Construction Management Plan

Including Dust, Erosion, Sediment Control, and River mitigations

Overview

Fulton Hogan has been asked to provide construction advice on the construction of two new shared pathway bridges - the Gibb's bridge and the Jickell's Bridge, both on Maitai Valley Road, crossing the Maitai River.

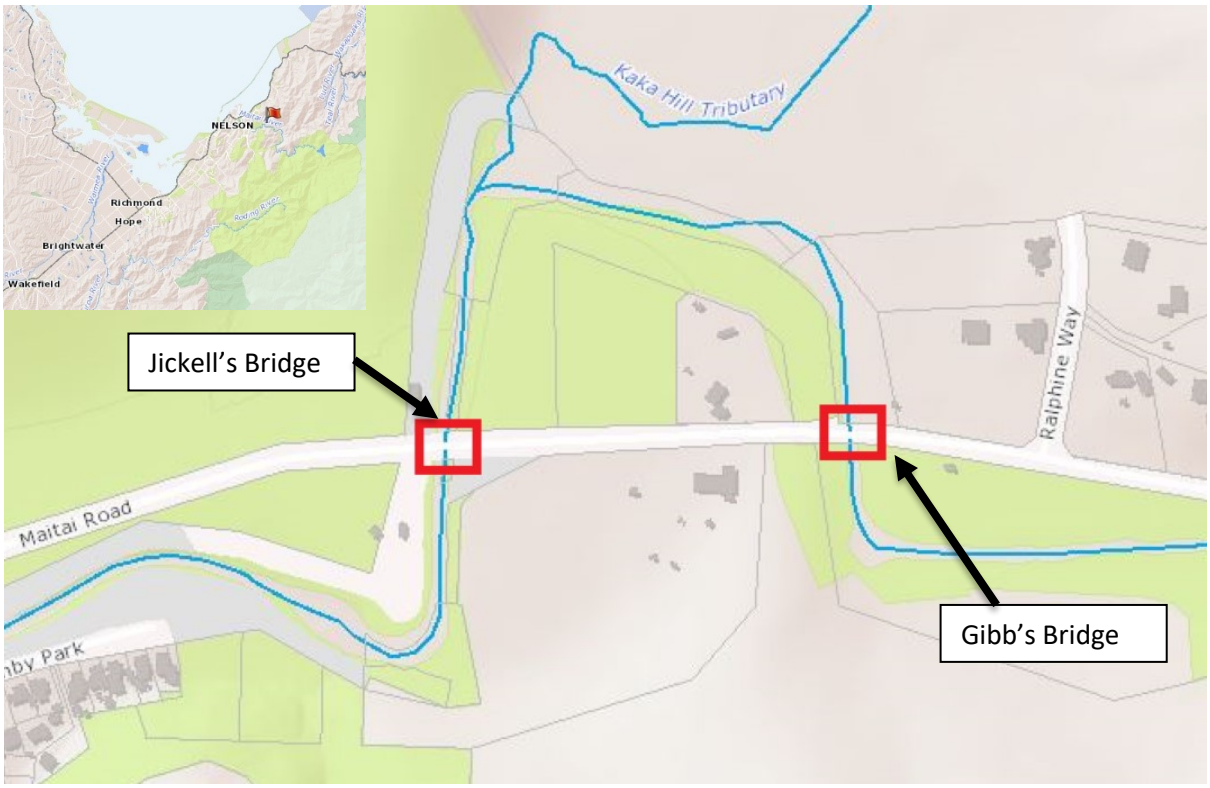

Figure 1. Location of Jickell's Bridge and Gibbs Bridge on Maitai Valley Road.

The subject matter concerns the proposal to construct new bridges adjacent to existing, to facilitate bike/pedestrian access and provide a platform for the extension of servicing infrastructure through to the land at 7 Ralphine Way. Specifically, Fulton Hogan has been asked to consider and provide options in terms of the construction methodology for these proposed works.

The sections below paraphrase the relevant values and issues of potential work in the Maitai River, construction options for these works, and proposed mitigation measures to minimise the adverse effects on the receiving environment.

The Maitai River

The Maitai River is the largest river in the Nelson Region with a catchment area of over 9,000 hectares. The river rises in the Bryant Range, behind Nelson City, and the upper catchment has two branches draining conservation and water supply protection land. The North Branch is dammed, just upstream of the confluence with the South Branch, to form the main Nelson water supply storage reservoir. The mid catchment is an important recreational and production forest area, and the lower catchment runs through the heart of Nelson City, before flowing into The Haven.

The Nelson Resource Management Plan attributes significant value to the Maitai River specifically for water quality, recreation, ecology, and cultural values. In the area of Gibbs and Jickell's Bridge, The NRMP assigns a conservation value of '1' (the highest) for the following reasons:

- Trout fishing, swimming, walking, passive recreation, kayaking and other boating.

- Identified wildlife corridors/significant native riparian vegetation.
- Flood management zones, and
- Water quality being managed for fishery and contract recreation purposes**.**

The Nelson City Council provides the following river flow history in terms of their monitoring site at Avon Terrace.

	Flood Flows	Drought Flow	
Return Period	**(m3/s)**	**1-day average**	**7-day average**
Annual	130	0.343	0.361
5 Year	175	0.274	0.293
10 Year	220	0.250	0.269
20 Year	267	0.233	0.252
Extreme Recorded	322 (17/08/2022)	0.209 (31/12/2005)	0.237 (27/12/2005)

Table 1. NCC Data for the Maitai River at Avon Terrace.

Accordingly, the Nelson City Council has set comparatively high (compared to other rivers in the region) minimum low flows and prohibited further water extraction permits from being issued. This would indicate the significance of the Maitai River to the community and the scrutiny that any rivers work would be subject to**.**

In terms of water depth, while the stream (at both locations) is shallow (<0.5m), during flood flows, the water depth can be around the 1.8m mark, rapidly rising without much warning. Although a significant change in water depth, the river flows have been noted as slight given the large ponding areas above both bridges. Only in the heaviest of storms has the river flow caused concern around the integrity of the bridges.

For this reason, timing of the works will be important to ensure minimal adverse effects on instream values and the surrounding environment.

Ecological Values

The Maitai River is identified as an important habitat for native fish species. Spawning seasons for our native species are well understood and the NRMP seeks to restrict riverbed disturbances during periods where there may be an impact on their spawning activity. Specifically, the Inanga spawning period runs from 15 March to 31 May; Koaro and Kokopu species spawn between 1 April and 15 August; and Trout spawn between 1 May to 30 September. While our native species spawning habitat is limited to the tidal reach (or just above) of our waterways, trout spawning habitat is ubiquitous and not generally limited to specific reaches.

Nelson is home to a range of native bird species, some of which are classified as endangered or threatened. The Nelson City Council and local community groups continue to restore habitat and control pests along the riparian margin of the Maitai River which enable our native birds to spread their ranges and roosting habitats. The NRMP does not identify any significant habitat in the vicinity of the bridge locations but notes that this reach of the river is important to several native species given the proximity to several conservation reserves. In general, most of our native species breeding during the months of April, May, and June.

To avoid adverse effects on native fish and bird species, the Nelson City Council recommends that works in waterways or associated riparian habitats are timed to occur outside the spawning/roosting season of our native species. If this is not possible, expert input and mitigation is required to ensure 'best industry practice' is applied and specific mitigation/controls are put in place to protect these habitats/species.

Cultural Values

Te Tau Ihu has a long and rich cultural history from both pre- and post-colonial times. While a great deal

of information is available about the postcolonial period of Nelson, not a great deal of information is available from pre-colonial time. It is known that the top of the South Island was important to a great many tribes around New Zealand and the area was the centre of trade, resource gathering, and transport. Colonial records indicate that the Maitai River (original name Mahitahi) was known as a significant source of food, medicine, building materials, transport, and spiritual ritual to the local iwi. To gain an understanding and appreciation of this history and importance of this area, one must engage with the local tribes. These are:

- Ngāti Kuia – (of the Ngāti Kuia Trust) Kurahaupō canoe
- Rangitāne – (of the Rangitāne o Wairau Trust) Kurahaupō canoe
- Ngāti Apa – (of the Ngāti Apa ki te Rā Tō Trust) Kurahaupō canoe
- Ngāti Koata – (of the Ngāti Koata Trust) Tainui canoe
- Ngāti Rārua – (of the Ngāti Rārua Iwi Trust) Tainui canoe
- Ngāti Toa – (of the Ngāti Toa Rangatira Trust) Tainui canoe
- Ngāti Tama – (of the Ngāti Tama kit Te Waipounamu Trust) Tokomaru canoe
- Te Ātiawa – (of the Te Ātiawa o Te Waka-a-Maui Trust) Tokomaru canoe

The rohe of each tribe differs and, in some locations, overlaps and hence to ascertain those sites, areas, or values of significance to local iwi can only be ascertained through consultation and discussion with local iwi.

The New Zealand Archaeological Association maintain a public website which identifies the rough locations of artifact discoveries throughout New Zealand. While not definitive, the map is useful to indicate rough areas of Māori occupation and activity. The excerpts below attest to an area of significant occupation and activity although no discoveries have been made in the specific location of works. Yet, significant discoveries have been recorded both upstream and downstream of the sites, indicating the entire area was well occupied/used by Māori in the past.

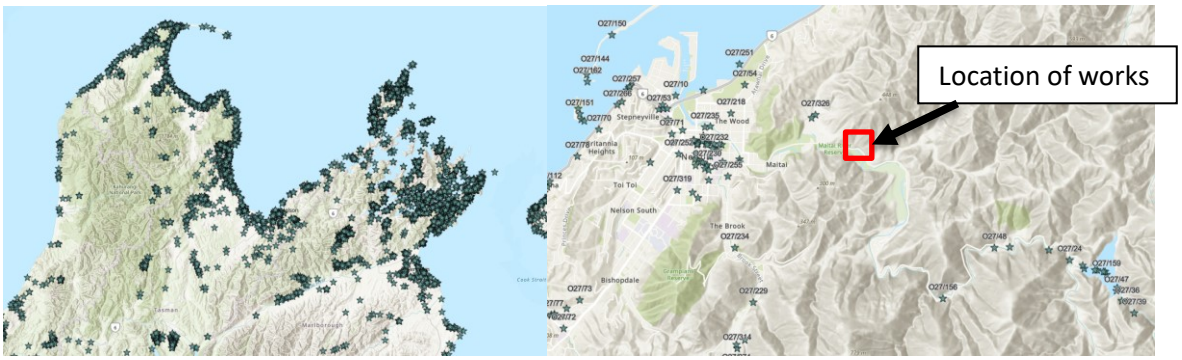

Figure 2. Excerpts from the National Archaeological Association Public Map showing artifact discovery locations.

Te Tau Ihu iwi achieved settlement with the Crown in 2012, and as part of that settlement achieved redress through a Statutory Acknowledgement over Crown owned portions of land or geographical features (such as lakes, rivers, wetlands, mountains or coastal marine areas). A statutory acknowledgment ensures that:

- Relevant consent authorities (i.e. Territorial and Regional Councils, the Environment Court, the Historic Places Trust, etc) have regard to the Statutory Acknowledgement in any decision-making process, and
- Require relevant consent authorities to provide summaries of resource consent application, or copies of notices of resource consent applications to relevant trustees, and
- Enable the relevant trustees and members of the relevant iwi to cite the Statutory Acknowledgement as evidence of the iwi's association with the 'statutory area'.

Statutory Acknowledgements apply and can have an impact on any activity within, adjacent to, or directly affecting the identified 'statutory area'. In terms of application of a Statutory Acknowledgement to a river or stream, the consideration applies to the body of water, the bed of the river, and the land that the waters will cover at its fullest flow without flowing over its banks. It does

not apply to the bed of a river not owned by the crown or an artificial watercourse.

In this case, in this location, seven of the eight Te Tau Ihu iwi have a statutory acknowledgement over the waters, riverbed, and riverbanks of the Maitai River. The only iwi that does not hold an acknowledgement is Ngāti Apa of Ngāti Apa Ki te Rā Tō Trust.

It is understood that the client is undertaking consultation with the relevant iwi on the project as a whole and with reference to the values associated with the Maitai River. This consultation will inform the mitigation measures that will need to be applied but in the absence of this work being completed, it is anticipated that, for construction works, the outcome could be one of or a combination of the below.

- Matakite assessment – Māori clairvoyant assessment to determine an area's cultural or spiritual significance.
- Cultural Impact Assessment – a report that evaluates the potential effects of a proposed activity on the cultural values and interests of relevant iwi/tribes.
- Iwi Monitor present during works – an authorised person who oversees construction and earthworks to ensure the natural environment is minimally impacted and to protect the cultural safety of everyone on site.
- Accidental Discovery protocol – sets out procedures that must be followed in the event that taonga (Maori artefacts), burial sites/kōiwi (human remains), or Māori archaeological sites are accidentally discovered.

While the consultation process will ensure that the design of the bridges will incorporate iwi concerns, it is the physical works that will have the potential to create the greatest impact on cultural values. The different construction methodologies below are designed to incorporate industry best practice, the Nelson Tasman Erosion and Sediment Control Guidelines (July 2019), and minimal impact on the receiving environment. These should inform any discussion with the local authority and iwi.

Schedule of works/timing

Given the nature of the works proposed, it is anticipated that approximately one month per bridge pier (4 weeks) will be required to complete the installation works (i.e. Riverbed/Riverbank works), depending on weather conditions.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
Record High (°C)	31	28	27	22	20	16	15	17	20	23	26	29	31
Average High (°C)	21.7	21.9	20.1	17.0	14.5	12.2	11.4	12.3	13.7	15.9	17.9	19.9	16.5
Daily Mean (°C)	18.3	18.2	16.3	13.3	10.8	8.7	7.7	8.6	10.1	12.5	14.9	17.0	13.0
Average Low (°C)	10.6	10.5	9.4	7.8	5.9	4.5	3.4	3.3	4.3	5.6	7.1	9.5	6.8
Record Low (°C)	4.0	3.0	3.0	2.0	-2.0	-2.0	-3.0	-4.0	-1.0	-1.0	1.0	3.0	-4.0
Average precipitation (mm)	105.6	80.7	105.7	132	127	152.0	131.0	133.0	131.4	131.4	94.5	141.2	122.1
Average precipitation days (≥1.0mm)	9.55	6.45	8.0	11.73	11.0	11.82	9.91	12.55	13.09	12.73	11.82	12.91	10.96
Average relative Humidity (%)	74.59	75.47	77.94	80.79	81.14	82.46	80.66	81.61	79.11	77.5	75.65	76.77	78.64
Mean Monthly Sunshine Hours	12.68	10.96	10.69	9.83	9.24	8.63	9.01	9.48	10.34	10.57	12.36	13.91	10.64
Inanga Spawning													
Kokopu & Koaro													
Trout Spawning													
Bird Roosting*		Ideal											
											Ideal		

Table 2. Climatic information, Fish spawning, and Bird Roosting information for Nelson Region.
*General roosting period, may be longer for some native species.

Such timing will allow one week to undertake site preparation, one week for casing installation, one week for casing clearance and one week for pier installation.

From the information provided above, works based in and around the Maitai River would be best completed during the season with the least rainfall, most stable weather conditions, lowest river levels,

and outside native fish spawning and bird roosting periods. By doing so, any works on the banks or in the riverbed will have the least impact on water quality, ecology, and native species. However, this period generally coincides with the peak recreational use of the area and the greatest period of scrutiny.

According to average local climate data, there are two -three-month windows where weather conditions and native species behaviour are most appropriate (See table 2). It would be our recommendation that the proposed works be best timed in the period between October to March.

The Maitai River @ Gibbs

The Gibb's Bridge is the most eastern of the bridges that form part of the proposal, some 1.1 kilometers east from the start of Maitai Valley road. The bridge is single laned, approximately 5.0 meters wide and 47.0 meters long. The bridge platform is supported by two piers and two abutments roughly 15 meters apart. Only one of the piers is located in the active river channel.

Figure 3. Concept Image of Gibbs Bridge with new cycle bridge adjacent.

Water flow under the bridge is from south to north with the active river channel being approximately 15.1 meters wide. The river is very shallow in this location (max depth 0.5m) with the principal flow of the river currently hard against the true right bank. The banks differ in slope with the true left bank being comparative steep and the true right bank being gentle, providing a large flood area to the east of the bridge.

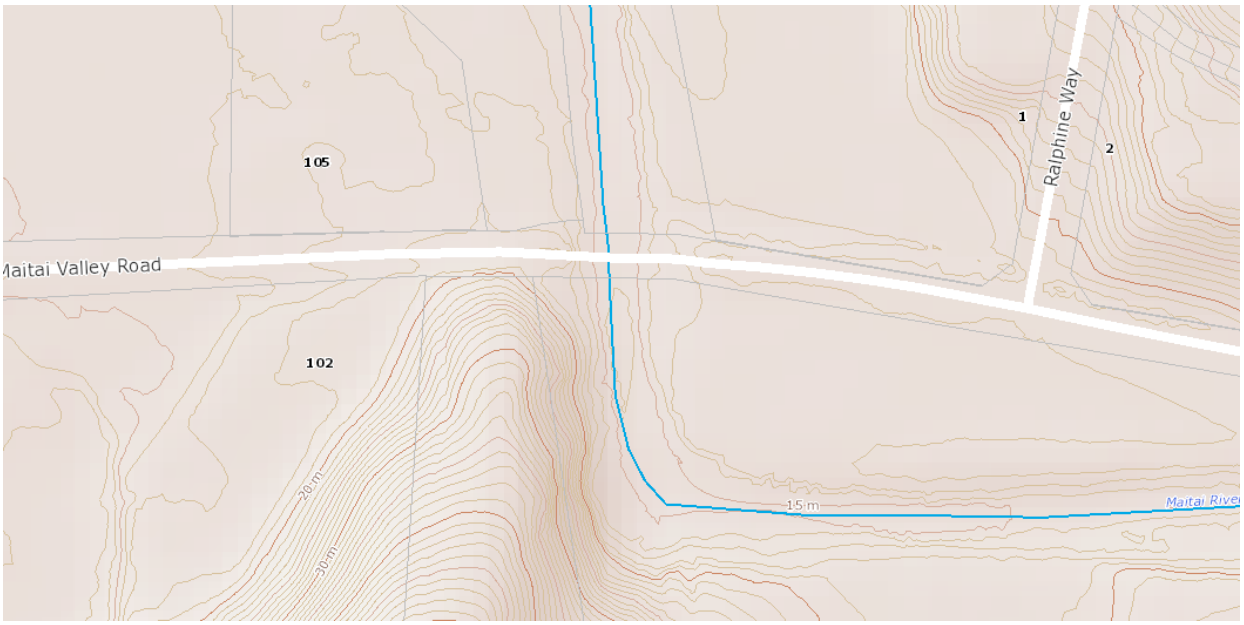

Figure 4. LIDAR information for Gibb's Bridge.

The current nature of the river flow (see photographs) puts the true left bridge pier more-or-less in the middle of the active channel. Approximately 90% of the water flow is running to the east of this pier as, it would appear, gravel has built up against the true left bank, below the bridge. There is currently no surface water flow to the west of this pier.

Nature of works

The structure proposed (at this stage) is a standalone cycle bridge providing a 3-meter deck upon 800mm diameter piers roughly 19 meters in length (See figure 5). The finished height of the new bridge should be level with the existing road bridge. Services are proposed to be laid through the centre of the bridge deck.

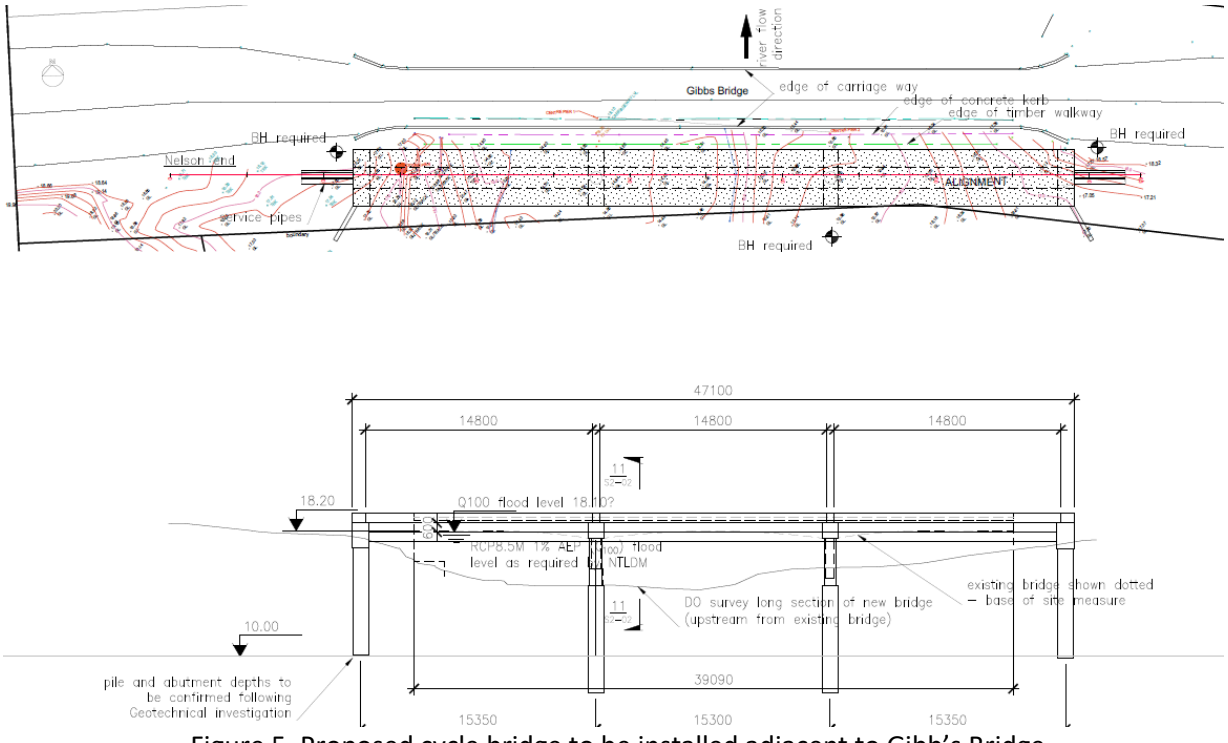

Figure 5. Proposed cycle bridge to be installed adjacent to Gibb's Bridge.

To install this structure will require the driving of piles, one within the active river channel, and the land disturbance to the riverbanks to provide for approaches to the bridge. Plant required will include diggers, cranes, augers, and trucks. Topsoil (on the riverbanks) will need to be removed creating bare land which can generate sediment laden water during rainfall events. Similarly, during hot weather,

bare land can create dust which can be distributed over an area larger than the site.

The overall strategy is to create access for a large excavator mounted piling rig to gain access to the riverbed so that it can drive the pier casings to the required depth into the riverbed. To achieve this the plant base must be within 1m of pier locations.

Two construction methodologies are suggested to complete this work. One seeks access from the true left bank while the other seeks access from the true right bank. Both have pro's and con's which are described below.

Regardless of which method is selected, the drilling works are likely to intercept ground water which must be removed to allow for the pier casing and concrete.

Dewatering works

On installation of the pier casing, it is proposed that a water pump be installed to remove water from within the casing. Further investigation is required but it is estimated that a total of 10m^3 of water will potentially need to be removed from the casing. This will then be pumped to a standard dewatering tube, which is essentially a filtration bag which can remove most of the sediment from the pumped dirty water. It is proposed that this dewatering bag be located downstream of the worksite on the true left bank of the Maitai River (See image below). Filtrate from the bag will then flow over a grassed and vegetated area for approximately 10 meters before returning to the river. The filtrate flow is not a direct point discharge, nor does it have sufficient flow to cause erosion.

This sort of system has been commonly employed for small dewatering works without issue or adverse environmental impact.

The dewatering bags come in a variety of sizes and mesh types. A suitable bag will be sourced depending on the nature of the sediments and volume of water expected.

Figure 6. Proposed dewatering mitigation measures.

Figure 7. Examples of commonly available dewatering bags.

The true right bank option

The true right bank offers the easiest access option to the riverbank.

Accessing this site will be from the existing formed road access and carpark directly across from Ralphine Way. Plant and vehicles will then track westward for approximately 100 meters over a grassed field to gain access to the true right riverbank.

Surface land disturbance (estimated to be 40m^3) will be required to allow for the formation of an access track with a reasonable gradient to allow access for the diggers.

As the main river channel is located hard against the true right bank of the river, the active channel will need to be diverted towards the true left bank necessitating the movement of gravels under and below the bridge and the installation of a diversion bund. Previous projects have employed filled 1-tonne bags which can be placed like rockwork to create an *in-situ* river wall, diverting rivers in a desired direction.

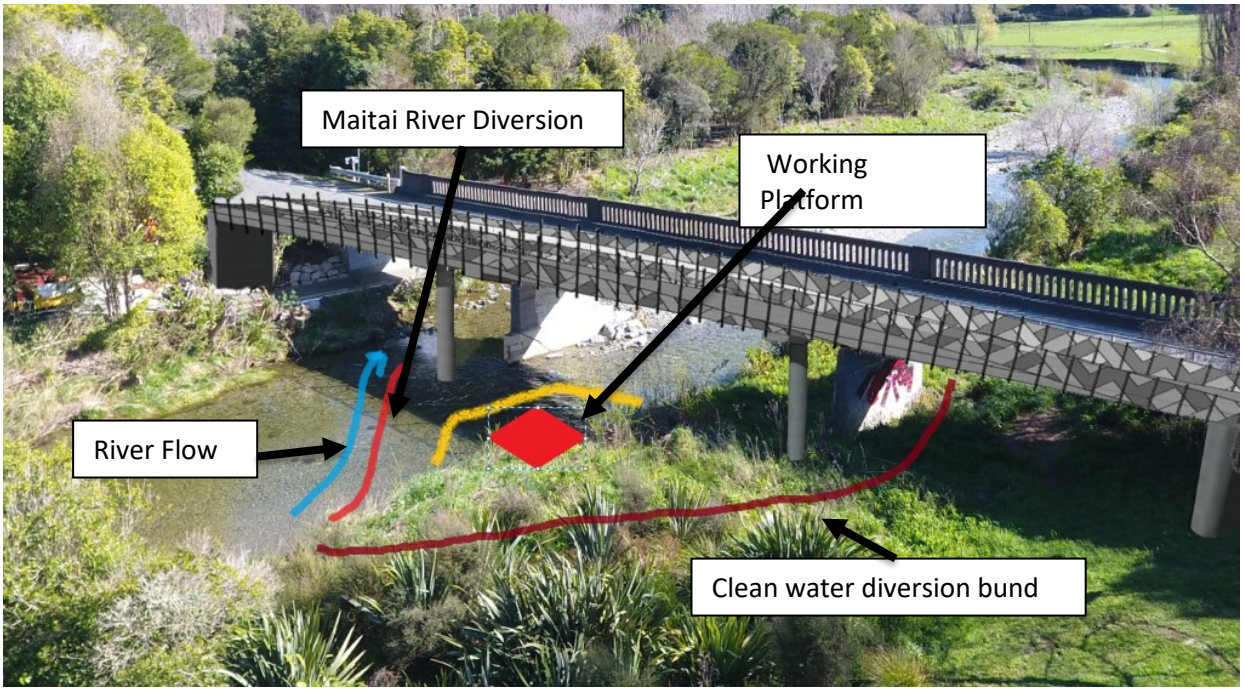

Figure 8. True Right Bank methodology.

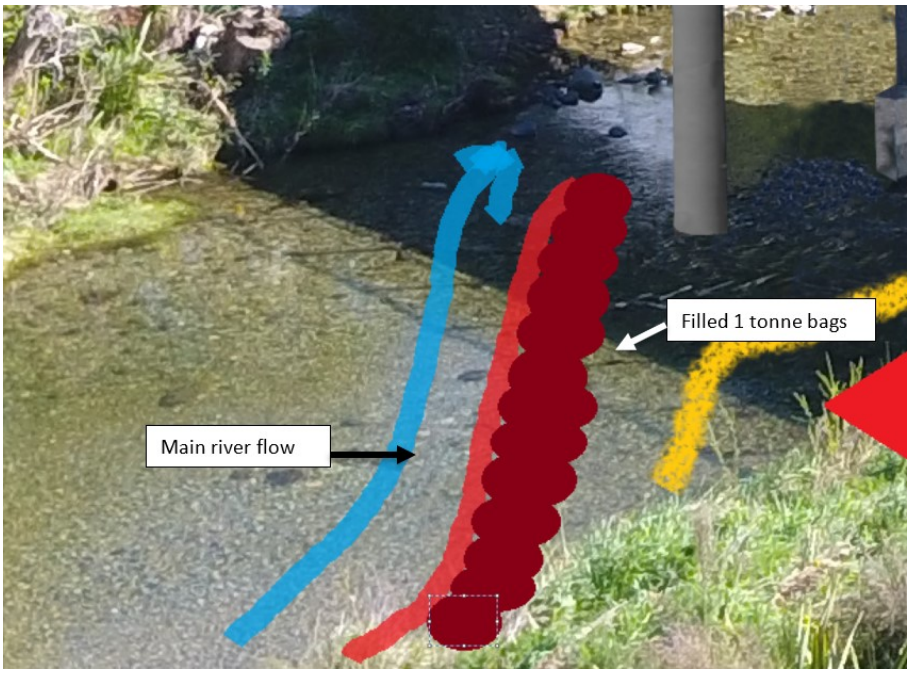

Figure 9. Diagram of proposed river diversion.

Once diverted, a gravel platform will need to be constructed in the riverbed to provide a stable, level platform for the plant to access the pier site (See Figure 10). This platform can be protected by filled 1-tonne bags or by large armour rock.

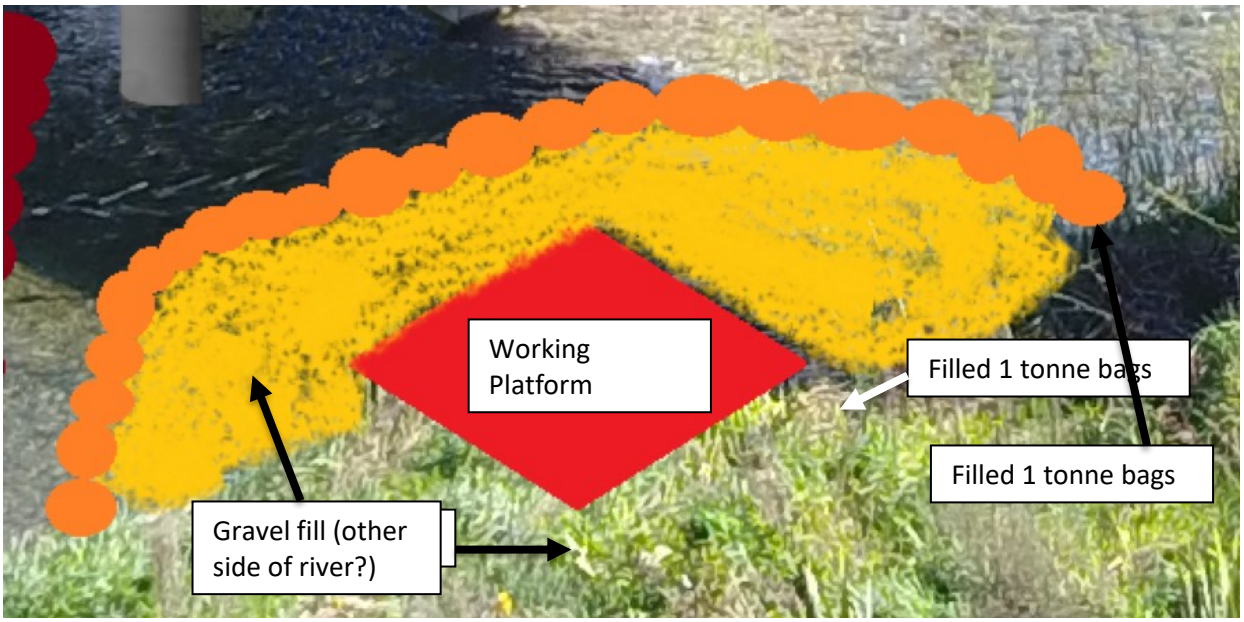

Figure 10. Level crane platform within the riverbed (true righthand bank).

To effectively manage the work area and limit the amount of surface water flows, a clean water diversion bund will be installed around the work area. This bunding reduces the area exposed to rain and surface water flows. Thereby any rain or surface water within the work area can be managed and appropriately treated before being released to the Maitai River environment (See Figure 11).

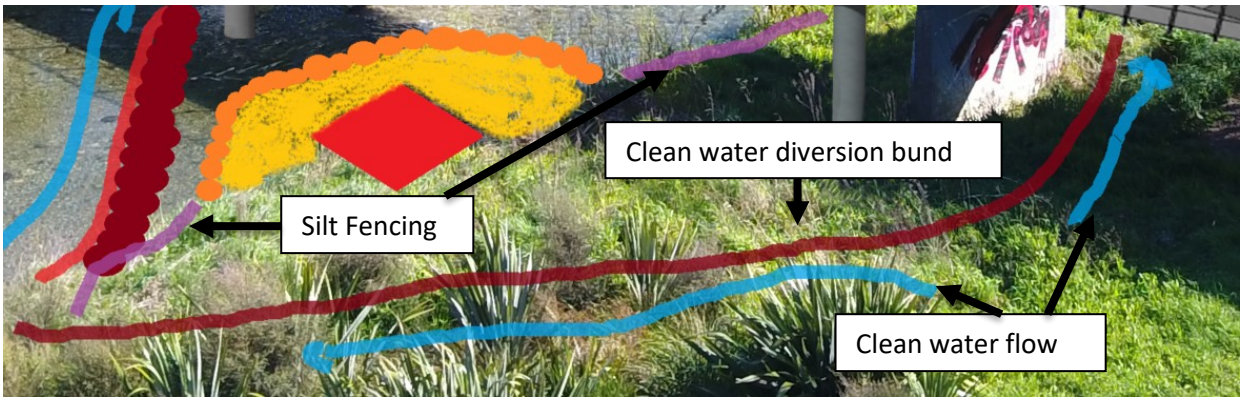

Figure 11. Clean water diversion bunding.

An all-weather access track will need to be formed over the reserve and riverbank (true right bank) to provide access for the crane, diggers and support vehicles. This track will be approximately 100m long and 4m wide.

At the conclusion of the construction works, all materials will be removed from the riverbed, the riverbank, and the reserve. The area will be reinstated to the same standard as that which existed prior to the works.

The true left bank option
The true left bank option is the more difficult option but will ensure less riverbed disturbance and river flow disturbance.

Accessing this site will be from the upstream side of the true left bank. In this location, an existing public walking track can be modified to provide access to plant (i.e. crane, diggers, trucks, etc.).

Figure 12. True left bank access option.

This will necessitate the removal of existing small trees, plants, pedestrian track and associated

amenities. Such can be reinstated after the completion of the works to the same standard. This access tracking option offers a short sharp access option of roughly 15m to the riverbed.

An existing public access track runs parallel to the Maitai River in this location. Public access will need to be restricted to the work site area and an alternative route created (outside the project footprint) for the duration of the works.

Surface land disturbance (estimated to be 40m^3) will be required to allow for the formation of an access track with a reasonable gradient to allow access for the crane and diggers. Processed gravel will need to be imported to form the track.

A clean water diversion bund will be created around the tracked area to ensure the impacts from rain and surface water flows during rain periods can be controlled and limited. Silt fencing will be installed adjacent to the river to ensure all water generated from within the work area can be treated before being released to the Maitai River environment.

As the main river channel is located hard against the true right bank of the river, the active channel will not need to be diverted. Instead, an in-water diversion bund of filled 1-tonne bags will be placed in the riverbed to protect the work area. There currently is not flow in this section of the river as the gravel buildup below the bridge (against the true left bank) is essentially preventing surface water from flowing.

Once the work area is protected, a small amount of gravel will be imported to create a level and stable crane platform. The site of the true left pier is closer to the left bank than the right bank and the existing riverbed is shallower in this location. Therefore, it is expected that a lesser amount of gravel will be required to create the platform compared to the true right bank option.

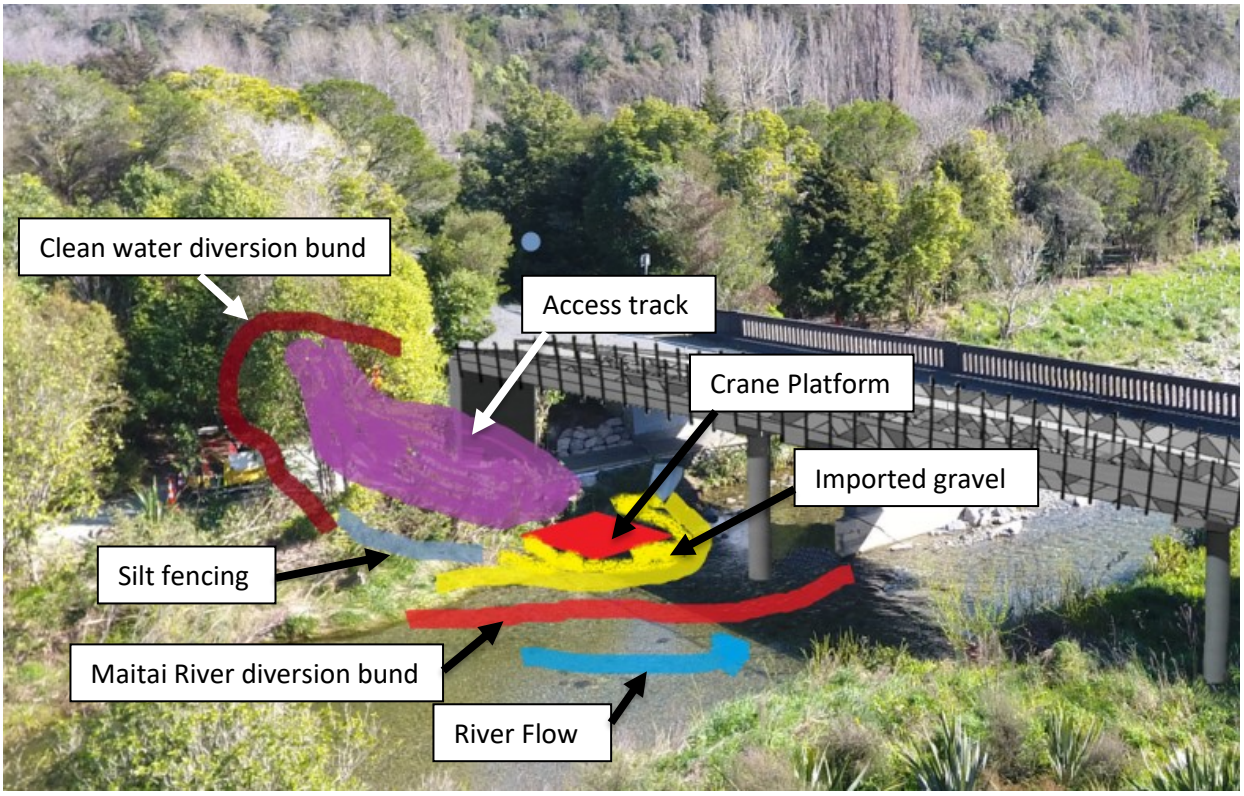

Figure 13. Overall site layout for true left bank option.

At the conclusion of the construction works, all materials will be removed from the riverbed, the riverbank, and the reserve. The area will be reinstated to the same standard as that which existed prior to the works.

Pro's & Con's

Pro's	True left bank option	True right bank option
	No diversion of Maitai River flow required	Much easier access to work site
	Shorter distances and areas of disturbance	Gentle terrain for plant and vehicles to navigate
	Less volume required to be imported	Minimal disturbance to public recreation during works
	Pier location closer to this side of the river	Minimal disturbance to existing landscaping improvements
		Natural separation between public space and work area
Con's	Steeper terrain for plant and vehicles to navigate	Diversion to active flow channel of Maitai River
	Disturbance to use of recreational area during peak periods	Longer distances of travel for plant and vehicles
	Necessitates removal of existing landscaping improvements	Larger areas of land disturbance
	Heavy plant in close proximity to public road	Large volume of imported material required
		In-river pier further from this side of the river

It is recommended that the true left bank be used as the development option. While it involves more land disturbance, it has minimal impact on river flows and less risk in terms of water quality.

The Maitai River @ Jickell's Bridge

The Jickell's Bridge is the most western of the bridges that form part of the proposal, some 800 meters east from the start of Maitai Valley road. The bridge is double laned, approximately 12.0 meters wide and 40.0 meters long. The bridge platform is supported by two piers located on the riverbanks with no piers located in the active river channel.

Figure 14. Concept diagram of the Jickell's Bridge.

Water flow under the bridge is from north to south with the active river channel being approximately 20.0 meters wide. The river is comparatively deep in this location (max depth 1.0-1.5m) and fast flowing. The riverbed is more-or-less of a consistent depth (in cross-section) with most of the flow being in the centre of the river.

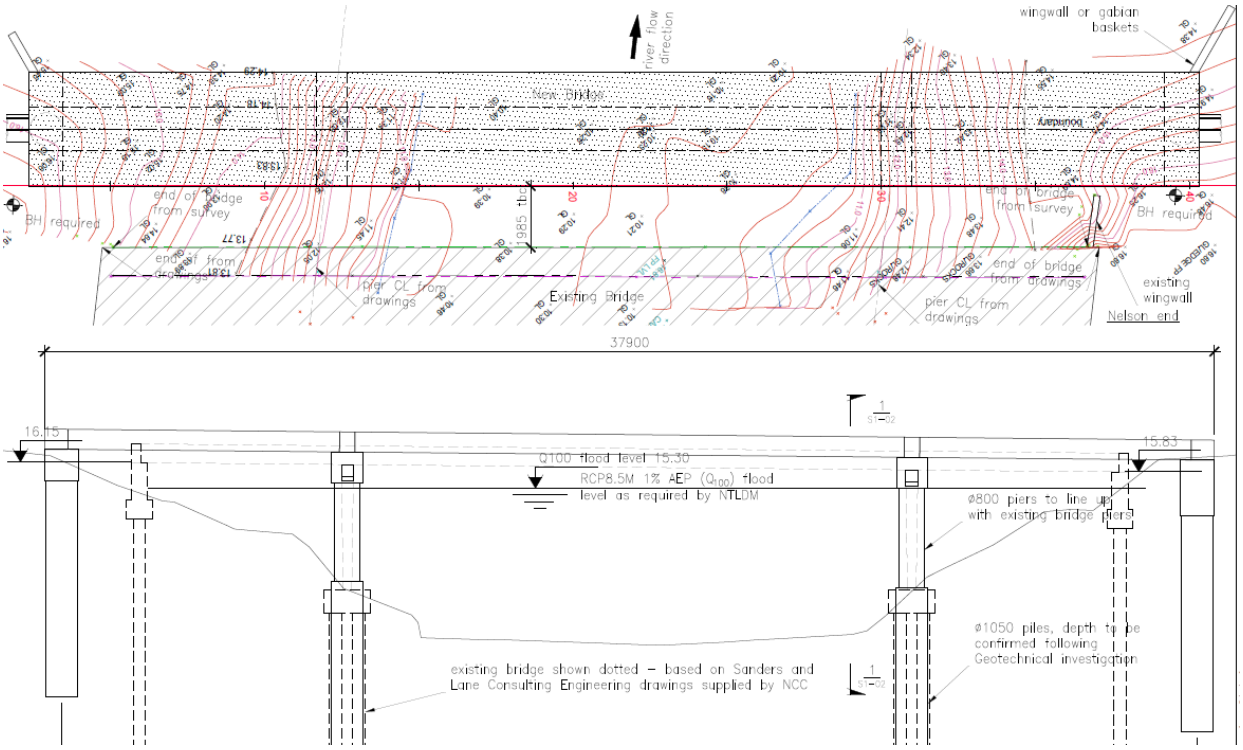

Figure 15. Engineering diagram for the Jickell's Bridge.

Both riverbanks are steep and deeply incised. Mature trees and plants are well established on both banks

and there are limited options for access. Pedestrian access tracks run parallel to the river on both sides.

Nature of works
The structure proposed (at this stage) is a standalone cycle bridge providing a 3.7-meter deck upon 800mm diameter piers roughly 20 meters high (See figure 15). Services are proposed to be laid through the centre of the bridge deck.

To install this structure will require the drilling of two piles on the banks of the Maitai River. None will be in the active channel of the river. Land disturbance to the riverbanks will be necessary to provide for approaches to the new cycle bridge. Plant required will include diggers, cranes, augers, and trucks. Topsoil (on the riverbanks) will need to be removed creating bare land which can generate sediment laden water.

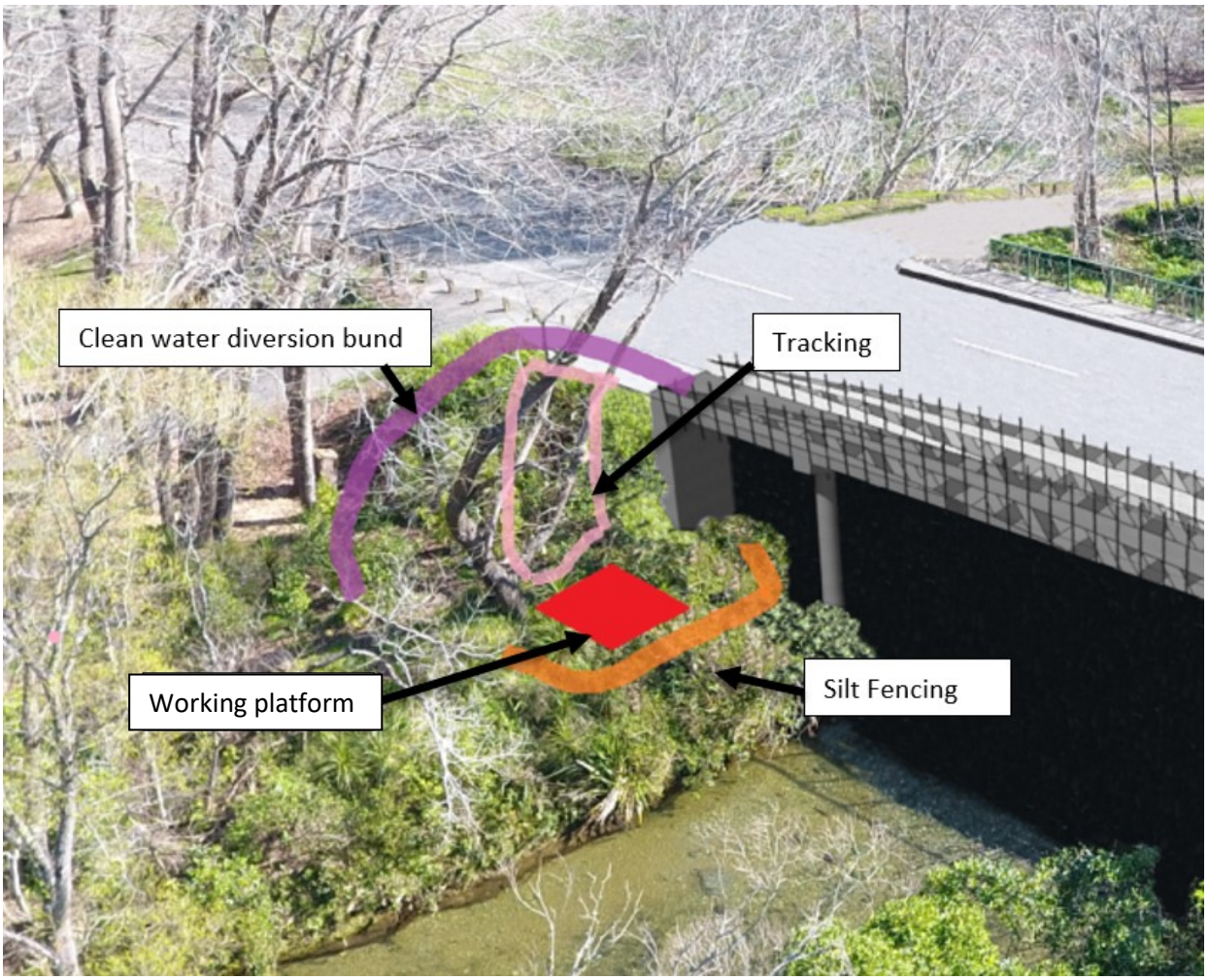

Figure 16. Proposed construction methodology for Jickell's Bridge, Right Bank.

The overall strategy is to create access for plant to gain access to the riverbank so that it can drill the pier casings to the required depth. To achieve this the plant base must be within 1m of pier locations.

Given the nature of the topography and the engineering design, there is only one option available to complete this work. This is described below.

Like the Gibb's bridge development, the drilling works are likely to intercept ground water which must be removed to allow for the pier casing and concrete.

Dewatering works
On installation of the pier casing, it is proposed that a water pump be installed to remove water from within the casing. Further investigation is required by it is estimated that a total of 10m^3 of water will potentially need to be removed from the casing. This will then be pumped to a standard dewatering

tube, which is essentially a filtration bag which can remove most of the sediment from the pumped dirty water.

It is proposed that the dewatering bag be located downstream of the worksite on the same side of the river as the works. Both sides of the river have large recreation reserve areas where filtrate water can flow of grassed areas and vegetated areas before returning to the Maitai River (See image below). The filtrate flow is not a direct point discharge, nor does it have sufficient flow to cause erosion. An alternative to the dewatering bag is direct irrigation to the park and its plantings through a k-line irrigation system.

The dewatering bag system has been commonly employed for small dewatering works without issue or adverse environmental impact.

The dewatering bags come in a variety of sizes and mesh types. A suitable bag will be sourced depending on the nature of the sediments and volume of water expected.

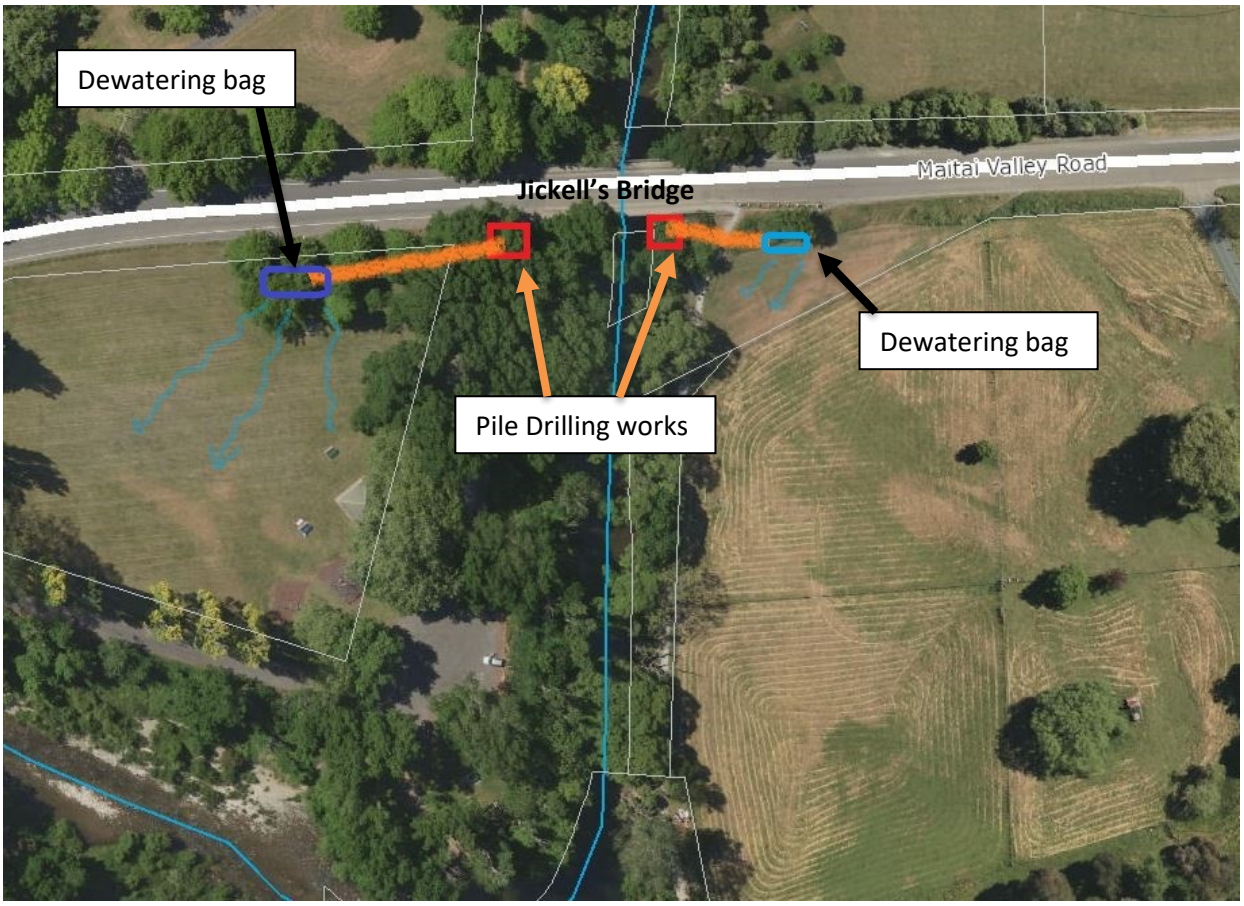

Figure 17. Dewatering plan for Jickell's bridge works.

Figure 18. Examples of commonly available dewatering bags.

The physical works

The methodology for the true left bank and the true right bank is the same. Accessing the area will be from the existing formed road (See figure 17). A track will then be created on the downstream side of the existing bridge where a crane platform will be established on close to the active channel but not in the water. It is estimated that the length of tracking should be no more than 15m and no wider than 4.0m.

Surface land disturbance (estimated to be 40m^3 on each side will be required to allow for the formation of an access track with a reasonable gradient to allow access for the diggers.

No river diversion will be necessary to gain access to the drilling sites. All works can be achieved from the dry land.

Clean water diversion bunding will be installed to limit the generation of sediment laden water from the work area and a silt fence will be installed at the lowest end of the work site to ensure no dirty water can make its way into the Maitai River environment.

At the conclusion of the construction works, all materials will be removed from the riverbed, the riverbank, and the reserve. The area will be reinstated to the same standard as that which existed prior to the works.

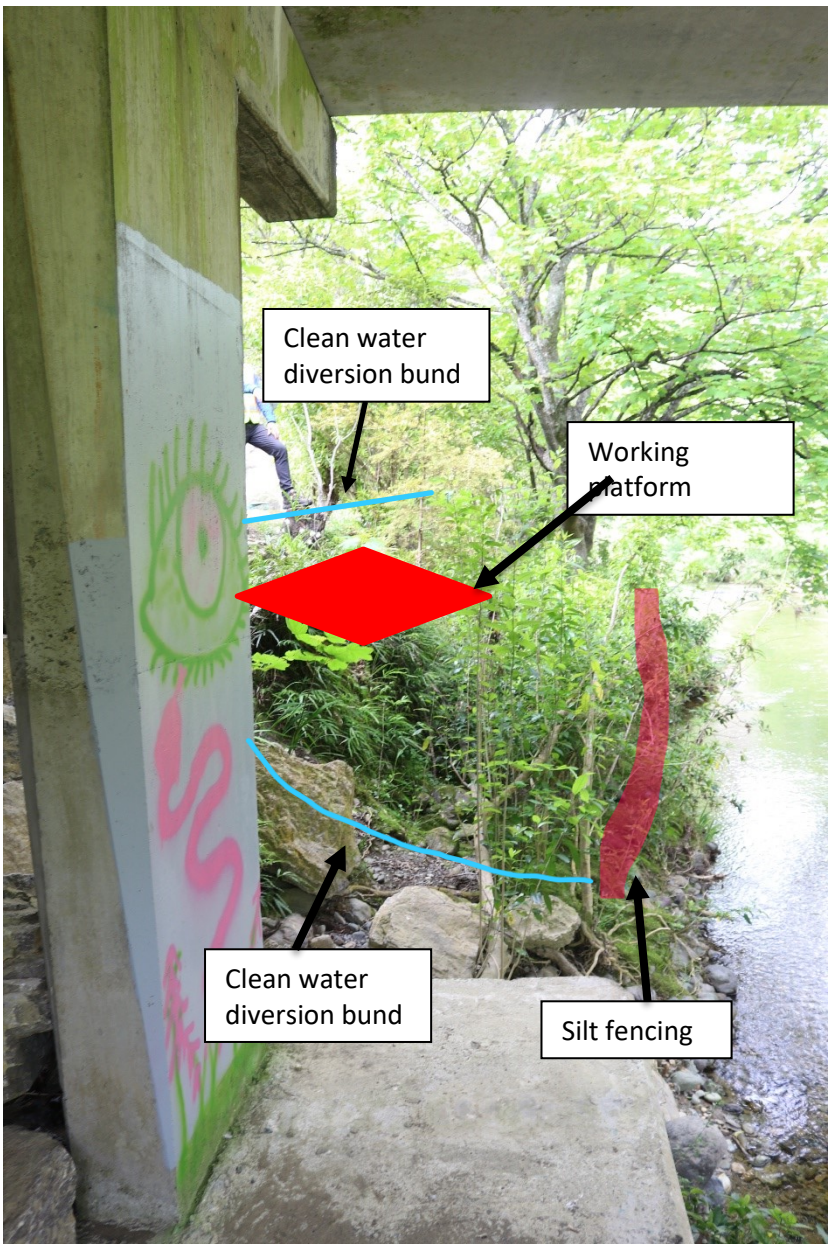

Figure 19. Proposed construction methodology for Jickell's Bridge, Left Bank.

Inspection of Controls during Construction

As part of the methodology, it is expected that daily site monitoring by an appropriate member of the project team will occur to ensure that the E&SC measures have been installed correctly; work practices and methodologies are being followed; and are functioning effectively throughout the duration of the works.

The aim is to identify and address any problem areas that have the potential to have an adverse effect on the environmental before the issue arises. As a minimum, Fulton Hogan staff will undertake:

- daily pre-start meetings – outlining work for the day and potential issues;
- machinery pre-start checks – to ensure the machinery is fit for the task and free from risk; and
- weekly environmental audits.

It is expected that in areas where the risk is high that monitoring of devices and practices will be undertaken more frequently before, during and after heavy rain events.

Best Practice Tools

Suitably qualified and experienced members of the Project team will be responsible for E&SC measures onsite. These individuals will be responsible for developing Site Specific E&SC measures, E&SC construction supervision, inspections, monitoring, maintenance and decommissioning of practices.

The list below is not exhaustive but outlines the minimum level of service with regards to installation, monitoring and evolution of E&SCs during the construction phase. All the points below will be undertaken by members of project team who are suitably qualified and experienced in the field of E&SC.

- Project staff responsible for E&SC must be conversant with consent conditions, this plan, best practice guidelines, monitoring requirements, site geology and areas sensitive to sediment yield generation
- The project team will monitor and react to weather forecasts. This is extremely important as construction activities may need to be amended or in extreme circumstances stopped to avoid generation of sediment during a weather event.
- The project team will undertake daily visual inspections of E&SC measures.
- The project team will undertake weekly inspections and self-auditing.

Proposed Inspection Types

Environmental Inspections

The Environmental Inspections will function as an early detection tool, with the aim to resolve any problems with E&SC practices before a rainfall event occurs.

Environmental inspections of E&SC measures are likely to be the main form of routine monitoring onsite during normal operations. Each inspection will comprise (but is not limited too) the following:

- Visually check that the E&SC measures are appropriate and comply with the methodologies and principles outlined in the ESCP,
- Visually check the construction of E&SC measures to confirm that they have been constructed in accordance with best practice guidelines,
- Visually check that the E&SC measures are functioning as intended, are fit for purpose and continue to remain so,
- Assess maintenance requirements.

The principal recording method that these checks have been undertaken is through the Fulton Hogan E37 Environmental checklist. A copy is provided in Appendix C of this document. All completed checklists are recorded in Fulton Hogan's CAMs system.

Should any of the above checks identify a defect or issue requiring further action, and depending on the severity of the issue, the project team will seek to rectify the problem within required timeframes.

A summary of inspection activities is noted below.

Table 3 - Inspection activities and frequencies

Inspection Activity	Frequency
Inspect all work area is stabilized	Progressively during construction and after rainfall events, high winds and leaving site
Access road exit points free from dirt/housekeeping	Daily

Inspection Activity	Frequency
Refueling outside restricted distance from Maitai River	Daily
Vehicle inspections for plant arriving and departing site to ensure it's clean and unlikely to spread pest species	Each piece of plant
Weather forecasting	Daily

Daily monitoring.
As identified above, weather and general site/housekeeping is expected to be checked daily. Spill kits will be available onsite.

Weekly Auditing
Once a week an audit of all E&SC measures onsite will be undertaken. Self-auditing is a proactive tool that encourages ownership and can instill a sense of pride with regards to E&SC performance. The table below highlights the self-auditing rating guide to be used on the project.

Table 4 - On site rating guide for E&SC measures

Rating	Construction/Maintenance	Examples (not exhaustive)
1	Best practice - no further action required.	
2	Minor technical issue with the control device, where the *purpose* of the guidelines/CEMP/SCEMPs/Erosion and Sediment Control Plan/consent conditions has been met. *Work to be carried out within 7 days*	- No silt fence support - Minor holes in silt fence - Minor discrepancy live/dead storage - Minor lack of volume in SRP/DEB
3	Controls absent or construction of the device is so poor that it leads to/is likely to lead to failure as an efficient erosion/sediment control method. *Work to be carried out within 3 days*	- No returns in silt fence - Discharge at pond outlet causing erosion - Inappropriate pond volumes - Flow paths or spillways inadequately stabilised - Diversion channels or bunds inadequately sized - Silt fence not trenched in
4	Controls absent or construction of the device is so poor that it leads to failure as an efficient erosion/sediment control method leading to an uncontrolled sediment discharge. *Work to be carried out immediately*	

Actions for Weather Events and Environmental Incidents

Weather Events
Best management practices will be used to minimise sediment and debris run off and monitor any potential effects. In addition to the visual inspections and weekly self-auditing, if a severe weather event is forecast, (a significant weather event is defined as greater than a 60mm over 24hr period) the following actions will be implemented.

Pre-Weather Event Procedure:

- Visually check controls onsite prior to weather event to ensure, as far as practicable, that they will function as intended.
- Depending on site specific circumstances and practices used onsite, consider limiting or ceasing works.

- Photograph E&SC measures prior to the weather event to document pre-weather event condition.

Post Weather Event Procedure:

- Check no conspicuous change in colour or visual clarity after reasonable mixing if sediment retention device is operating and discharging into Saxton Creek; and
- General inspection of site controls for damage.

Environmental Incidents

In the unlikely scenario of an event where sediment or contaminants are released from site we will take immediate measures to stop the discharge and will notify the council's monitoring officer of the spill and actions taken.

Fulton Hogan regularly trains staff and conducts annual drills in spill response techniques. Appendix 3 contains a copy of the standardized spill response procedure.

Appendix 1 – Silt Fencing

Silt fences are intended to be used in this project, as and when required. Fulton Hogan considers that silt fences are a last resort and not a first line sediment management device. They will be used as an extra layer of protection in certain areas or before unexpected major weather events.

Figure 20. Photograph of installed silt fence.

Given the limitations described in section 9.2.3 of the Nelson/Tasman guidelines (Chapter 9, page 18), these measures will only be deployed for small areas and in combination with other sediment management devices (below).

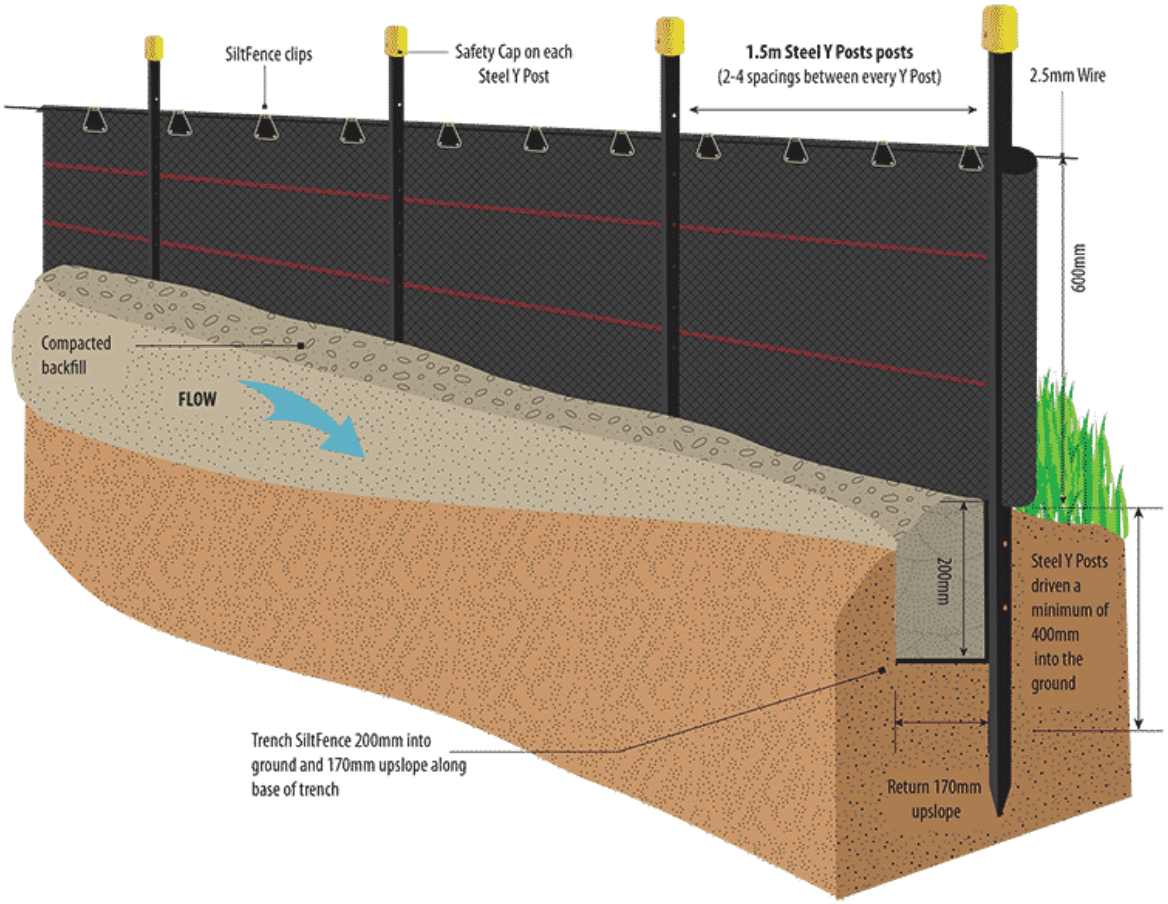

Figure 21. Diagram of silt fence appropriately installed.

When employed, all staff will ensure that the fences are installed in accordance with section 9.2.4 of the guidelines.

All site staff will ensure that the fences are maintained such that:

- Installed fences will be inspected at least once a week and after each rainfall event;
- Inspection will include checking for damage including rips, tears, bulges in the fabric, broken support wires, loose posts/waratahs, overtopping, outflanking, undercutting, and leaking joins in fabric;
- Repairs will be made as soon as identified;
- Removal of accumulated sediment when bulging occurs or when sediment accumulation reaches 20% of the fabric height;
- Remove sediment deposits as necessary (prior to 20% of fabric height) to continue to allow for adequate sediment storage and reduce pressure on the silt fence; and
- Dispose of sediment to a secure area to ensure that it does not discharge to the receiving environment.

Appendix 2 – Diversion Bunding

The Nelson/Tasman Erosion and Sediment Control Guidelines 2019 indicate that such a method is an appropriate control to divert clean water from outside the work area and minimise surface flows. However, the guide indicates that the bunds are not recommended for work areas more than 2 ha without specific engineering input. In this case, all work areas are under this specification.

Figure 22. Example of a diversion bund.

Each diversion bund will surround the work area and direct surface water flow away from the work area. Dirty water from within the work area will be discharged through the dewatering bag thereby ensuring that no dirty water is released to the Maitai River.

Key design features that have been considered include:

- ensuring that the bunds are completed before earthworks commence; the bunds are stabilised before the principal works commence; and
- the capacity of the bunding exceeds the risk profile for the receiving environment by 10%.

In this case, the site catchment area is mainly the recreation areas which are not hard surfaces and should absorb most of the stormwater surface flows. As a default, it is anticipated that the bund will be at least 300mm high and 1m wide.

As per the guidelines, regular maintenance will take place including:

- Weekly inspection, after every rainfall and during periods of prolonged rainfall for scour and areas where breaches could occur. Repair immediately, if required, to ensure that the design capacity is maintained.
- Removal of accumulated sediment deposited in the diversion channel where there is a risk of overtopping due to a lack of freeboard.
- Regular checking of invert and outlets to ensure that these remain free from scour and erosion.
- Regular checking for low spots, areas of water ponding, formation of tunnel gullies, sediment deposition and debris blockage and rectify immediately.
- Check for stabilisation cover and ensure full stabilisation cover remains where required, and
- Protect against damage from earthmoving operations and reinstated if damaged.
- Regular clearance of sumps to maintain efficiency.

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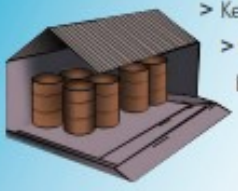
Appendix 3 – Spill procedure

SPILL CHECKLIST

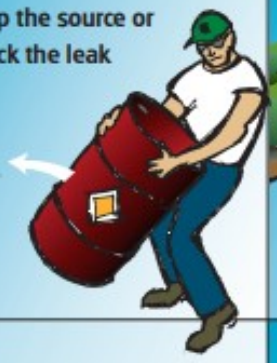
1 Minimise risk
> Minimise volumes stored
> Store safely - cover & bund
> Keep sites tidy
> Monitor for leaks & spills



2 Be prepared
> Have spill gear handy
> Make sure staff are well trained
> Practice

3 Assess the situation
> Can you clean it up safely?
> What PPE is needed?

4 Stop the source or block the leak



5

Contain spill & block drains

6 Call
Foreman/Supervisor
Ph.....
Department/Divisional Manager
Ph.....
Environmental Manager/SQTE
Ph.....

You may also need to contact

Suction Tanker	Ph.....
Local Pollution Hotline	Ph.....
Spill Gear Providers	Ph.....
Waste Disposal Co.	Ph.....
Other	Ph.....

Fire Service: **111 for emergency**

7 Clean everything up with
> Spill kit (boom, pads & loose absorbant)
> Crusher dust/sand
> Using correct PPE

Protect stormwater

8 Dispose of all waste safely
> Spilt material, contaminated earth, PPE & spill gear
> To an approved site or contractor
> So there is no further leakage or pollution

9 Fill out an OFI
> Review incident
> Prevent from happening again

10 Restock spill kit & PPE

Also see Operational Guide E10 - Spill Preparation & Response - Best Practice

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good work

Appendix 4 – Environmental Auditing (E37)

Date:	**Region/Project:**	**Department:**
Location:	**Activity:**	**Inspector:** **Other personnel present:**
Relevant Docs: Consents/EMPs/EMS/other docs.		

#	Check... (see over page for prompts)	Compliant Y/N/NA	Comments/Observations
1	**HazID/Environmental Management** Environmental Hazards & Controls on HazID and/or risk control plan?		
2	**Authorisations** Consents/permits are in place & complied with? Permitted Activities are understood? Include applicable consents/permitted activity rules.		
3	**Containment/leaks//spills** Chemical / fuel / lubricants storage is secure & clean?' Any signs & sources of leaks & spills? Good spill response preparation & risk reduction?		
4	**Energy** Effective energy management practices in place?		
5	**Water Use** Effective water management practices in place?		
6	**Wastes** Effective waste management practices in place? Does site understand where the correct waste disposal facility for material to be disposed of is?		
7	**Washing** Signs of washing? Is it contained?		

8	**Flora and Fauna** Protection of vegetated areas (including trees) and fauna effective?		
9	**Waterways** Protection of waterways effective?		
10	**Erosion and Sediment Control** Erosion & sediment control measures in place & effective?		
11	**Concrete, Lime & Cement** All concrete works controls are effective?		
12	**Dust, Odour, Noise & Vibration** All sources are prevented or managed effectively?		
13	**Weather** Is weather monitored for risky activities and controls put in place to address risk?		
14	**Historical & Archaeological Sites** Is there risk of finding archaeological heritage items and are required controls effective?		
15	**Contaminated Sites** Is there a risk of activities occurring within contaminated land and are required controls effective?		
16	**Housekeeping** Housekeeping is maintained at a high standard?		

General Comments:

Outstanding Actions:

Check:

- **All unsafe acts or non-compliances observed have been corrected and discussed with staff.**
- **All positive observations have been discussed and reinforced with staff.**

Signed (Observer)

_____

#	Aspect to Consider	Prompts
1	**HazID /Environmental Management -** Check that all related environmental hazards & opportunities are included on the site HazID and/or risk control plan and significant hazards are included on any hazard boards. Check activities that present an environmental risk are well managed. **Impact -** Breach of local, regional, or national rules, standards or requirements Site personal unaware of environmental risks.	▪ Spills ▪ Concrete ▪ Sediment & Erosion ▪ EMP on site ▪ Noise, Vibration, Dust, Odour ▪ Signage & staff awareness of risks ▪ (Refer to E01) ▪ Good procedures in place & well understood
2	**Authorisation -** Check that all consents are in place & that all activities with compliance requirements (including permitted activities) are being complied with. **Impacts -** Breach of local, regional, or national rules, standards or requirements – public nuisance, property harm, pollution of air, land or water.	▪ Any discharges to land, air or water ▪ Works in a water course, on or under a tree ▪ Extraction of any mineral resource ▪ Refer to E13
3	**Containment/Leaks/Spills -** Check all chemicals, fuels, lubricants & other material (such as cement etc.) are adequately / safely contained. Check for leaking and signs of spills. Check spill preparation and prevention is on site and keep an eye out for any signs of spill residues on yards or in drains. **Impacts -** Contamination of land and water – poisons, smothers or causes long-term effects to land- and water-based life	▪ Containment ▪ Secondary containment ▪ MSDS are available ▪ Bund valves are in the shut (or locked out) position ▪ Handling & stormwater managed to prevent pollution ▪ Leaks ▪ Spills ▪ Documented spill plan ▪ All spill kits are well located, fully stocked & appropriate for the area of risk ▪ Staff are suitably competent to respond to a spill. ▪ Refer to E09 & E10
4	**Energy -** Keep an eye out for any obvious energy wastage **Impact -** Unsustainable consumption of non –renewable or polluting resources such as fuel, electricity, gas etc. and unnecessary emission of carbon dioxide.	▪ Heat loss, idling, lights on etc. ▪ Looks for smart ways to reduce energy use
5	**Water Use -** Check that any significant uses of water are being managed to minimise waste, reduce use & maximise recycling. **Impact -** Unsustainable consumption	▪ wet patches observed when no rain has occurred ▪ Not collecting roof water ▪ Disposal of water that could be reused
6	**Wastes -** Check in & around waste bins for stuff that can be recycled or may leak out of the bin. Check all liquid waste is being well managed to prevent leaks, spill & waste. **Impact -** Breach of local, regional or national rules standards or requirements – long-term pollution of land or water, exhaustion of natural resources.	▪ Check wastes can't be reduced through the 3Rs ▪ Make sure waste areas are tidy & well managed ▪ Talk to waste contractor for signs & reduction assistance ▪ Try & design waste out of the process
7	**Washing -** Keep an eye out for signs that washing is taking place where wash water is not properly collected and disposed of & check wash facilities are being operated & maintained properly. **Impact -** pollution of receiving waters and infrastructure or vegetation	▪ Hoses, buckets & brushes by doors, water sources etc. ▪ Puddles on the ground in dry weather ▪ Ground staining
8	**Flora and Fauna -** Check that none of our activities have the potential to have an effect on fauna, or impact under the drip line of any significant trees without appropriate authorisation.	▪ Be aware of significant trees ▪ Refer to E21 and E63

	Impact - Breach of local, regional and national rules or requirements – damage to significant trees or riparian vegetation and fauna.	
9	**Waterways -** Check that none of our activities have the potential to enter any watercourse. **Impact -** Breach of local, regional and national rules or requirements – damage to water course.	▪ Be aware of nearby water courses ▪ Refer to E71
10	**Erosion and Sediment Control -** Check that all sediment & erosion control measures are in place, well maintained and functioning. **Impact -** Pollution of receiving waters and infrastructure with sediment – blocks drainage systems and harms aquatic life via smothering, abrasion and choking.	▪ Catch pit protection ▪ Stabilisation ▪ Dewatering controls ▪ Access protection ▪ Refer to E24
11	**Concrete, Lime & Cement -** Are all activities involving concrete, lime or cement managed to prevent any run-off or pollution. **Impact -** pollution of receiving waters and infrastructure with corrosive slurry – harms/kills aquatic life and causes blockages in drains.	▪ e.g. cutting, grinding, pouring, laying, washing, piling, moulding, blasting, stabilising, exposed aggregate, curb & channel etc. ▪ Refer to E06, E07 & E17
12	**Dust, Odour, Noise & Vibration -** Keep an eye out for signs of dust generation or transport off site or any sources of odour, vibration or noise that might cause a nuisance to any neighbours. **Impact -** nuisance to public and damage to property.	▪ Machinery & equipment ▪ Stockpiles ▪ Refer to E12 ▪ Stockpiles ▪ Diversion drains ▪ Silt fences ▪ Other treatment devices
13	**Weather -** Is the weather known if activities are being carried out that could be impacted by wet or windy weather? **Impact -** pollution of receiving waters and infrastructure with corrosive slurry or emulsion – harms/kills aquatic life and causes blockages in drains. Air discharge from dusty site operations.	▪ Concreting ▪ Emulsion
14	**Historical and Archaeological Sites - Keep** an eye out for potential indicators of historical sites such as middens (food or rubbish pits indicated by shells), Urupa (burial sites), old buildings, traditional cultivation, bathing sites. **Impact -** Historical/Archaeological: Damage to site or artefacts of historical or archaeological material.	▪ Middens – food or rubbish pits indicated by shells ▪ Burial sites ▪ Old buildings ▪ Urupa Traditional cultivation ▪ Bathing sites ▪ Refer to E56
15	**Contaminated Land -** Keep an eye out for signs of encountering contaminated soils – texture, colour, etc. in, or next to old landfills, reclamations or industrial sites. **Impact -** Exposing people and/or environment to hazardous materials	▪ Refer to E64 ▪ Discolouration of soils ▪ Smells of chemicals
16	**Housekeeping -** Check the general state of the site. Look behind things, buildings, containers, fences, back doors and work out where stormwater flows to from the site and check for signs of contamination / pollution etc. **Impact -** Increased risk of environmental and H&S incidents, reduced efficiency, reduced professional image.	▪ Junk around the edge of the site ▪ Piles of 'old' gear & equipment ▪ Old containers ▪ Subcontractors ▪ Manufacturing processes

Appendix 5 - Site Photos

Gibbs Bridge, Right bank, Upstream

Gibbs Bridge, Right bank, Upstream

Gibbs Bridge, Right bank, Looking upstream

Gibbs Bridge, Right bank, Downstream

Gibbs Bridge, Right bank, Looking across

Gibbs Bridge, Right bank, Looking across

Gibbs Bridge, Instream, Looking upstream

Gibbs Bridge, Left bank, Access

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Gibbs Bridge, Left bank, Looking across

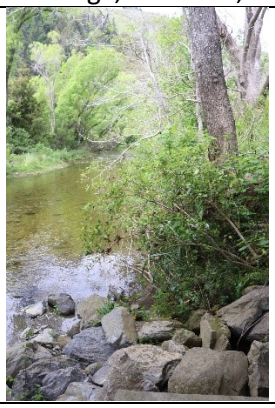
Gibbs Bridge, Left bank, Access downstream

Gibbs Bridge, Left bank, Access downstream

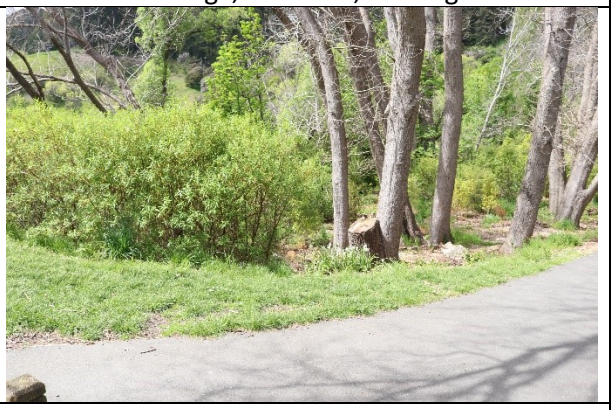
Jeckill's Bridge, Left bank, Access downstream

Jeckill's Bridge, Left bank, Access

Jeckill's Bridge, Left bank, Looking across



Jeckill's Bridge, Left bank, Looking across



Jeckill's Bridge, Left bank, Access