Viaduct Gardens Construction methodology
(Limited to works on wall and Outfall)

Sequence of Works

Wall Works

a) Access to the wall at beach level

a. Access to the seaward side of the wall will be via an existing ramp approx. 50m away from the wall.

b. Access is shared with current harbour activities.

c. Plant using this access route will return to the top of the ramp storage area at the end of each shift.

d. Typical plant that will use this route will be tracked excavator and tracked dumper. Wheeled duper may be used if beach condition allows.

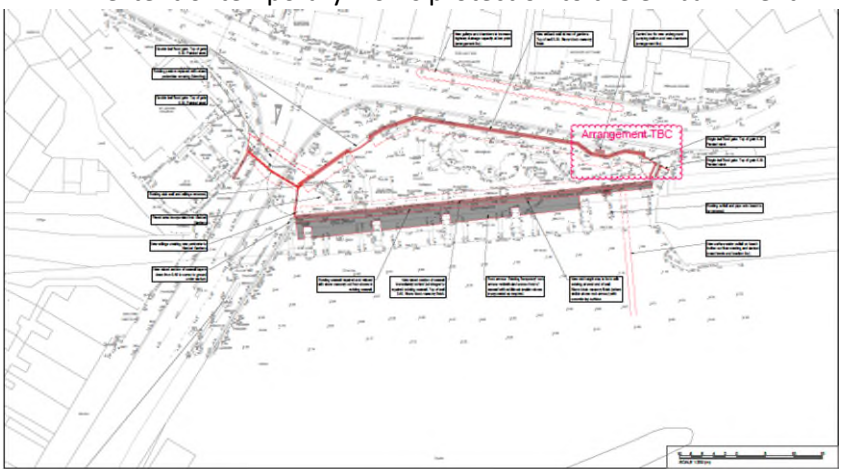
e. Majority of the works will be caried out from the viaduct garden side of the wall to avoid marine working.

b) Temporary works

a. Prior to dismantling the existing wall , some temporary support works will be required to stabile the structure and existing filled garden areas.
b. Sheet piling or king post walls will be used to support the embankment .
c. Installation of these will be manly form the Viaduct Garden side of the wall , with possible assistance from the back with an excavator.
d. Current wall and beach rock armour will remain in place during installation of temporary works.
e. Scaffolding may be required at the end of the works to construct the wall parapet . Scaffold poles may need to extend to beach level.
f. Existing surface water drainage outfalls will be maintained as active throughout the works until it is swapped over to the permanent works. Some minor over pumping may need to be carried out during wall construction with water pumped from the nearest upstream manhole from the outfall. Water will be pumped onto rock armour to prevent scour.

c) Existing wall demolition / Removal

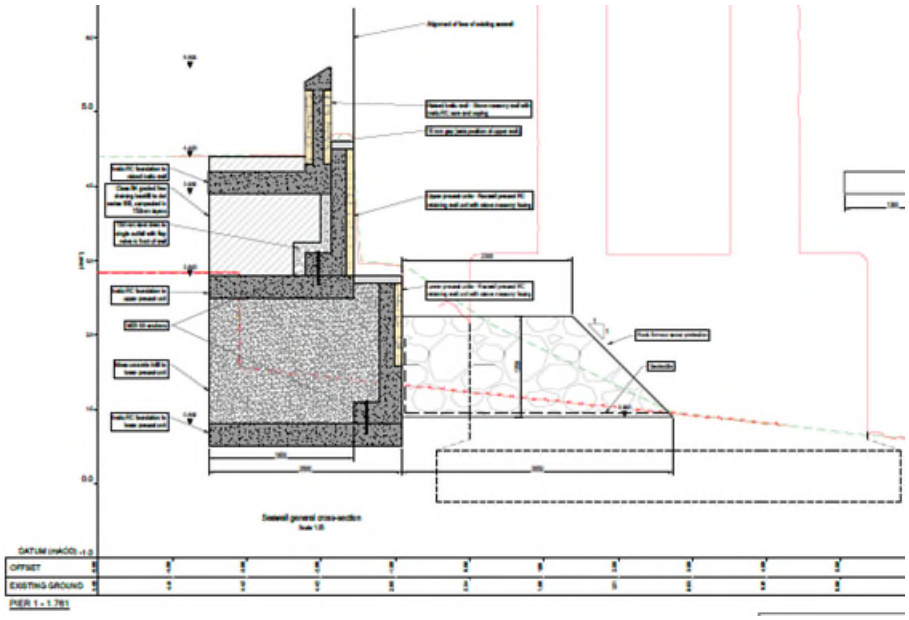
a. Exiting wall will be demolished in sections with exposed wall dependant of extent of temporary works protection to the embankment.



b. Existing rock armour at the toe of the wall will be moved back form the wall to expose the face - this material along with some additional armour as required will be re used as armour on completion of the new wall.
c. Upper part of stone wall will be removed and take into the gardens side of the wall for re use in the parapet.
d. Lower part of wall will be excavated down to the beach and loaded away for disposal or re-used as armour if suitable.
e. Excavation from behind the stone facing, to the temporary support will be loaded onto dumper and taken away for disposal. This material is expected to be sand & gravel and only small amount to be retained as backfill if necessary to the gardens side.
f. Existing piped outfalls will have temporary supports as necessary.
g. Existing Electrical cable will be temporarily protected dusting this works.
h. Excavation work to the last 500mm to formation level will be done “just in time” to receive in situ concrete base slab.

d) Wall foundations

a. Wall foundation will be cast in situ as per drawing detail below



b. Concrete will be poured by skip or pump from the garden side of the wall (top of wall)
c. Concrete pour will be done early in shift to allow curing before next tide , with time times and heights monitored for the activity.
d. Pour length will match temporary support location / length installed for the embankment.
e. Existing rock armour will be positioned just other side of viaduct foundations to act as shelter , this may be reinforced with excavated sand / beach materials for the foundation dig.

e) Precast Wall

a. Top and middle sections will be PCC L shaped units as shown in the drawing above .
b. PCC units will be laid directly on the base in situ slab once cured. With the PCC unit anchored into the base slab using grouted in dowels.
c. PCC unit will be craned in by an excavator , either from the top of the embankment or from the bottom , dependant on working space around existing structures.
d. Once the lower unit is in place and anchored then joints will be sealed ready for the in-situ concrete backfill.
e. Temporary end shutters will be placed at the sections to be poured.
f. Concrete will be placed using pump or skip for the top of the wall.
g. Once the base unit is in place and backfilled the wall will then no longer be tidal condition susceptible.
h. Middle wall (PCC) will be installed in same manner.
i. Backfill for middle wall will be done form the gardens side of the wall with placement and compaction carried out in thin layers.
j. Upper part of wall and where new and existing outfalls will be cast in situ.

f) Cast in situ sections

a. Areas where existing and new pipework / cabling protrude the wall will be cast in situ in lieu of using PCC units , this is to ensure flexibility in locating the pipe/ cable around the new wall.
b. One whole section of PCC unit will be left out and a shutter placed either side of the PCC unit – in situ sections will be 1.0 - 1.5m long.
c. In situ section will have reinforcement and will tie into the PCC units with dowels or similar.
d. In situ sections will be stone faced to match surrounding precast units with facing tied in with anchors to the concrete
e. Concrete pours for the wall be done using pump or skip for the top of the wall.
f. There are approx. 2-3 areas where this method will be used. If pipes are only in lower section, then middle section can return to the PCC wall method and vice versa. This will minimise in situ concrete works.

g) In situ parapet wall

a. The parapet wall will be installed as an in-situ wall once the lower and mid sections are complete.
b. Base slab will be poured form the gardens side of wall, and rebar installed as starter bars.
c. Two stone walls facing will be built, with the middle of the wall being infilled with concrete.
d. Coping will be in situ concrete as shown on previous drawing. Access to the parapet will be mainly form the garden, with scaffold used on the seaward side.

h) Rock Armour

a. On completion of the lower and middle wall, access form the beach side will no longer be required, therefore the permanent rock armour can be installed.
b. Previously removed armour stored at beach level will be placed by excavator on the geotextile laid against the new wall.
c. Additional armour will delivered to the harbour side by road wagon and transferred to temporary stockpile.
d. Additional armour as required, will be brought to the wall using a dumper
e. Armour will be placed to profile as shown in the drawing above with care undertaken during placement around the viaduct foundations.
f. Beach will be reinstated around the viaduct and any waste/undersized armour removed or used as rip rap within the armour section.

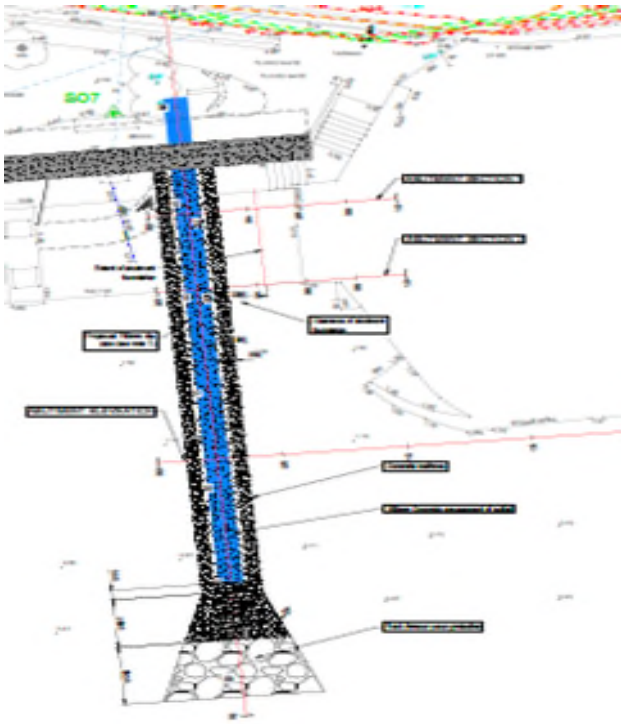
Pipe outfall works

a) Temp works

a. Existing piped outfall will remain operational until new system is complete.
b. Rock armour excavated from the wall works may be used to protect the new piped outfall area during excavation and concrete works as a temporary measure . This bund may also be reinforced using excavated beach materials from the pipe works.

b) Pipe work installation

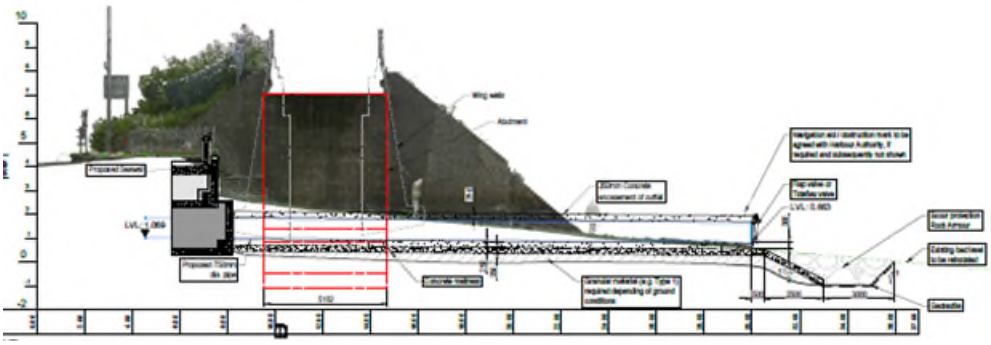
a. The new outfall pipe will be a 750mm diameter pipe and will protrude approx. 22m from the new wall face.



b. Timing of the works will be to coincide with good weather and low tides as excavation work vary but go as low as approx. -0.5 Aod.
c. Pipework protruding through the new wall will have been previously installed with coupler inserted into the new wall
d. The beach material for the bed will be excavated out and new granular layer placed to provide a firm profile for the pipework , with material brough in by dumper across the beach.
e. Placement of the concrete mattress will be done when tides and weather conditions are favourable, with accelerators considered to be used to ensure the concrete cures before next tide.
f. Pipework will be laid on the mattress on spacers to allow for the concrete surround to be placed.
g. Pipe will be coupled together in a sealed system. Pipe work will likely be plastic material, with pipes brought to the works are down the ramp and across the beach
h. Temporary anchors will be put on the pipe so it remains in correct position until surround is placed

c) Concrete surround

a. Once the bed mattress is cured, then the pipe will be laid to the line and level as shown in the drawing below



b. Pipe is to be fully bedded and surrounded in 250mm thick concrete.
c. Shutters will be placed either side of the pipe and anchored to the concrete mattress.
d. Concrete will either be pumped to works area or brough in with dumper and place with excavator.
e. Shutters will be removed once concrete is cured and take off site .

d) Outfall detail

a. The anti-scour basin will be constructed once the pipe is fully surrounded in concrete.
b. Rock armour will be placed in the end by excavator with material brought in by dumper along the beach.
c. A bolt on flap valve or tide vale will the installed at the end of the pipework
d. Once complete any rock armour used as temporary protection will be removed and taken back to the wall as permanent works.
e. Beach levels will be restored round the new pipe and any debris form the works cleared away .