SERIES: IRRIGATION + File No. 15/17.
WATER SUPPLY SCHEMES. Volume No. 1

PROPOSED:
SUBJECT (or NAME): DUNSTAN RURAL WATER SUPPLY SCHEME.

File Opened 13-4-79 File Closed:
Previous File: NONE - NEW. Subsequent File:

OTHER RELEVANT FILES

Subject: File No.

Folio	Referred to	Date	Cleared, Initials	Folio	Referred to	Date	Cleared, Initials

CLOSED 16.12.83

DISPOSAL CATEGORY

DUNSTAN FLAT NO. 1 IRRIGATION SCHEME

A feasibility study of a fully piped irrigation scheme to serve 127 ha on 22 properties lying between Dunstan Road and the foot of the airport terrace, and extending northwest from the Alexandra residential area to Airport Road has now been completed.

This paper outlines the proposed scheme which would completely replace the service currently provided by the Manuherikia irrigation scheme in this area.

PROPOSED SCHEME

The proposed scheme would be served through a storage pond of the "turkey-nest" type located on the terrace adjacent to, and east of, Alexandra airport. This storage would cover a total area of slightly over 5 ha (13 acres) with material being excavated from within this area to form a surrounding earth embankment. A clay blanket, lining the floor of the pond, would be provided to reduce leakage into the porous gravels.

With an operating range of 2.5 m (8 feet approximately) the pond would provide slightly over 100 000 m^3 (80 acre-feet) of storage.

Water would be drawn from the storage pond through a primary rotary-screen filter and valve system into a low pressure concrete pipeline along the top of the terrace. Flows would be controlled automatically at the outlet point according to demand using downstream pressure. The low pressure line itself would be buried and consist of 900 mm diameter rubber ring jointed concrete pipes with manholes at intervals for maintenance purposes.

From the low pressure system water would be carried over the terrace into the high pressure distribution lines. These pipes would decrease in diameter from 450 mm (18 inches) at the upstream end to 150 mm (6 inches) and would utilise the 70 m drop over the terrace to generate static pressures at supply points. In general pipes over 300 mm diameter are likely to be asbestos cement with PVC being used for smaller lines.

Individual properties would be supplied through constant pressure valves and water meters. It is envisaged that internal or within-property reticulation would be by buried PVC pipelines to hydrant points for spray application plant or fixed sprinkler installations.

D[illegible].

NWS ?

Area within Alex. Borough

WATER SUPPLY

Water for the scheme would initially be drawn from the existing Manuherikia irrigation scheme at the head of the Brandy Hill drop and, in the longer term, from the proposed Manuherikia Valley irrigation scheme.

In both cases the proposed scheme storage would be replenished largely using small residual or surplus flows from the larger schemes. This will become particularly important with new, large scale, irrigation development from the Manuherikia River since it will allow the use of the unavoidable tail-end flows which would otherwise be wasted. However, in the short term the proposed scheme would be dependent on the satisfactory functioning of the existing irrigation works, although the storage would be sufficient for a full irrigation cycle without any replenishment.

Design of the scheme has been based on an irrigation water requirement of 70 mm (or approximately 3 inches) at nine day intervals but with sufficient pipeline capacity to provide this water over five days. In practice this means that the system will only have to operate for slightly over half the time to meet the assessed maximum demand or alternatively that the supply could be provided almost twice as quickly as strictly necessary. This will ensure the high level of flexibility essential with spray application and the anticipated horticultural land use.

Average seasonal use is expected to be about 1100 mm (or slightly over 43 inches) but, to cope with more extreme conditions, the scheme would have the capacity to deliver up to 1800 mm (72 inches).

The scheme would not provide water for either domestic or stockwater puproses.

ON-FARM SYSTEMS

Water would be provided from the scheme at a minimum pressure of 75 psi or 500 kPa (kilopascals), or sufficient to operate most conventional spray plant and fixed sprinkler installations. No pumping would be required.

On the light soils which would be served by the scheme, and with horticultural land use, spray application offers advantages and flexibility, and it is envisaged that all irrigation would be by such systems.

The proposed scheme would also have the capacity to meet frost-control demands at a rate of 4 mm per hour over an area of 40 ha (or roughly a third of the total area of the scheme). However, the supply of water for frost-control would be subject to a total pressure break at the supply point with pumping into the on-farm system. Irrigation supplies would continue to be provided under pressure, through a suitable bypass, and pumping would not be necessary.

COSTS AND WATER CHARGES

At current price levels, the estimated capital or installation cost of the proposed scheme would be:

	$
Headworks including supply works from existing Manuherikia scheme, storage, low pressure line and upper section of high pressure system	870 000
Distribution works including the high pressure pipelines within the irrigated area, controls, fittings and valves to individual property supply points	210 000
On-farm works including buried mainlines, hydrants, fixed sprinkler installations but excluding mobile spray plant and frost-control pumping	445 000
	$1 525 000

Under current irrigation policy headworks costs are eligible for 100% Government grant, approved fixed on-farm works attract a 50% suspensory loan (the other 50% being met directly by the farmer) and half the cost of distribution works is recoverable with interest over a 40 year term through annual water charges.

Water charges must also cover annual operation and maintenance costs, which on a scheme of the type proposed are minimal, and a contribution to a renewal fund to ensure future repair and replacement of the works. A charge will also be made for the bulk water drawn from the existing Manuherikia scheme or in the future from the Manuherikia Valley scheme.

This will result in an annual cost structure as follows:

Water supply	$ 12/ha
Capital charges	110/ha
Operation and maintenance	8/ha
Renewal fund contribution	5/ha
	$135/ha

To meet these costs all water supplied by the scheme as measured at individual supply points would be charged at a rate of $11 per 1000 m^3 ($13.50 per acre-foot). A minimum annual charge of $110 per ha ($44.50 per acre) served by the scheme would apply.

CONCLUSION

The proposed scheme has been envisaged and designed as a highly sophisticated system providing a specialised horticultural supply. As such its cost and water charge structure is high, requiring a commitment by landowners to intensive horticultural system.

With this commitment and support by the landowners concerned, the proposed scheme would be presented to the Otago Officials Committee on Irrigation and Rural Water Supply for recommendation to the Water Resources Council. Subject to Government economic criteria being met, and the availability of funds for construction, this would lead to the approval-in-principle of the proposal. A poll, on the basis of one landowner one vote, would follow in which an 80% support would be required for the scheme to proceed to approval and construction.

In the event of the poll being carried all landowners within the designated boundary of the scheme would become liable for water charges.

It should also be noted that proceeding with such a scheme on the fringe of a developing urban area may require controls to ensure continuing horticultural use of the land, and hence protection of the scheme investment.

C J REID
Ministry of Works and Development
Dunedin

March 1982

CJR:JAP

1 April 1981 15/17

The County Clerk
Vincent County Council
PO Box 4
CLYDE

Dear Sir

DUNSTAN FLAT IRRIGATION

As noted in the outline of the proposed Manuherikia Valley irrigation scheme forwarded to you with my letter of 9 June 1980, it is not intended to continue the distribution of irrigation water to the Dunstan Flat by open-race, which is proving increasingly more difficult and costly, but rather to meet specific future demands in this area by separate piped sub-schemes.

In response to farmer interest, preliminary investigation has now been completed for such a proposal to serve the area between Dunstan Road and the foot of the airport terrace, and extending north-westwards from the Alexandra Borough boundary at Hillcrest Road to Airport Road. Extension of the proposal to serve land immediately inside the borough boundary would also be possible but other adjacent areas would better be served by separate systems if and when the demand arises.

The present proposal would require a storage pond covering approximately 5 ha on the terrace adjacent to Alexandra airport, from where a piped distribution system would utilise the fall available over the terrace to develop the pressures necessary for spray irrigation. Supply would initially be drawn from the existing Manuherikia irrigation scheme using water which cannot currently be fully utilised or which would become available with the consequent termination of supply from the existing open-race east of Airport Road. In the longer term the scheme could be supplied by, and would form an adjunct to, the proposed Manuherikia Valley scheme.

Capital cost of the proposal at close to $7000 per ha and the annual water charge, which at current costs would be approaching $90 per ha, are relatively high. However the close matching of the proposal to the intensive horticultural development possible and likely on the small holdings in this area should allow such costs to be sustained.

Further details of the proposal are provided in an enclosed report which has recently been distributed to, and discussed at a meeting of, the occupiers in the area. This meeting has

also supported the more detailed investigation of Alternative B in the report (ie, a scheme designed primarily to meet irrigation rather than frost-control demands) with a view to the presentation of a scheme for approval towards the middle of the year.

As you will appreciate the implementation of such a scheme would require some reasonable certainty of the continuance of both horticultural land use and the present subdivision pattern in the area. Although a notice could be registered against all land titles within the scheme area, this does not restrict change of land use or subdivision and some long term protection may be desirable through planning procedures.

Your Council's views and comments on the proposal and the planning implications it raises would be appreciated. Comment is also being sought from the Alexandra Borough Council particularly concerning possible expansion of the urban area and the long term planning objectives for the irrigable land within the borough boundary.

Any further information you require will gladly be provided and Mr Reid would be pleased to discuss matters further with you.

Yours faithfully

R D Grant
District Commissioner of Works

per

(C J Reid)

Encl

DISTRIBUTION

The Resident Engineer
ALEXANDRA

Water and Soil

DUNSTAN ROAD IRRIGATION

Summary of investigations into a fully piped irrigation scheme to provide a horticultural service to 117 ha on 22 properties in the area extending northwest from Alexandra to Airport Road, and lying between Dunstan Road and the foot of the terrace. Two alternative proposals are outlined:

Alternative A

An on-demand scheme utilising the head available over the terrace to provide a pressurised supply for irrigation and for frost control demands over half the irrigated area.

Alternative B

A scheme utilising the available head to provide a scheduled irrigation supply but with frost control demands being met by pumping from storage within individual orchards.

In either case the new proposal would completely replace the supply currently provided by the Manuherikia irrigation scheme in this area.

PROPOSED SCHEME

The proposed scheme would be supplied initially from the existing Manuherikia irrigation scheme and, in the longer term, from the proposed Manuherikia Valley scheme through a storage pond located on the terrace adjacent to Alexandra airport.

The storage pond would be of the "turkey-nest" type from within which approximately 45 000 m^3 (cubic metres) of material would be excavated to form the surrounding embankment. Although greater storage could readily be provided, a total area of 5 ha (12.5 acres) and an operating range of 2.2 m (slightly over seven feet) would give a capacity of 100 000 m^3 (or roughly 80 acre-feet). Provision has been made for lining of the storage by clay blanket or membrane to reduce leakage through the highly porous gravels expected in this area.

Water would be drawn from the storage pond through a primary screen filter probably of the rotary type, and an automatic valve controlled by downstream pressure but with provision for manual control. From the outlet works, a low pressure concrete pipeline would carry water along the top of the terrace to feed the high pressure distribution system.

High pressure distribution could be either by a single piped system serving the whole area or by four, roughly equal sized, sub-schemes operating independently off the

low pressure line. With both alternatives A and B, the capital costs of the two systems are comparable but the latter, which allows the use of smaller diameter pipes, at present seems marginally more attractive. However the single distribution system requires about 25% less pipe than the four subschemes.

Whatever system is installed, individual properties would be served through 100 mm (four inch) constant pressure solenoid valves but with provision in alternative B for a bypass to storage.

WATER SUPPLY

Both alternatives A and B have been designed on the basis of an irrigation water requirement of 80 mm (slightly over three inches) every nine days, the 100 000 m^3 of storage proposed being sufficient to meet slightly more than one irrigation of 80 mm over the whole area.

Alternative A would deliver this supply essentially on demand which is equivalent to a demand factor of five (ie, the proposed scheme would have the ability to meet the full water requirement over one-fifth of the nine day period or alternatively meet five times the steady irrigation demand). Over the 117 ha area this would require pipes capable of carrying a flow of 2300 m^3/h (cubic metres per hour) or approximately 23 cusecs. This flow would also be sufficient to meet a frost control demand of 4 mm/hour or 16 points per hour over 58 ha.

Alternative B with scheduling or partial rostering of supplies on the other hand would require a demand factor of two (ie, the system would have twice the capacity needed to meet a steady demand). This would require pipes capable of delivering a total of 800 m^3/h or eight cusecs. Although such a system would be capable of providing water under pressure for frost control over 20 ha (45 acres), demands from larger orchard areas could only be met through within property storage replenished from the scheme.

Except for orchard frost control under alternative B, water would be delivered to individual users at a minimum pressure of 75 psi or 500 kPa (kilopascals).

In operation it is envisaged that the scheme storage would be replenished largely using small residual or surplus flows from the Manuherikia scheme. However, a period of sustained irrigation demand such as might occur during the January-February period, could be met with a supply of 300 m^3/h (three cusecs) or substantially less than currently distributed to this area. At times of frost control demand the supply required could reach 800 m^3/h (eight cusecs) but this would tend to occur at times of relatively plentiful supply and low irrigation needs.

COSTS AND CHARGES

Although pipe costs are currently changing rather rapidly and there is at present no reasonable alternative to asbestos cement in pipes over 200 mm diameter, capital costs of the two alternative proposals are estimated as follows:

Alternative	A	B
Storage pond including lining and outlet works	171 500	171 500
Main pipeline supplying scheme including laying and fittings	320 900	244 000
Distribution pipes including anchor blocks and fittings	267 700	102 600
Valves, controls, pressure relief and scour provisions	34 800	25 700
	$794 900	$543 800
	$6800/ha	$4600/ha

Under current irrigation policy (which it should be noted does not extend to works for frost control purposes) expenditure on headworks to supply an approved scheme is eligible for 100% Government grant while half the cost of distribution works is recoverable with interest at current rates through water charges.

Water charges must also cover annual operation and maintenance costs, which on a scheme of the type proposed are minimal, and a contribution to an interest bearing renewal fund to ensure future repair and replacement of the works.

For the two alternative schemes the total cost of recoverable works, the annual capital charge, annual operation and maintenance costs and the renewal fund contribution are assessed as follows:

Alternative	A	B
Distribution works cost	$290 000	$115 000
Capital charge	$162/ha	$63/ha
Operation and maintenance	$8/ha	$8/ha
Renewal fund contribution	$12/ha	$5/ha
Total annual cost	$182/ha	$76/ha

No provision has been made in capital costs for on-farm works which, in terms of current policy, are eligible for 1:1 subsidy on the cost of all fixed works. However the farmers' share of such costs is recoverable directly and does not affect scheme water charges.

CONCLUSIONS

The very high costs of alternative A which have become apparent with the detailed investigation arise from two main factors:

1 The large capacity required to meet frost control demands and, with this, the need to move into larger diameter and more costly pipes.

2 The need to use asbestos cement (or possibly steel) pipes in sizes over 200 mm as opposed to PVC which is only available in smaller diameters.

On the other hand alternative B, with its lower delivery rates, would enable less costly PVC pipes to be used for all except the main delivery line. However it would mean orchardists would face additional costs of providing storage and pumping for frost control (but not for irrigation which would be delivered under pressure).

In the light of these factors alternative B has a marked cost advantage over alternative A and appears a viable means of meeting the water needs of the area. Alternative A cannot be recommended to potential users.

(C J Reid)
Water and Soil Engineer

Dunedin

17 December 1980