

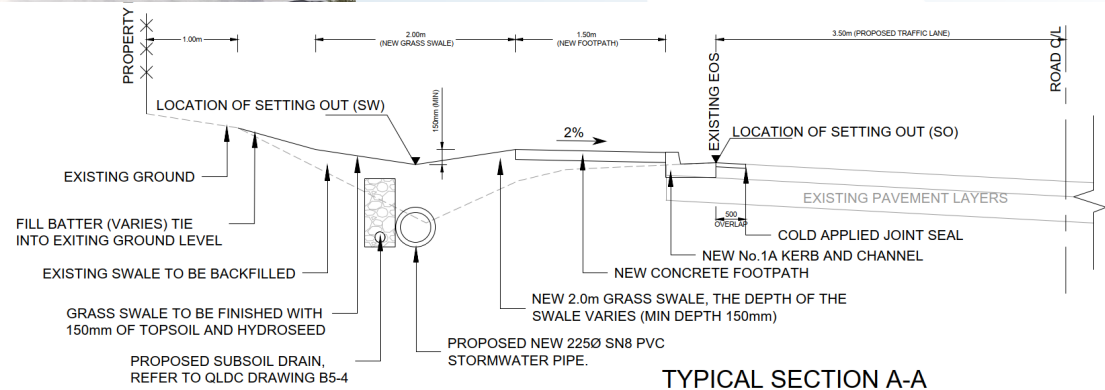
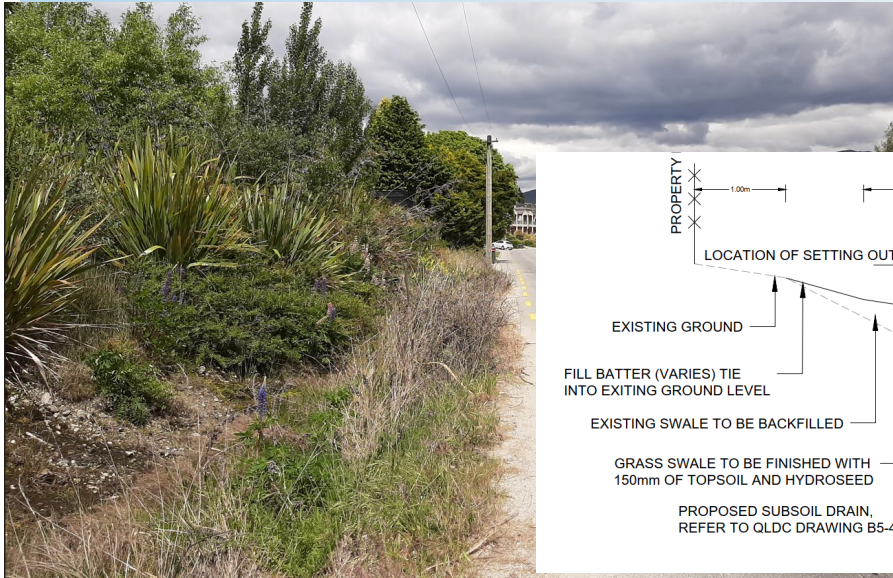
Don't forget that  
fish can climb

*Esther McArthur, Civil Engineer*

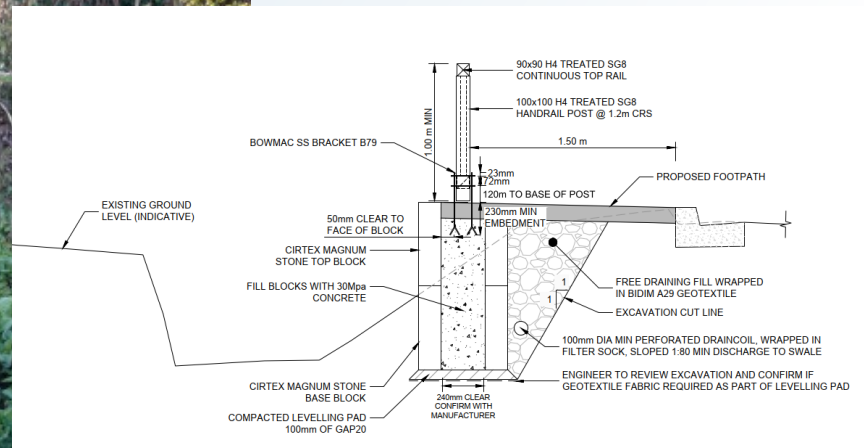
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# Project Scope





**TYPICAL SECTION A-A**



**RETAINING WALL WITH HANDRAIL TYPE 1**

# ORC Consent Questions

**A freshwater flow and fish passage assessment should be completed by a suitably qualified ecologist of the two spring fed watercourses (Northern Swale and Southern Swale).**

**Determine the presence or absence of native and introduced fish species, particularly kōaro, within the two watercourses. This should be completed by a suitably qualified ecologist.**

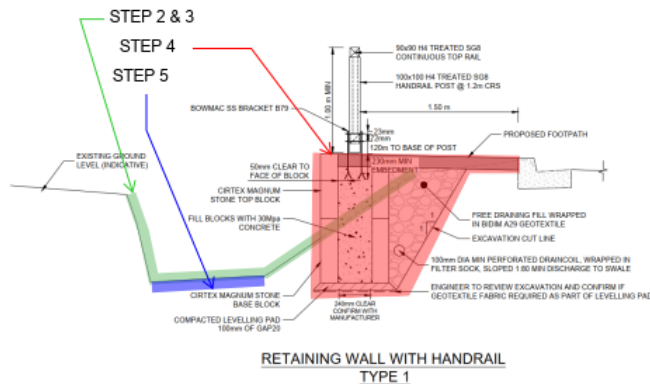
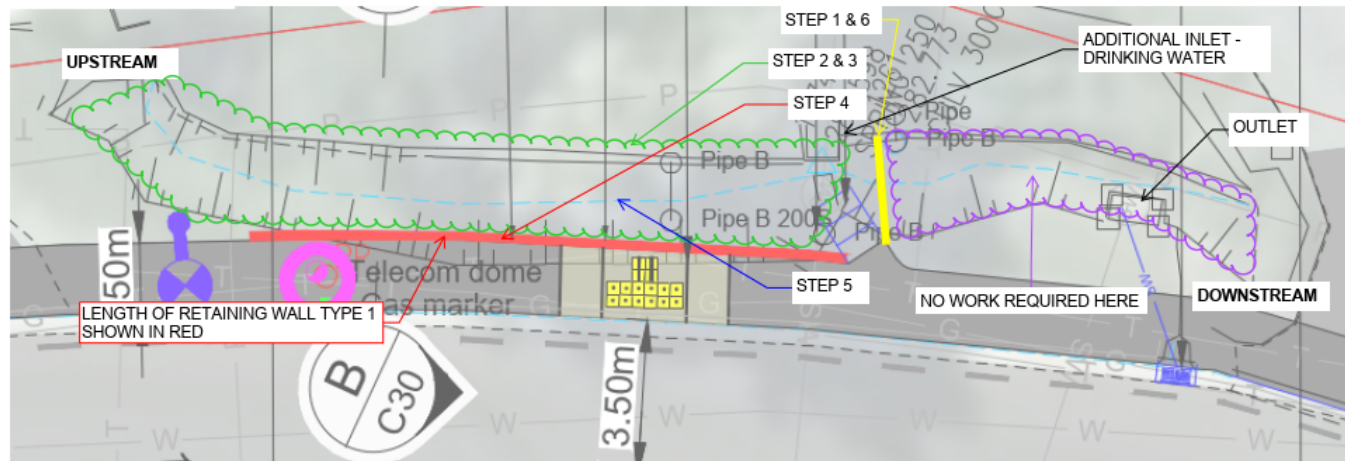
**A macrophyte and macroinvertebrate assessment should be completed, particularly for the Northern Swale where any habitat will be permanently lost by the proposed activity.**

# Fish!



Swale	Species	Number	Size Range (mm)	Length (mm)
Northern	Kōaro	1	87	87
Southern	Kōaro	1	176	176
	Rainbow trout	1	69	69

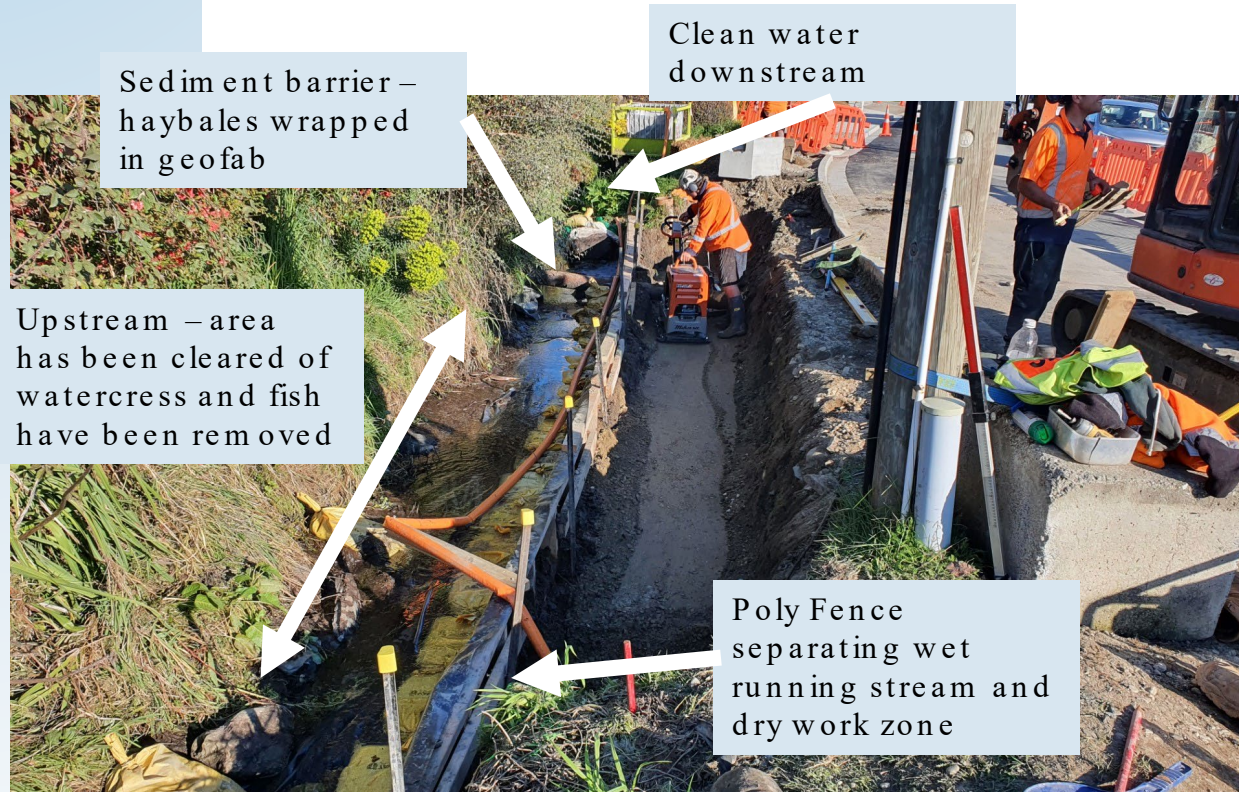
# Southern Swale – Fish Management Plan and Mitigation/Improvements



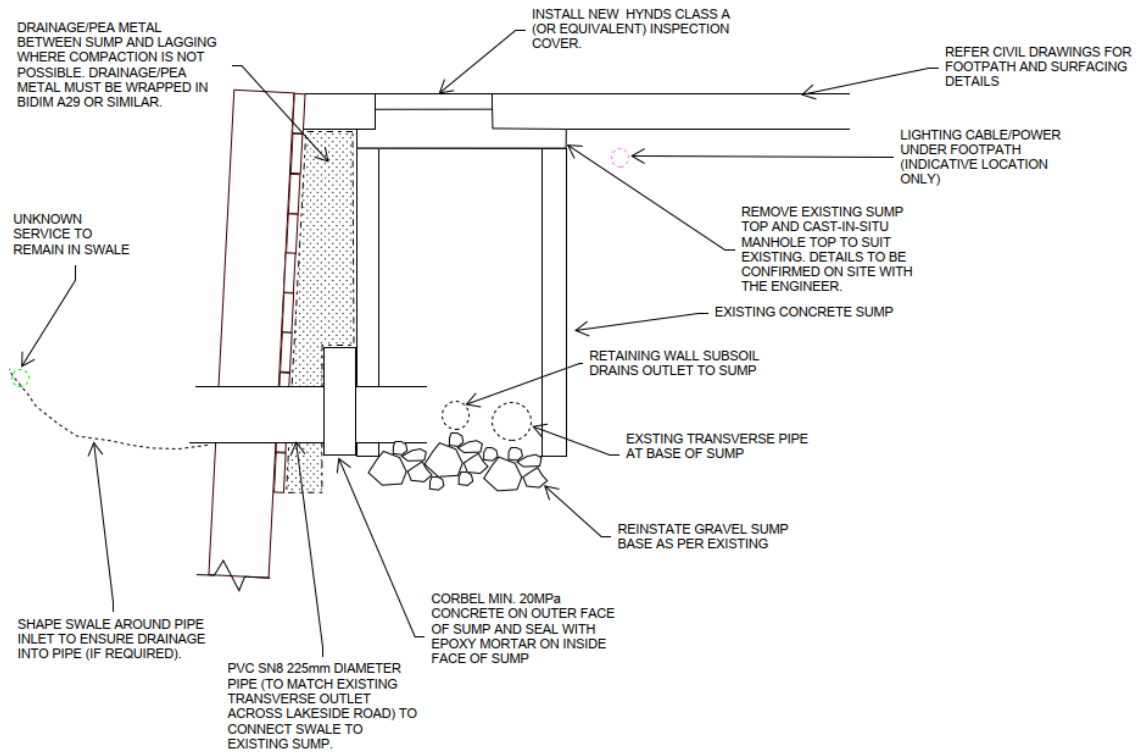
## PROPOSED WORK SCHEDULE ON THE SOUTHERN SWALE:

1. INSTALL TEMPORARY SEDIMENT BARRIER AT THE 20M MARK
2. REMOVE WATERCRESS FROM UPSTREAM
3. CHECK FOR FISH SALVAGE FROM THIS SECTION. IF REQUIRED, RELOCATE THEM DOWNSTREAM OF THE TEMPORARY SEDIMENT BARRIER.
4. CONSTRUCT RETAINING WALL
5. CREATE SOME SMALL POCKETS OF DEEPER WATER (100MM) AND ADD COBBLES AND COARSE GRAVEL IF REQUIRED.
6. ONCE ESTABLISHED, REMOVE TEMPORARY SEDIMENT BARRIER.

# Southern Swale – Fish Management in Construction



# Northern Swale Re-Design



**CROSS SECTION FOR EXISTING SUMP CONNECTION TO SWALE**



# Lessons Learnt

- Ecological importance of a roadside ditch
- Aquatic ecologist
- How designs can be adjusted to accommodate Kōaro
- Don't forget that fish can climb

Thank you

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