

ROTORUA'S EXPERIENCE IN PRESSURE SEWER SYSTEM IMPLEMENTATION

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ABSTRACT

Rotorua District Council has completed the first community wide application of low pressure grinder pump (LPGP) system in New Zealand. This involved the installation of LPGP pumping units to service sixty (60) existing residential development and a marae at Hinemoa Point, Rotorua. This lakeside community is characterized by undulating topography and high water table.

A paper presented to the NZWWA 2007 Conference by one of the authors summarized the result of a study undertaken that concluded that LPGP is the best sewer servicing option for Hinemoa Point and other lakeshore communities in Rotorua because of cost and environmental considerations.

This paper will outline Rotorua District Council's experience related to the construction, commissioning and start up operation of the LPGP system installed; in particular dealing with the householders during construction phase. It will also attempt to validate the decisions made related to the ownership of the systems and procurement and implementation models. This will be of interest to infrastructure managers who are contemplating or in the process of implementing pressure sewer systems within their area of responsibility.

1. INTRODUCTION

Hinemoa Point is a community within the urban boundary of Rotorua and is located on the southeastern shores of Lake Rotorua. It includes 61 developed properties and 33 vacant sections which are either freehold or under Maori ownership. There is potential for development of another 100 sections within the identified service area of the sewerage scheme.

Figure 1 – Locality Map of Hinemoa Point

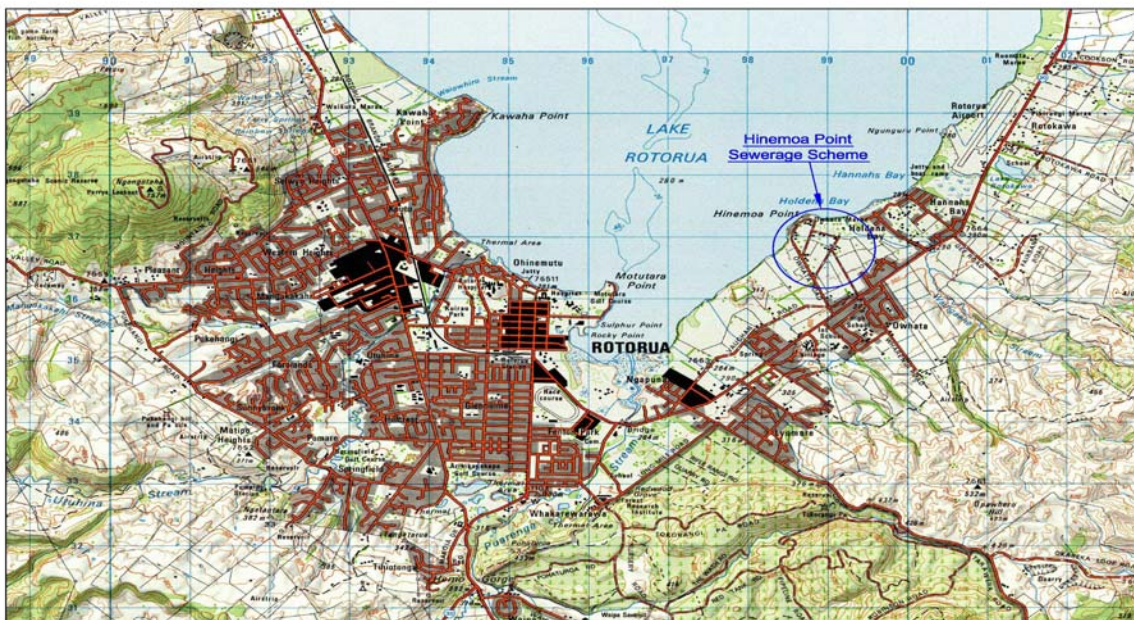


Figure 2

Aerial Map of Hinemoa Point showing developed/undeveloped sections and Area of Benefit boundary.



The community is characterized by extensive flat lands on the low lying sectors and rolling topography on the area towards the lake. The low lying properties have inherent high water table issues while the hilly areas towards the lake are characterized by the presence of rock boulders which makes excavation difficult.

A sewerage scheme was originally proposed in the late 80's, but for several reasons did not proceed. In 2005, Council started the identification of sewer servicing options for the community. After an extensive investigation of options and consultation with the community, it was decided to proceed with the implementation of Low

Pressure Grinder Pump System (LPGP) in favour of conventional gravity system for Hinemoa Point because of cost and environmental considerations.

2. POLICIES RELATED TO OWNERSHIP, OPERATIONS AND MAINTENANCE OF THE INSTALLED LOW PRESSURE GRINDER PUMP SYSTEMS

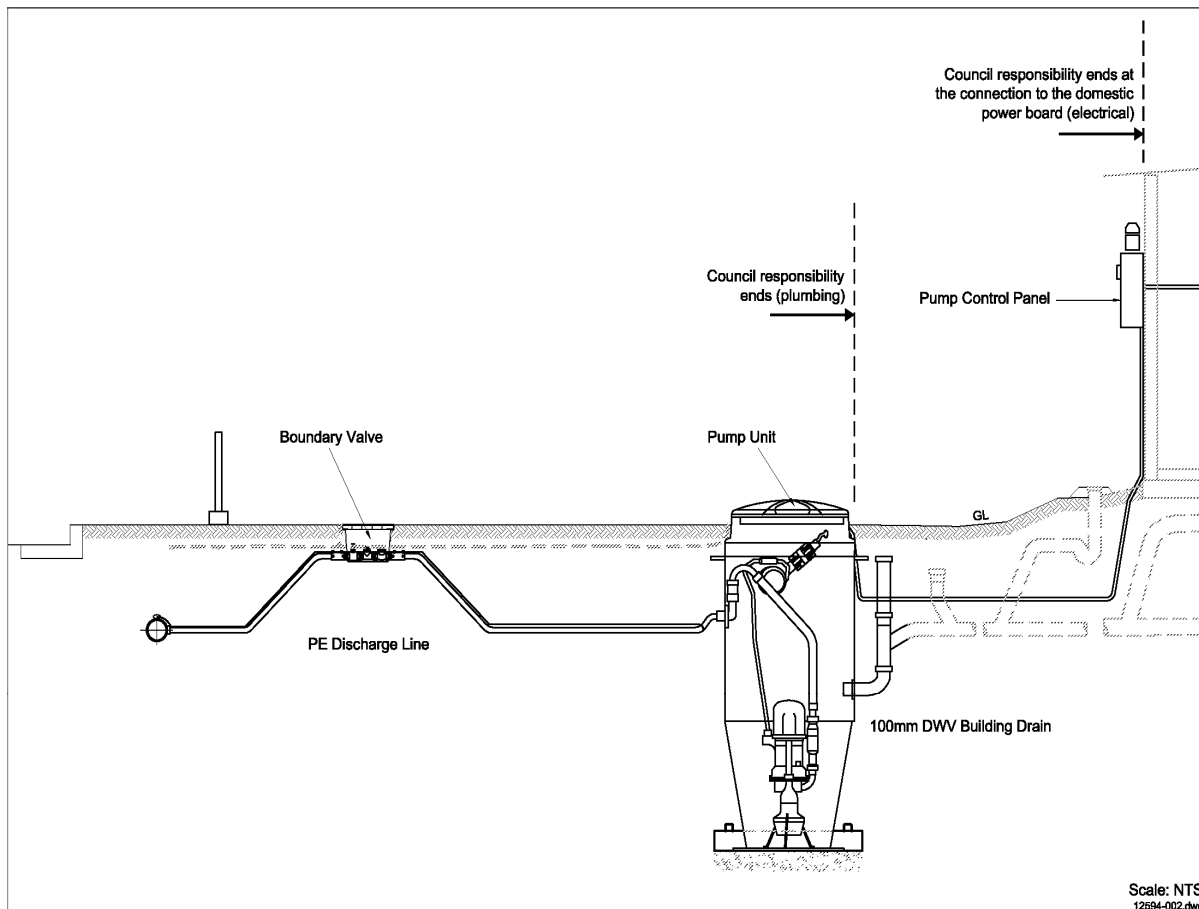
2.1 OWNERSHIP MODEL

The existing Council policy on sewerage servicing adequately define the delineation between segments of a conventional gravity system that are in public and private ownership including responsibility for operation and maintenance. This existing policy in their present form is inadequate to provide guidance in the establishment of ownership, operation and maintenance of low pressure grinder pump system.

Rotorua District Council in developing its policy related to the ownership and responsibility for operation and maintenance of the installed LPGP systems have considered that the long term reliability of the systems depends on the level of maintenance put into them. After a thorough evaluation of the two possible ownership models, Rotorua District Council decided to include the LPGP units installed within private properties as part of the Council asset. This means that Council would be responsible for their maintenance and replacement while the property owners pay for the running cost. The pumping units are connected to the individual property's power supply.

The specific delineation of responsibilities are depicted on the following diagram.

Figure 3 – Delineation of Responsibility for Maintenance



2.2 AUTHORISATION TO INSTALL THE LPGP UNITS ON PRIVATE PROPERTY AND UNDERTAKE MAINTENANCE WORK AS REQUIRED

The Rotorua District Council used the provisions and followed the procedures set by Section 181 and Schedule 12 of the Local Government Act 2002, in acquiring approvals to install LPGP pumping units within private properties. Since the pumping units and appurtenances are part of Council's asset, access to undertake replacement and maintenance work on private properties will be done under the authority provided by the provision of the same section of the Local Government Act 2002.

3. PROJECT DELIVERY/PROCUREMENT MODELS

The Project Delivery/Procurement Models evaluated for the implementation of Low Pressure Grinder Pump Systems in Rotorua included the following:

- a) Single contract for the supply, design, installation and commissioning/start up of the system.
- b) Separate contract for the supply of equipment, design, installation and commissioning of pumping units and street mains.

Rotorua District Council decided to proceed with separate procurement/contract for the different phases of the project. The scope of each phase of the project are shown on the following table.

Table 1- LPGP System Project Phase and Scope of Work

Project Phase	Scope of Work
Supply of LPGP Units (Ecoflow Ltd/EONE Corporation)	Supply and Delivery of pump core, tanks and control panels Peer Review of Design done by others Training of Installers and Maintenance personnel Supervision and Audit of Installation Testing and Commissioning Provision of unlimited 3 year warranty.
Design (Hydrus Engineering Consultants Business Unit of Rotorua District Council)	Plumbing and Electrical Audit On Property Installation Design Street Main Network Design Trunk/Transfer System Design Contract Administration and Construction Supervision
Construction (Castlecorp Business unit of Rotorua District Council)	Supply and Installation of Street Main Network and Trunk Main System Supply and Installation of Individual Service lines Installation of Pumping Unit including electrical connection Testing and Commissioning of Network Testing and Commissioning of Individual Pumping Units

Rotorua District Council's decision to implement the project as above was made for the following reasons:

- a) Entering into a separate contract (ideally long term) with the supplier ensures that they will provide the required level of support during installation, commissioning and post installation. This would be more difficult if the supplier is just a sub contractor of a construction firm.
- b) The skills of contractors/personnel employed at different phases of the project are appropriately focused on areas they are reasonably competent on.

4. DESIGN DEVELOPMENT

The design (concept to detail) was undertaken by Hydrus Engineering Consultants a Professional Engineering Services, Business Unit of Rotorua District Council. Peer review of the design was undertaken by an independent Engineer employed by the supplier.

The design of the system was based on the requirements set out by WSA-07(Pressure Sewerage Code of Australia) and the Rotorua Civil Engineering Industry Standard.

4.1 SYSTEM NETWORK DESIGN

The major challenge we faced during the network design was providing capacity within the street and trunk mains to allow for future development.

Hinemoa Point includes large tracts of vacant land that are in Maori Ownership. Although the location of the community (being lakeside and within the urban area boundary) could be considered as attractive for further marketable subdivision development, it is not straight forward for land under Maori ownership. The challenge was to provide sufficient capacity within the street and trunk mains to allow for further development in the future but not cause any operational issues such as septicity and solids deposition.

A careful analysis of the actual specific community and area wide actual growth including comparison with predicted growth was undertaken. A pragmatic level of development in the future was estimated using the three information available. This predicated level of development was used in sizing the street and trunk mains. To avoid operational and maintenance issues within the street and trunk mains, clean outs/flushing points were provided at strategic locations within the system to allow for periodic flushing should solid deposition occur within the short to medium term.

4.2 ON SITE INSTALLATION DESIGN CHALLENGES

The on site installation includes the pumping units and the pressure main connecting the pumping unit to the street main and the connection of the pumping unit to the domestic power supply. This design phase involves ensuring that the domestic plumbing system has no stormwater connection and that the performance of the domestic power supply system would not be adversely affected with the connection of the LPGP unit. However, the most important aspect of the design phase is establishing the location of the LPGP Unit in consultation with the owner. Challenges related to this phase of the work included:

a) Obtaining access to properties so that inspection could be undertaken.

This situation usually involved holiday or unoccupied properties. The difficulty was highlighted during the electrical audit/design phase where access to the power board inside the house was required. Considerable research were undertaken to determine contact numbers of property owners that don't reside on the property. The rating database has always been a good start, but have not always provided good results.

b) Obtaining agreement from the property owner on the location of the pumping unit.

The challenge here is balancing the wishes of the property owner against the practical/optimum location of the pumping unit after taking into consideration engineering requirements.

In cases where there were conflicts between the owner's wishes and staff determination of the location of the pumping units, this has always been resolved by going through a consultation process approached with a win/win attitude.

5.0 SUPPLY PROCUREMENT AND CHALLENGES

The supply of the pumping units (pump core, tanks and alarm panels) were tendered publicly using Rotorua District Council supply of Equipment Standard General Conditions of Contract with scope as described in Section 3. The latest tender however used as General Conditions- AS/NZS 4911:2002- Supply of Equipment Without Installation.

For this particular contract the challenge we faced involved finding a secured open and covered storage space near the construction site to store the tanks and core units while awaiting installation. Although RDC has been fortunate to find a site for this case, succeeding project locations may not have these facilities. The solution to this would be to programme the delivery of units to the site in quantities and intervals that would fit with the installation programme of the installation contractor.

6.0 CONSTRUCTION/INSTALLATION AND CHALLENGES

The construction of the street mains and installation of the individual pumping units was undertaken by Castlecorp the Maintenance/Construction Business Unit of Rotorua District Council. Castlecorp will be undertaking the maintenance of the installed units, hence their involvement in the construction of the first LPGP Systems in Rotorua enabled them to get familiarized with the system.

Challenges experienced during the construction phase included:

a) Rapid upskilling of personnel both in the installation and trouble shooting/maintenance of the system.

Since this is the first LPGP system in Rotorua and the first community wide application of LPGP in New Zealand, the installers had to be developed from within with training and supervision provided by the supplier.

The training involved classroom training and hands on installation work supervised by the suppliers representative. It did not take long before the Contractor's plumber and electrician to get familiar with the installation techniques and requirements.

b) Property owners changing agreed location of pumping units

This is an issue that could potentially blow out of proportion if not handled carefully by the Contractor or by Council staff. The few cases in Hinemoa Point were sorted on site with a positive attitude and with the objective of achieving a win/win situation for both parties. This means that the property owners were able to get their desired change with minimal cost and inconvenience to the Contract works.

c) Property owner's expectation on the level of reinstatement.

The installation of low pressure grinder pump units and their corresponding service connection to the street mains involves considerable disturbance of existing lawns and garden within private properties. The Contract provisions require the Contractor to reinstate disturbed surfaces to the conditions they were found prior to the work undertaken. There were cases where the level of reinstatement expected by the owner is higher than what is required under the provisions of the contract. In cases where the effort/cost involved in meeting the expectation of the owner were minimal, the additional works were undertaken. In cases where the expectations of the owner and the required level is irreconcilable because of cost and practicality, these were politely refused.

The photographs of conditions of the property surfaces prior to the work being undertaken were referred to in these cases as proof of what is the rightful level of reinstatement required.

7. COMMISSIONING AND START UP

The commissioning and start up phase of the project was undertaken by the equipment supplier (Ecoflow / Eone).

7.1 SCOPE OF COMMISSIONING AND START UP

a) Onsite inspection

Prior to commissioning the LPGP units, an audit of the onsite installation was undertaken. The onsite inspection covered; electrical supply is correct (wiring and breakers), the tank has been installed in the correct position (relative to boundaries / buildings and also at the correct depth and not in an area that is likely to flood). The inlet and outlets were also inspected, with the discharge line being pressure tested for leaks from the tank to the isolation valve in the boundary kit.

As the tanks had been installed with “Pre ballasted” concrete around the base, no water in the tank was required to hold them in place while back filling. As there was no water in the tanks at the installation phase we could easily see if any water infiltration had occurred through the inlet / outlet or cable entry. (tanks sat for a period of months between installation and commissioning – during the winter months).

b) Commissioning

All units were commissioned to the manufacturers requirements. High level alarm, normal start / stop, current draws, voltage drops, and capacity rates were all checked and recorded on data sheets and entered into the RDC LPGP database.

7.2 COMMISSIONING CHALLENGES

The complete system comprises 61 units, however only approximately 30% of these households had agreed to connect straight away. This presented the question of when the units should be commissioned. RDC decided to commission all 61 units at the same time, then leave the boundary kits in the “Open” position and the pumps powered up. This meant that the home owners could connect at their leisure and the system would be operational. It also meant the supplier’s and council engineers did not need to make one off site trips to commission units.

Another issue that presented itself at commissioning time was the detection of leaks in the onsite discharge line. Whilst the incident rate was very low, it was found that leaks at the electrofusion joint of the boundary kit was present. The supplier over came this by supplying boundary kits with a 300mm length PE stub at each end, already electrofusion welded and pressure tested at the factory.

8.0 CONCLUSIONS

The completion of Hinemoa Point Sewerage Scheme has proven that Low Pressure Grinder Pump System is the best sewer servicing option for this area after cost and environmental considerations.

The implementation of the project through separate phases enabled Rotorua District Council to secure commitment from the equipment supplier to provide long term post installation support and the two Business Units of Council to become familiar with the design, installation, operation and maintenance of the system. The lessons learnt from this project will be used to improve processes/techniques in the implementation of succeeding LPGP system projects within the district.

The involvement of private property owners from design to commissioning of their individual pumping units is critical to the success of the project. Although the hundred percent agreement of both parties is ideal, in cases where differences arise; these differences should be resolved with a positive and win/win attitude.