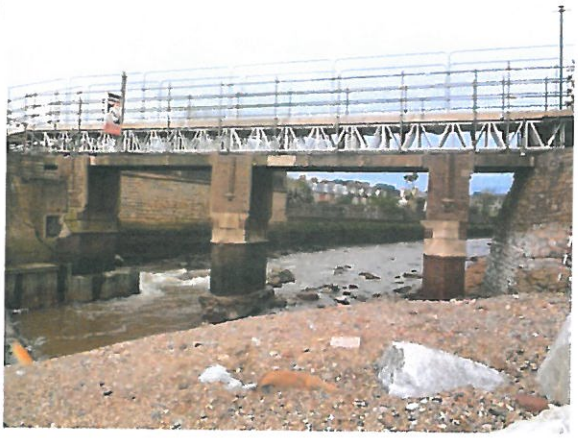
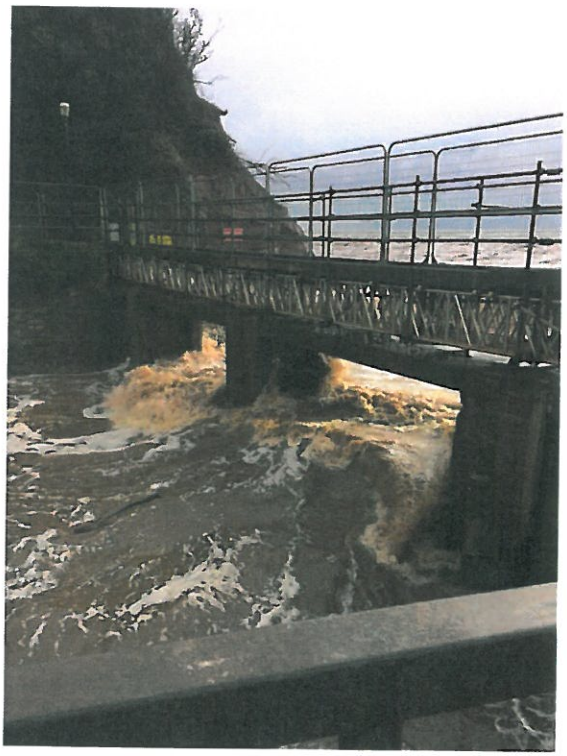
Alma Bridge

Feasibility Study





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Alma Bridge Replacement

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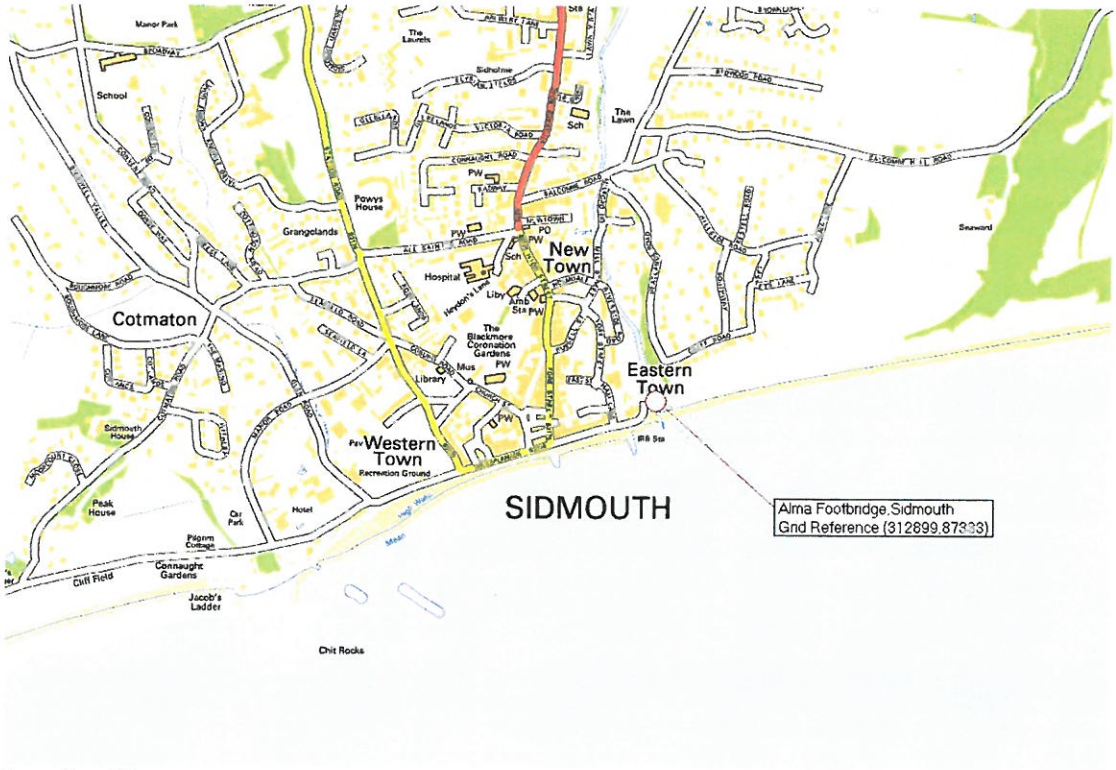
Alma Bridge Replacement

1 Introduction

Alma Bridge is located at the mouth of the River Sid at the eastern end of Sidmouth Esplanade. The footbridge has been a popular and well used crossing point over the River Sid for the past 160 years and probably early structures existed before this. More recently the bridge has provided a link for a public right of way forming part of the South West Coast Path accessing the World Heritage Jurassic Coast. The bridge also provides access to the town and seafront for residents living to the east of the river.



Location Plan

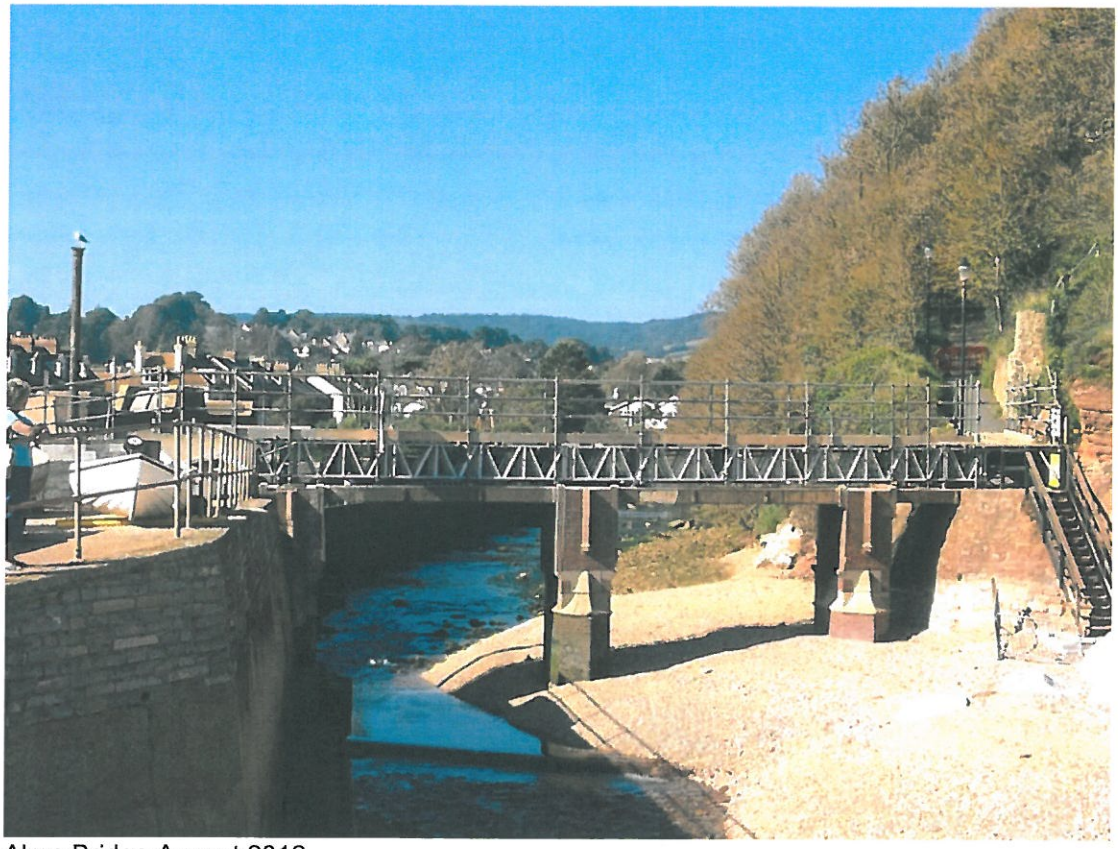
The current bridge links the town on the west side of the river to the east side via the Hanger Path which leads from beach level up to Cliff Road. The path originally comprised of a series of steps close to the cliff top, but due to cliff erosion was realigned inland approximately 10 years ago. The path is very steep with gradients in the order of 1 in 6 making it unsuitable for people using wheelchairs and mobility scooters. There is an alternative inland route using the public highway and bridge crossing at Mill Street. This is also a steep route although it is understood residents with mobility scooters use this route.

The current bridge foundations were severely damaged and scoured by river flooding in 2012, leaving it in poor condition and hence Devon County Council has been considering replacement options. A scaffold structure over-spans the existing bridge which has enabled it to remain open for the past five years or so. During the same period East Devon District Council (EDDC) have been undertaking work to produce a Beach Management Plan (BMP) for the Sidmouth frontage to protect the town from future coastal flooding.

It became clear at an early stage that the proposed bridge works and the BMP are interlinked with each having impacts upon the other. DCC has been working with EDDC together with other stakeholders; Natural England (NE), the Environment Agency (EA), Jurassic Coast Team (JCT) and Sidmouth Town Council (STC) to provide a new bridge solution that complements and does not conflict with the works of the BMP.

2 Project Background

The poor condition of the bridge is the main contributing factor requiring its replacement. However the ongoing erosion of the sea cliffs to the east of the bridge will have a significant impact on determining the location and the lifespan of the new bridge and the connecting Hanger Path.



Alma Bridge August 2012

DCC has been undertaking surveys of the cliff to establish the current short term erosion rate, as this is needed to predict the lifespan of the current bridge and any new bridge into the future. Since 2012 to 2015 the surveys indicate the amount of cliff erosion has been in excess of 7 metres (over 2 metres per year). The continuing erosion will eventually mean Alma Bridge will be affected and closure is inevitable, possibly within the next 1 to 4 years. Hence DCC are considering replacement of the bridge and this report will outline the various options.

As the cliff erodes, the structures on the west side of the river will also come under threat as they become exposed to the sea and easterly storms. This will affect the SWW pumping station, the Alma bridge abutment, the river training wall and the EA flood wall on the Ham. The location of the bridge is affected in the shorter term by erosion of the east cliff and in the medium term by the potential need to upgrade the flood defence wall adjacent to the Ham (see photo below). The bridge will need to be designed to take into consideration these future issues and to ensure investment for the predicted lifespan of the bridge can be justified.

River training walls and EA flood wall behind at the boundary to the Ham

3 Bridge replacement proposals

As East cliff erodes, as well as loss of the bridge it will also mean the South West Water pumping station will become exposed to full coastal conditions and easterly storms. It is also likely that the river training wall and the EA river flood wall upstream of the pumping station at the Ham will become exposed, which is predicted to occur within the next 30 years.

The EA walls are not of coastal defence standard and hence the town could become at risk to coastal flooding unless they are upgraded. In the shorter term the EA have confirmed: "*The River Sid defences currently provide a good standard of protection against flooding. We are aware that due to ongoing erosion of the cliffs to the east of the River Sid and the likely increase in storminess and sea level rise due to climate change these flood defences along the river upstream of Alma Bridge will need to be improved in the future. Although further improvements to manage flood risk along the river frontage are not justified at this time we are currently reviewing maintenance requirements along the River Sid wall and look forward to working with DCC to assist in developing their options for bridge access over the river.*"

Hence for a new bridge located within this area it is very likely that it will have a limited lifespan and will also become exposed to full coastal conditions and easterly storms. It should also be noted the bridge links into the Hanger path, which in itself is also at risk due to cliff erosion.

The location of the bridge is therefore also linked and affected by the lifespan of Hanger path, it would be pointless to install a bridge with a 50 year lifespan if the path it connects to has a lifespan less than this.

For the bridge replacement judgement has been used for predicting the lifespan of the new bridge and Hanger Path. It is accepted that erosion rates vary and are due to a combination of factors. Cliff falls are episodic and erosion is not necessarily a gradual/slow incremental process, a single cliff fall can result in very significant loss in a very short timeframe. A worst case scenario has been assumed: the short term rate will continue for the next 10 years, after which erosion slows and return to the longer term rate when the BMP works are in place. This assumption means a further 20m of cliff erosion may occur over the next 10 years after which erosion may start to reduce to longer term rates. This is a very approximate assumption and can only be determined with any accuracy once the BMP works are in place and surveys are undertaken over an extended period.

Alma Bridge Replacement

A steel footbridge structure in this coastal environment is expected to have a lifespan of 50 years after which it will need replacement.

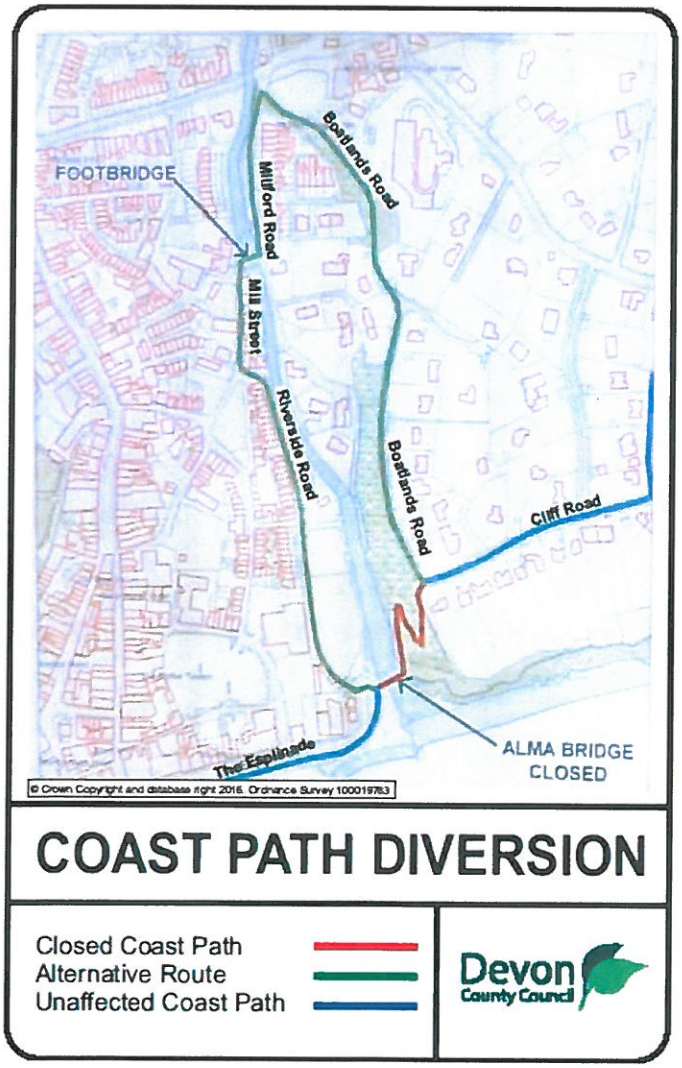
During the feasibility study for a new bridge DCC have considered the following options:

1. Do nothing. When the bridge is closed the coast path will revert inland.
2. Bridge replacement with a new bridge on the current alignment. Rock armour to the toe of the cliff to protect the bridge and Hanger path from further erosion.
3. Bridge replacement with steps at each end just upstream of the pumping station.
4. Bridge replacement with ramps at each end of the bridge 50m upstream of the current bridge.
5. Bridge replacement with steps at each end of the bridge 45m upstream of the current bridge.

The options are considered as follows:

Option 1 - Do nothing. When the bridge is closed the coast path will revert inland.

This is the cheapest option, which has not been ruled out if other options are found to be unachievable. Alma Bridge would be demolished and the path diverted inland using the bridge at Mill Street and Beatlands and Cliff Road.



Alma Bridge Replacement

Option 2 – Replacement with a new bridge on the current alignment.

This option proposes a new bridge at the existing location. To protect the bridge to ensure it has an adequate lifespan rock armouring to the toe of the cliff would be required. This was initially considered in 2012, but having consulted extensively it became clear due to the sites environmental designations rock armour was not going to be permitted.

A rock revetment would effectively bury the important geology and obscure the features that underpin the Site's Outstanding Universal Value and hence could not be supported by Natural England or the Jurassic Coast Team.

Without rock armouring the bridge would have a very limited lifespan and investment could not be justified. Having measured the cliff erosion rate at 2m per year this option became unviable and was abandoned.

Option 3 - Replacement bridge with steps at each end upstream of the pumping station.

This is an interim option located 18m upstream of the existing bridge adjacent to the SWW pumping station. It has a flight of steps at both ends of the bridge. Due to cliff erosion rates if left unchecked the bridge will have an anticipated lifespan of 10 years before any BMP works are implemented.

Due to limited lifespan and poor cost benefit this option is not considered viable.

Option 4 - Replacement bridge with ramps at each end of the bridge 50m upstream of the current bridge.

This option proposes a new bridge located 50m upstream to ensure a lifespan of +50 years taking into account the current short and longer term erosion rates. A lifespan much greater than 50 years may be achievable when the BMP works are implemented and cliff erosion is slowed but this cannot be quantified at this time.

The Hanger path is likely to require diversion inland within 20 years.

The topography of the site means there is a significant level difference between the east and west side. The east path rises steeply, a 1 in 6 gradient meaning the further the bridge is located inland the greater the level difference. A bridge located 50m inland would result in a significant level difference in the order of 10m. This would require either steps or ramps on both sides of the river to access the bridge.

This option proposes ramps to access the bridge. The west ramp structure could be constructed to provide part of an enhanced coastal defence wall to protect the town from flooding as the east cliff erodes. A ramp gradient of 1 in 12 would allow access to the bridge, which would also be set at the same gradient to minimise the level change on the east side to link into the Hanger Path. However a significant ramp structure would be required on the east side to facilitate access from the bridge onto Hanger Path. This ramp structure would be very costly and logistically very difficult to construct.

The cliff / slope above the proposed east ramp may need to be stabilised to allow the Hanger Path to be re-aligned and constructed to acceptable gradients.

Alma Bridge Replacement

Option 5 - Replacement bridge with steps at each end of the bridge 45m upstream of the current bridge.

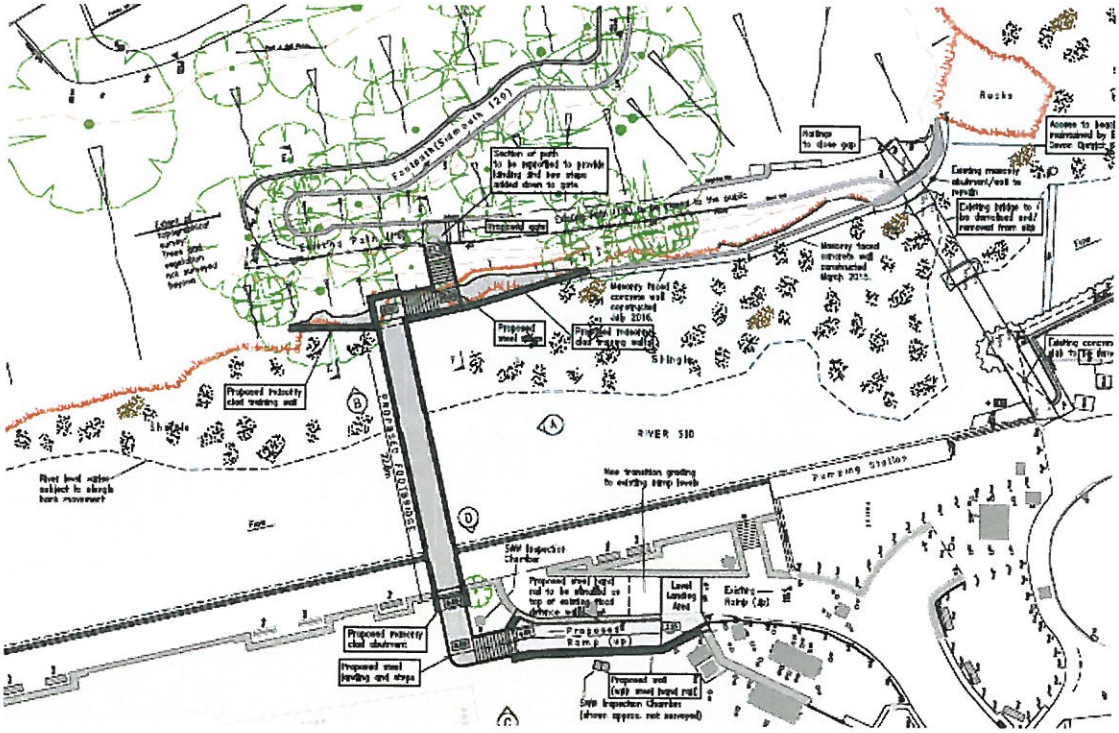
This option proposes a new bridge located 45m upstream to provide an estimated lifespan up to 50 years taking into account the current short and longer term erosion rates. A lifespan greater than 50 years may be achievable when the BMP works are implemented and cliff erosion is slowed but this cannot be quantified at this time.

To deliver a scheme within the constraints of the sites footprint and topography and within an affordable budget, short flights of steps have been adopted in the design. These steps together with the slope over the length of the bridge deck help to achieve the change in levels at this location to join with the existing Hanger path.

The Hanger path is likely to require diversion inland within 20 years and hence provision for future realignment of the path needs to be considered with this option.

The path to the bridge on the west side crosses the Ham. The steps help to minimise the amount of land take and impact on the recreational areas in the Ham and the path is located as close as possible to the rear face of the EA flood wall. A gap will be formed on the existing flood wall to allow access on to the new path from the ramp section of path leading to the river walkway. In order to maintain flood protection a small section of additional flood wall will be constructed.

The integrity of the flood protection will be maintained at its current levels.



4 Recommendations and Conclusions

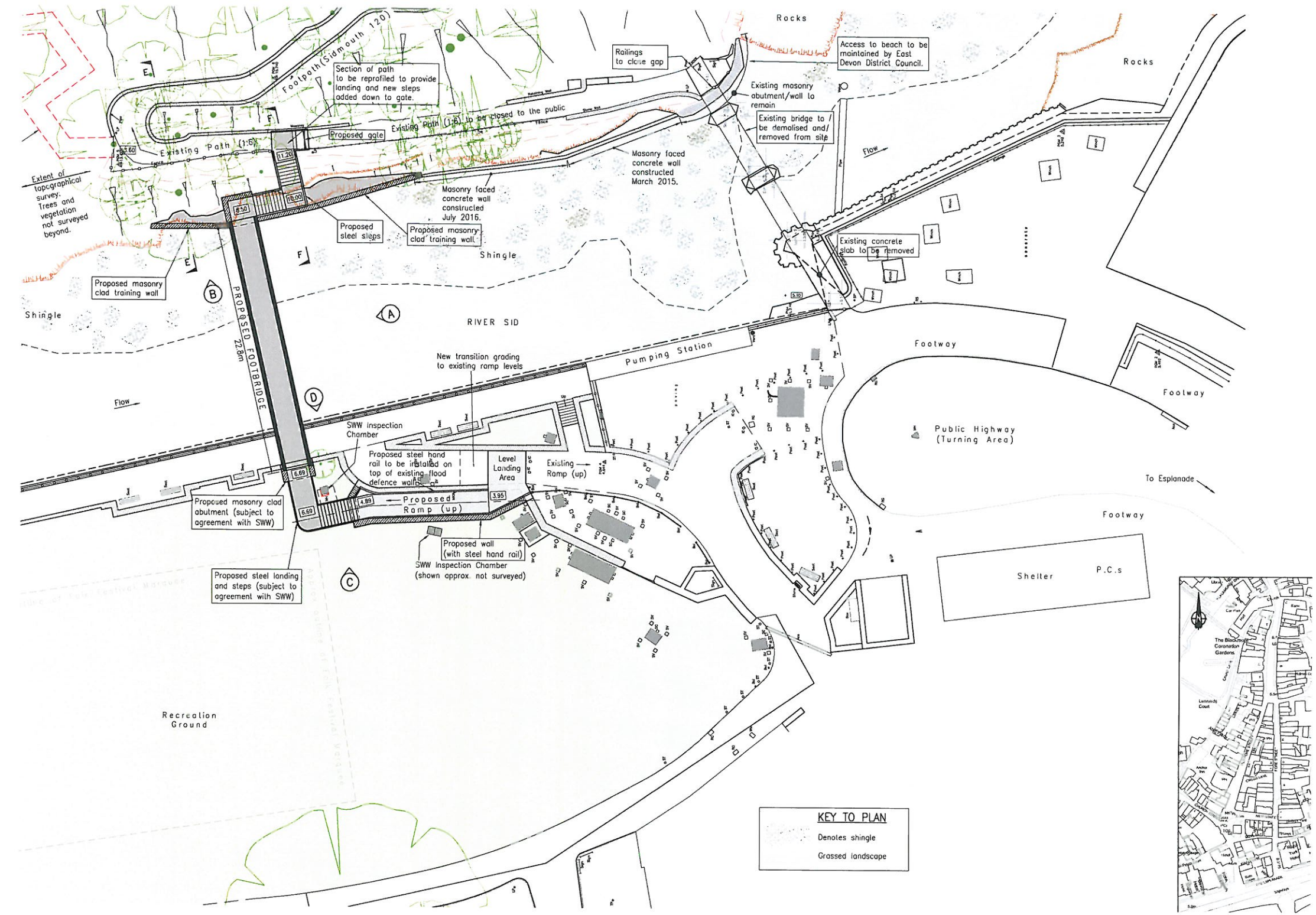
The proposals vary from do-nothing, abandoning the existing bridge and diverting the coastal path inland to various options to replace the bridge. The most expensive option 4 considers replacement with ramp structures at each end to provide access for all, including wheel chair users and disabled people. The existing Hanger path is currently unsuitable to provide access for all, so would need to be realigned and reconstructed if option 4 were pursued which may prove to be impossible within the space available.

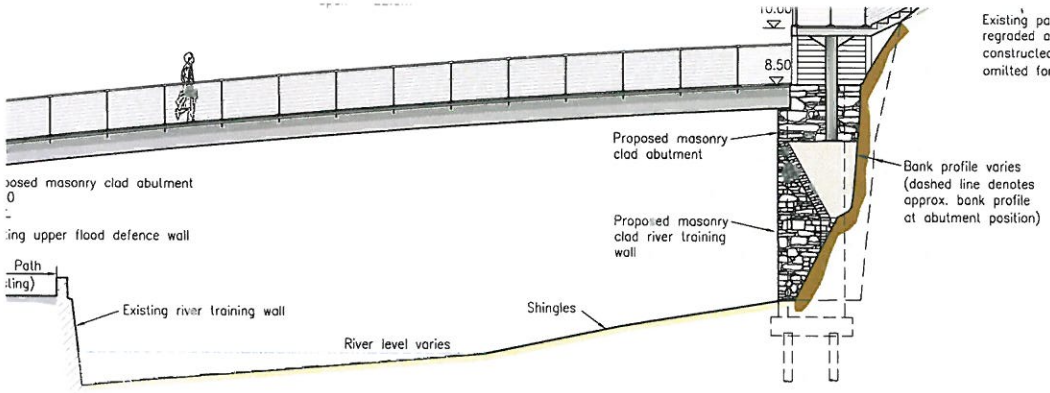
The other options propose the use of steps at each end of the bridge to minimise the construction difficulties, land take, impact on the environment and construction cost. These options would be a compromise and would provide access for the majority of people using the coastal path at present. An alternative inland diversion route is available but is really only feasible for non-disabled people and people with mobility scooters as the gradients are considered too steep for wheel chair users and people with other mobility impairments.

Option 5, replacing the bridge with steps at each end is likely to be the preferred option in terms of affordability. This option could be delivered relatively quickly pending planning and approvals, it requires only a small amount of land take from the Ham. However it is subject to confirming acceptance from SWW as the bridge and step foundations are in close proximity to their underground sewers.

It is recommended consultation and surveys are undertaken to establish the current users of the bridge and to determine what impacts a replacement bridge with steps will have on the community and in particular disabled people and wheel chair users.

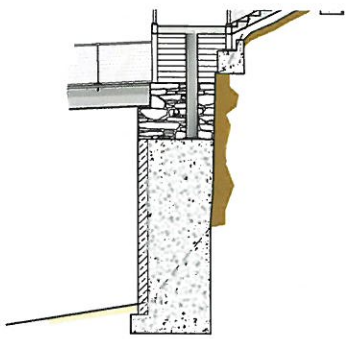
Nick Jennings
DCC Principal Bridge Engineer


Rocks
Railings to close gap
Access to beach to be maintained by East Devon District Council.
Rocks
Section of path to be reprofiled to provide landing and new steps added down to gate.
Footpath (Sidmouth 120)
Existing masonry abutment/wall to remain
Existing Path (1:8) to be closed to the public
Existing bridge to be demolished and removed from site
Proposed gate
Existing Path (1:6)
Flow
Masonry faced concrete wall constructed March 2015.
Extent of topographical survey. Trees and vegetation not surveyed beyond.
Masonry faced concrete wall constructed July 2016.
Proposed steel steps
Proposed masonry clad training wall
Shingle
Existing concrete slab to be removed
Proposed masonry clad training wall
PROPOSED FOOTBRIDGE 22.8m
RIVER SID
Shingle
Pumping Station
Footway
New transition grading to existing ramp levels
Flow
Footway
SWW Inspection Chamber
Public Highway (Turning Area)
Proposed steel hand rail to be installed on top of existing flood defence wall
Level Landing Area
Existing Ramp (up)
To Esplanade
Proposed masonry clad abutment (subject to agreement with SWW)
Proposed Ramp (up)
Footway
Proposed wall (with steel hand rail)
SWW Inspection Chamber (shown approx. not surveyed)
Shelter
P.C.s
Proposed steel landing and steps (subject to agreement with SWW)
Recreation Ground
KEY TO PLAN
Denotes shingle
Grassed landscape

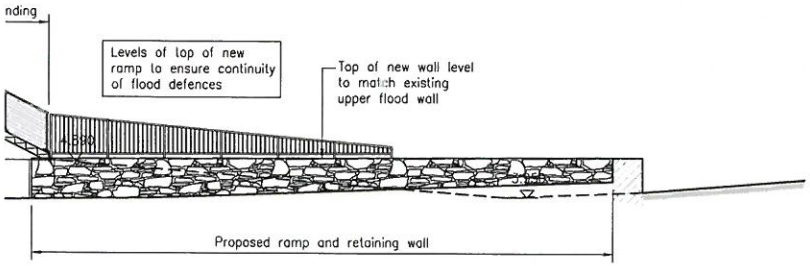


ELEVATION ON 'A'
SCALE 1:100

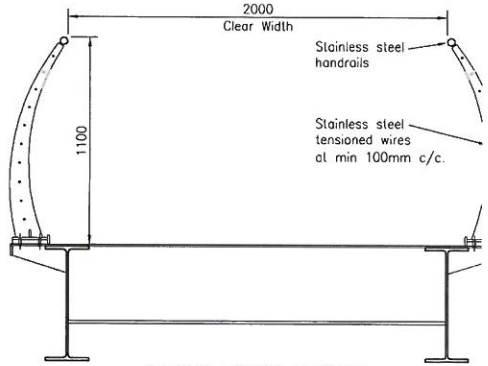
Existing path to be regraded and new steps constructed (new gate omitted for clarity)



SECTION F-F
SCALE 1:100



ELEVATION ON 'C'
SCALE 1:100



TYPICAL CROSS SECTION
(THROUGH BRIDGE DECK)
SCALE 1:20