

21. NO DIG SEWER REPAIR AND RENOVATION TECHNOLOGY PROGRESS

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Corporate Plan Output: Liquid Waste Capital Renewal and Replacement	

The purpose of this report is to outline progress with further investigation into sewer repair and renovation technology and to report proposed strategies to implement these No-Dig solutions particularly the use of pipeline grouting.

BACKGROUND

This Council currently spends \$2.1m per year on sewer renewal work. This figure includes the present \$400,000 per year on the flow monitoring and flow modelling project. The bulk of this expenditure is on the renewal of old pipes that are broken, cracked and leaking significant groundwater into the network. Our sewer inspections are increasingly showing the pipes to be structurally sound but the joints are no longer serviceable and either allow the ingress of groundwater that overloads the system, particularly in wet weather or they allow the leakage of sewage out into the groundwater. Increasingly effective methods of rehabilitating these pipe joints are to either reline the whole pipe (which is marginally cheaper than renewal of the pipeline) or to pressure grout the pipe joints (which can be significantly cheaper than renewal), both options without having to dig up the existing pipe. Grouting work is not however an option when the pipe is structurally unsound. It is expected that in the next five years the Council will be spending up to \$500,000 per year of its sewer renewal budget on sewer grouting as an alternative and cost effective alternative to complete pipe renewal. It is likely that this level of expenditure will be ongoing.

Investigations into these options were reported to the Committee on 6 July 1999 following Graham Williams (the Contracts Manager) attendance at the North American No-Dig Conference in Orlando Florida in May 1999. The Committee encouraged the further investigation of No-Dig options and authorised a staff visit to Australia to further this process. Two staff (Graham Williams, Contracts Manager and Neville Stewart, Senior Engineering Officer) have now spent a week in Sydney discussing No-Dig systems, in particular sewer grouting with equipment manufacturers, grouting contractors and Asset Managers. This trip has been extremely useful for clearly defining the best methods of pipe renovation in different situations, for identifying the optimum choice of equipment for sewer grouting and for gaining an understanding of the costs associated with this work.

USE OF NO-DIG TECHNIQUES IN CHRISTCHURCH TO DATE

The following comments are relevant

- Early trials in the 1970s of injection grouting of sewer mains and laterals while initially successful have not lasted long and were very expensive.
- In 1992 trials were also carried out using flood grouting techniques that were intended to seal joints in both the main and the laterals. Again this trial while initially successful failed to last for more than five years before the infiltration rate returned to previous levels.
- Slip linings, pipe bursting and cured in place lining have all been used and generally successfully as renewal techniques, but their application is limited technically to particular circumstances.
- Patch repairs of sewers (a No-Dig internal repair method) was developed by Neville Stewart following a previous visit to a No-Dig conference in Perth and is being used in Christchurch for completing many of the necessary sewer repairs. To date about 60 of these repairs have been completed.
- Although quotations for some grouting work have been sought, grouting of pipe joints has not yet been used in Christchurch. The cost of grouting the pipe joints was far too high to be viable, as it was approximately the same cost as digging and laying a new pipe and laterals. Until recently there have only been two contractors in the New Zealand with the capability to undertake sewer grouting. There is now a third contractor with this capability and all are North Island based. The Waste Management Unit believes that some North Island Councils are paying excessively for joint grouting work.

POTENTIAL USE OF SEWER GROUTING IN CHRISTCHURCH

In Christchurch approximately 25% of the wastewater flow arriving at the plant comes from groundwater so there is a large scope for increasing the system capacity by reducing the ingress of ground water. This is particularly relevant at times of wet weather where the major contributor to overflows in large storm events is groundwater infiltration. Consent application has been made for wet weather overflows from the reticulation system. As well as other issues, work associated with this consent will include reducing the amount of infiltration into the piping network as one means of reducing the volume and frequency of overflows.

The flow monitoring and modelling currently being undertaken will be used to identify the areas of the city reticulation system that are worst in terms of groundwater infiltration and exfiltration. Areas so identified will be the main candidates for sewer grouting as a renovation technique. There is also a large area of the city in the New Brighton to Burwood area where it has been known for many years that the rubber rings used in the pipe joints are subject to biological degradation. While this phenomenon has not caused any serious problems with the system operation or service level so far, it is clearly expected that extra renovation effort will be required here in the coming years. These areas are also candidates for sewer grouting. There is therefore sufficient sewer grouting work available in Christchurch to keep at least one grouting rig operational full time for many years to come.

It is well recognised in the industry that ground water infiltration gets into both the sewer mains and into the sewer laterals extending into private properties. Eliminating infiltration into the main is only part of the solution and often a large part of the solution is to eliminate the infiltration into the laterals. The relative contribution from the main and the laterals is difficult to determine exactly but both sources need to be addressed in the long term. It is also well recognised in the wastewater industry that total elimination of infiltration is not feasible and that the best cost benefit occurs at about 50% reduction of infiltration.

LIFE OF INJECTION GROUTING

As intimated above earlier trials of both flood and injection grouting were not successful and were very expensive. Overseas experience particularly in the USA and in Australia shows clearly that the life of the more commonly used injection grouting is very variable, from as little as one year up to 20 years. It is apparent that success of grouting is very dependent on choosing the appropriate situations in which to use it. For example it is very suitable in silt and sand soils but not suitable in highly permeable gravel soils where other No-Dig renovation methods are more suitable. In the past the high cost and short life of injection grouting has made this form of renovation uneconomic. However, the life of grouting now is much better and if used in the appropriate situations then cost is expected to be much lower than in the past. Injection grouting is therefore an appropriate technology to pursue further and is likely to be used increasingly as a cost effective alternate method to complete pipe renewal.

STRATEGY FOR SEWER GROUTING IN CHRISTCHURCH

Currently contract prices for sewer grouting are unacceptably high in New Zealand. A possible option therefore is for the Council to set up and operate its own grout rig. Before pursuing this option however an alternative would be for the Council to seek registration of interest from local contractors to set up their own grouting operation. It is envisaged that this would lead to a negotiated contract with a suitable contractor to carry out sewer grouting work at agreed rates to an agreed standard, for an agreed period of say three or four years. A contractor would need to buy equipment costing some \$400,000. The largest part of the grouting operational costs is labour. A three or four year contract would give a contractor some certainty of continuous work for the investment made and give the Council a start into a long term grouting programme at a competitive cost.

The next decision to make is what part of the sewer system to grout – the main, the junction and/or the lateral? It is well proven technology to grout the main, the junction and a short distance up the lateral from inside the main. Currently grouting of the main and the junction are carried out in a separate operation. Techniques for grouting the whole of lateral cost effectively are still developing but some interesting possibilities are emerging in Sydney. Overseas experience is that grouting of the lateral right through to the boundary should still be a priority in the future for this work to be fully effective.

It is proposed that the initial strategy for sewer grouting should be by way of a negotiated contract for an agreed period with a local contractor and should cover the grouting of mains and their junctions with the laterals. The effectiveness of infiltration reduction could then be gauged through flow monitoring before a further decision is made on the need and extent of further required lateral grouting. No additional budget is required to progress into a grouting programme as funds are already included as part of the sewer renewal budget.

SUMMARY

In appropriate locations grouting of sewer pipe joints using latest technology can provide a cost effective alternative to pipe replacement or lining. The Waste Management Unit intend to call for expressions of interest from local contractors with the view to establishing a grouting contract with a three or four year term.

Recommendation: That the information be received.

Chairman's

Recommendation: That staff provide a cost effective comparison between a Waste Management Unit developed and Canroad operated sewer grout rig operation and an operation provided by a private contractor.