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Dear Derek

**South Bonar Campsite, Bonar Bridge
Stage 1 Coastal Flood Risk Assessment**

Please find attached a summary report, which outlines a high level assessment of the current coastal flood risk conditions at your site. Our analysis of publicly available LiDAR data, in conjunction with the extreme tidal levels dataset and future climate change projections, indicate that the southern section of the site is within the 1 in 200 year coastal flood extent, along with much of the low lying land to the west and south-west of the site. However, given the proposals are for the redevelopment of a previously developed site, with no change to the land use vulnerability, we are confident that the principle of development can be asserted and agreed with the Scottish Environment Protection Agency (SEPA) and The Highland Council (THC).

If required, and following consultation with SEPA and THC, we will provide the client with an additional scope and fee proposal for conducting a detailed Flood Risk Assessment (FRA) to satisfy the requirements of SEPA and THC.

We are open to discuss any aspects of the report and look forward to speaking with you in due course.

Yours sincerely
for EnviroCentre Ltd

(issued electronically)

David Hall
Environmental Consultant

Dr Iain Struthers
Principal Consultant

PROPOSED REDEVELOPMENT OF SOUTH BONAR CAMPSITE, BONAR BRIDGE: FLOOD RISK ASSESSMENT

Outline of Work and Methodology

EnviroCentre Limited were commissioned by David Narro Associates to undertake a high level Flood Risk Assessment (FRA) for a proposed redevelopment at South Bonar Campsite, Bonar Bridge. The Scottish Environment Protection Agency (SEPA) have published flood extent maps¹, which indicate that the site is at high risk of coastal flooding, with no significant flood risk from other sources. This assessment therefore focuses on understanding coastal flood risk to the site.

This assessment involved:

- review of existing information, including relevant development planning guidance;
- extreme sea level analysis to determine the coastal flood extents during a 1 in 200 year (0.5% AEP) return period event accounting for climate change, and;
- preparation of a plan showing the coastal flood extents across the site and surrounding land.

Local Topography

LiDAR for Scotland Phase II digital terrain data² was used to assess topography within and adjacent to the development site. This data indicates that land elevations across the site vary between approximately 2 mAOD, along much of the eastern boundary of the site, and approximately 5 mAOD near the northern boundary (adjacent to the A836). There are large areas of low lying ground (less than 3 mAOD) to the west of the site and also to the north of the A836. The elevation of the section of the A836 immediately adjacent to the site ranges from 4-6 mAOD, with slightly lower elevations further to the west along the A836 (3-4 mAOD).

Coastal Flood Risk

Table 1 provides a range of extreme design sea water levels. These levels have been derived from the Environment Agency/Department for Environment Food and Rural Affairs report entitled “Coastal flood boundary conditions for UK mainland and islands” (McMillan et al., 2011), which has been adopted by SEPA. This methodology includes the effects of both atmospheric tides and storm surge, but does not take into account the potential effects of wave action, funnelling or local bathymetry at this location. SEPA have indicated that an approximate 1 in 200 year water level for the area is **3.27 mAOD**, with a confidence interval of $\pm 0.3\text{m}$, based on extreme still water level calculations using the

¹ <https://map.sepa.org.uk/floodmap/map.htm>

² <https://remotesensingdata.gov.scot/data#/map>



Coastal Flood Boundary (CFB) Method. Due to the position of the site on the Kyle of Sutherland, wave action is not considered likely to provide a significant effect.

Table 1: Extreme Sea Levels for Bonar Bridge (22km from site, base year 2008)

Flood Return Period (years)	Extreme Sea Level (mAOD)	Confidence Interval (m)
2	2.86	±0.2
5	2.94	±0.2
10	3.01	±0.2
25	3.09	±0.2
50	3.15	±0.2
75	3.18	±0.2
100	3.21	±0.3
200	3.27	±0.3
500	3.36	±0.3
1000	3.43	±0.4

SEPA's latest (2019) climate change guidance³ advises applying a sea level rise of 0.89m for the North Highland River Basin Region to account for the impacts of climate change up to the year 2100. An approximate 1 in 200 year plus climate change water level for the area would therefore be **4.16 mAOD**. Figures 1 and 2 indicate the projected coastal flood extent across the site and surrounding land (based on LiDAR ground levels) for the 1 in 200 year and 1 in 200 year plus climate change flood events, respectively.

³ https://www.sepa.org.uk/media/426913/lups_cc1.pdf

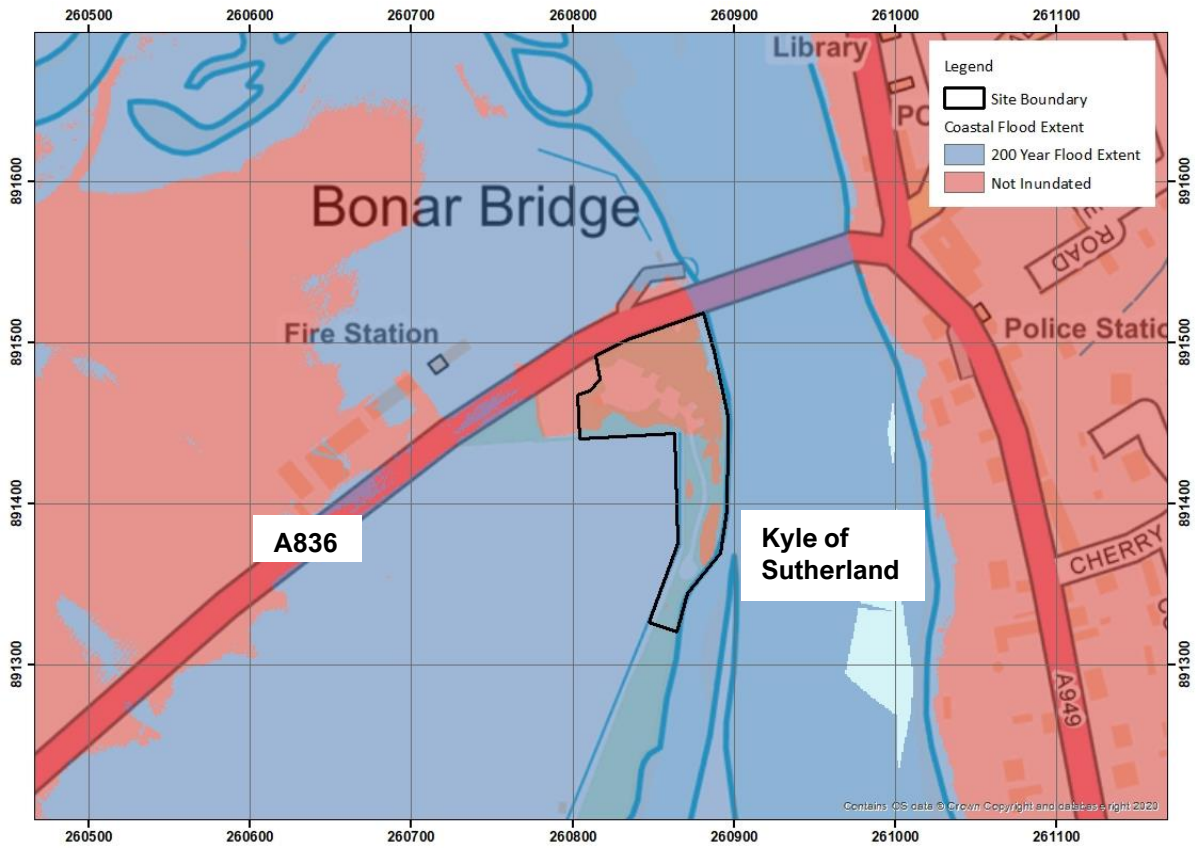


Figure 1: 1 in 200 year (0.5% AEP) coastal flood extent

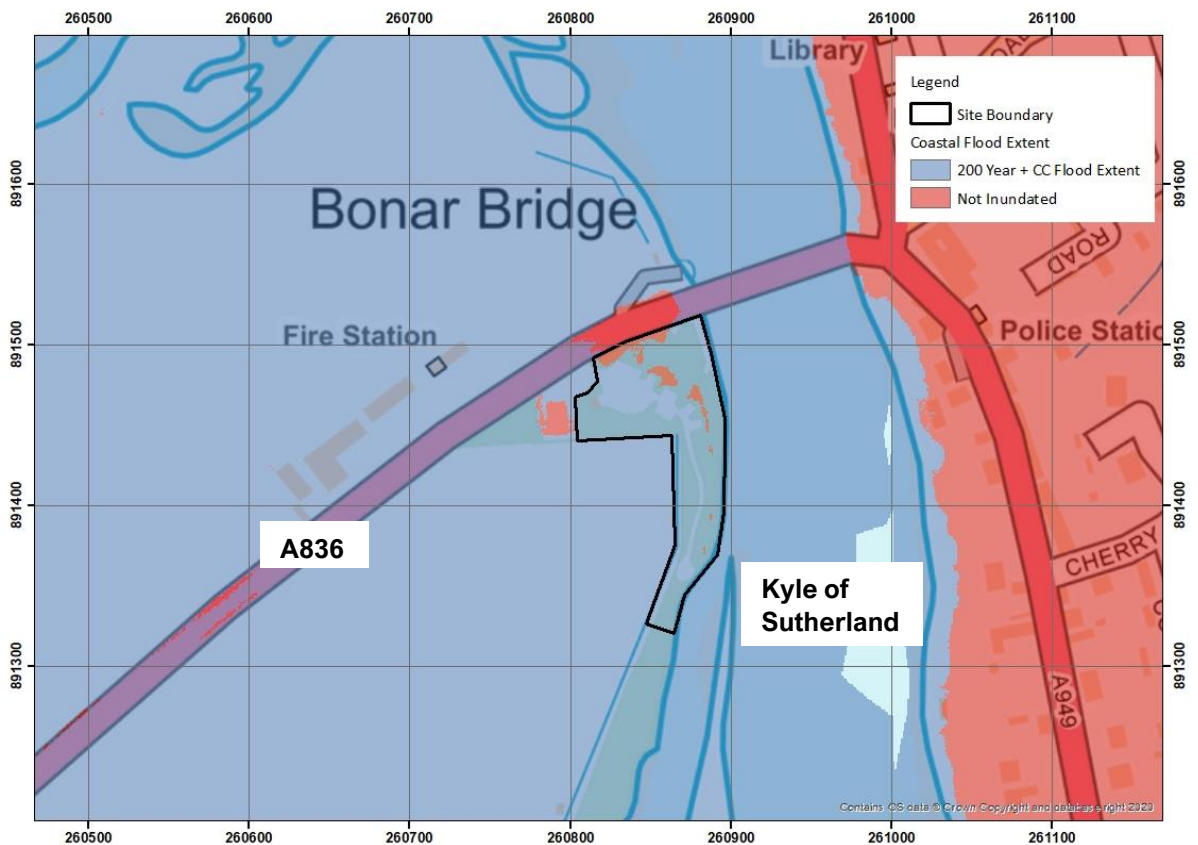


Figure 2: 1 in 200 year plus climate change coastal flood extent

Review of Relevant Guidance and Summary of Coastal Flood Risk

It is expected that coastal flooding would be fairly extensive across the land to the west and south-west of the site for the 1 in 200 year coastal flooding event. Although much of the southern section of the site would likely be inundated during such an event, it is likely that much of the northern section of the site, along with the adjacent section of the A836, would not be flooded.

There is one new building proposed within the redevelopment site. This proposed new facility, located within the northern section of the site, would include a WC and shower room, washing up point, plant room and an external covered dining space. It is recommended that the finished floor level of this new building is set at 4.76 mAOD or above, to provide 600 mm freeboard protection above 1 in 200 year plus climate change coastal water levels. In addition to freeboard, SEPA would recommend that water resilient materials and forms of construction are considered for development in coastal areas, particularly if the development may be exposed during storm conditions.

The extent of flooding in the vicinity of the site during the 1 in 200 year coastal flooding event would normally be a significant barrier to development. Furthermore, SEPA's (2018) land use vulnerability guidance⁴ classifies camping sites as a 'Most Vulnerable Uses'. This guidance states that "most vulnerable" development is generally not suitable within 1 in 200 year flood extents, with exception of:

"Redevelopment of a previously developed site where it involves the demolition of existing buildings and/or erection of additional buildings within a development site, and the proposed land use is equal or less vulnerable than the existing land use."

As the proposed development entails redevelopment of an existing site for the same usage, we are confident that the principle of development can be asserted and agreed with SEPA and The Highland Council (THC). Additionally, although initial indications are that safe access/egress would be possible from the northern section of the site during a 1 in 200 year coastal flooding event, the normal requirement for safe access/egress provision in relation to flood risk does not apply to redevelopment proposals. We would also note that coastal flooding is readily forecastable, such that there will be adequate flood warning to prepare for evacuation, and to evacuate the site, in the event of extreme tide warning in Dornoch Firth.

Following consultation with THC and SEPA to agree the principle of redevelopment at this location, and to determine any further requirements for site-specific flood risk assessment and flood management or mitigation on site, we will provide a scope and fee proposal for any additional flood analysis that is required to support planning consent.

⁴ <https://www.sepa.org.uk/media/143416/land-use-vulnerability-guidance.pdf>