

IN THE MATTER of the Resource Management Act 1991 ('the Act')

AND of an application for resource consent to construct and operate a
campground at Davie Street, Hokitika

IN THE MATTER

EVIDENCE OF BRYCE WEAL

ON BEHALF OF TUFFY INVESTMENTS LIMITED

INTRODUCTION

1. My full name is Bryce Arthur Weal. I am a Civil/Structural Engineer, I am a member of the Institute of Professional Engineers New Zealand and also a member of the Association of Consulting Engineers New Zealand.
2. I hold a Bachelor of Engineering degree from Auckland University and graduated in 1974. I am a CPEng Engineer and also hold a New Zealand Certificate in Engineering from Waikato Technical Institute which preceded the BE degree. I have some 42 years' experience in Civil/Structural Projects throughout New Zealand.
3. I have read and understood the Environment Courts Code of Conduct and agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this statement of evidence are within my area of expertise.
4. The data, information facts and assumptions I have considered in forming my opinions are noted in my evidence.
5. I have not omitted to consider material facts known to me that might alter or detract from the opinions I have expressed.
6. In addition to my technical qualifications and experience I have also participated, in my earlier years, in camping around New Zealand and elsewhere in the world. So I am aware of the health, safety and operational issues that occur.
7. Earlier in my career as a Civil/Structural Engineer I was employed by the Ministry of Works and Development in the Hamilton Bridge design section. I assessed catchments, flow rates and performance of culverts, stream and river channels etc. At that time there was very little thought given to detention/soakage systems but in later years when because of growth and climate change the infrastructure systems have come under some stress and detention/soakage systems have become common place. I have designed a number of such systems mainly in Hamilton (Innovation Park, Commercial/Industrial Developments in new industrial areas) but also in Rolleston for Westland Milk.

SCOPE OF EVIDENCE

8. The purpose of my evidence is to present the stormwater management strategy developed for the camp ground in Davie Street and outline the process and technical assessments used to develop it. I will cover management of stormwater for both the design "storm" (10% probability of occurring annually) and larger events that exceed the NZBC design requirements.

EXECUTIVE SUMMARY

9. The stormwater disposal system to be adopted on the campsite property is by soakage trenches and soakpits.
10. The volume of stormwater has been assessed using a 10% probability as required NZBC E2/VM1.
11. All known discharges have been assessed and provided with a soakage system using the free draining gravels that exist at approximately 1.5m below the ground level.
12. Secondary overland flow has been provided using the campsite as the disposal/detention area.

BACKGROUND

13. The proposed campsite is located on Lot1 of DP34911 which is 2.5070 hectares (25070m²) in area. A part of the site is covered in bush (native plants and exotics) which will remain. Approximately 22000m² of the site is available for cabins (of various configurations), an amenities block, dining block, manager's house, shop, utilities building, tent sites and motor home parks. The total area of the buildings is 1374m² (6.2% of the clear area) which means there are large green spaces that occur. The cabins range from 3m to 4m high, amenities/dining 4m, shop/utilities 5m and managers house 4m. There are only two buildings that exceed 4m in height. A circular asphalted roadway runs around within the site with the cabins etc. outside this roadway and the amenities/dining inside the roadway i.e. central to the site.

APPROACH TO STORMWATER

14. The stormwater reticulation and disposal has been considered from the outset with two options being investigated.
15. The first option considered was to continue with a solution that followed what existed by installing a 600mm diameter pipe to connect the Heenan Place outlet directly to the Davie Street Council reticulated system, these 600mm diameter pipes were purchased and are stored on site. The existing "legal" connections from some of the adjacent residential properties would be provided with individual soak pits as for the camping ground buildings.
16. The second option was to dispense with the 600mm diameter pipeline and to use soak pits to dispose of all the water entering and being generated by the site.
17. Following a number of discussions and an investigation into the ability of the ground to determine its permeability option 2 was selected as the preferred option.

This also had the added advantage of removing the Heenan Place discharge completely from the Council reticulation system which would help to improve the town's downstream disposal system that is currently under some stress during large events. In addition a pipe solution would exacerbate the stress that the current stormwater system is under by reducing the time of concentration.

EXISTING SITE

18. The site that existed prior to any work (other than the bush area) was covered in rubbishy foliage with a series of open channels across it. These open channels (or drains) were approximately 1.0m to 1.5m deep and effectively took the water from the Heenan Place discharge to the Davie Street inlet. The open channels would have also provided some detention/storage in major storm events however the Davie Street inlet pipe at 600mm diameter is obviously able to take a very large flow into the Council reticulated system because of its large diameter.

On checking the invert levels we have found that the Heenan Place outlet is 470mm higher than the Davie Street inlet pipe. This gives a minimal slope of 1 in 500, which may not have been sufficient to take the Heenan Place flow via a pipeline.

19. The site that exists currently has had some reshaping of the ground and the open channels backfilled. Currently, therefore, there is no water disposal from Heenan Place directly to the Davie Street inlet so disposal currently relies on soakage through the natural ground, i.e. a soakage trench system is not yet constructed for the Heenan Place outlet.
20. The area of the site and surrounding residences is underlain with silts and poorly draining materials. Below these silts, approximately 1.5m depth, exists a hard almost impervious layer of only 100mm to 200mm thickness known locally as a hard pan. Below this hard pan exists clean free draining gravels (the water table is at some depth below this hard pan) that provides extremely good drainage.
21. The permeability of the gravels below the hard pan was established using the New Zealand Building Code E2/VM1 Clause 9.03 method, a permeability of 1.11 cm/sec resulted.
22. There are a number of small pipes discharging stormwater into the site from some of the surrounding residential sections. These discharges are very small and minor in nature compared to the flow from the Heenan Place outlet.

PROPOSED STORMWATER DISPOSAL MANAGEMENT

23. A very large proportion of the stormwater to be disposed of enters the site via the Heenan Place outlet pipe.

The catchment area that contributes to this outlet was established by Coastwide Surveys who have an office in Hokitika and a very good background/experience of the local area. Using this catchment information the stormwater volumes were established using the method in the New Zealand Building Code Section E1/VM1. A design storm event having a probability occurring annually of 10% has been used and NIWA data to establish the rainfall intensity.

24. Following the establishment of the design event LIDAR (Light Detection and Ranging) information (aerial survey) was provided by Council and used by Stiles and Hooker to check the catchment area. Coastwide Surveys established an overall area of 40400m² while Stiles and Hooker established a lower catchment area of 32000m². The larger catchment area 40400m² has been used for the calculation of the flow from the Heenan Place outlet. This area does not include the campsite area or Jollie Street residences that back onto the campsite.
25. The Heenan Place disposal system will consist of an 11.25m long x 2m wide soakage trench that will be excavated through the hard pan to expose the free draining gravels beneath. The size of soakage trench has been established using the design flow (found as described in 23 above) and the permeability (described in 21 above). The soakage trench can be grassed over.

The soakage trench will be fitted with a Hynds 3300 litre silt interceptor upstream, to remove all of the material that may over time, cause the soakage trench to become less effective. The soakage trench will comprise of a Hynds well liner with manhole to give access to allow inspection of the soakage trench which if necessary will allow cleaning of the soakage trench. The silt trap that is fitted upstream of the soakage trench will need to be checked on a regular basis (once every 6 months but also prior to a major storm event) and cleaned when required. The interceptor can collect a large volume of silt before cleaning is required but it should still be monitored regularly.

26. For the lower flows that result from the campsite development and surrounding residential properties smaller localised soak pits will be established for the disposal of the discharges. The stormwater management assessment included a developed campsite with a stormwater reticulation system and soakpit layout. The soakage areas were established by calculation with Heenan Place (22m²). Developed camp site (15m²) and discharges onto the camp site (1.6m²). A typical soak pit detail was provided that showed each individual soak pit would have a 4m² discharge area available.
27. Following the queries relating to the Jollie Street catchment area I have reassessed the discharges onto the camp site from the Jollie Street residences. As noted above Jollie Street is below the level of the adjacent residential properties and the LIDAR data (levels) shows that approximately 20m of the rear of the properties drains back to the campsite and the front to Jollie Street. Using a catchment area of 20m x 250m long, applying runoff coefficients for roofs, driveways, and grassed areas with the design rainfall intensity a required soakpit area of 8.6m² is calculated.

This compares to the previously determined 1.6m^2 , so it is now over 5 times the previous assessment. The typical soakpit has a 4m^2 discharge area which means 2 soak pits are required to dispose of the Jollie Street stormwater. In our drawings (attached Appendix I) there are 4 catch pits that have been designated specifically for the Jollie Street runoff i.e. a total of 16m^2 of soakage area, which is much more than the 8.6m^2 required. The secondary flow path is onto the campsite (refer 34 below).

28. Finally the existing 600mm diameter pipe that exists in Davie Street will be extended into the campsite to pick up two Davie Street properties and be fitted with a grate to take any overland flow if it should eventuate. The campsite is lower than the surrounding residential properties so that some protection for the developed campsite will be required. Any such occurrence would be at the end of a major event and the detention available within the campsite is very large, we don't see the Davie Street inlet as ever being required.
29. The Heenan Place soakage trench will be vested to Council ownership so that it becomes part of the Council reticulation system. Refer to the drawings in Appendix I for a pictorial description of the disposal system.

CONSULTATION

30. There has been ongoing discussions with staff at the Westland District Council both prior to the resource consent application being lodged and afterwards.
31. The following briefly itemises the consultation that has occurred with Council
 - Various discussions occurred, reviewing of property files etc. to gather information that started the process of consultation.
 - 2nd March 2016 – stormwater assessment was emailed to Council for the pipe across the site solution.
 - 18th April 2016 – meeting occurred to discuss 2nd March assessment (Council – Pam Wilson, Rebecca Beaumont/Eddie Newman/Tuffy – Evan Jones, Lynda Watson, Bryce Weal) Eddie Newman
 - 19th April 2016 – 2nd March assessment shelved and another proposal (soakpits) mooted.
 - 8th June 2016 – meeting (Council – Rebecca Beaumont, Eddie Newman/Tuffy – Evan Jones, Bryce Weal
 - 19th July 2016 – meeting (Council – Rebecca Beaumont, Vivek Goel/Tuffy – Lynda Watson)

- 17th January 2017 – on site meeting (Council – Vivek Goel, Eddie Newman, John Strange/ Tuffy – Evan Jones, Lynda Watson, Bryce Weal)
32. I provided a stormwater assessment and report as part of the resource consent application. This assessment identified the catchment types and areas, identified the design storm and time of concentration all of which were used to calculate the volume of stormwater to be disposed of. The report also established the stormwater generated within the campsite development, identified the permeability of the receiving gravels and established soakage trench and pit dimensions and provided the stormwater management system that was required.

33. **RFI DATED 24TH MAY 2016**

Council requested further information on surface runoff from surrounding properties, flow testing, total volume of flow, how legal and illegal discharges were established. The stormwater assessment described the catchment, runoff coefficients and contained calculations that established the storm event for the Heenan Place soakage and included permeability testing results so a lot of the requested information had been provided. However the Council request also included some information on the flows from the residential properties. We had searched the property files to obtain this information but following the RFI requested that Council look through their records as a further investigation. The updated stormwater assessment dated 1st September 2016 was forwarded Council on the 1st September 2016.

34. **RFI DATED 23RD DECEMBER 2016.**

An RFI was received from Council requesting consideration of 4 aspects.

- **Catchment Area Assessment**
The submitters have queried the accuracy of the total stormwater volume entering the site, and I agree that the Heenan Place assessment does not include all of the small flows (noted in 22 above) that occur from some of the surrounding residential sites. The Heenan Place assessment though is correct, the other flows are taken by smaller individual soakpits that are not part of the Heenan Place disposal solution. The submitters also claim that other stormwater sources have been ignored but this is not the case. All known discharges were dealt with but any others can also be included in a reticulation system to the individual soakpits if required.

- Concrete Nib/Filling of Open Drains.

The submitters claim that the nib that has been constructed around the perimeter of the campsite and the filling of the open drains has caused upstream effects and impeded overland flows. I agree that both of these constructions have resulted in some effects on both the upstream flows and raising the water table. The concrete nib will be partially removed at the lower point of each residential property to provide an overland flow path onto the campsite. For the filling of the open drains the proposed soakage trench will alleviate this issue.

- Secondary Flowpath, Provision

The submitters have asked for the secondary flowpath to be identified and protected. The partial removal of the concrete nib will ensure a secondary flow path exists from the surrounding residential sites. However the LIDAR, information confirms that the ground levels crown between Jollie Street and the campsite so the actual secondary flow path does not occur as a flow across the Jollie Street properties. The secondary flow path is down Jollie Street in a southerly direction to a low point in Jollie Street where stormwater will pond. For the Heenan Place soakage trench an outlet structure will be provided (at the invert of the current Heenan Place outlet pipe) and a 600mm diameter pipe will take any secondary flow to the large soakage trench that has already been constructed. A bubble up chamber will also be added to provide an outlet into the low areas of the campsite; in the very unlikely event that both soakage trenches cannot dispose of the storm discharge. The bubble up chamber will be within the campsite property at a lower level than the surrounding properties (10.3m) and the campsite roadway will become a detention area that allows shallow ponding and a secondary flow path to the Council reticulation system in Davie Street.

- Wider upstream effects caused by filling in the open drains.

As noted above I agree that the filling in of the drains has impeded large flows; it was always the intention to carry on with the soakage trench construction, however work was stopped before a temporary soakage trench could be formed. Once the soakage trench has been constructed in Heenan Place the outlet restriction caused by filling in of the drains will no longer exist and there will be no upstream effects. The invert of the proposed soakage trench is below the invert of the current outlet.

34. I have also had a number of discussions with Council both by phone and recently met (22nd January) on site with Messrs Vivek Goel, Eddie Newman, John Strange (representing Council), Evan Jones (Tuffy Investments Ltd) and Lynda Watson of Coastwide Surveys Ltd (representing Tuffy).

At this meeting the queries raised were the:

- Additional catchment areas from the adjacent residential sites.
 - Provide an overland flowpath from the adjacent residential sites.
 - Consider if a secondary flow path is required from the Heenan Place soakage trench.
 - Clarify any upstream effect from the filling in of the open drains.
36. As a result of the discussions with Council on the 22nd January the following additions were made.
- Nib removed locally for each residence
 - Connection of all residential flows to a soakage pit (initially this was just the known discharges).
 - Secondary flow path from the proposed Heenan Place soakage trench.

37. **SUBMITTER CONCERNS**

The submitters have raised concerns through the Council regarding the proposed stormwater disposal system. These concerns have been replayed to me through the Council and I consider that these concerns have been addressed through RFI responses to Council and in this evidence.

38. **COMMENTS ON THE OFFICERS REPORT**

I have read the section 42A Report prepared by Ms Jess Hollis. In her report at Clause 7.74 and again in 7.86 Ms Hollis notes that insufficient evidence has been provided regarding the stormwater effects on adjoining properties. I have provided responses to all requests from the Council for further information, and I have provided a detailed description of the assessment process and resulting stormwater disposal system for the proposed campground.

In my opinion, the design is an improvement on the previous open drain system, and the benefits of a more efficient stormwater disposal system will benefit the surrounding neighbours.

39. **CONDITIONS**

Included in the application and in the evidence of Ms Lynda Watson were a set of proposed conditions. I have been asked to comment on whether, in my opinion, there are any conditions that I consider should be included these have been discussed and relayed to Ms Watson.

40. **CONCLUSION**

The stormwater strategy for the Davie Street campground has been developed based on

- Site inspections and surveys
- Design storm events calculation
- Calculations of catchment area
- Assessment of catchment type
- Determination of permeability coefficient
- Calculation of the soakage areas required
- Establishment of the secondary flow paths

41. Through preliminary assessment and concept design I have prepared the stormwater management solution using soakage trenches and soak pits.
42. An initial option of piping the main discharge to the Council reticulation system was investigated and discarded.
43. The solution that has been established serves the local community, adjacent residences; the campsite and at the same time relieves some of the stress that the Council system is under.

B.A. Weal





Engineering Consultant

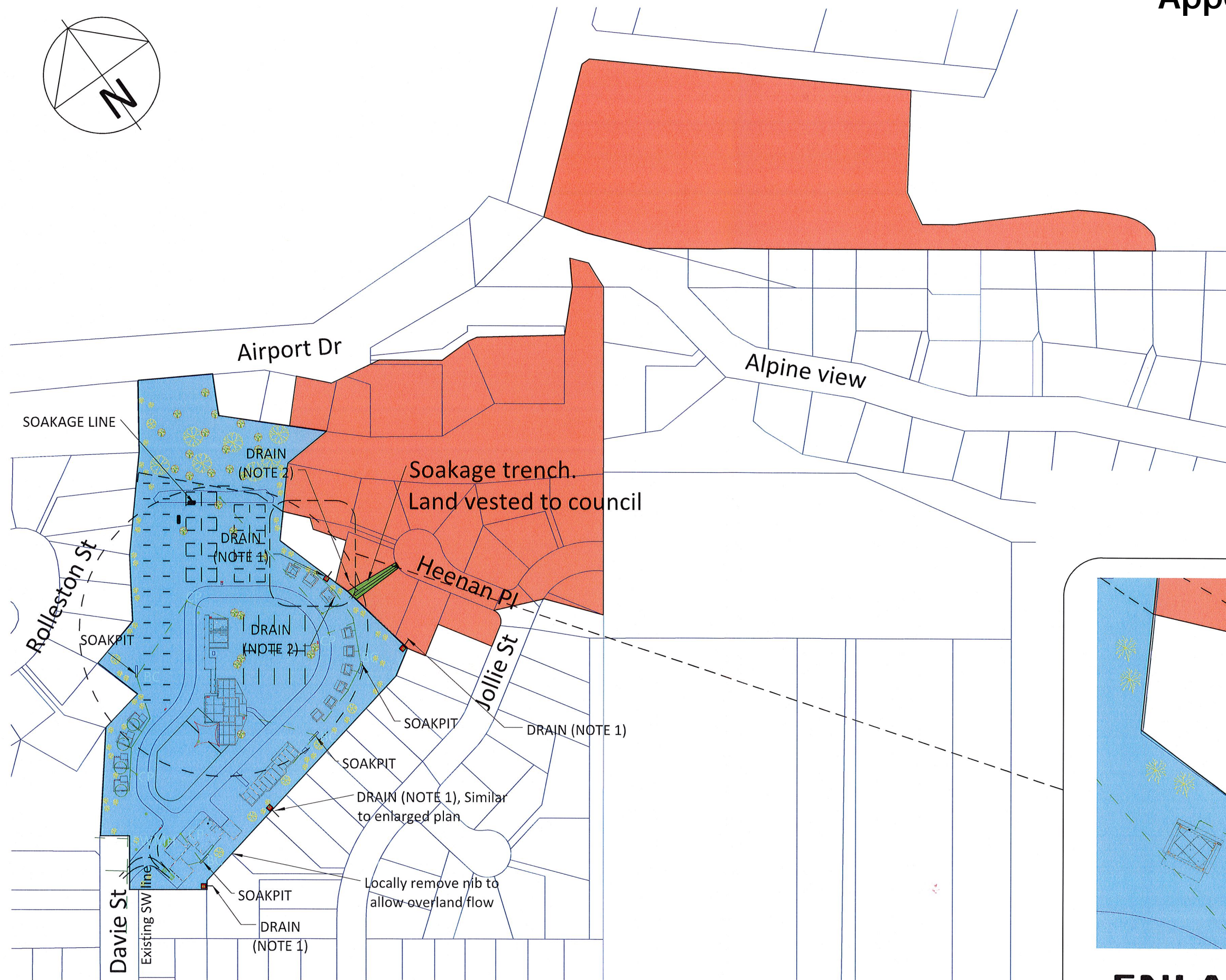
Dated this 10th day of February 2017

APPENDIX I

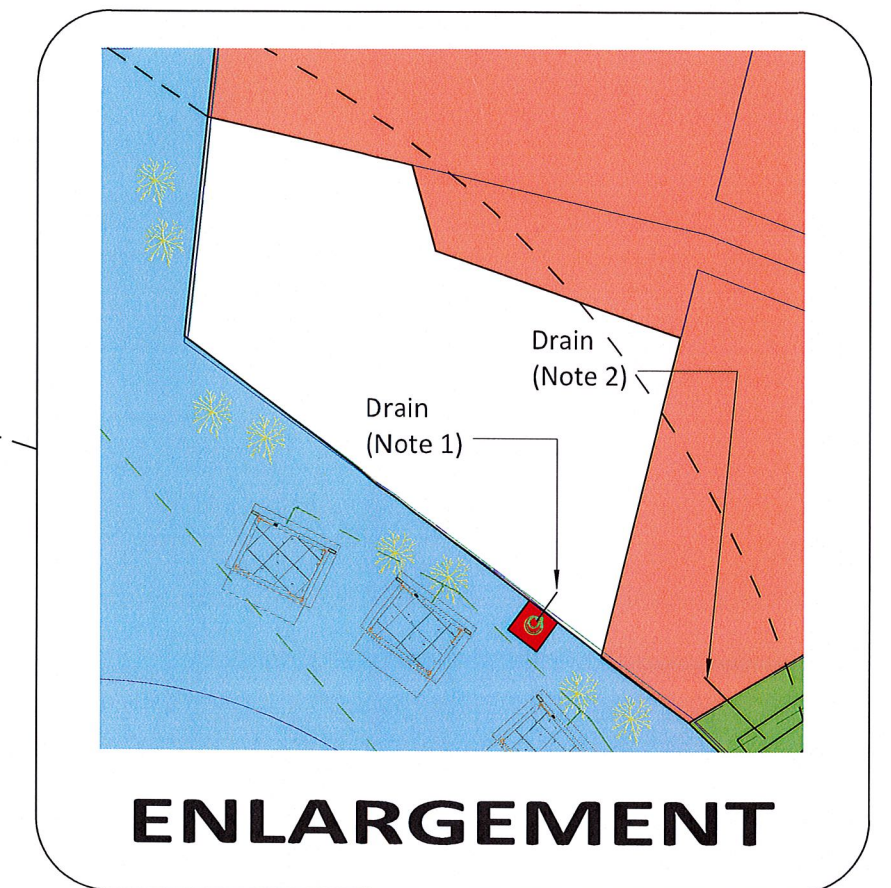
Drawings to be read in conjunction with the assessment.

CATCHMENT AREA LEGEND

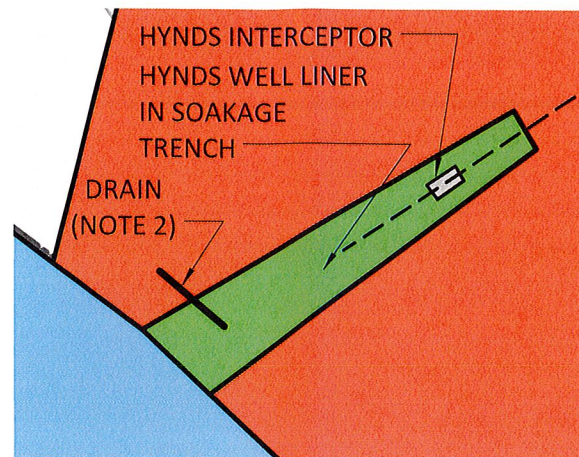
-  = DEVELOPED CAMP SITE
-  = HEENAN PLACE CATCHMENT
-  = LAND VESTED TO COUNCIL
-  NOTE 1: DRAIN DISCHARGING INTO CAMP SITE TO BE PROVIDED WITH SOAKPIT AND EASEMENT OVER
- NOTE 2: PIPE TO BE DIVERTED INTO HEENAN PLACE SOAKAGE TRENCH



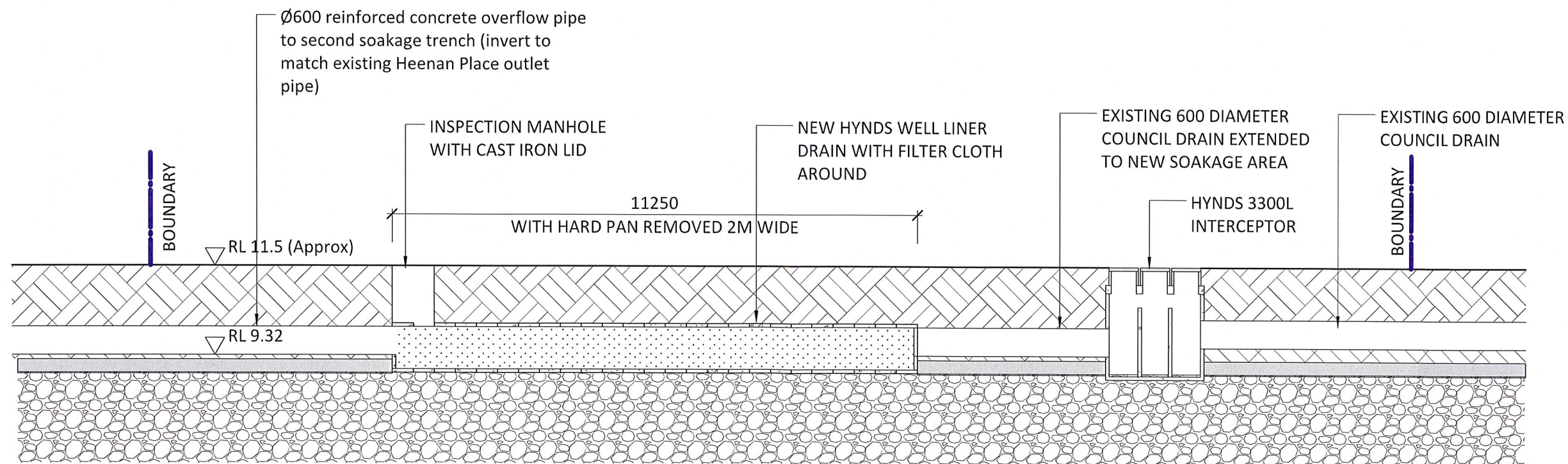
CATCHMENT PLAN



ENLARGEMENT



ENLARGEMENT



A TYPICAL DRAINAGE SECTION

Scale 1 : 100@ A3