COMHAIRLE NAN EILEAN SIAR

ASSETS, FINANCES AND RESOURCES

LOCH NA OBE
BARRA

REPLACEMENT CAUSEWAY AND CULVERT OPENING

PLANNING CONSULTATION REPORT

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[redacted]

REPORT

CONTENTS

		PAGE No.
Contents		
1.0	General Project Details	Page 1
2.0	Nature of Project	Page 1
3.0	Method Statement	Page 2
4.0	Consultations	Page 2
5.0	Land Ownership and Access	Page 2
6.0	Other relevant Issues	Page 4
7.0	Alternatives Considered/Comparison	Page 4

APPENDIX A – LOCATION PLAN and MHWS LEVELS

APPENDIX B – PROPOSED GENERAL ARRANGEMENT

APPENDIX C – PHOTOGRAPHS

APPENDIX D – CONSULTATIONS

APPENDIX E – METHOD STATEMENT

REVISIONS

Rev.	Date	DESCRIPTION	SIGNATURE
-	17-05-22	Issue 1	Angus M Gillies
1	23-08-22	Issue 2	Angus M Gillies

PREPARED BY Angus M Gillies BEng, MSc, MICE,CEng		
DATE 22/05/22		
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1.0 GENERAL PROJECT DETAILS

Comhairle nan Eilean Siar (CNES) as part of its obligation to maintain all infrastructure within its network propose to replace the existing Loch na Obe causeway and structure, Barra (Structure S140), following the findings of an emergency inspection on the 6th September 2021. The inspection confirmed collapse of the existing abutment east wall section such that it has potential to destabilise the bridging slab structure and an eventual collapse mechanism.

The structure has been temporarily supported using compacted rock fill to the east abutment side to provide additional support from the roadside verge to river bed level adjacent to the bridging slab support. The general condition of the overall causeway and the extent of repairs required to return the structure to a satisfactory condition cannot be justified in terms of the return for investment and would not in any case alleviate the current flood risk associated with the location.

Location plan of the structure and plan showing existing MHWS levels is shown in Appendix A.

NGR: NF 70949 01873.

2.0 NATURE OF PROJECT

Substructures

The works require the formation of rock fill embankments either side of the existing channel through which Obe river runs into little Loch na Obe and thereafter into the sea estuary. Loch na Obe is a sheltered tidal inlet which is not exposed to significant wave action or rapid tidal flows. The embankment is to be constructed using local quarry sourced material as main fill compacted in layers and protected with large 60 – 300kg stone/rock armour as a protective layer. These embankments will form the sub-structural support for the causeway approaches to a pre-cast concrete culvert which allows river and tidal flows from little loch na Obe. The final road level of the proposed causeway system shall be increased from the existing 2.601m AoD to 4.480m AoD to account for 1:200 year flood, climate change (1.0m) and freeboard (0.6m).

Culvert structure

The main structure comprises a 2.6m span pre-cast concrete box culvert delivered to site in 2.071m sections with cast in-situ wingwalls, inlet and outlet bases. The box sections shall be delivered using artic vehicles and installed on site using cranes and pulleys. The construction sequence shall require traffic flows to be maintained using half and half construction of the box sections across the width of the carriageway. The invert of the box structure is to be buried below bed level and a minimum of 450mm of existing bed material is to be reinstated to the culvert invert level.

Load capacity:	40t.
Finish:	F3.
Design Life:	120 years
Material	min C40/50 concrete
Cover	XS3 (BS 8500-1)

No significant marine traffic currently uses the existing opening. Clearance from high water to soffit level shall be marginally increased from the existing structure by 0.7m. The width of the clear opening shall be increased from 1.8m to 2.6m.

Approach Roads

The existing approach roads shall require some re-alignment to tie into the new causeway. The width of the road shall be widened to accommodate 2 lanes of traffic over the extents of the causeway. This will require widening to both sides of the existing embankment using compacted rock fill placed symmetrically either side of the existing causeway core structure. The carriageway width shall be 6.3m with 1.25m wide verges either side and rock armour boulders provided to act as restraint barriers in character with existing barrier systems to Northbay in Barra and less susceptible to corrosion in a marine environment.

An outline of the scheme is contained within Appendix B.

Photographs of the existing structure are contained in Appendix C.

3.0 METHOD STATEMENT

Traffic management

- The works are to be carried out under traffic management. Signage shall be erected advising the public of the planned works 3 weeks prior to start date.
- Traffic shall continue to use the existing causeway under traffic management until the replacement is in place. Intermittent short term closures may be required throughout the duration of the works.

Rock fill

Rock fill and armour stone shall be imported from a local quarry source using 6 or 8 wheel tipper lorries using the existing road network.

Culvert

The culvert sections shall be installed by crane on compacted rock fill overlaid with a depth of blinding mass concrete as required. In-situ concrete works shall be undertaken in dry conditions using overpumping and concrete mixes shall include an anti-washout.

Quantities

Approximate fill quantities in main embankment works:

Item of Fill	Rock Armour Tonnes (Slope Armour)	Rock Armour Tonnes (Toe Armour)	General core rock fill (m^3)	Concrete Tonnes (Precast Units)	Concrete Tonnes (In-situ concrete)
Above MHWS	3919	-	1421	75	-
Below MHWS	2002	2080	800	175	25
Total	5921	2080	2221	250	25

4.0 CONSULATIONS

A number of statutory consultees have to be consulted with regards to the proposed development, these include:

- Marine Scotland.
- Planning.
- Pier and Harbours.
- Scottish Environmental Protection Agency (SEPA).
- Crown Estates Scotland.
- Nature Scotland.
- Western Isles Archaeologist.
- Historic Scotland.
- Land owners.

SEPA, Planning, Pier and Harbours, Landowners and Nature Scotland have been contacted to date. Archaeologist and Historic Scotland shall be consulted during the planning application stages although it is thought the land acquisition and works will have little impact on archaeology of historic structures. Crown Estates and Landowners shall be formally consulted with through CNES legal services.

Land acquisition and access permits are currently being sought in areas affected by the works.
A number of the consultees are currently still be engaged in active discussions regarding the works. Marine Scotland will take the lead role for consultation requirements in the works adjacent to the loch inlet and/or below MHWS tidal level.

We await response from Nature Scotland - Otter survey may have to be carried out and a report forwarded to assess whether an Otter licence is required for the works.

Marine Scotland and Planning may screen the proposals to determine whether an Environmental Impact Assessment is required.

Reference has been made to Scotland's National Marine Plan:

GEN 2	Economic benefit to road users and island residents, tourism and business development.
GEN 3	Social benefit to allow ease of residential access for buses and coaches.
GEN 6	Consultation with Historic Environment Scotland, Archaeological Services and Nature Scotland.
GEN 7	Natural stone facing armour stone to blend in with existing coast line.
GEN 9	Nature Scotland consulted, otter surveys to be carried out if required and licence to be in place prior to works if required.
GEN 11	No disposals in marine environment.
GEN 13	Noise reduction to be stipulated for machinery, no blasting.
GEN 14	Dust to be reduced by water dampening, designated fuel areas bunded.
GEN 18	Public engagement through community groups and media outlets.

SNH website has been viewed to determine if the works are in the vicinity of any conservation areas and no areas were identified adjacent to the works.

5.0 LAND OWNERSHIP AND ACCESS

Landowners to the approaches have been identified and written correspondence will be sent with regards to the extent of ground to be permanently or temporary required for the purposes of the embankment construction.

The west side of the scheme footprint is owned by Mr Michael Mackinnon, Morghan, Isle of Barra. Following on site meeting during visit 22nd March 2022 he has no objection in principle to the scheme or any land take required.

East side of embankment is presumed to be owned by Crown Estates. No response received to date and we await response from CNES legal services but considering minimal land take required there should be issues for the embankment footprint.

6.0 OTHER RELEVANT ISSUES

Utilities

A 110mm dia HDPE Scottish Water main is located on the inlet side of the causeway buried within the existing bed material approximately 6.0m from the outer embankment wall. A BT amoured cable is located to the outlet side of the causeway buried within the verge running to a junction box noted in the survey and crossing the road to the household towards the east side of the causeway.

Marine

A fish farm exists in Loch na Obe inlet and uses approach embankment for tying up barges/walkway which will have to be removed. Fish farm will be notified of the works and we await their response for any mitigation factors to be included within the contract.

7.0 ALTERNATIVES CONSIDERED/COMPARISON

Type	Est cost	Design life	Cost/yr	Notes
2 lane causeway (i)	500,000	120 +	4,000	Best long term option. Could potentially be built relatively quickly and cheaper as costs based on locally imported rock. Within character of area and does not substantially change the existing structure and layout. Better alignment for road users.
Single lane causeway (ii)	500,000	120 +	4,000	Good long term option as per option Causeway(i) but restricting road width to one lane to reduce embankment width. Some benefit from reduced materials but culvert will still require full width to accommodate traffic flows during construction. Savings offset by added complexity during construction stages.
Bridge with approach embankments	1,000,000	120 +	2,000	Good from marine and planning perspective. High upfront cost and

				timescale for installation. Also no real requirement for larger spanning bridge option. Poor in terms of aesthetics and not within character of local area.
Temporary remedial works	100,000	15	6,700	Cheaper short term solution but will not resolve issues with flooding of existing approaches and structure and will likely require future works and constant monitoring.

8.0 SUMMARY

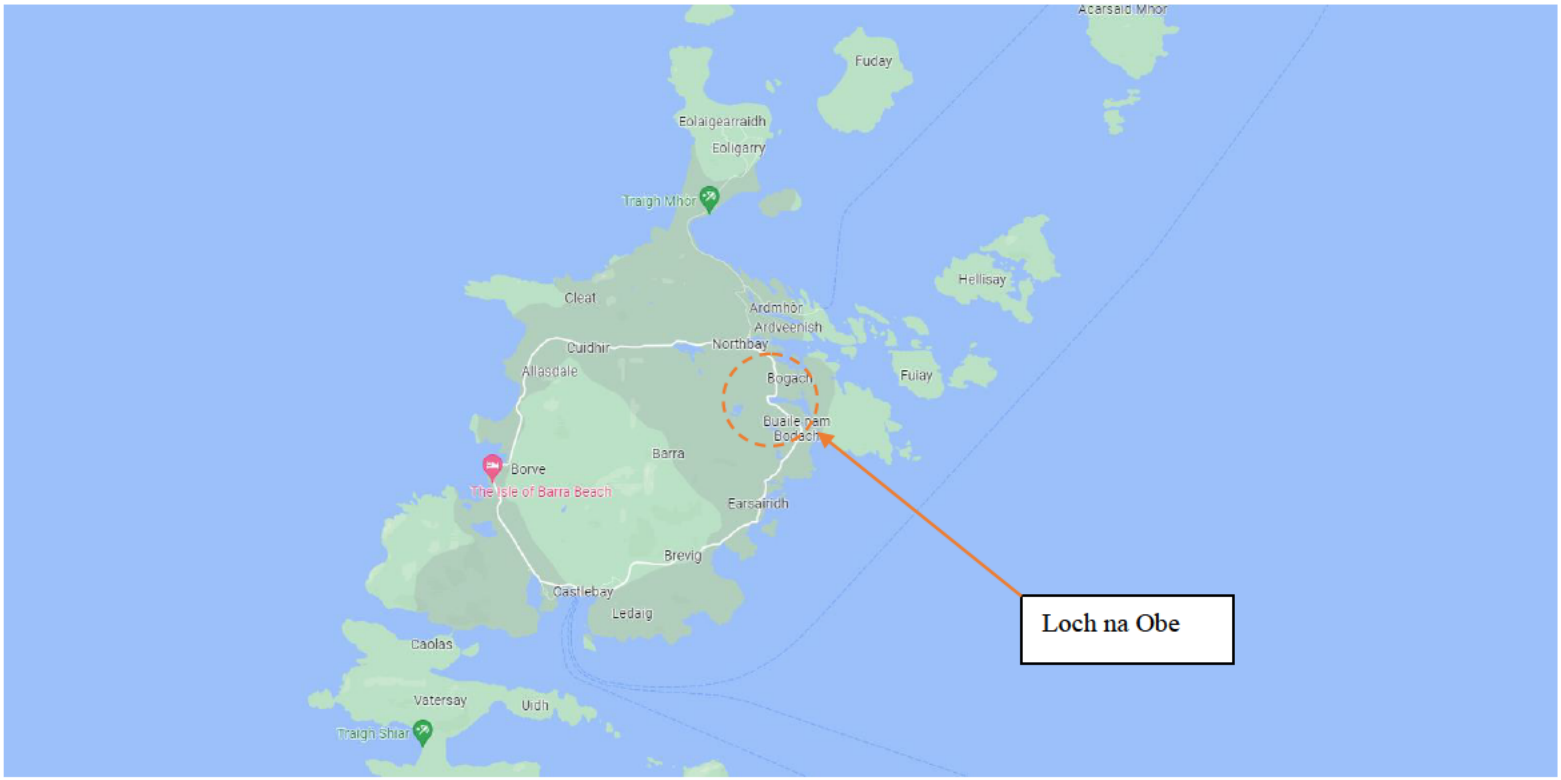
Existing causeway to be replaced with a 2 lane carriageway supported on rock fill embankments with small armourstone/rock protective outer layer. Level of the replacement structure shall be increased from the existing to accommodate flooding and sea level rise.

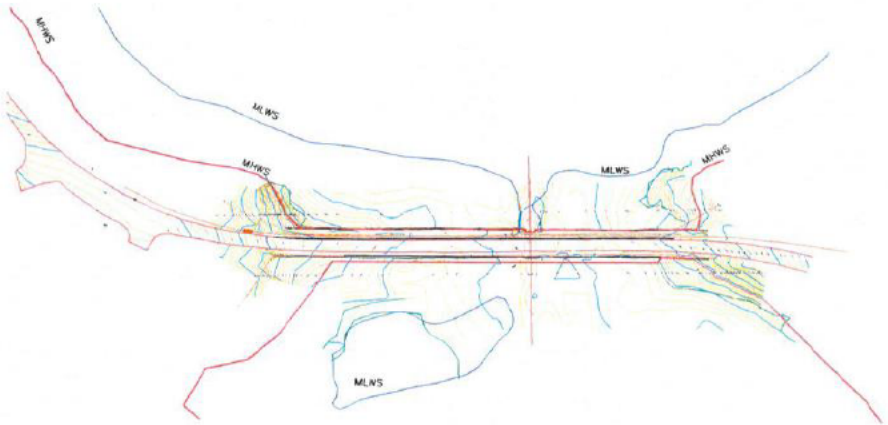
Existing river/tidal outlet bridge location to be retained with the replacement of with pre-cast concrete culvert units allowing for marginal width increase and raised soffit level.

Road restraint provided by rock armour boulders to retain the character of the surrounding area.

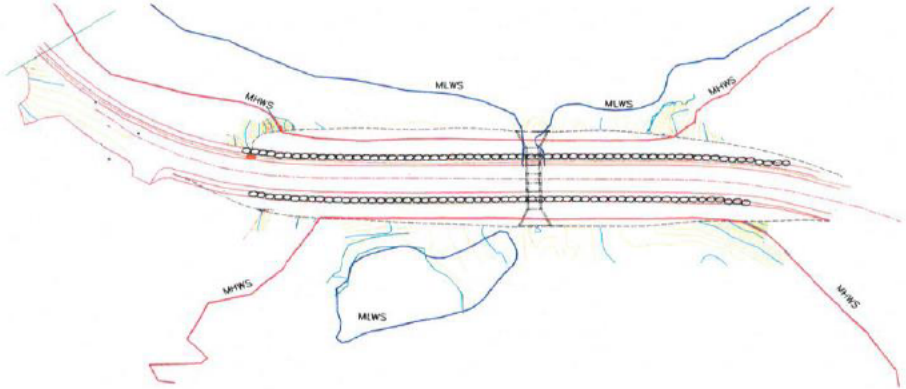
APPENDIX A

Location Plan and MHWS Levels

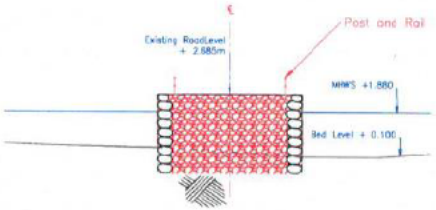

Acarsaid Mhor
Fuday
Eolaigearraidh
Eoligarry
Traigh Mhor
Hellisay
Cleat
Ardmhor
Ardveenish
Northbay
Cuidhir
Allasdale
Bogach
Fuiay
Buaile nam Bodach
Barra
Borve
The Isle of Barra Beach
Earsairidh
Brevig
Castlebay
Ledaig
Caolas
Vatersay
Uidh
Traigh Shiar
Loch na Obe



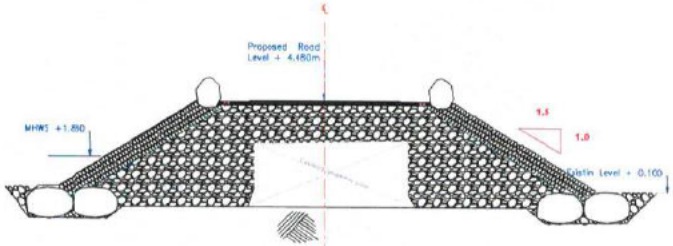
Existing Alignment High and Low Tide
Scale 1:500



Proposed Alignment High and Low Tide
Scale 1:500



Existing Causeway
Scale 1:100



Proposed Causeway
Scale 1:100

Do not scale from this drawing, work to figured dimensions only. All existing dimensions to be checked on site. All discrepancies must be notified to the issuing office.

This drawing is to be read in conjunction with all other relevant documentation including that produced by other Consultants Departments, consultants, sub-contractors and suppliers.

NOTES:

1. All survey measurement carried out using Spectra Precision PM 500 base corrected RTK GPS position system.
2. Measurements to ETRS89 transformed to Ordance Survey GB using OSTN 15.
3. Survey carried out by NMK 06th and 7th October 2017.
4. Tide Chart levels from Marine Chart Reference 2778 Sound of Barra.

MHWS	1.880m
MHWN	0.880m
MLWN	-0.520m
MLWS	-1.720m

Levels AoD
Chart Datum 2.32m below Ordnance Datum (Local)

rev	description	drawn	chd	date

COMHAIRLE NAN EILEAN SIAR
ASSETS AND INFRASTRUCTURE:

Project:
Loch na Obe
Replacement Culvert and Approaches
Structure S140

Drawing:
Marine Plan

Project No: T600

Scale:	As Shown at A1	Date:	31/03/22
Original Size:	A1	Drawn:	AMG
		Checked:	AMG

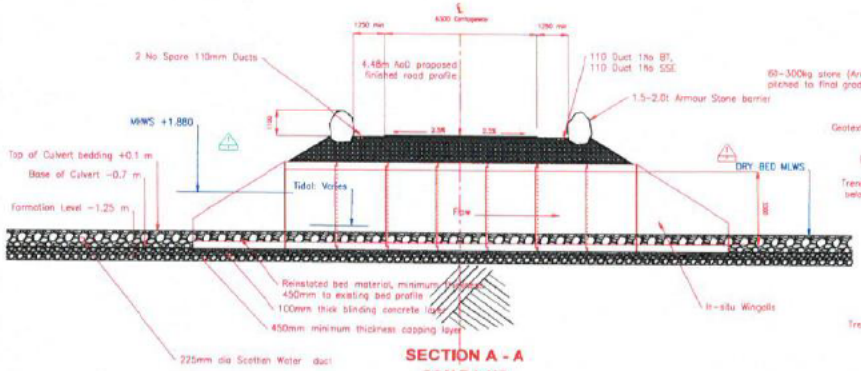
Angus McMillan, HEng, MSc., CEng, MICE
Bridges and Structures Engineer
Goodwick Road, Stornoway, HS1 2BW [redacted]
Goodwick, Stornoway, HS1 2BW [redacted]

PRELIMINARY

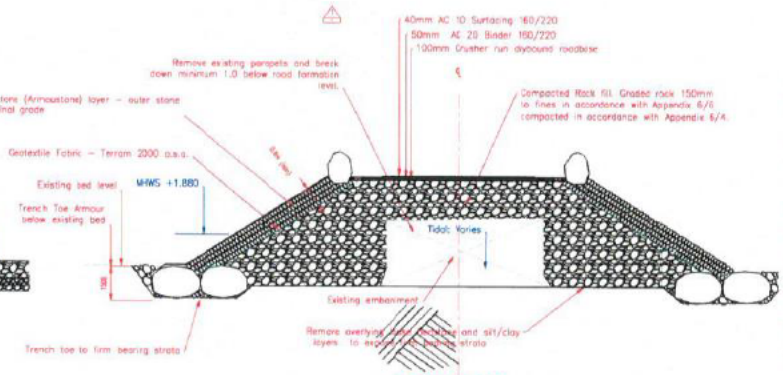
DRAWING No. 14A (SB 45) Marine Plan Rev.

APPENDIX B

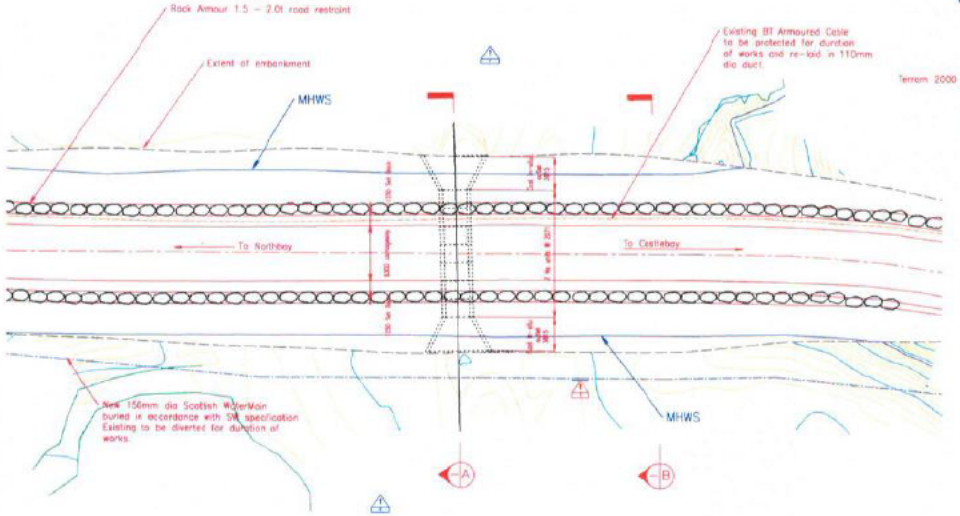
Proposed General Arrangement



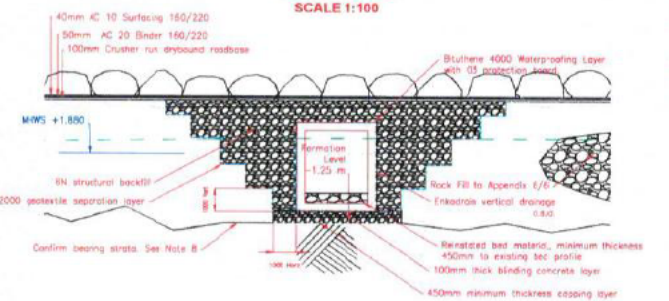
SECTION A - A
SCALE 1:100

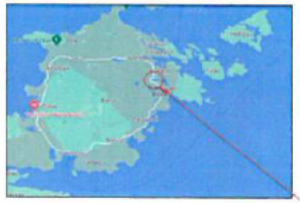


SECTION B -B
SCALE 1:100

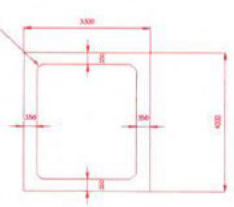


PLAN
SCALE 1:250





LOCATION PLAN
SCALE NTS



CULVERT DIMENSIONS
SCALE 1:100

Do not scale from this drawing; work to figured dimensions only. All existing dimensions to be checked on site. All discrepancies must be notified to the issuing office.

This drawing is to be read in conjunction with all other relevant documentation including that produced by other Comhairle Departments, consultants, sub-contractors and suppliers.

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NOTES:

1. ALL DIMENSIONS IN mm U.N.O.
2. ALL LEVELS IN METERS AND RELATIVE TO ORDNANCE DATUM.
3. THERE ARE RECORDED BURIED SERVICES TO THE MUST AS SHOWN ON SITE PLAN LAYOUT. THESE WERE ESTABLISHED FROM INITIAL SERVICES SEARCHES AND SITE SURVEY 20-10-17. SERVICES ARE TO BE CONFIRMED PRIOR TO COMMENCING ANY WORKS IN CONSULTATION WITH UTILITIES PROVIDERS.
4. ROCK PROFILE/BEARING STRATA TO BE CONFIRMED BY SITE INVESTIGATION FOLLOWING SI GEOTECHNICAL REPORT. FOUNDING LEVELS SHALL BE CONFIRM.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING ALL BURIED SERVICES AND MARK THEIR LOCATION/PROVIDE PROTECTION IN ACCORDANCE WITH RECOMMENDATION OF THE UTILITIES PROVIDERS PRIOR TO COMMENCING THE WORKS. SEE CONTRACT SPECIAL REQUIREMENTS AND DRAWING 14A (5B 45) 004 FOR FURTHER DETAILS.
6. CONTRACTOR SHALL LIAISE WITH THE CULVERT SUPPLIER AND INSTALLATION METHOD FOR ANY TEMPORARY WORKS REQUIRED.
7. TRAFFIC SHALL BE MAINTAINED ON THE EXISTING CAUSEWAY BRIDGE UNDER TRAFFIC MANAGEMENT AND DIRECTED FOLLOWING INSTALLATION OF THE UPSTREAM HALF OF THE CULVERT. DOWNSTREAM CULVERT SHALL THEN BE INSTALLED FOLLOWING EXCAVATION AND DEMOLITION OF REMAINING BRIDGE SECTION.
8. ENGINEER TO CONFIRM FOUNDATION LEVEL TO REDUCE RISK OF DIFFERENTIAL SETTLEMENT. FORMATION LEVEL SHALL COMPRISE OF SOUND BED MATERIAL OR ROCK. EXCESS DIFFERENTIAL FOUNDING LEVELS SHALL BE MINIMISED BY ROCK BREAK-OUT, MASS CONCRETE OR COMBINATION THEREOF.
9. ALL EXPOSED CONCRETE FINISHES SHALL BE F3, U3. ALL BURIED SURFACES SHALL BE F2, F2, IN ACCORDANCE WITH SPECIFICATION APPENDIX 17/3.
10. ALL EXPOSED CONCRETE SHALL HAVE 25 X 25 CHAMFERS.
11. ALL BURIED SURFACES NOT PROTECTED BY WATERPROOFING SHALL HAVE 1 COATS BITUMINOUS BASED PAINT AND ALL EXPOSED CONCRETE SURFACES TREATED IN ACCORDANCE WITH BS 8215.
12. CONTRACTOR SHALL LIAISE WITH FISHERIES AND HARBOUR AUTHORITIES AND SHALL MINIMISE IMPACT OF THE WORKS TO EXISTING FISHERIES OR SHELLFISH INSTALLATIONS WITHIN THE VICINITY OF THE WORKS. MITIGATION OF POLLUTION SHALL COMPRISE OF REDUCED FINES CONTENT IN EMBANKMENT FILL BELOW WATER LEVEL AND INFILL OPERATION RESTRICTED TO LOW WATER DRY BED CONDITIONS.
13. ROCK FILL SHALL BE SA BELOW ANY MLWS AREAS OTHERWISE ROCK FILL SHALL BE IN ACCORDANCE WITH SPECIFICATION APPENDIX 6/6 COMPACTED IN ACCORDANCE WITH APPENDIX 6/4
14. ALL STRUCTURAL FILL ABOVE MLWS IN EMBANKMENTS SHALL BE IN ACCORDANCE WITH APPENDIX 6/6 COMPACTED IN ACCORDANCE WITH APPENDIX 6/4. FILL ADJACENT TO STRUCTURES SHALL BE IN COMPACTED IN ACCORDANCE WITH APPENDIX 6/4.
15. TERRAM SHALL BE PLACED BETWEEN OUTER EMBANKMENT ARMOURSTONE LAYER AND COMPACTED FILL.
16. TOE ARMOURSTONE FOUNDING LAYER TO BE CHECKED BY THE ENGINEER FOR SUFFICIENT BEARING CAPACITY AND STABILITY PRIOR TO EMBANKMENT CONSTRUCTION.
17. CULVERT MIN ALLOWABLE BEARING PRESSURE 150KPA FOUNDING LAYERS TO BE COMPACTED IN ACCORDANCE WITH SPECIFICATION APPENDIX 6/4 TO ACHIEVE REQUIRED BEARING PRESSURE. DENSITY TESTING OF COMPACTED FILL AS DESCRIBED BY THE ENGINEER ON SITE TO BS 1377-4.

rev	description	drawn	ckd	date

COMHAIRLE NAN EILEAN SIAR
ASSETS AND INFRASTRUCTURE:

Project:
Loch Na Obe
Replacement Culvert and Approaches structure S140

Drawing:
Plan and Longitudinal Section

Project No: T500

Scale:	As Shown @A1	Date:	31/03/22
Original Size:	A1	Drawn:	AMO
		Checked:	AMO

Angus M Gillies, BEng, MSc., CEng, MICE
Bridges and Structures Engineer
[redacted] Road, Stornoway, HS1 2BW [redacted]
Balivanich, Benbecula, HS7 5LS [redacted]

SIGNIFICANT RESIDUAL HAZARDS

PRELIMINARY

DRAWING No. 14A (5B 45) 001

Rev:

APPENDIX C

Photographs

Looking West

Looking East

Typical stone wall arrangement

Collapsed wall section adjacent to bridge opening

APPENDIX D

Consultations

a) Piers and Harbours

Angus Gillies

From:	Angus Gillies
Sent:	31 May 2022 16:55
To:	Kenneth Morrison - TS | G
Cc:	Iain Buchanan
Subject:	Loch na Obe - Culvert Replacement Barra
Attachments:	Marine Plan - 14A (5B 45).pdf; Loch na Obe 1 to 2500 (Mark Up).pdf; Loch Na Obe.pdf; IMG_2931.JPG; IMG_2934.JPG; IMG_2904.JPG; Loch na Obe Aerial.pdf

Kenny/Iain,

See attached plan, photos and location map showing details of proposed culvert replacement project adjacent to Loch na Obe, Barra. Location is between Bogach and Baile na Bodach.

Applying for marine licence for the works and just thought I would run this by you. Existing causeway is marine environment but suspect there will be little or no implications for pier and harbours other than acknowledgement of the works or notification to any fish farms that may be using Loch na Obe inlet. We note some pontoons tied up adjacent to the existing causeway but think these have been there for some time.

Regards

Aonghas MacGillosa (Angus M Gillies), BEng., MSc., CEng., MICE
Innleadair Drochaid agus Togailichean (Bridges and Structures Engineer)|
Rathaidean, Drochhaidean agus Solais (Roads, Bridges and Street Lighting)
Comhairle nan Eilean Siar | Rathad Shanndabhaig | Steornabhagh | Eilean Leodhais | HS1 2BW
[redacted]

(2) PLANNING DEPARTMENT

Innleadair Drochaid agus Togailichean (Bridges and Structures Engineer) |
Rathaidean, Drochaidean agus Solais (Roads, Bridges and Street Lighting)
Angus Gillies
Comhairle nan Eilean Siar | Rathad Shannda[illegible] | Steòrnabhagh | Eilean Leòdhais | HS1 2BW
[redacted]

Cc: [redacted] Morag Ferguson - Dev | G; Anne Napier; Lee Harkness
RE: Loch Na Obe Culvert Replacement - Barra

Ag Obair Comhla airson na h-Eileanan Siar **COMHAIRLE NAN EILEAN SIAR** Working Together for the Western Isles

From: Angus Gillies <[redacted]
Sent: 17 March 2022 17:13
To: Iain Macleod - Planning <[redacted]
Subject: Loch Na Obe Culvert Replacement - Barra

Iain,

Initial stages of looking into replacement structure on the A888 Barra loop road at Loch na Obe - see attached map.

We would like to follow current requirements for the minimum design level of road on the new section of road to cater for the 1:200 flood event and climate change effects similar to recommendations in email below on Bernera.

The existing structure is in poor condition structurally and approach causeways are subject to tidal flooding during combinations of high water spring tides and pressure system surges.

From Lochboisdale Chart

MHWS	-	4.1m
MLWS	-	0.5m
Chart datum	-	2.32 below OD local

Culvert level	-	2.4m AoD
MHWS	-	1.78m AoD
MLWS	-	-1.82m AoD

Can you provide recommendation for design level of structure at this location using Coastal Flood Boundary Method. I have assumed mhws + 1.1m

Estimate using methodology as per Bernera: 1.78 (mhws) +1.1 (1:200)+1.0 (sea rise)+ 0.6 (freeboard) = 4.480m AoD. This seems excessive for location as we would be required to lift embankment heights 2.0m above existing. The higher the embankment the greater the need for material infill and hence cost.

Let us know your thoughts on the above and whether there can be any relaxation on the height of embankment required.

Regards

Aonghas MacGillosa (Angus M Gillies), BEng., MSc., CEng., MICE

(3) NATURE SCOTLAND

Angus Gillies

From:	Angus Gillies
Sent:	12 May 2022 17:42
To:	Roddy MacMinn
Subject:	Loch na Obe (Barra) - Culvert and Causeway Replacement
Attachments:	General Arrangement - Boundary and Location Plans.pdf; General Arrangement - 000-Topographical Survey.pdf; General Arrangement - 001-General Arrangement.pdf; IMG_6145.JPG; IMG_6146.JPG

Hi Roddy,

Another bridge replacement works currently being developed for Loch Na Obe area in Barra and looking initiate contact with SNH to assess what the survey requirement are going to be for the works.

Attach proposed drawing, topo survey and some photos.

The existing culvert has deteriorated to the point whereby the east side abutment has collapsed and remaining causeway is becoming unstable.

NGR: NF 70950 01869

Had a look at Nature Scotland maps for SSSI and any site restrictions but does not look like there is anything in this area. Let us know your thoughts once you have had time to look through the attached.

Regards

Aonghas MacGillosa (Angus M Gillies), BEng., MSc., CEng., MICE
Innleadair Drochaid agus Togailichean (Bridges and Structures Engineer)|
Rathaidean, Drochhaidean agus Solais (Roads, Bridges and Street Lighting)
Comhairle nan Eilean Siar | Rathad Shanndabhaig | Steornabhagh | Eilean Leodhais | HS1 2BW
[redacted]

(4) SEPA

Good day Angus. Thanks for the consultation. The causeway and structure here is on coastal waters which extends up to tidal limit at NF 70864 01847. As such the CAR engineering regime relates to inland waters only and does not extend to coastal and transitional waters. Therefore any engineering work to the causeway and culvert and other such road structures here will require to be undertaken in accordance with the requirements of Marine Scotland and does not require any watercourse engineering authorisation from SEPA. SEPAs only remit at this location under CAR are pollution control ones for any runoff. I enclose a link to good practice pollution prevention guidance note for working in or near water gpp-5-works-and-maintenance-in-or-near-water.pdf (netregs.org.uk).
Regards

John McCabe – Environment Protection Officer, Water Permitting Team
Scottish Environment Protection Agency, 31 Miller Road, Ayr KA7 2AX
[redacted]

From: Angus Gillies <[redacted]
Sent: 20 May 2022 16:05
To: CB Permitting Water <waterpermitting@sepa.org.uk>
Subject: ENG - Causeway and Structure Replacement - Loch na Obe - Isle of Barra

Enquiry regarding SEPA requirements for proposed emergency installation bridge and causeway works , Loch na Obe, Morghan, Isle of Barra.

The existing structure has been in poor condition for the past 10+ years with multiple defects to the support walls and embankments. Other notable issues raised with regards the structure include defective non-standard parapets and flooding of the embankment during periods of high tides when in combination with low pressures weather systems and certain wind directions. Road structure is typically closed 1-2 times per year due to flooding and has been highlighted as a high risk area for flooding and future sea level rise. Recent collapse of outer stonework adjacent to the bridge abutment has raised concern over the long term integrity of the structure. Consequently we propose to provide a replacement structure and approach embankments.

Proposal is to install widened embankment to carry a dual carriageway road at a higher road level than existing with adequate road side restraint along a similar alignment. Embankment opening shall

APPENDIX E

Method Statement

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LOCH NA OBE CULVERT AND EMBANKMENT REPLACEMENT
METHOD STATEMENTS

The following Method Statements refer to the Watercourses listed as follows:

Loch Na Obe culvert and approach road embankment widening. NGR: NF 70949 01873

Method Statement – Replacement Culvert

Watercourses covered by this method statement: Little Loch na Obe
Culvert: Replacement of 1.8m wide bridge slab structure with 2.6m wide Precast Box Culvert.
Alignment: Increase road width from single track to double track.

Hazards
Pollution from construction plant
Silt and clay sediment going to sea outfall or settling out in watercourse
Disturbing the natural bed in watercourse

Environmental Measures
Plant to be clean and checked for oil, fuel or hydraulic fluid leaks.
Fuelling not to be carried out within 10m of a watercourse. Spill kits to be immediately accessible. Mobile fuel bowser intrinsically tamper proof with self contained bunding.
Contractor to contact Western Isles Fisheries if appropriate.

Environmental Methodology
Multiple silt settlement traps to be placed downstream of the culvert using sand bags and or straw bales. Traps to be emptied of silt during the works and immediately prior to removal. Silt to be deposited in an area remote from watercourse. On completion of the works the silt sediment traps to be removed and the watercourse allowed to return to normal.

The flows are conducive to relying only on silt settlement traps during construction but if silt traps are overwhelmed pump from first silt settlement trap overland and allow silted water to soakaway and filter through the natural vegetation

Construction

- Protect and/or relocate existing services.
- Install water management and traffic management.
- Excavate trench upstream and place toe armour.
- Remove loose stone, gravel and silt from upstream embankment foundations.
- Infill embankment up to temporary road level in compacted layers.
- Divert traffic under traffic management to upstream side, protect edge with vehicle restraints.
- Excavate downstream trench, place toe armour, remove loose materials and infill embankment up to temporary road level.
- Remove downstream bridge over half the embankment width.
- Under tidal works and water management place concrete apron and wingwall sections on downstream side.
- Excavate foundations approximately 450mm below existing bed level and retain material for reuse.
- Lay culvert bed materials and install downstream culvert sections.
- Backfill structure adjacent to box sections, complete trenching and backfill and divert traffic to downstream culverts.
- Under traffic management and temporary road restraints remove remaining upstream bridge section.

- Repeat installation to upstream section as above for remaining works.
- Complete embankment works to final levels.
- Complete road base, surfacing and restraint barrier armour.
- Reinstate services in roadside verges.
- White lining, fencing and miscellaneous works.

General Notes

Any fish caught to be placed downstream and mesh screens provided to prevent fish entering work zone.

SEPA to be alerted should any significant silting or pollution occur.