Otago Regional Council

Our reference:
EN09SC

00693455

7 November 2006

Queenstown-Lakes District Council
Private Bag 50072
Queenstown

Attention: Mark Kunath

Dear Mark

Stoney Creek/Middle Creek Flood Hazard

As requested I enclose a report prepared by the Otago Regional Council for Queenstown-Lakes District Council dated November 2006, describing the flood hazard at Stoney Creek/Middle Creek and the relationship with the mitigation works completed, under way, or yet to be started.

The report covers the matters discussed at the meeting held at your Queenstown office on 11 November 2005 that you and I attended along with Duncan Field, Graeme Martin, Fraser McRae, Rene Kampman, Malika Elner and other staff of CivicCorp.

At that meeting the report prepared by the Otago Regional Council for Queenstown-Lakes District Council dated 10 October 2005 was discussed. Graeme Martin tabled and spoke to a sheet setting out a number of assumptions upon which the minimum flood protection standard for Meadowstone Stages 5 and 6 is predicated and some options for enhancement of the minimum standard. The contents of that sheet have been incorporated into the November 2006 report.

Recently Alan Dippie of Willowridge Developments Ltd wrote to both the Otago Regional Council and Queenstown-Lakes District Council regarding a parcel of land located between Meadowstone Stages 5 and 6. The Otago Regional Council regards this parcel of land as having similar hazard exposure to Meadowstone Stages 5 and 6 and has therefore included it within Zone A (refer Figure 3, November 2006 report). Queenstown-Lakes District Council may of course hold more detailed or specific information regarding the flood hazard of this particular parcel of land that requires it to be considered differently to Meadowstone Stages 5 and 6 on matters of development and building control.

Resource consent applications have been lodged with the Otago Regional Council for the overland flowpaths that are to be formed near the intersection of Meadowstone Drive and Mt Aspiring Road. Over recent months consultants acting for the owners of the land within the area defined as Zone E (refer Figure 3, November 2006 report) have discussed with Council staff various issues relating to flood hazard of that land. At one stage Council was proposing to extend the overland flowpaths near Meadowstone Drive onto a small part of this land

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however this is not now being pursued because the landowner has not given permission for these works and the works as originally proposed meet the requirements for Stage 1A as set out in the tripartite agreement. Despite this, Council staff would like to participate in any discussions held jointly with Queenstown-Lakes District Council, the landowner and their consultants regarding development proposals for this parcel of land and how they might be integrated with existing and proposed scheme works.

Following several meetings with Robyn Blennerhassett the situation regarding access to her property has been resolved, and the outstanding flood mitigation works on her property have been completed and are operational. I note also that Ms Blennerhassett's brother Stuart very generously provided a quantity of armour rock at no cost which was used in the scheme works.

Finally, I will shortly send you a schedule setting out the status of each of the Stage 1A items and an invoice for the contribution to be made by Queenstown-Lakes District Council for costs to date in accordance with the tripartite agreement.

Yours sincerely

Gavin Palmer
Director Environmental Engineering and Natural Hazards

Stoney Creek/Middle Creek Flood Mitigation Works - Progress Report
Prepared by Otago Regional Council for Queenstown-Lakes District Council
November 2006

1. Introduction

The Otago Regional Council is implementing Stage 1 of the Stoney Creek/Middle Creek flood mitigation works at Wanaka, with funding contributions from Queenstown-Lakes District Council and Willowridge Developments Ltd. The elements that make up Stage 1 are shown in Figure 1. Stage 2 comprises enhancements that will be undertaken as part of future roading and property developments and will be funded as part of those developments.

The identified Stoney Creek/Middle Creek flood hazard zone is shown in Figure 2.

This report outlines progress with Stage 1 and the corresponding reduction in flood hazard. It also states the assumptions upon which the assessment of residual flood hazard is predicated. Residual flooding and debris flow risks will remain for the Stoney Creek/Middle Creek alluvial fan even after the completion of Stages 1 and 2.

This report supersedes an earlier report prepared by the Otago Regional Council for Queenstown-Lakes District Council dated 10 October 2005. As noted in that earlier report, some building and land subdivision sites within the identified flood hazard zone will be locally elevated and have a protection level above the 1 in 50 year standard without the Stage 1 flood mitigation works.

2. Progress

2.1 Works Completed or Underway

The following elements of the Stoney Creek/Middle Creek flood mitigation works have been completed and are operational:

1. Enlargement of the Stoney Creek channel between Studholme Road and the upstream end of Meadowstone Stage 6;
2. Construction of the lower debris trap on Stoney Creek, immediately upstream of Meadowstone Stage 6;
3. Construction of the debris trap on Middle Creek where it exits the fan, and;
4. Restoration of the hydraulic capacity of the race connecting Middle Creek to Stoney Creek (race capacity up to one cumec).

In accordance with the implementation strategy endorsed by the Otago Regional Council in April 2005 and publicly consulted on in May and June 2005, the channel and debris traps are not to be rock-lined as part of Stage 1 and will remain as-is. Localised erosion and deposition are to be expected during flood flows but the risk of breakout and avulsion over this section of Stoney Creek has been reduced significantly. The Otago Regional Council expects unlined sections of channel to be brought up to an urban standard as part of any intensified urban development, similar to that which exists within the Meadowstone Stage 6 development.

Historically the irrigation race referred to as item 4 above flowed toward Middle Creek, however the Otago Regional Council considers that during the 2004 flood the race intercepted some of the flow in Middle Creek and discharged this to Stoney Creek. The work that Council has undertaken on the race is intended to restore this recent function. Flows from Middle Creek of up to one cumec will flow along the race to Stoney Creek, and flows in excess of this will continue overland to the existing swale feature downslope of the Middle Creek pipe bridge (Figure 1). A geosynthetic clay liner has been installed along a section of the race to reduce the risk of the downhill side of the race failing under prolonged flow conditions. The need for the lining resulted from an inspection undertaken by Tonkin and Taylor Ltd for Council in 2005. They noted the downslope batter of the race is too steep to provide normal safety factors for saturated flow conditions.

As a consequence of the works completed to date (items 1, 2, 3 and 4 above) the capacity of Stoney Creek between Studholme Road and the upstream end of Meadowstone Stage 6 now equals or exceeds that required to contain a 50 year floodwater flow, based on the current understanding of catchment hydrology[1]. The area which will have a minimum 50 year protection standard as a consequence of having completed items 1, 2, 3 and 4 above is denoted Zone A in Figure 3. The minimum 1 in 50 year flood protection assurance is predicated upon:

- The Meadowstone Stage 6 subdivision consent required bunding on the two rural perimeter edges of the subdivision remain intact as an overland flow barrier and with the "as constructed" top elevation without low points at gated accesses (Figure 1);
- Existing flood detention ponding areas to the south-west and south-east of the bunding referred to above are retained and not diminished;
- No land surface changes that might redirect overland flows or any alterations to, or reinstatement of, historic water races are to be permitted in the catchments of Stoney and Middle Creeks;
- No diversion of any water into Stoney or Middle Creek catchments from any catchment is to occur except the current operative and authorised race flow(s) from the Cardrona River to Middle Creek; and
- Land-use changes that increase peak storm runoff outside the present subdivision approvals are not to occur.

These assumptions were discussed at a meeting held on 11 November 2005 attended by staff of the Otago Regional Council, Queenstown-Lakes District Council and Civic Corporation Ltd.

The flooding risk in those parts of the flood hazard zone denoted Zone B and Zone E in Figure 3 has been reduced as a consequence of the completed Stage 1 works, but any intensified urban development in these two zones should be subject to site-specific flood hazard assessment. The Otago Regional Council expects unlined sections of channel in Zone E to be brought up to an urban standard for hydraulic capacity and erosion protection as part of any intensified urban development, similar to that which exists within the Meadowstone Stage 6 development. The method of dealing with the flood hazard of Zone E should complement the overland flowpaths that are to be formed near the intersection of Mt Aspiring Road and Meadowstone Drive.

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[1] The following design flows have been adopted for Stoney Creek: 50 year return period = 7.6 cumecs, 100 year return period = 10.4 cumecs.

The flood protection standard for Meadowstone Stages 5 and 6 can be lifted above the minimal building consent standard by:

- Completing the remaining Stage 1 works (see 2.2 below);
- Increasing the capacity of Middle Creek between the ponding area in Zone B and Lake Wanaka, particularly at three critical zones (upstream existing housing to Meadowstone Drive; by the Dippie house; and upstream of Mt Aspiring Road);
- Assuring the Middle Creek channel capacity in suburbia is not reduced by landscaping and vegetation (this may require Queenstown-Lakes District Council putting in place a bylaw);
- Enhancing a flow slowing wide grassed swale from the Middle Creek "pipe bridge and race diversion" to the entry to the Meadowstone housing (Figure 1);
- Enhancing the existing flood detention storage capacity in Zone B;
- Implementing the proposed super-design provisions relating to Stoney Creek, and;
- Identifying and implementing super-design provisions for Middle Creek.

The basis of these enhancement options was discussed at the meeting on 11 November 2005 referred to above. The super-design provisions for Stoney Creek referred to above include lowering or altering the surface and berms of Studholme Road and the surface and berms of Mt Aspiring Road between the intersection with Studholme Road and the Stoney Creek crossing so they can contain and convey surface flows.

2.2 Works yet to be implemented

The following work elements are yet to be implemented;

5. Creation of overland flowpaths near the intersection of Mt Aspiring Road and Meadowstone Drive;
6. Replacement of the Hawthenden Ltd (Hopgood) property culvert on Stoney Creek;
7. Creation of a side-spill structure to regulate the breakout of superdesign flows from Stoney Creek;
8. Enlargement of sections of the Stoney Creek channel upstream of Studholme Road on the Hawthenden Ltd property;
9. Construction of the upper debris trap on Stoney Creek on the Hawthenden Ltd property.

Once item 5 is completed then Zone C in Figure 3 will have a minimum 50 year protection standard.

Once Item 6 above is completed then all of Zone D in Figure 3 will have a minimum 50 year protection standard.

Opportunities for incorporating a side-spill structure into land development proposals are being considered as part of proposed new driveway crossings on Stoney Creek on the Blennerhassett property.

Items 6, 8 and 9 listed above are located entirely on property owned by Hawthenden Ltd. The directors of Hawthenden Ltd have not yet given permission for these works to take place.

The risk of channel avulsion at the head of the Stoney Creek fan due to hydrological events is assessed to meet the minimum 1 in 50 year standard provided channel blockage does not occur. However, the trigger for channel avulsion will probably be a stochastic event such as an earthquake, mass movement, vegetation burning or tree fall. The avulsion has the potential to affect Zone F (Figure 3) but would most probably occur on the left (west) of the channel. Deductions of the probability of these events occurring is far from precise. The upper debris trap provides greater certainty that the consequences of such an event can be managed by trapping such material before it reaches locations where breakout could occur. The proposed upper debris trap to be located on the Hawthenden Ltd property (item 9 above) reduces the risk of channel blockage further downstream, including at and downstream of the Hawthenden property crossing.

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Figure 2 Identified hazard zone for Stoney Creek/Middle Creek, Wanaka (November 2006)

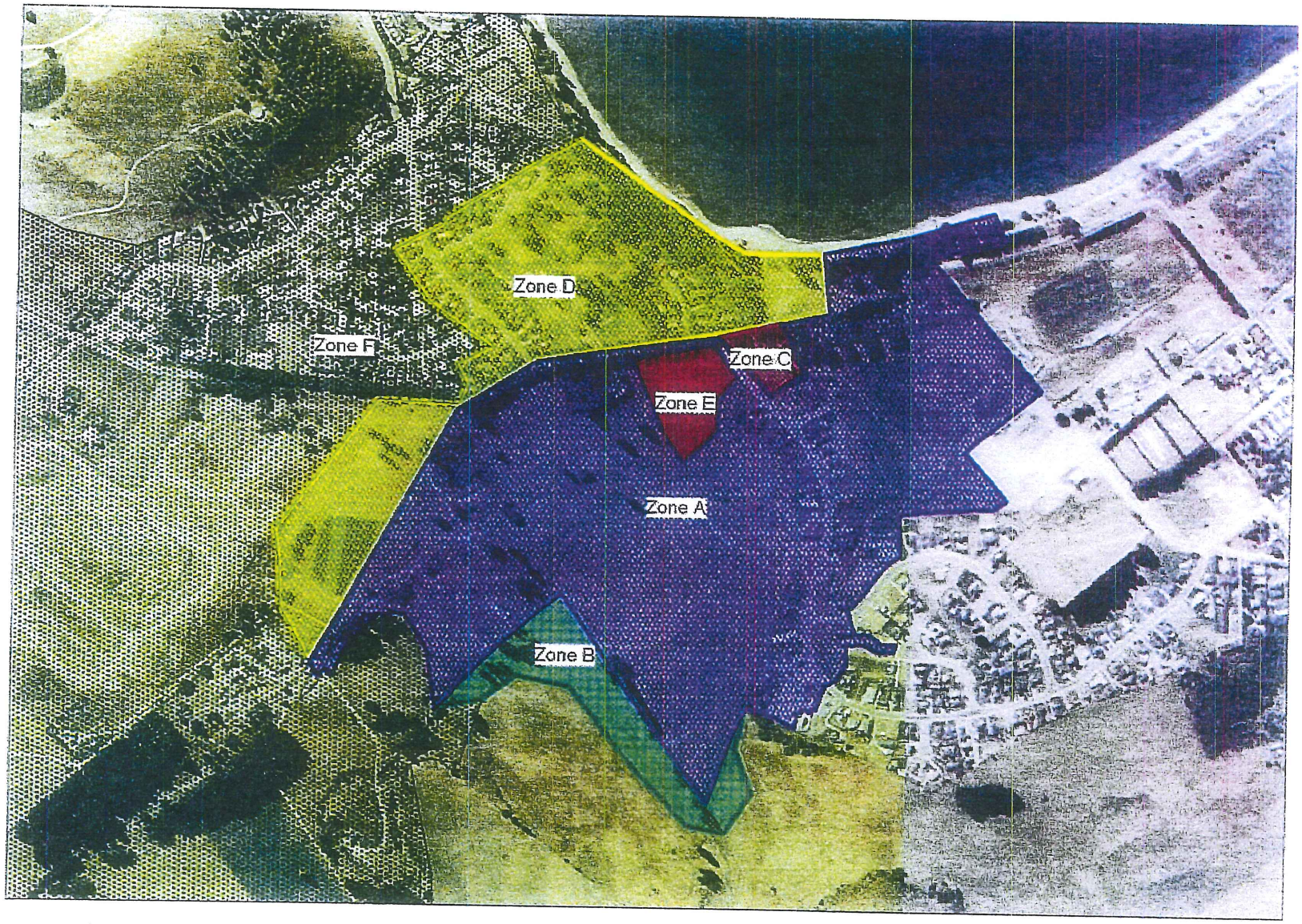


Figure 3 Hazard zones associated with individual elements of the Stage 1 mitigation works (November 2006)

Stoney Creek / Middle Creek - Natural Hazard Information Sheet

Historical Information

Over recent years there have been a number of reports produced as a result of the study of the Alluvial Fan areas described as Stoney Creek and Middle Creek in Wanaka.

In 1999 and 2004 there were rainfall events which resulted in overland flooding, and sediment deposition within this area. As a result of those events, the Otago Regional Council (ORC) undertook a review of the area and produced a report in Sept 2004 on Natural Hazards and potential mitigation options.

Since that time there have been some mitigation works already undertaken by the ORC to partially mitigate the effect from the risk of natural hazards. This has resulted in a reduction in the probability of occurrence of overland flooding and sediment deposition. The most recent advice from the ORC is a report provided to the Queenstown Lakes District Council (QLDC) dated 7 November 2006, which supersedes their earlier reports

Additionally QLDC contracted Opus International to undertake further reporting about the natural hazard risk. The resulting draft report produced in July 2006 was peer reviewed by an independent engineer, and legal advice sought by QLDC. The outcome of this report, was a confirmation that the risk from debris flow or landslide dam break for the whole area was at a sufficiently low level of probability of occurrence to not require any restrictions for consent processes.

In terms of overland flooding risks, there was a more defined map (than the original ORC map from Sept 2004) produced, which indicated some areas of medium and low flood risk mainly in the areas adjacent to the current creek beds. This map is dated 20/07/06 and a copy is attached to this report.

Current Situation

For areas outside the yellow and red zones on that map – there are no restrictions upon building consents or resource consents in relation to natural hazards.

Within the low risk area (yellow shading) and the medium risk area (red shading) building consents may still be issued with appropriately engineered mitigation measures such as raised floor levels or appropriate bunding for example. Those properties would require an individual site assessment of the risk involved.

Future Situation

The QLDC have commissioned a further report by Opus International which takes into account the mitigation work already undertaken by the ORC. This draft report produced is dated December 2008 and is still under consideration for being adopted by QLDC. It does further reduce the areas of low and medium flooding risk.

Physical works to further reduce or eliminate the risk from natural hazards are ongoing, and are being planned by the ORC. The most recent report available, and already refered to in this document is dated 7 November 2006 and provides an update about the protection works already undertaken, and those still to be completed. Further updates relating to the planning for these works could be obtained by contacting the ORC office in Dunedin.

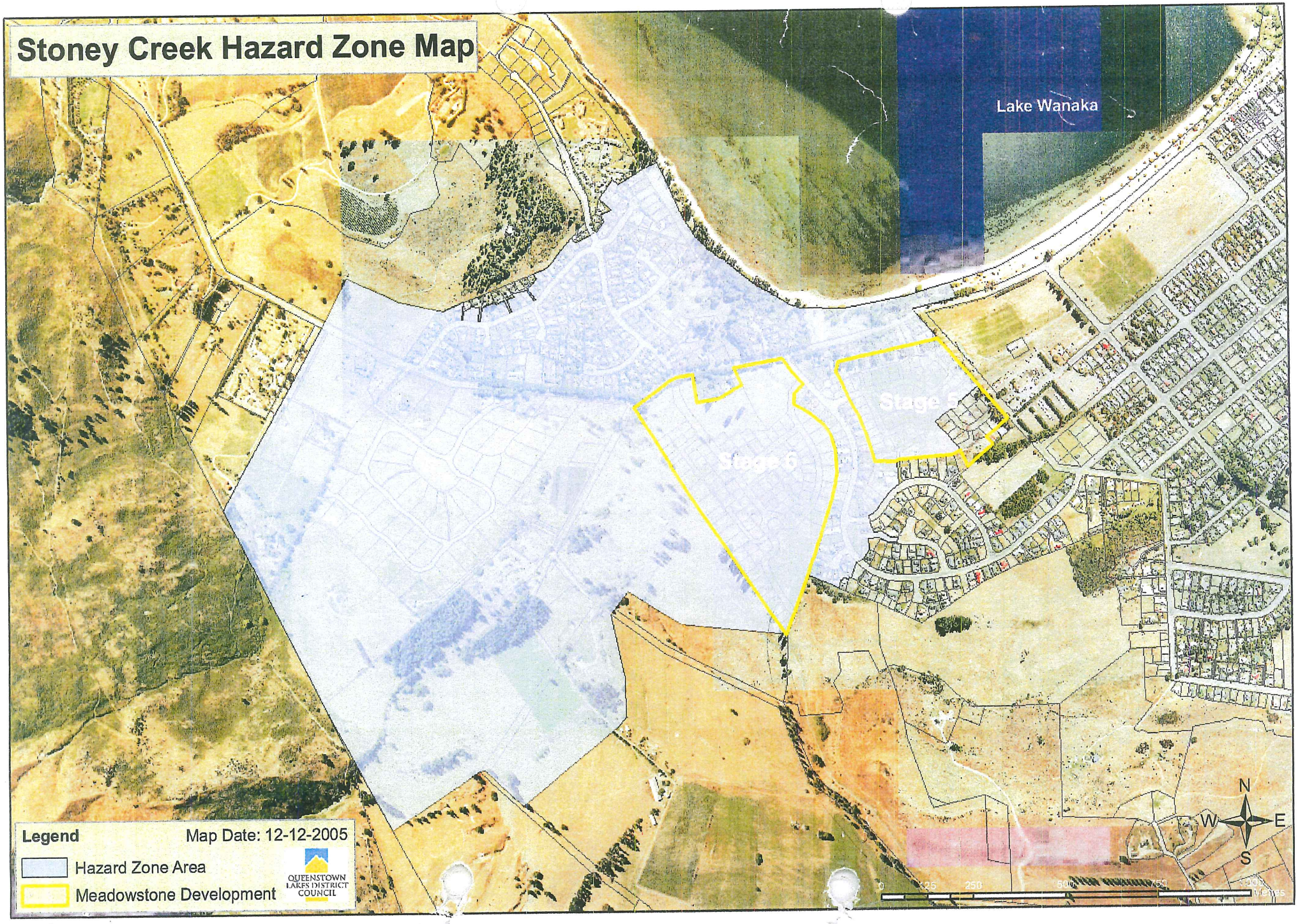
List of Reports Available

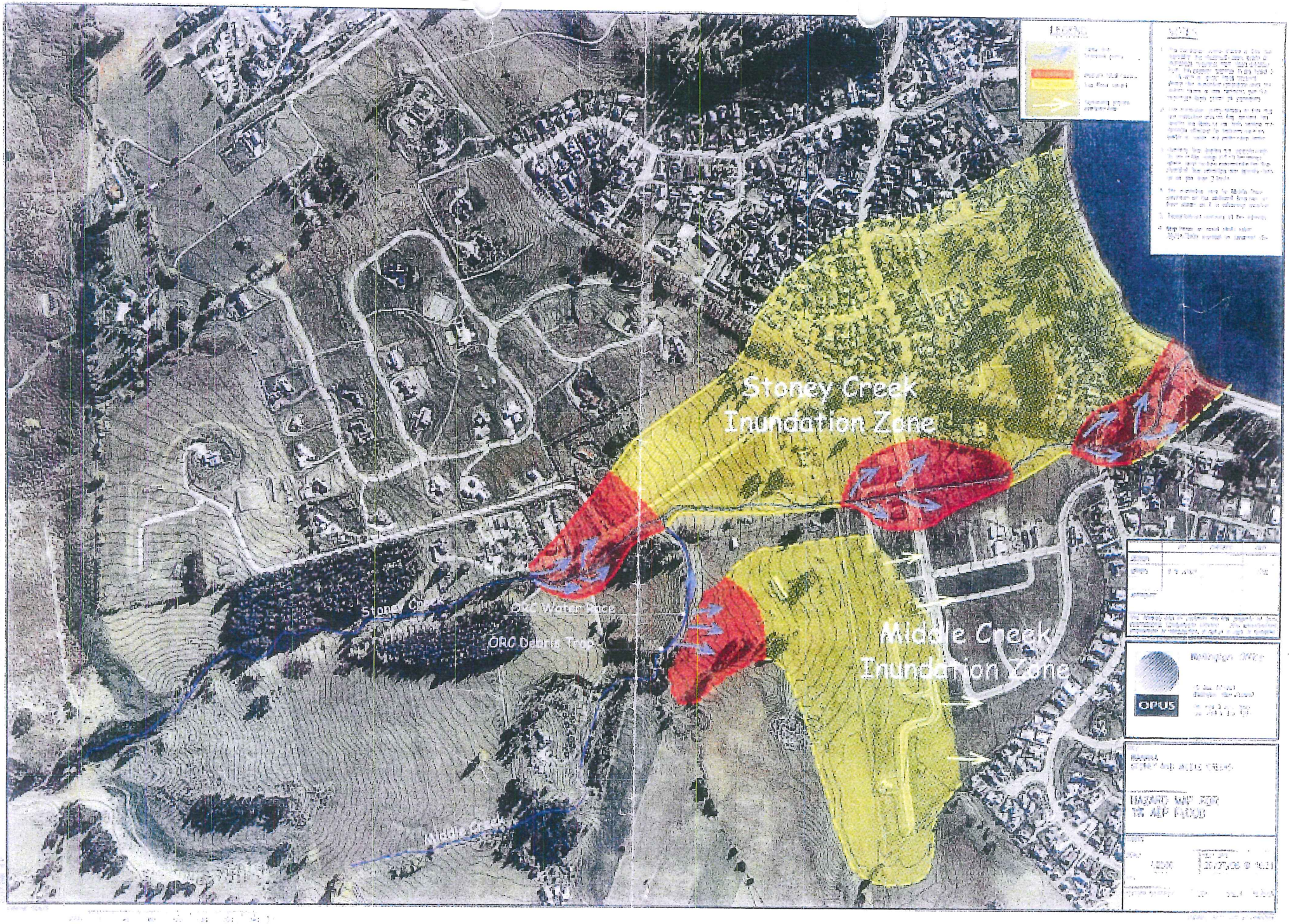
- Sept 2004 ORC report identifying Stoney Creek alluvial fan as a nautral flood and sediment deposition hazard over a wide area (superseded by the Nov 2006 ORC report)
- Jul 2006 report from Opus International identifying the lower and medium risk areas for flooding
- 7 November 2006 ORC report to QLDC on progress for protection works to be undertaken. (Copy of this report is attached including the updated maps)
- Dec 2008 further detailed report from Opus International which provided an update to the risk to the whole Stoney Creek and Middle creek areas, taking into account the mitigation works already completed. This report is still in draft stage - being considered by QLDC.

More Specific Site Information - Heaton Park

In December 2004 a subdivision resource consent was applied for to create this, and other property lots within Heaton Park. As part of that application (which was granted in 2006) there were independent engineering reports provided by Duffil Watts & King, and R Hall & Associates, which identified in their view the risk of natural hazards to this specific land as being very low in terms of the probability of occurrence.

It is confirmed again that QLDC will issue Building and Resource consents for these properties within Heaton Park specifically without any encumbrances relating to natural hazards.


Stoney Creek Hazard Zone Map
Lake Wanaka
Stage 6
Legend
Map Date: 12-12-2005
Hazard Zone Area
Meadowstone Development
QUEENSTOWN LAKES DISTRICT COUNCIL
N
W
E
S


Stoney Creek
Inundation Zone
Middle Creek
Inundation Zone
ORC Debris Trap
OPUS

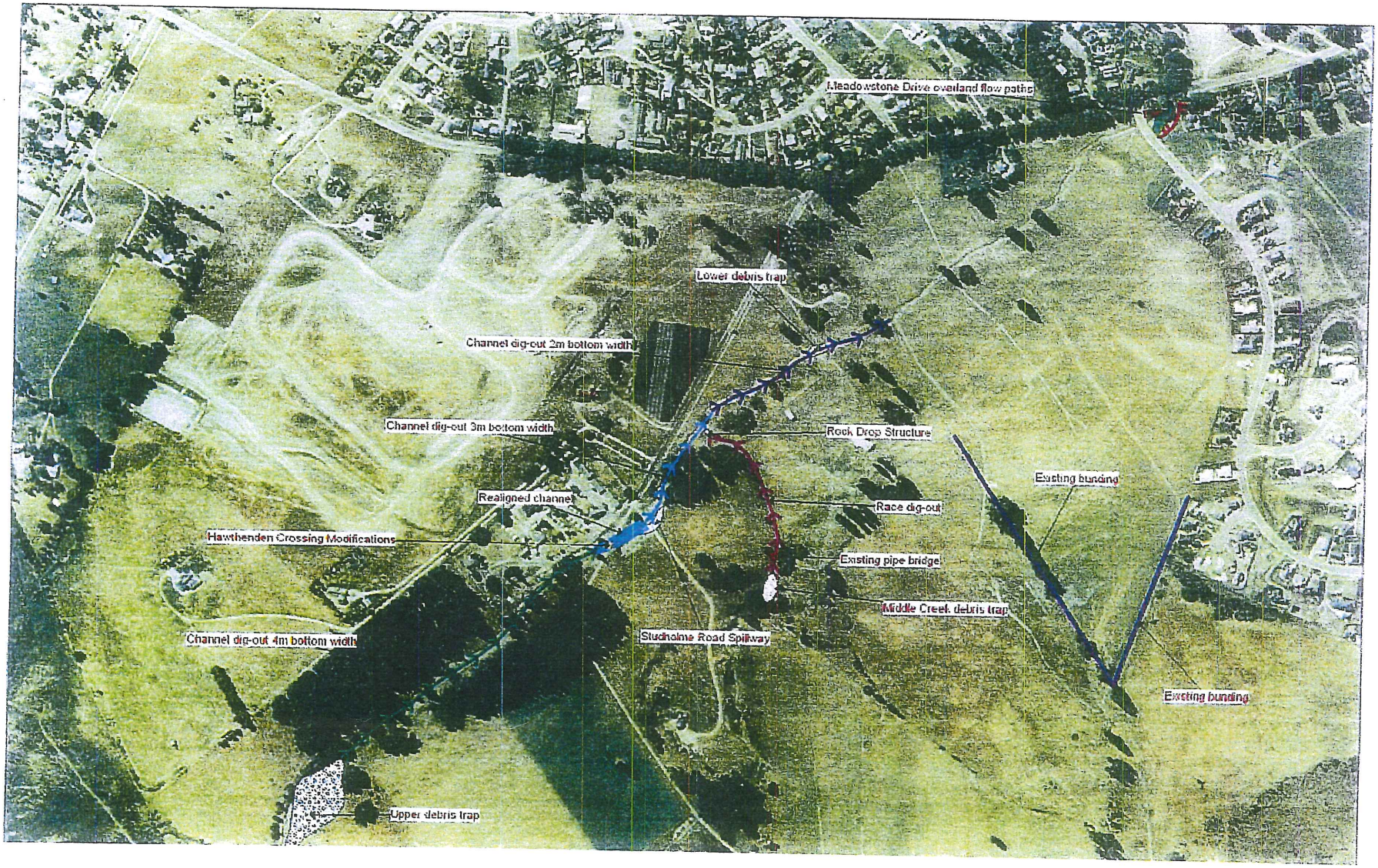


Figure 1 Stoney Creek/Middle Creek Stage 1 Hazard Mitigation Works

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Report to Queenstown-Lakes District Council on Stoney Creek/Middle Creek Flood Hazard

Prepared by Otago Regional Council

10 October 2005

1 Introduction

Council is implementing Stage 1 of the Stoney Creek flood hazard mitigation works at Wanaka. The Queenstown-Lakes District Council (QLDC) has requested that Council provide a map showing the properties protected by the works on the Blennerhassett property and the properties protected by the works on the property above them. This report contains the information sought by QLDC. It should be noted that even after the Stage 1 works are completed, a portion of the identified flood hazard zone will still require site-specific assessment by applicants when lodging building and land subdivision consents for developments within that portion of the flood hazard zone.

2 Flood Hazard Zone

The identified Stoney Creek/Middle Creek flood hazard zone is shown in Figure 1. The boundary of the zone was adjusted slightly following the public consultation undertaken by Council earlier this year, and has been further adjusted based on additional topographical data. Figure 1 shows the zone after being adjusted.

3 Flood mitigation

The identified flood hazard zone can be divided into three areas as shown in Figure 2, based on the nature of the hazard. Each of the three areas is described below in terms of the proposed Stage 1 mitigation works and the consequent hazard mitigation.

3.1 Area A

As with other reaches of Stoney Creek, the channel upstream of the Hawthenden crossing is prone to blockage by debris and avulsion. Although most of this reach currently has sufficient capacity to convey the assessed 50 year return period flow, there are several locations where breakout could occur. The conveyance of this reach is also dependent on the waterway remaining clear of significant obstructions. On this basis, Council can only be sufficiently confident that all the area marked A in Figure 2 can achieve a 50 year protection standard, based on the current understanding of flood hydrology and channel behaviour, when all of the following works are completed;

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1. Construct upper debris trap on Stoney Creek on the Hawthenden property, and;
2. Enlarge Stoney Creek channel between the upper debris trap referred to in 1 above and Studholme Rd.

These works are located on the Hawthenden property with the exception of a short (approximately 120 metre) section of Stoney Creek channel located on the camping ground and the section of channel between the Hawthenden crossing and Studholme Road (located on the Studholme property).

Some building and land subdivision sites within Area A will be locally elevated and have a protection level above the 1 in 50 year standard before the proposed flood mitigation works are undertaken.

3.2 Area B

The area marked B in Figure 2 is prone to the effects of avulsion at and downstream of the Hawthenden crossing, or from Middle Creek at or below the elevated water pipe bridge. Channel avulsion at Studholme Road was experienced in 1999 and 2004. Further, much of the channel downstream of the Hawthenden crossing can not convey the assessed 50 year return period flow, even if the current waterway area is maintained during an event. Council can only be confident that all the area marked B in Figure 2 can achieve a 50 year protection standard, based on the current understanding of flood hydrology and channel behaviour, when the works listed in 1 and 2 above are completed **and** all of the following works are completed;

3. Replace the Hawthenden crossing with a ford or similar structure with sufficient capacity;
4. Increase the capacity at the Studholme Rd crossing by enlarging the overflow channel on the eastern side of the crossing;
5. Enlarge Stoney Creek channel between Studholme Rd crossing and the upstream end of Meadowstone Stage 6 subdivision;
6. Construct debris trap on Stoney Creek on the Blennerhassett property, immediately upstream of Meadowstone Stage 6 subdivision;
7. Construct earth bunds next to Stoney Creek at the Mt Aspiring Rd/Meadowstone Drive culvert;
8. Restore the capacity in the race connecting Middle Creek to Stoney Creek, and construct a drop structure at the downstream end of the race at the confluence with Stoney Creek;
9. Construct a debris trap on Middle Creek near the pipe bridge;
10. Construct diversion structure on Middle Creek near the pipe bridge at the confluence of Middle Creek and the race;
11. Enlarge Middle Creek channel in the Blennerhasset property downstream of the proposed debris trap.

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All of these works are located on the Blennerhassett property, with the exception of Item 3 which is located on Hawthenden property and Items 4 and 7 which are located on road reserve.

Items 4 to 9 inclusive are part of the Stage 1A resource consent.

Items 10 and 11 above were the subject of further investigation at the time of consent lodgement for the Stage 1A works. They are relatively minor in terms of cost and will therefore be implemented as part of the Stage 1 works, subject to obtaining the necessary resource consents and landowner approval.

As for Area A, some building and land subdivision sites within Area B will be locally elevated and have a protection level above the 1 in 50 year standard before the proposed flood mitigation works are undertaken.

3.3 Area C

The area marked C in Figure 2 is dependent on all of the works listed in 1 to 11 above in order to achieve a 50 year flood protection standard and a satisfactory level of hazard mitigation. Area C is also dependent on the capacity of existing drainage elements within Area C and should therefore be subject to site-specific flood hazard assessment, even after the Stage 1 works (i.e. Items 1 to 11) are completed. The portion of the Blennerhasset property near the south-east corner of the Meadowstone Stage 6 subdivision is included in Area C because it is low-lying area and because it may be affected by any capacity constrictions that may exist downstream. Area C also includes those parts of the Meadowstone subdivisions that lie within the identified flood hazard area.