



Ministry of Works
and Development
ALEXANDRA RESIDENCY

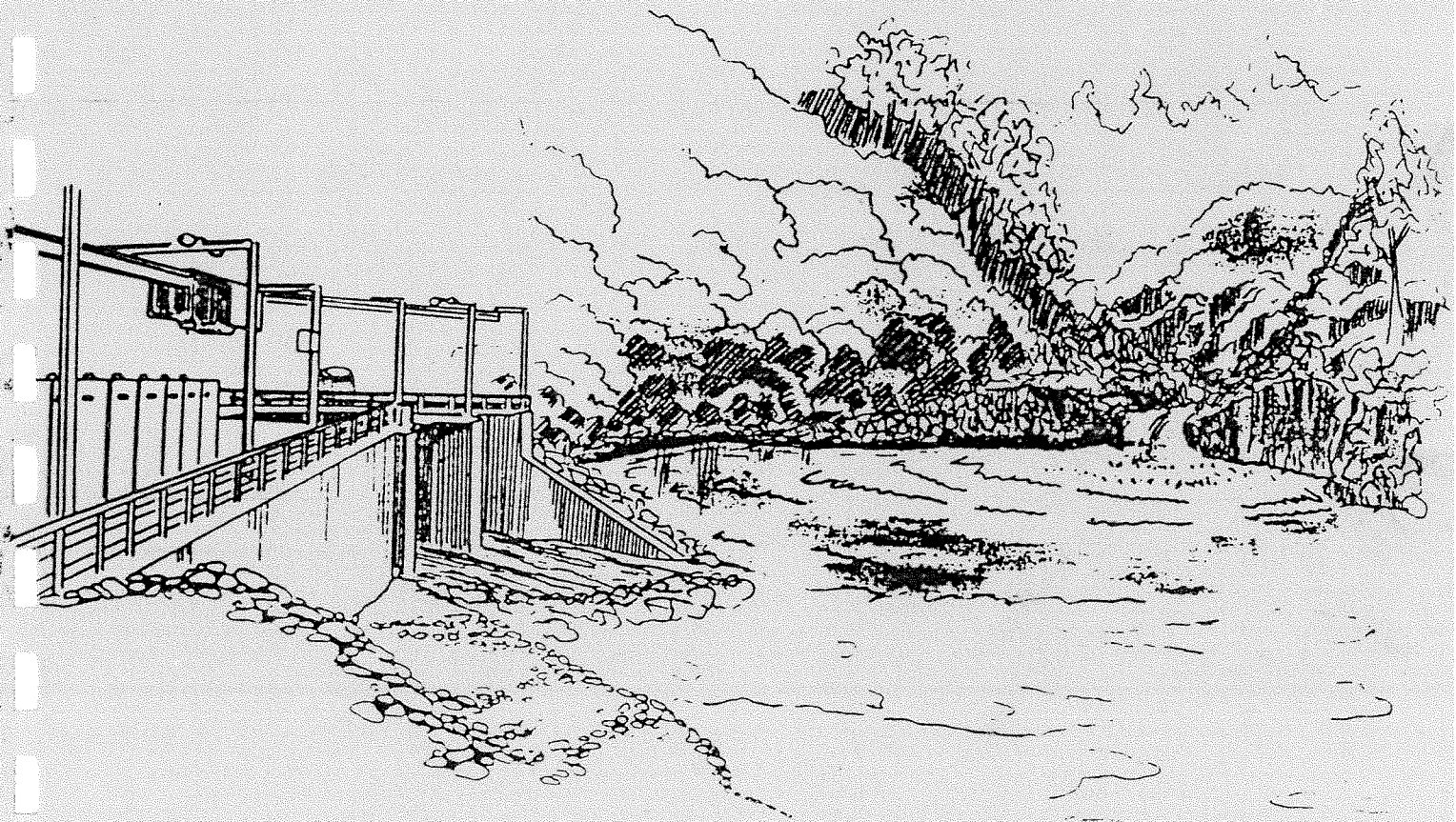
JOHN ANDERSON
AQUA IRRIGATION

(5)

CENTRAL OTAGO IRRIGATION SCHEMES

FLOOD DAMAGE REPORT

9-11 MARCH 1987



Omakau Irrigation Scheme Committee
C/- Mr M Heckler
Lauder Creek Road
OMAKAU

Dear Sir

**OMAKAU IRRIGATION SCHEME
FLOOD DAMAGE: 9 - 11 MARCH 1987**

The extent of the recent flood damage to the Omakau Irrigation Scheme has been collated and assessed and it is clear significant damage has occurred to many intakes and race systems generally. The total estimated cost of flood damage has been assessed at \$30,000 (Rough Order Costs) and major repairs can be itemised as follows:

1. LAUDER MAIN INTAKE REPAIRS

Urgent repairs have already commenced and it is anticipated repairs will be completed by Monday 30 March. Costs to repair the Lauder Main is estimated at \$5,500.00.

2. LAUDER MAIN SLIP

Earthwork costs to repair the slip at Becks, has been estimated at \$5,500.00.

3. NATAKANUI A AND B SYPHONS - under Thomson Creek

The above syphons have been exposed in the river bed and as a consequence, suffered structural minor damage. Remedial repairs involving patching and rock protection has been estimated at \$3,500.00.

4. NATAKANUI INTAKE

Repairs to the above intake involving mechanical plant and materials has been estimated at \$1,700.00.

5. CLEAR WATER RACE DAMAGE

Repairs involving mechanical plant and the purchase of the ten 600 mm diameter reinforced concrete rubber ring jointed pipes (RCRRJ) has been estimated at \$5,400.00

6. CLEAR WATER INTAKE

The above intake has suffered major damage and repairs involving mechanical plant, the purchase of ten 600 mm diameter RCRRJ pipes and miscellaneous material has been estimated at \$6,500.00.

7. COUNTY RACE - PIPELINE OVER DEVONSHIRE CREEK

Repairs involving mechanical plant and the purchase of six second hand steel pipes has been estimated at \$2,500.00.

Presently only the urgent works which are necessary to ensure scheme assets and structures are not further damaged, are proceeding. However as a result of the severity of the flood damage and high estimated cost of repairs, it is clear further engineering input is required in an attempt to reduce the total estimated cost of repairs.

All major repairs have been costed separately for ready identification.

Yours faithfully

Q McCarthy
for Manager
Alexandra Residency

Q McCarthy

27 March 1987

15/9

Hawkdun and Idaburn Irrigation Scheme Committee
C/- Mr W Dowling
RD 2
RANFURRY

Dear Sir

**HAWKDUN/IDABURN IRRIGATION SCHEME
FLOOD DAMAGE 9 - 11 MARCH 1987**

The extent of the recent flood damage to the Hawkdun/Idaburn Schemes has been collated and assessed and it is clear both schemes have suffered major damage to scheme structures and race systems.

The total cost of flood damage repairs is estimated at \$85,000 and major repairs are itemised as follows. All costs are Rough Order Costs.

1. IDABURN INTAKE

The existing intake structure over a distance of some 150 metres was washed away and a new pipeline structure is now required. The estimated very rough order costs to repair the intake has been estimated at \$11,000. However, as a result of the high estimated cost of flood damage, it is obvious further engineering input is necessary in an effort to ensure the proposed remedial works for the Idaburn Intake are the most cost effective. The major component in any remedial proposal is the pipe conveying system and on the basis of estimated cost of \$11,000, second hand steel pipes have been costed.

2. PIERCES GORGE

A major race failure has occurred in the main race at Pierces Gorge which will involve significant remedial earthworks. The estimated cost of repairs is estimated at \$14,000.00.

3 GATE CREEK BYWASH STRUCTURE

The existing bywash structure has been completely destroyed and the estimated cost to repair the structure to the previous standards is estimated at \$13,000. However in view of the high estimated repair cost, a revised approach to bywash structures may have to be considered.

3. JOHNSTONE CREEK

A race failure has occurred immediately upstream of the Johnstones Creek Syphon. Remedial earthworks to repair the race bank, and access track has been estimated at \$6500.

5. DILLONS GORGE RACE BLOWOUT

A race failure has occurred at Dillons Gorge which will involve significant remedial earthworks. Earthwork costs have been estimated at \$6500.

6. HILLS CREEK

Hill Creek intake structure and a section of the main race has been completely destroyed and significant remedial works are now required. Repair costs have been estimated at \$6500.

7. DOWNSTREAM OF SCOTTS FLUME

A small section of the race has failed. However, the absence of suitable material in the immediate vicinity to repair the damaged section of race necessitates the transportation of material. Costs to repair the race failure have been estimated at \$4000.

8. BOUNDARY CREEK SYPHON

The Boundary Creek Syphon has been severely damaged with at least three or four pipes being washed out. It appears that many of the 'syphons' are rapidly turning into aqueducts. Costs to repair the syphon have been estimated at \$3500.

In addition to the above major repairs, minor repair work is necessary at Coal Gully, Butchers Creek, Little Ten Chain, Idaburn Intake, Peepoes, Hut Creek, and numerous miscellaneous failures on the Main Race and distributories. Costs to carry out the 'minor' repair works has been estimated at \$13,000.

The main access track has been damaged in numerous locations, making access to the headworks all but impossible. Costs to upgrade the main access track has been estimated at \$7,000.

In conclusion the combined Hawkdun/Idaburn scheme have suffered major failures and in view of the high estimated repair costs, significant engineering input is necessary to ensure the method and mode of repairs are the most cost effective.

On the Hawkdun Scheme all repairs downstream of Johnstones Creek (including all minor repairs) will be given the higher priority to ensure we are operational at the commencement of next irrigation season. We would then work progressively back up the Mt Ida Race securing and collecting inflows as works progress. All major repairs have been costed separately for ready identification.

Yours faithfully

Q McCarthy
for Manager
Alexandra Residency

Q McCarthy

24 March 1987

15/14

The Secretary
Manuherikia Irrigation Scheme Committee
C/o Mr R Macfie
Springvale
RD 3
ALEXANDRA

Dear Sir

MANUHERIKIA IRRIGATION SCHEME
FLOOD DAMAGE 9 - 11 MARCH 1987

The extent of flood damage to the Manuherikia Irrigation Scheme has been assessed and confirmed as follows.

The Waikerikeri syphon has once again been washed out and is in reality, rapidly turning into an aqueduct. Headraceman, A Drake, has commenced temporary repairs and water should be available to downstream users by Wednesday, 25 March 1987. Rough order cost to carry out temporary repairs to the above syphon is estimated at \$3,700.

The Borough Race intake was washed away and temporary repairs have been estimated at \$1,000.

The Chatto Creek Gorge access track has suffered significant undermining and erosion and although there is no immediate danger to the integrity of the race system, the long term stability is of some concern. The access track in parts can now only be traversed by motorcycle and it is clear further engineering input is required prior to remedial works being undertaken.

Your Committee will be kept fully informed with regards to proposed works in the Chatto Creek Gorge.

Yours faithfully

Q McCarthy
for Manager
Alexandra Residency

Q McCarthy

24 March 1987

15/9

The Secretary
Galloway Irrigation Scheme Committee
C/o Mr A C van Leeuwen
Galloway
RD 3
ALEXANDRA

Dear Sir

GALLOWAY IRRIGATION SCHEME
FLOOD DAMAGE 9-11 MARCH 1987

The extent of flood damage suffered to the Galloway Irrigation Scheme has been collated and assessed as 'rough order costs' between \$6,000 - \$8,000.

The Galloway pump house escaped major repairs with only the small pump being submerged and requiring dismantling and drying out. A rough order of costs to completely dismantle and clean the small pump and to repair/replace the fuses, contacts and the main switch is assessed at approximately \$2,000.

The remaining work which includes river training, cleaning out the intake race of gravel buildup and repairing erosion damage at the inverts of culverts has been assessed between \$4,000 - \$6,000.

It is anticipated urgent repairs will be completed by Tuesday, 24 March 1987, thus allowing limited irrigation supplies to continue if requested.

Concerns expressed by you in the telecon between yourself and the writer (19 March 1987) regarding the extent of the flood damage to the Galloway Scheme in are noted. The extent of damage to individual schemes could not be officially confirmed to the respective Committees, until the full extent of damage to all schemes had been gauged and assessed. Obviously, the Department's immediate priorities lie with urgent repairs necessary to protect the integrity of scheme assets and structures.

You are reminded that the Committee's first point of contact regarding an indication of the extent of damage should be address through your local Headraceman.

Yours faithfully

Q McCarthy
for Manager
Alexandra Residency

**CENTRAL OTAGO IRRIGATION SCHEMES
FLOOD DAMAGE REPORT
9 - 11 MARCH 1987**

1.0 GENERAL

The extent of the recent flood damage to Central Otago Schemes has been collated and assessed (ROC) at \$140,000.

The Hawkdun/Idaburn Schemes have sustained major damage with the total cost of repairs being estimated at \$85,000.

The Omakau Scheme suffered lesser damage with most flood damage being limited to the many creek fed intakes and syphons. Repairs are estimated at \$30,000. Recent inspections confirms the Arrow schemes has suffered significant damage to the De-silter. At the time of writing this report an estimate of rough order costs to repair the De-silter had not been assessed.

Damage to the remaining schemes including the Galloway, Manuherkia, Ripponvale, Ardgour Schemes and flood damage to the remainder of the Arrow Scheme has been estimated at \$25,000.

All major repairs have been costed separately with individual WACS numbers for ready identification of costs.

2.0 HAWKDUN/IDABURN SCHEMES

2.1 Idaburn Intake Structure

The existing intake structure over a distance of some 150 metres was washed away and a new pipeline structure is now required. The assessed very rough order costs to repair the intake has been estimated at \$11,000. However it is clear further engineering input is necessary in an effort to ensure the necessary remedial works for the Idaburn Intake are the most cost effective. The major component in any remedial proposal is the pipe conveying system.



23M IH02 KPAJBA01YUJMAH

5.0

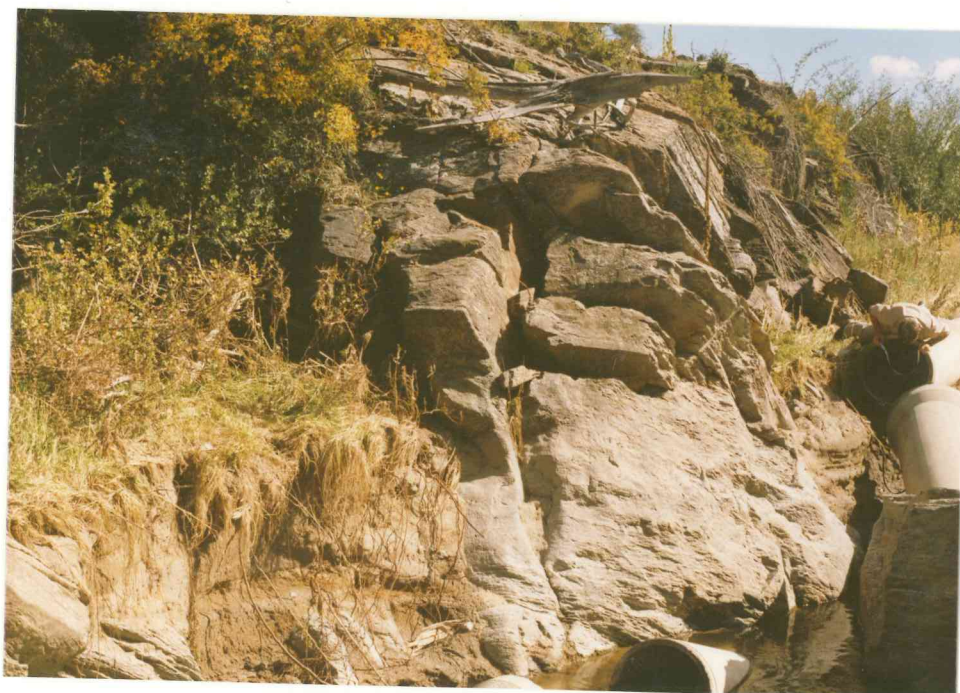


8368796





The above photograph highlights the extent of damage to the Idaburn Intake



87088/E

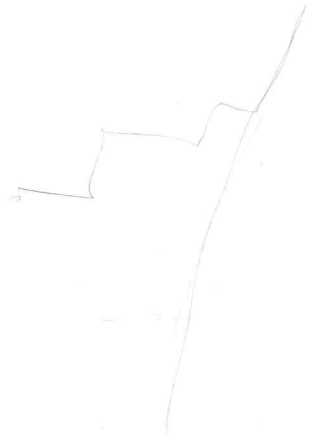
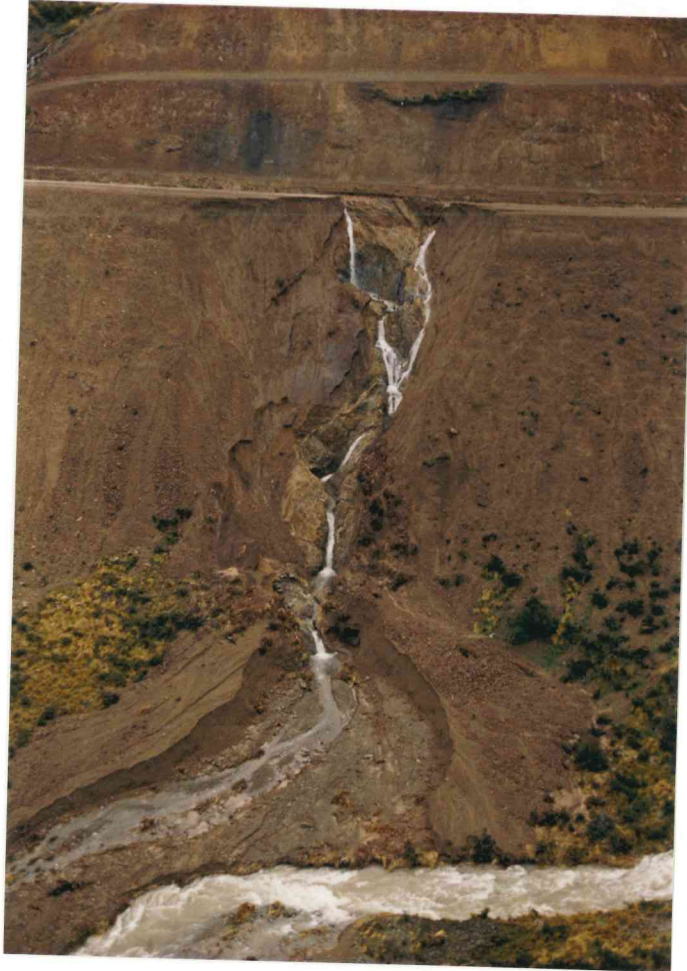
Further Engineering input is required to arrive at the most cost effective proposal to convey water around the rock bluff

The river has in many places eroded the bench, on which the pipeline was previously located, back to natural bedrock. Repairs will necessitate either the construction of a bench with adequate rock protection (Rip Rap) to ensure against future erosion, or some other proposal to convey the water around such areas.

2.2 Pierces Gorge

A major race failure has occurred in the main race at Pierces Gorge which will involve significant remedial earthworks. The estimated cost of repairs is estimated at \$14,000.





87060/8

Photograph highlighting the extent of the
Pierces Gorge Race failure

2.3 Gate Creek Bywash Structure

The existing bywash structure has been completely destroyed and the estimated cost to repair the structure to the previous standards is estimated at \$13,000. However in view of the high estimated repair cost, a revised approach to the method and location of bywash structures may have to be considered.



87060/12



87060/11

Photograph highlights the damage suffered to the Gate Creek

2.4 Johnstone Creek

A major race failure has occurred immediately upstream of the Johnstone Creek Syphon. Remedial earthworks to repair the race bank and access track has been estimated at \$6,500.



87060/18



87060/19

Johnstone Creek Race Failure

2.5 Dillons Gorge

A race failure has occurred at Dillons Gorge which will involve significant remedial earthworks. Earthwork costs have been estimated at \$6,500.



87060/25

Dillons Gorge Race failure

2.6 Hills Creek

Hills Creek intake structure and a section of the main race has been completely destroyed and significant remedial earthworks are now required. Repair costs has been estimated at \$6,500.

2.7 Downstream of Scotts Flume

A small section of the race has failed. However, the absence of suitable material in the immediate vicinity to repair the damaged section of race necessitates the transportation of material. Costs to repair the race failure has been estimated at \$4,000.

2.8 Boundary Creek Syphon

The Boundary Creek Syphon has been severely damaged with at least three or four pipes being washed out. One could suggest that many of the syphons are rapidly turning into aqueducts. Costs to repair the syphon has been estimated at \$3,500.



87082/9

Boundary Creek Syphon failure

2.9

In addition to the above major repairs, minor repair work is necessary at Coal Gully, Butchers Creek, Little Ten Chain, Peepoes, Hut Creek and numerous miscellaneous failures on the Main Race and distributaries. Costs to carry out the 'minor' work has been estimated at \$13,000.

The main access track has been damaged in numerous locations making access to the headworks all but impossible. Costs to upgrade the main access track has been estimated at \$7,000.

In conclusion the combined Hawkdun/Idaburn schemes have suffered major failures and in view of the high estimated repair costs significant engineering input is necessary to ensure the method and mode of repairs are the most cost effective. On the Hawkdun Scheme, all repairs downstream of Johnstones Creek (including all minor repairs) will be given the higher priority to ensure this section of the Main Race is operational at the commencement of next irrigation scheme. Remedial earthworks and repairs would then work progressively back up the Mt Ida Race securing and collecting inflows as works progress.



87060/16

Photograph highlighting damage to the
Mount Ida race at Little Ten Chain Creek



87060/2

Photograph highlighting damage to the
Ida race at Peepoes Creek



87060/11

Photograph highlighting race failure at
Coal Gully

2.10 Falls Dam

The hydrological gauging station located above Falls Dam on the Manuherikia River indicated the peak inflow of approximately 70 cumecs was reached at midday 10 March 1987. Allowing for the additional water entering Falls Dam downstream of the recording station (estimated at 50% of the Manuherikia River flow) then the maximum inflow would have been approximately 150 cumecs.

The spillway is rated at 425 cumecs. However, since the hydraulic characteristics have been 'modified' by the addition of a 2 ft high rib wall to increase lake storage, the overall effect could have reduced the capacity since there is no longer the smooth lamina flow at the concrete/water interface. It is recommended a revised discharge rating curve is built up.

A further point of concern is the access track which is used for launching boats etc. it is clear the construction of the ramp inhibits discharge especially during flood conditions.

Both these issues will be addressed further in separate correspondence.





Photographs highlighting the close proximity of
the boat launching ramp to the spillway

3.0 OMAKAU IRRIGATION SCHEME

The extent of flood damage sustained by the Omakau Scheme has been collated and assessed (ROC) at \$30,000. Major repairs can be itemised as follows:

3.1 Lauder Main Intake

The existing intake structure has been substantially damaged with a section of the structure being destroyed completely. Estimated cost of repairs has been assessed at \$5,500.



87079/16

Photograph highlighting the section of
Intake which was completely destroyed



87079/19

Photograph highlighting the movement off line of the right hand abutment and the section which was completely destroyed

3.2 Lauder Main Slip

Earthworks costs to repair the slip at Becks has been estimated at \$5,500.

3.3 Matakanui A and B Syphons - under Thomson Creek

The above syphons have been exposed in the river bed and as a consequence, suffered minor structural damage. Remedial repairs involving patching and rock protection has been estimated at \$3,500.



87086/13A

Photograph showing damage to the Matakanui 'A' syphon which traverse under Thomson Creek

3.4 Matakanui Intake

Repairs to the above intake involving mechanical plant and materials has been estimated at \$1,700.



87086/17A

Matakanui Main Intake

3.5 Clear Water Race Damage

Repairs involving mechanical plant and the purchase of ten 600 mm diameter (RCRRJ) pipes has been estimated at \$5,400.

3.6 Clear Water Intake

The above intake has suffered major damage and repairs involving mechanical plant, the purchase of ten 600 mm diameter (RCRRJ) pipes and miscellaneous material has been estimated at \$6,500.



87086/2A



87086/4A

Photographs highlighting damage
to the Clear Water Intake

3.7 County Race - Pipeline under Devonshire Creek

Repairs involving mechanical plant and the purchase of six second hand steel pipes has been estimated at \$2,500.



87086/7A

County Pipeline under Devonshire Creek

4.0 MANUHERIKIA IRRIGATION SCHEME

The extent of flood damage sustained to the Manuherikia Scheme has been collated and assessed at approximately \$5,000 (ROC).

4.1 Waikerikeri Syphon

The Waikerikeri Syphon has once again been washed out and is in reality, rapidly turning into an aqueduct. Temporary repairs have already commenced and (ROC) costs to carry out temporary repairs to the above syphon is estimated at \$3,700.



87084/09

Waikerikeri Syphon

4.2 Borough Race Intake

The Borough Race Intake was washed away and temporary repairs has been estimated at \$1,000.

4.3 Chatto Creek Gorge Access Track

The Chatto Creek Gorge access track has suffered significant undermining and erosion, and although there is no immediate danger to the integrity of the race system, the long term stability is of some concern. The access track in parts can now only be traversed by motorcycle and it is clear further engineering input is required prior to remedial works being undertaken.

22



87063/10



87070/9



87072/2



87070/20



87063/14



87063/6

Chatto Creek Gorge
Photograph highlighting extent of erosion and
undermining to access track

5.0 GALLOWAY IRRIGATION SCHEME

The extent of flood damage sustained to the Galloway Scheme has been assessed (ROC) at \$8,000.

The Galloway pumphouse escaped major damage with only the small pump being partly submerged and therefore requiring dismantling and drying out. Costs to completely dismantle and clean the small pump and to repair/replace the fuses, contacts, and the main switch is assessed at approximately \$2,000.



87065/10

Galloway Pumphouse during flooding

The remaining work which includes river training, cleaning out the intake race of gravel buildup and repairing erosion damage at culvert inverts has been assessed at \$6,000.

6.0 ARROW IRRIGATION SCHEME

Emergency repairs to river training (redirecting the Arrow River through scoles tunnel rather than its present course - around the tunnel) and access tracks (others than the main Arrowtown Masetown track) is assessed (ROC) at \$3,500.

Repairs to the desilter which resulted as a consequence of the toe of the batter on which the structure is located being severely eroded and undermined by the high river flows, has been addressed separately in report 15/2, dated 30 March 1987. However for the basis of this report, photographs have been added for interest value.

The intake is blocked with a heavy buildup of silt which requires to be flushed away prior to commencement of supplying irrigation water.





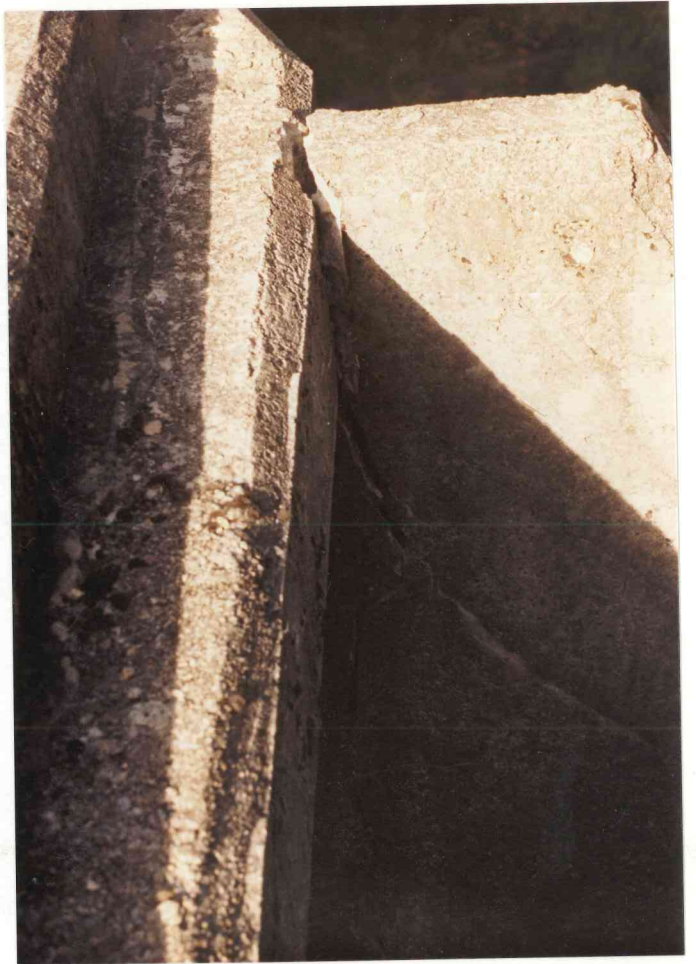
View from the Arrow river looking directly towards the desilting structure. The bywash structure is reliant entirely on support gained from the 'flushing' pipes and the river has significantly undermined the toe of the batter.



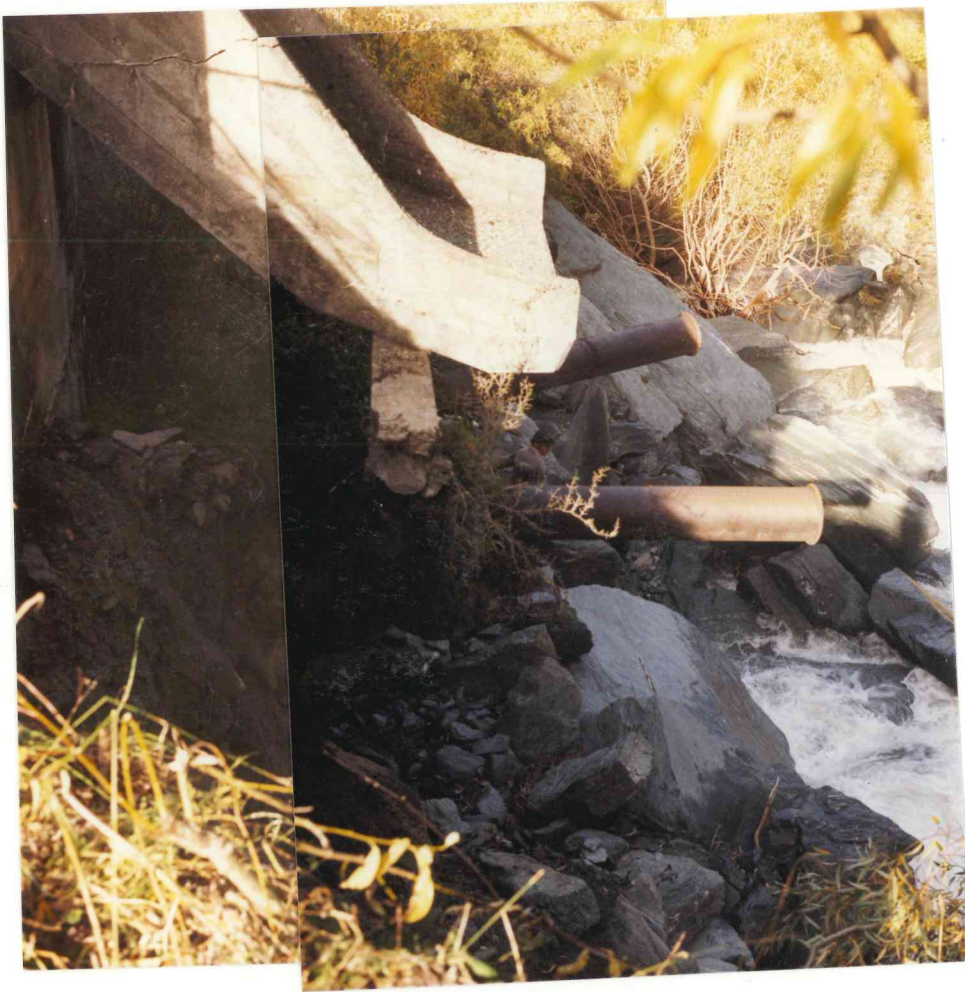
View of the race inlet to the desilting structure. The area marked has moved and as a result of the downstream erosion there is now little lateral support.



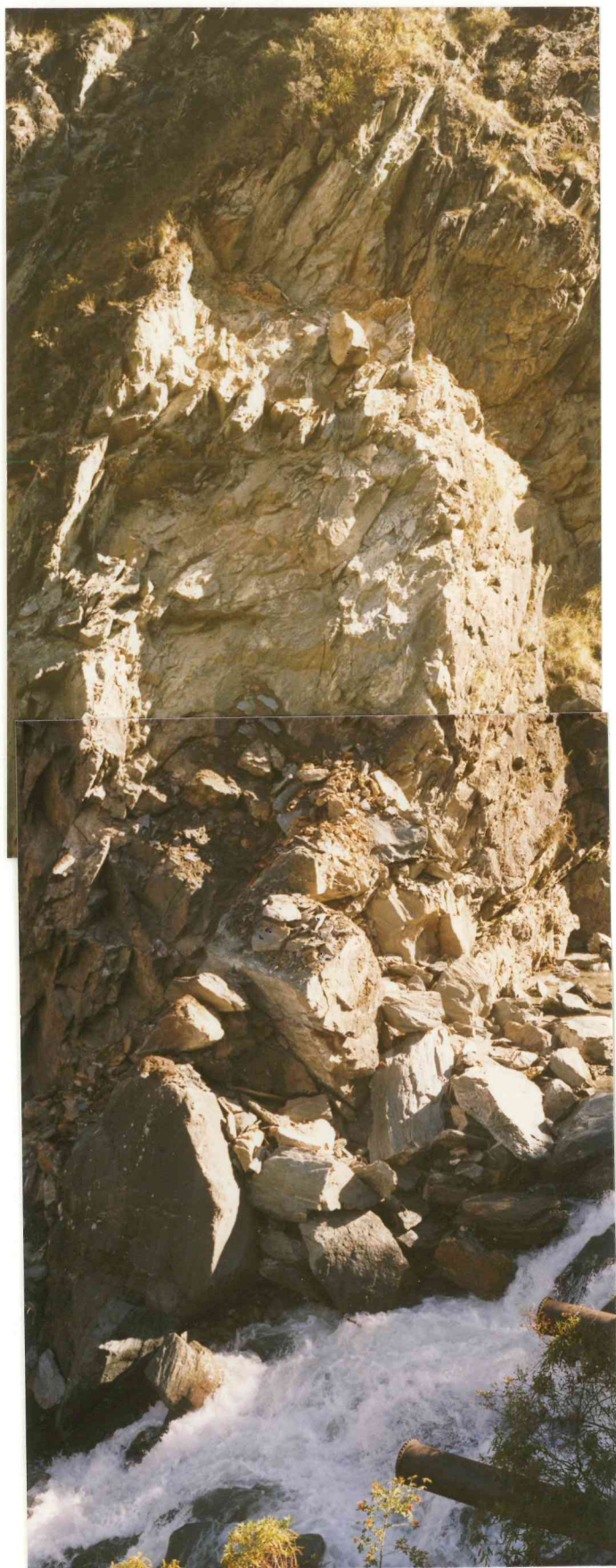
View of the above area from the downstream or river side.



View of the concrete bywash structure highlighting the severe cracking and movement to date.



Photographs highlighting the extent of erosion damage to the toe of the batter on which the desilter structure is located.



View of the slip material which has forced the river further to the true left hand side. Obviously the slip material should be cleared and used as Rip-Rap protection at the base of the concrete structure.

Q J McCarthy

30 March 1987

15/2

District Commissioner of Works
Ministry of Works and Development
Private Bag
DUNEDIN

ATTENTION DWSO

ARROW IRRIGATION SCHEME - DESILTER STRUCTURE

A site visit by Messrs D Patterson, Q McCarthy and M Robins (Chairman of the Arrow Scheme) confirmed the Arrow desilter structure sustained damage as a result of the toe of the batter on which the desilter is located, being severely eroded during high river flows.

It appears the erosion damage was largely due to a slip on the right hand side forcing the flow of water further towards the left hand bank or desilter side.

The concrete bywash structure fixed to the side of the desilter appears now to be reliant entirely on the support gained from the steel desilting outlet pipes.

A further concern is the race entrance to the desilter structure.

A section of the true right hand side has moved and as a result of the erosion on the downstream side, there is now little lateral support and it is very conceivable this section could fail entirely.

In conclusion the recent flood damage has threatened the long term stability of the desilting structure and it is clear engineering input from District Office is urgently required to assess the risk and method of repairs.

Your comments and conclusions regarding the above would be appreciated urgently.

Yours faithfully

Q J McCarthy
for Manager
ALEXANDRA RESIDENCY