive map (Ref. 11)
- Historic Environment Scotland (HES), Canmore database (Ref. 12)
- Google aerial imagery (Ref.13)
- Bing aerial imagery (Ref. 14)
- ACC tender information (Ref. 15)

2 Desk Study

2.1 Introduction

A desk-based assessment of the site and ground conditions has been undertaken using information from readily available sources outlined in Section 1.2. To aid with description of the site, chainages have been assigned to Donmouth Road, as shown in Figure 2.1.

Figure 2.1: Site Plan Showing Chainages



Source: OS OpenData Supply - Ordnance Survey © Crown copyright 2016. All rights reserved. Licence number 100026791

Note: Chainages in 100m intervals and noted as 'Ch100' in report text

2.2 Site Description

A summary of pertinent site details is presented in Table 2.1.

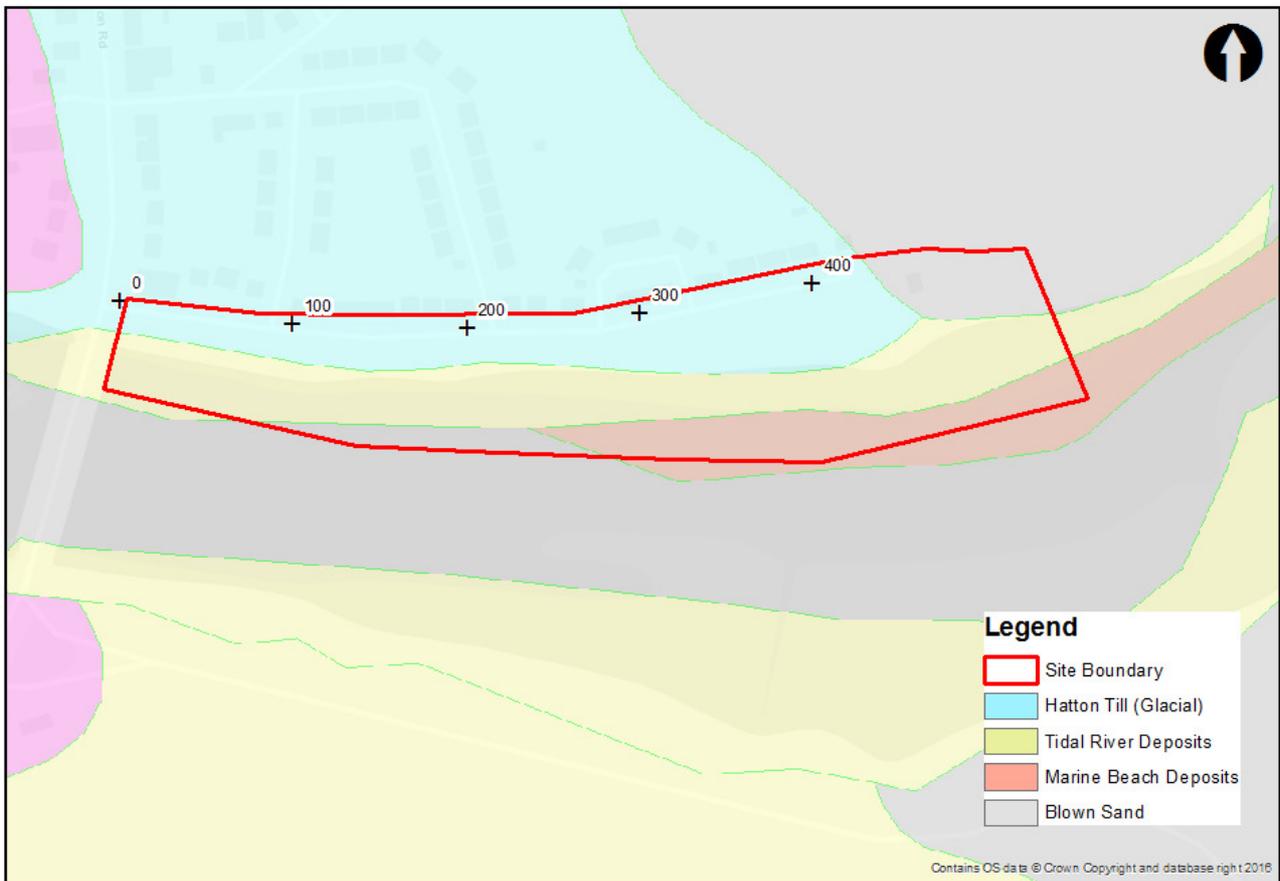
Table 2.1: Site Details

Aspect	Comments
Site Name	Donmouth, Aberdeen
Site Area	Approx. 4.4ha
National Grid Reference (NGR)	from NJ 94647 09488 (Ch0) to NJ 95142 09537 (Ch496)
Local Authority	Aberdeen City Council (ACC)

Aspect	Comments
Location	The site lies at the mouth of the River Don, immediately downstream of the Bridge of Don bridge, along the northern bank of the River Don. The site comprises the coastal embankment between Donmouth Road and the River Don.
Current Land Use and Surface Conditions	Current land use is residential/recreational. Donmouth Road is an unclassified road within the residential area of the Bridge of Don, Aberdeen (Ch0 -400). The road follows along the crest of the embankment which forms the northern bank of the River Don, near the mouth of the river. There is also a carpark and a Scottish Water facility within the site boundary.
Topography	The ground slopes down from Donmouth Road to the River Don.
Surrounding Area	There is residential housing along the northern extent of Donmouth Road. The Bridge of Don (bridge) (Ch0) is present to the west of the site, River Don and its southern bank to the south, and the Aberdeen beach and the River Don estuary to the east.
Historical Site Use (Ref.1)	<p>The earliest available historical map, dated 1843-1882, shows the site to be an embankment with a path or track along the crest of the embankment (Ch0-496). There are no buildings within the site boundary, however there are buildings to the immediate north west of the site and a coastguard station 25m north. A rocket house (Ch496) and boat house located 70m east of the site. There is a small tributary burn which flows through the site, north to south (Ch170). The Donn Mill is indicated to be 75m west of the site, upstream.</p> <p>The 1888-1913 map indicates little change other than the Rocket house is now shown to be a building further to the west, and offsite to the north (north of Ch350) and the original rocket house is now a boat house and watch house (Ch496). Buildings to the north west of site are noted to be Donview Hotel (Ch0).</p> <p>By 1955, the map shows Donmouth Road in its current location as well as residential housing to the north of the road (Ch0-400). The small burn previously shown (Ch170) is no longer recorded, however there are spreads noted at the embankment where it previously met the River Don. Upslope from the spreads is a Sewage Tank (Ch170).</p> <p>The 1966-75 mapping shows a carpark located to the south of Donmouth Road to the eastern end of site (Ch300-400), and the spreads on the western side are no longer recorded. A Radar Training Station is shown at the eastern extent of Donmouth Road (Ch425).</p> <p>There has been little change between the mid 1970's and the present day.</p>
Published Geology (Refs. 2 and 3)	<p><u>Superficial Deposits</u></p> <p>The BGS Geoindex Map Viewer and Geology of Britain Viewer indicates the site to be underlain by:</p> <ul style="list-style-type: none"> • Tidal River Deposits described as clay, silt and sand with localised peat and gravel associated with infilling of tidal rivers, present across the majority of the site. • Marine Beach Deposits described as silt, sand and gravel are indicated to be present along the eastern section of the site in the estuary. • Blown Sand is present in the north east of the site associated with the adjacent beach. • Hatton Till Formation (glacial till) described as diamicton, clayey, pebbly, calcareous, red, and crudely stratified. There is a glacial meltwater channel present within the till which is shown to be orientated from north to south, with the end of the channel within the western area of the site. <p>Although not recorded on the geological maps, made ground of unknown thickness is anticipated to be present overlying the natural deposits associated with the historical development of the site and Donmouth Road.</p> <p><u>Bedrock Geology</u></p> <p>The solid geology beneath the west of the site is semipelite and psammite of the Aberdeen Formation (Argyll Group) described as interlayered psammite and semipelite. Interbedded conglomerate and sandstone of the Brig o' Balgownie Formation underlies the east of the site.</p> <p>There is no evidence of faulting within the site or the surrounding area.</p> <p><u>BGS Landslip Records</u></p> <p>The British Geological Survey (BGS) do not hold any records of historical landslips.</p> <p><u>BGS Boreholes</u></p> <p>There are no BGS borehole scans located within the site, however there are nine</p>

Aspect	Comments
	<p>located to the west of the site at the Bridge of Don (bridge) (south of Ch0).</p> <p>Boreholes record unconsolidated superficial deposits consisting of sands, gravels and silts, with occasional buried peat/organic deposits. These are recorded to be underlain by 'granulite' (a fine- to medium-grained metamorphic rock with a granular texture) which shows varying degrees of weathering.</p>
Hydrogeology (Ref. 4 and 5)	<p>The BGS Geoindex Map Viewer does not record hydrology for the site, due to a function of scale. The nearest records are for</p> <ul style="list-style-type: none"> a 'Low productivity aquifer' with small amounts of groundwater in the near surface weathered zone, secondary fractures, and rare springs associated with the Argyll Group. <p>The SEPA RBMP website records the 'Blackdog Coastal Sand and Gravel' groundwater body to be present beneath the site (Water Body No: 150370). A groundwater body is considered to be potentially capable of sustaining a water supply of 10m³ per day or 50 people on a continuous basis. It is considered to be a potential receptor with regards to contaminated land.</p> <p>In 2008, SEPA classified this groundwater body as having an overall status of 'Good with High confidence'. There is no trend for pollutants for this water body.</p>
Hydrology (Ref. 5)	<p>The River Don (Water Body No: 200104) is present immediately south of the site. In 2008, SEPA classified this water body as having an overall status of 'High with Medium confidence'.</p>
Mining and Quarrying (Refs. 1, and 6 to 8)	<p>Aberdeen is not located within a Coal Authority Reporting Area and the geology is not noted to be coal bearing. Consequently, the risk associated with abandoned mine workings below the site is considered to be negligible.</p> <p>There are no records of quarrying activity within, or in the vicinity of, the site.</p>
Unexploded Ordnance (UXO) (Ref.9)	<p>The Pre Desk Study Assessment (PDSA) for the site indicates a low risk of encountering UXO at the site.</p>
Designated Areas (Refs. 5, 10 and 11)	<p>The SNH Sitelink online viewer records that the River Don and its estuary sand banks are part of the Donmouth Local Nature Reserve.</p>
Archaeology (Ref. 12)	<p>There are no Historic Environment Scotland (HES) features within the site, and approximately 5 records within 100m of the site boundary.</p> <p>The Old Aberdeen/Balgownie Conservation Area is located immediately west of the site, and includes the Bridge of Don (bridge).</p>
Aerial Photography Interpretation (Refs. 13 to 15)	<p>A review of freely available aerial photography from 2001 to 2012 shows that there are signs of possible movement within the embankment in the western area of the site (Ch100-200). This is in the form of darker lines, possibly cracks, slumps or steps within the embankment profile.</p> <p>Between 2007 and 2008 there are small signs of movement of the embankment in the west of the site (Ch25), and by 2012, this area is shown to have failed with the main scarp visible, with the failure approximately 10-15m wide.</p>
ACC Tender Information (Ref. 15)	<p>The site photographs show the general slope to be uneven and heavily vegetated, and show evidence of movement within the embankment although the exact location is not discernible from the photographs.</p> <p>There is an area of remedial works which have been carried out at the western end of the site, consisting of the placement of large grade quarried stone. Heras fencing panels have also been placed at the crest of the slope in this area (Ch25)</p> <p>There are two outlet pipes shown on the photographs, however the exact locations are not discernible.</p>
Utilities	<p>There may be services associated with the Scottish Water facility in the east of the site. The small burn that was present running north to south through the site may have been culverted. Additionally, services associated with street lighting etc. may be present within the road.</p>

Figure 2.2: Superficial Geology Plan



Source: BGS Opensource Data NERC

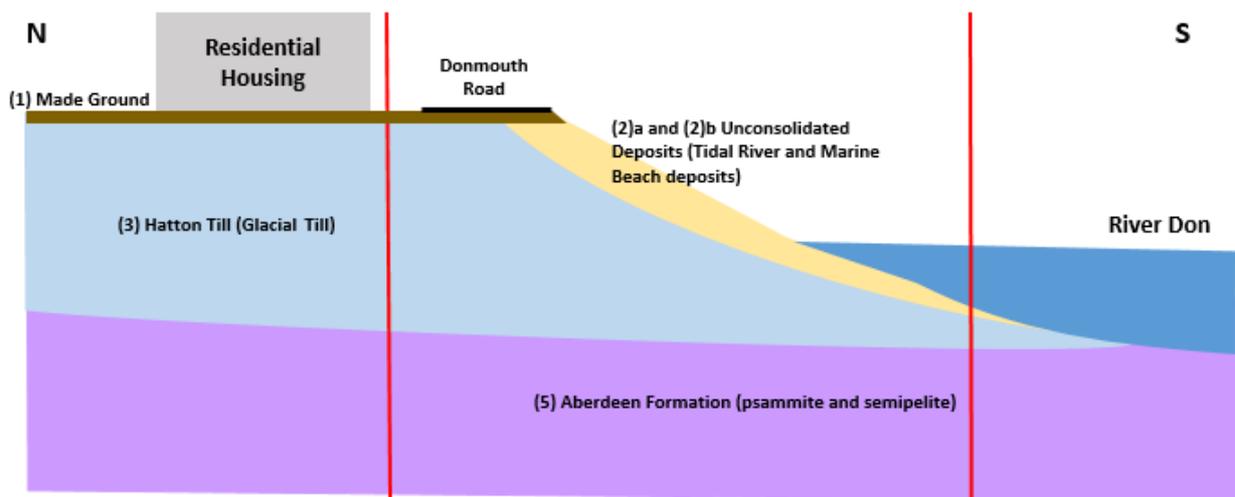
2.2.1 Preliminary Ground Model

The preliminary ground model for the site has been compiled using available published information, and is shown in Table 2.2 and Figure 2.3.

Table 2.2: Preliminary Ground Model

Strata ID	Thickness (m)	Description	Comment
(1) Made Ground	Unknown	Unknown	Associated with historical development of the site and Donmouth Road.
(2) Unconsolidated deposits	(2)a Tidal River Deposits	Clay, silt and sand with localised peat and gravel	Present across the majority of the site.
	(2)b Marine Beach Deposits	Gravel, sand, silt and clay	Present along the south west of the site.
(3) Hatton Till Formation	Unknown	Glacial till, described as diamicton, clayey, pebbly, calcareous, red, and crudely stratified	Note there is a glacial meltwater channel present within the till which is shown to be orientated from north to south, with the end of the channel within the western area of the site.
(4) Brig o' Balgownie Formation	Unknown	Interbedded conglomerate and sandstone	The lower boundary is defined by the unconformity with Aberdeen Formation. In the east of the site.
(5) Aberdeen Formation	Unknown	Interlayered psammite and semipelite	Present in the west of the site.

Figure 2.3: Illustrative Preliminary Ground Model



Do not scale

(4) Brig o' Balgownie – Conglomerate and Sandstone is not shown, however expected to be encountered beneath superficial deposits in the east of the site.

3 Summary and Conclusions

3.1 Site and Ground Conditions

The review of available geological records indicates the site to be underlain by unconsolidated deposits, glacial till, underlain by psammite and semi-pelite metamorphosed igneous rocks of the Aberdeen Formation and the Brig o' Balgownie. BGS borehole records nearby indicate superficial deposits consisting of sands, gravels and silts, with occasional buried peat/organic deposits, underlain by 'granulite' (a fine- to medium-grained metamorphic rock with a granular texture of polygonal crystals) which shows varying degrees of weathering.

Aerial imagery indicates that there has been recent and historical movement of the embankments along Donmouth Road.

Photographs and information provided as part of the tender information indicates that there has been recent movement of the slopes within the site, and that remediation measures have been constructed.

3.2 Recommendations for Further Work

Based on the above assessment, it is recommended that a site walkover is undertaken to map areas of erosion or damage to the coastal embankment. This information can then be used to assess the risk of instability along the coastal embankments, and determine the requirement for remedial measures and ground investigation at the site.

Should remedial measures be required at the site, consideration may need to be given to site constraints such as; the sites location within a nature reserve and any associated permissions or consents, the presence of made ground and the tidal location of the site.

4 References

1. National Library of Scotland, online mapping viewer, <http://maps.nls.uk/geo/explore> (accessed: December 2016)
2. British Geological Survey (BGS) Geology of Britain Viewer, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> (accessed: December 2016)
3. BGS GeoIndex Map Viewer, <http://mapapps2.bgs.ac.uk/geoindex/home.html> (accessed: August 2015)
4. BGS 1:625,000 Hydrogeological Map of Scotland
5. Scottish Environmental Protection Agency (SEPA) RBMP Online Viewer, <http://gis.sepa.org.uk/rbmp/> (accessed: August 2015)
6. Coal Authority Gazetteer for Scotland, <https://www.gov.uk/government/publications/coal-mining-andbrine-subsidence-claim-search-directory-of-places> (accessed: August 2015)
7. Coal Authority Interactive Map Viewer, <http://mapapps2.bgs.ac.uk/coalauthority/home.html> (accessed: December 2016)
8. BGS Non Coal Mining Plans Portal, <http://mapapps2.bgs.ac.uk/mineplans/home.html> (accessed: December 2016)
9. Zetica, Pre Desk Study Assessment, dated 16th December 2016
10. ACC, Map of Nature Reserve, <http://maps.aberdeencity.gov.uk> (accessed: December 2016)
11. Scottish Natural Heritage (SNH), interactive map, <http://www.snh.gov.uk/publications-data-and-research/snhi-information-service/map/> (accessed: December 2016)
12. Historic Environment Scotland (HES), Canmore Database, <https://www.historicenvironment.scot/archives-and-research/archives-and-collections/canmore-database/> (accessed: December 2016)
13. Google aerial imagery, <https://www.google.co.uk/maps> (accessed: December 2016)
14. Bing aerial imagery, <https://www.bing.com/maps> (accessed: December 2016)
15. ACC Tender Information Pack Vol 2.2 – Work Package 2 Scoping Document, Donmouth Road Coastal Embankment Condition Survey, dated October 2016.

