Jeffreys Suction Tank Options Assessments

Christchurch City Council

Final Report

April 2018

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Executive Summary

Introduction

The Jeffreys Pump Station suction tank suffered some damage during the February 2011 earthquake. The Council initiated a project, on 26 April 2016, to replace the tank. The original proposal was for a 250 m^3 tank at the damaged suction tank location.

However, after consideration of a number of factors the Council decided to change the tank size to a 500 m^3 suction tank. Below is a list of some of these factors:

- A 500 m^3 suction tank would provide sufficient additional buffer storage to make the most of the potential flow capacities from the Jeffreys Pump Station wells than what could be achieved with a 250 m^3 suction tank.
- A 500 m^3 suction tank would provide additional sand settlement (than a 250 m^3 suction tank) to provide better water quality.
- While the 250 m^3 suction tank could, depending on the baffle design and dosing rate, achieve the minimum contact time required for effective chlorination (should the need arise), the larger suction tank will provide even more effective chlorination results at lower dosing rate than a 250 m^3 suction tank under similar operational conditions.
- A 500 m^3 tank would future proof the network requirements for the next 50-100 years than a 250 m^3 suction tank would. Future proofing includes additional capacity associated with any future legislative requirements for fluoridation.
- The cost benefit of the increase in size was considered to be acceptable enough for the investment in a larger suction tank to be made.

Alternative Site Chosen for 500 m^3 Suction Tank

The existing suction tank site was not large enough to accommodate the footprint of the proposed 500 m^3. Thus, the Council and the nominated consultants (Opus) decided on an alternative site – herein called Option 1 (which was presented to the residents and the Community Board). The selection of the site was based on the following factors:

- Low capital costs.
- It had the least impact on the existing pump station site (low risk to the existing structures) and the existing facilities on the reserve (rugby field, tennis court, playground).
- It was a site where all planning rules were complied with.
- There were no other services at the site that would need relocating.

Concerns Associated with the Proposed 500 m^3 Suction Tank Site

During consultation with the local residents it became apparent that some residents were not in favour of the proposed location for a variety of reasons, some of which included:

- Potential for criminal and undesirable activities in and around the tank area.
- Visual impacts on existing residents.
- Impact of the construction works on their properties.

A full list of the residents' concerns is provided in Section 2.2.4 and **Appendix A**. **Appendix B** also provides the consultative process that has been undertaken to date.

Stage 1 Options Assessment

In October 2017, the Council undertook a detailed options assessment. Seven options (discussed in detail in Section 3) including the original Option 1 where analysed using a Multi-Criteria Analysis (MCA). The seven sites are:

- Option 1- original site option presented to the residents during the consultation phase.
- Option 2 – at the front of the existing pump station building and compound.
- Option 3 – within the Waiwetu Reserve and adjacent to 30 and 30A Jeffreys Road.
- Option 4 – adjacent to 28A and 30 Jeffreys Road but on the park side.
- Option 5 – next to the tennis court.
- Option 6 – on the existing playground near the library.
- Option 7 – between the rugby pitch and Jeffreys Road.

The results from MCA recommended the adoption of a different option to Option 1. The recommended option was Option 2 (in front of the existing pump station compound).

Option 2 was widely accepted by the Waiwetu Street residents. However, residents of 53 Waiwetu Street were not happy with this option and they suggested another location. This eighth option is referred to as Option 8 and is described in detail in Section 3.

Stage 2 Options Assessment

The suggestion of an eighth option necessitated another option assessment to test the option against the other seven options (the original Option 1, the six new options assessed in the Stage 1 options assessment).

MCA Assessment Criteria

A MCA was carried out to determine the best option. A list of assessment criteria, broadly grouped into Technical, Environmental, Social and Financial categories, were developed and each option was assessed for suitability based on these criteria. A detailed assessment of the pros and cons for each site was carried out.

The social category included the impact on the residents and crime prevention principles and was given the largest single weighting (50%). The issues that were of most concern to the residents were assessed in detail.

One of the MCA criteria was the financial and to be able to score this it was necessary to estimate the project costs. High level (+/-40%) cost estimates were generated for each of the eight options. Table ES1 summarises these costs. For the purposes of this assessment whole life costs were not estimated. The primary reason was that the overall costs were going to be in the same order as the capital costs with Option 7 being the most expensive because of the long distances to the suction tank and the possible requirement to pump the water from the wells to the suction tank and then back again to the surface pumps. Thus, it was deemed that there was no merit in estimating the whole life costs.

Table ES1 – Cost Estimates

Option	Cost Estimate
Option 1	$2,570,700
Option 2	$2,680,700
Option 3	$2,700,500
Option 4	$3,065,700
Option 5	$3,041,500
Option 6	$3,088,800
Option 7	$3,146,000
Option 8	$2,788,500

Stage 1 MCA Analysis

During the Stage 1 MCA analysis there were seven options (Options 1-7) being assessed.

Table ES2 summarises the MCA scores for each of the seven Stage 1 options.

Table ES2 – Stage 1 MCA Scoring Results

Criteria	Score	Ranking
Option 1	57.46	6
Option 2	69.32	1
Option 3	52.77	5
Option 4	49.31	7
Option 5	65.12	3
Option 6	63.20	4
Option 7	65.36	2

Based on the Stage 1 MCA analysis, the order of preference was:

- Option 2 – at the existing pump station.
- Option 7 – next to Jeffreys Road.
- Option 5 – next to the tennis court.
- Option 6 – where the playground is located.
- Option 3 – in Waiwetu Reserve.
- Option 1 – the site option that was presented to the residents.
- Option 4 – adjacent to 28A and 30 Jeffreys Road.

Stage 2 MCA Analysis

On the 9th of March 2018 the residents of 53 Waiwetu Street submitted a layout with a suggested new site for the proposed Jeffreys Road Suction Tank.

The introduction of the new option did not necessitate any changes to the criteria and sub-criteria. The original instruction to give a weight of 50% to the Social Criteria was retained.

Table ES3 summarises the MCA scores for each of the eight Stage 2 options.

Table ES3 – Stage 2 MCA Scoring Results

Criteria	Score	Ranking
Option 1	61.24	5
Option 2	76.95	1
Option 3	56.72	7
Option 4	55.72	8
Option 5	66.48	3
Option 6	63.86	4
Option 7	66.61	2
Option 8	58.29	6

Based on the Stage 2 MCA analysis, the order of preference was:

- Option 2 – at the existing pump station.
- Option 7 – next to Jeffreys Road.
- Option 5 – next to the tennis court.
- Option 6 – where the playground is located.
- Option 1 – the site option that was presented to the residents.
- Option 8 – next to tennis court – new option suggested by residents.
- Option 3 – in Waiwetu Reserve.
- Option 4 – adjacent to 28A and 30 Jeffreys Road.

A sensitivity analysis was carried out. This involved changing the scores of the four headline criteria. Table ES4 gives the sensitivity analyses scores adopted. Scenario 1 provides the average MCA scores that generated the results in Table ES3. Scenarios 2-5 are the changes made to the base scenario scores to test the sensitivity of the results to the scores.

Table ES4 – Scores Adopted for the Sensitivity Analyses

	Technical	Enviro	Social	Financial	Total
Scenario 1	26%	10%	50%	14%	100%
Scenario 2	30%	5%	25%	40%	100%
Scenario 3	30%	5%	45%	20%	100%
Scenario 4	50%	10%	10%	30%	100%
Scenario 5	10%	50%	20%	20%	100%

Table ES5 below provides the results of the MCA sensitivity analyses.

Table ES5 – Sensitivity Analysis Results

Scenario		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
1	Score	61.24	76.95	56.72	55.72	66.48	63.86	66.61	58.29
	Rank	5	1	7	8	3	4	2	6
2	Score	75.27	80.34	66.78	56.24	63.07	58.96	56.14	62.26
	Rank	2	1	3	7	4	6	8	5
3	Score	64.6	78.1	58.2	55.3	65.3	62.0	64.0	58.6
	Rank	3	1	7	8	2	5	4	6
4	Score	75.2	79.5	65.1	57.5	62.8	60.4	58.6	63.2
	Rank	2	1	3	8	5	6	7	4
5	Score	58.5	61.4	63.6	61.5	64.5	63.4	62.5	62.0
	Rank	8	7	2	6	1	3	4	5

Table ES5 shows that Option 2 still scored better than any other option, after increasing or decreasing the percentages allocated to the four criteria, under most scenarios. Scenario 5 showed Option 2 coming in 7th place with Option 5 being the preferred option. Scenario 5 also resulted in Option 2 being less preferred than Option 8 which came in at 5 compared to 7th for Scenario 2. In Scenario 5, the environmental criterion was assumed to make up 50% of the weighting and as Option 2 is closer to the stream than Option 5, Option 8 or most other options this scenario did not score as well as in the other four scenarios. Scenario 5 is considered to be an extreme case as the environmental issues associated with the construction of the suction tank and the impact of the stream can be mitigated. Therefore, the 50% weight is unrealistic. Furthermore, allocating a 50% weight to the environmental criterion negates the importance of the possible effects on neighbouring properties.

Summary

Two MCA analyses have been carried out since October 2017. The first assessment (Stage 1 MCA) was used to assess the initial list of seven alternative sites. The second MCA (Stage 2 MCA) was used to assess the Stage 1 options plus the eighth site suggested by the residents of 53 Waiwetu Street.

Eight options have been investigated in detail. The top three options based on the two MCAs are:

- **Option 2** – at the existing pump station.
- **Option 7** – next to Jeffreys Road.
- **Option 5** – next to the tennis court.

Option 8 recommended by the residents of 53 Waiwetu came in at 5 out of the 8 options.

Option 2 is recommended for implementation. It should be noted that while Options 5 and 7 scored well using the MCA, their capital costs (Table 4.2) are 13-17% (i.e. $361K-$465K) more than Option 2. Any departure from the adoption of Option 2 will need to be supported by a very strong case in order to justify the expenditure of an extra $361-$465K of the ratepayers' money. Option 8 costs $107K more than Option 2.

Christchurch City Council

Contents

1 Introduction and Project Objectives

1.1 Project Background and Purpose

1.1.1 Background

The Jeffreys Pump Station is located at 18 Jeffreys Road, Fendalton, Christchurch and within the current North West Pressure Zone. Some parts of the Jeffreys Pump Station such as the suction tank and some wells were damaged during the February 2011 earthquake. While parts of the infrastructure (e.g. the wells) have been restored or upgraded, the suction tank has been offline since that time limiting its potential contribution (e.g. sand removal, flow buffering capabilities and storage) to the water supply network.

In March 2016 an assessment was carried out to weigh up the options to repair or replace the suction tank. It was considered that the cost to repair the tank was going to be considerable given (i) the extent of the damage and (ii) the design/construction of the existing tank. While repair work would bring back the suction tank online, the result would not achieve Council's overall objectives for the network. These objectives include provision of buffer storage, sand settlement and optimising the equalisation of flows from the 4 artesian wells on site. This is because repairing the tank would have reduced the overall capacity of the tank. Furthermore, the repaired tank would still be susceptible to future EQ damage as the foundation work and the structure of the tank were based on old construction methods. Thus, the long-term benefits of replacing the tank outweighed the immediate benefits from repairing the tank. A new tank based on the standard CCC 250m^3 capacity reservoir design was recommended and proposed in the project brief in April 2016.

The Council initiated the project to build the 250 m^3 suction tank and appointed Opus Consultants as the project engineers. The proposed tank size was later changed to a 500 m^3 tank (detailed reasons for this are discussed in Section 2).

1.2 Purpose of this Report

The main objectives of this report are:

- To provide an assessment of the suitability of the available sites for the proposed 500 m^3 tank.
- Assess each of the alternative options to determine their feasibility using a number of criteria that include technical, social, environment and financial factors and the accompanying sub-criteria.
- Recommend the preferred option(s).

1.3 Structure of this Report

This report has been structured as follows:

Section 1: Introduces the Project Background and Structure of the Report.

Section 2: Discusses the Suction Tank Size and Site Options.

Section 3: Alternative Sites for the proposed Tank.

Section 4: Option Selection Criteria.

Section 5: Multi-Criteria Analysis

Section 6: Summary and Recommendations.

2 Suction Tank Size and Site Options

2.1 Proposed Suction Tank Size

As discussed in Section 1, the original project brief was based on a 250 m^3 suction tank to replace the old 200 m^3 suction tank damaged during the 2011 earthquakes. The 250 m^3 suction tank was recommended because it was the smallest standard CCC reservoir design that most closely matched the capacity of the old suction tank.

Since then, the project control group (PCG) has reconsidered the size of the suction tank taking into account a number of factors and the cost benefits of a 250 m^3 suction tank vis-à-vis a 500 m^3 suction tank. The following were the basis for the suggested changes to the tank size:

- A 500 m^3 suction tank would provide sufficient additional buffer storage to make the most of the potential flow capacities from the Jeffreys Pump Station wells than what could be achieved with a 250 m^3 suction tank.
- A 500 m^3 suction tank would provide additional sand settlement (than a 250 m^3 suction tank) to provide better water quality.
- While the 250 m^3 suction tank could, depending on the baffle design and dosing rate, achieve the minimum contact time required for effective chlorination (should the need arise), the larger suction tank will provide even more effective chlorination results at lower dosing rate than a 250 m^3 suction tank under similar operational conditions.
- A 500 m^3 tank would future proof the network requirements for the next 50-100 years than a 250 m^3 suction tank would. Future proofing includes additional capacity associated with any future legislative requirements for fluoridation.
- The cost benefit of the increase in size was considered to be acceptable enough for the investment in a larger suction tank to be made.

2.2 Consequence of the Proposed Larger Tank

2.2.1 General

The 250 m^3 replacement suction tank was proposed to be installed at the same location as the existing tank. The question was whether or not a larger tank could fit on the same site given the proximity of the existing and new wells on the site.

2.2.2 Tank Shapes

Several suction tank configurations (e.g. rectangular vs circular vs square and different tank heights) were considered to assess whether the footprint would still permit the use of the current suction tank site. It soon became clear that the site of the current tank was too small to fit a larger 500 m^3 tank.

The rectangular shape was the most preferred on the basis of the follows factors:

- Efficiency and efficacy of the sand removal as a rectangular tank would have a longer flow path for sand removal.
- The longest flow path also offered the longest contact time in case chlorination was required.

Based on the above considerations, a rectangular tank was selected. It should be noted that other tank shapes and configurations could also be designed, though at a larger cost, to achieve the same levels of sand removal and chlorination effective.

2.2.3 Tank Footprint

Given the inadequacy of the existing tank site to accommodate a larger tank, the design team identified an alternative location (shown in Figure 2.1 as Option 1). The choice of Option 1 (Site 1) was based on the following factors:

- Low capital cost.
- It had the least impact on the existing pump station site (low risk to the existing structures) and the existing facilities on the reserve (rugby field, tennis court, playground).
- It was a site where all planning rules were complied with.
- There were no other services at the site that would need to be relocated.

The footprint of the proposed tank at site Option 1 was 14.5 m x 11.3 m and the tank height was 5 m.

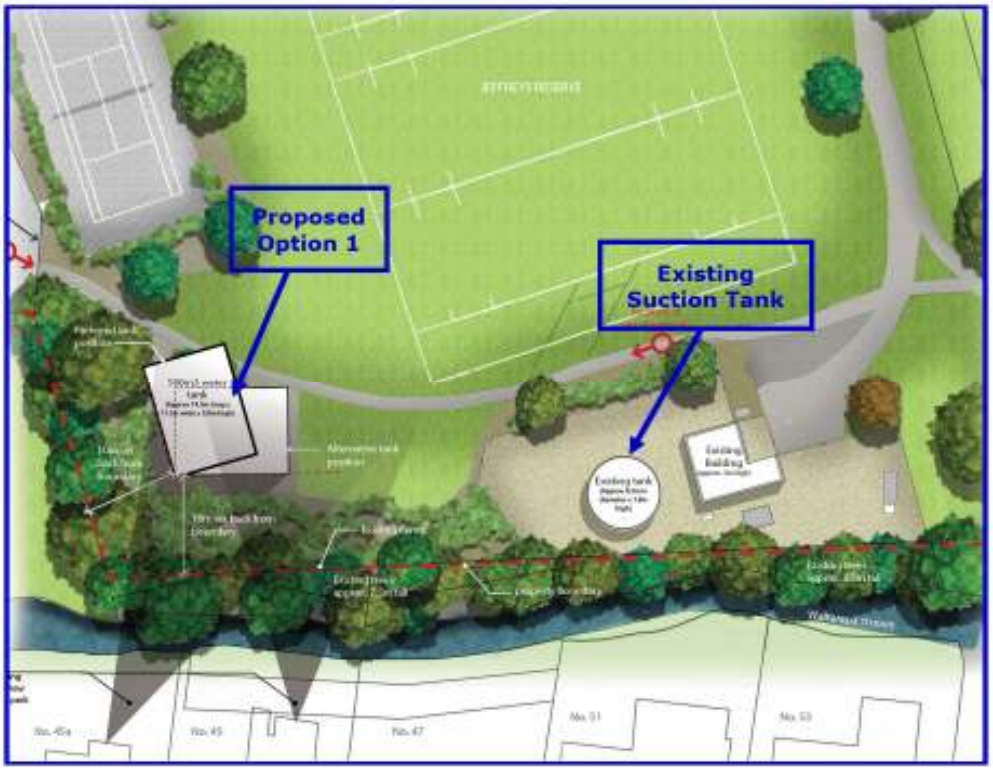

Figure 2.1 – Proposed Alternative Option 1

2.2.4 Consultation and Concerns Raised

A design and layout was prepared. The concept was put out for consultation with the residents and the Community Board. **Appendix A** provides the details of the consultation work that was carried out by the project team.

The residents' feedback was collated at all stages of the consultation process and this indicated that some residents were concerned about aspects of the proposed suction tank at this location. The main concerns were:

- Visual impact on some of the existing residential properties on Waiwetu Street, Clyde Road and Thornycroft Street.
- Loss of visual enjoyment of the park as a result of the proposed 5 m tank height. One submitter noted " *the Carrodus house that will be moved onto adjacent Clyde Road section currently empty* and t*he effect on 45-degree outlooks would be significant as some houses are built to make the most of the views over the park and the line of sight to the tank would be extensive*".
- Possible effects (noise, dust and vibrations) of the construction activities.
- Potential for encouraging undesirable activities (e.g. tagging, loitering, freedom camping etc) and illicit activities (e.g. use of drugs) arising from the possible dead spaces between the tank and the private fences.
- Consideration of alternative sites – the residents expressed concern at what they perceived as lack of consideration of alternative sites/options.

- The perceived short consultation period by the Council. One submission suggested that the Council was being "*devious by moving the proposal from the first site to a place where it doesn't need consenting because it meets City Plan requirements including setbacks*".
- The perceived lack of detail on the look of the park and the replacement/mitigating landscaping.

Figure 2.2 below summarises of the feedback statistics.

Submissions	Total	Percentage
Number of Feedback Submissions	35	100%
Directly or Indirectly Oppose	32	91%
Fully Support Plan	1	3%
Support Plan on Condition of Further Considerations	2	6%

Issues	Total	Percentage
Tank Relocation/Other Options	20	57%
H&/Security	19	54%
Residential Impacts	17	49%
Reserve Aesthetic	16	46%
Community Improvement	8	23%
Technical/Engineering	6	17%
Recreational Impacts	3	9%
Feedback Process Improvement	3	9%
Consent Queries/Issues	2	6%
Construction Impacts	2	6%
Water Supply	2	6%
Environmental	2	6%

Figure 2.2 – Analysis of the Residents Feedback

A full list of the residents' concerns is presented in **Appendix B**.

2.2.5 Outcomes from the Consultation Process

While locating the suction tank at the Option 1 site complies with the district (CCC) and the regional (ECan) planning tools and could be carried out without further consultation or consents, the Council decided to assess other sites within Jeffreys Reserve and Waiwetu Reserve to confirm the comparable suitability or otherwise of Option 1.

The first five issues in Figure 2.2 shows that the overwhelming majority of the people who gave feedback wanted other locations to be considered.

2.2.6 Stage 1 Options Assessment and Further Consultation

The Council undertook a detailed options assessment. Seven options (discussed in detail in Section 3) including the original Option 1 where analysed using a Multi-Criteria Analysis (MCA). The results from MCA recommended the adoption of a different option to Option 1. The recommended option was Option 2 (in front of the existing pump station compound).

Option 2 was widely accepted by the Waiwetu Street residents. However, residents of 53 Waiwetu Street were not happy with this option and they suggested another location. This eighth option is referred to as Option 8 and is described in detail in Section 3.

2.2.7 Stage 2 Options Assessment

The suggestion of an eighth option necessitated another option assessment to test the option against the other seven options (the original Option 1, the six new options assessed in the Stage 1 options assessment).

Details of the Stage 2 options assessment are presented in the following sections of this report.

3 Alternative Sites for the Proposed Suction Tank

3.1 Stage 1 Option Assessment - Alternative Sites

In addition to the amended Option 1 described in Section 2.2.3 above, six other options were identified for further consideration. Figure 3.1 shows the locations of the proposed Options 2-7 relative to Option 1.

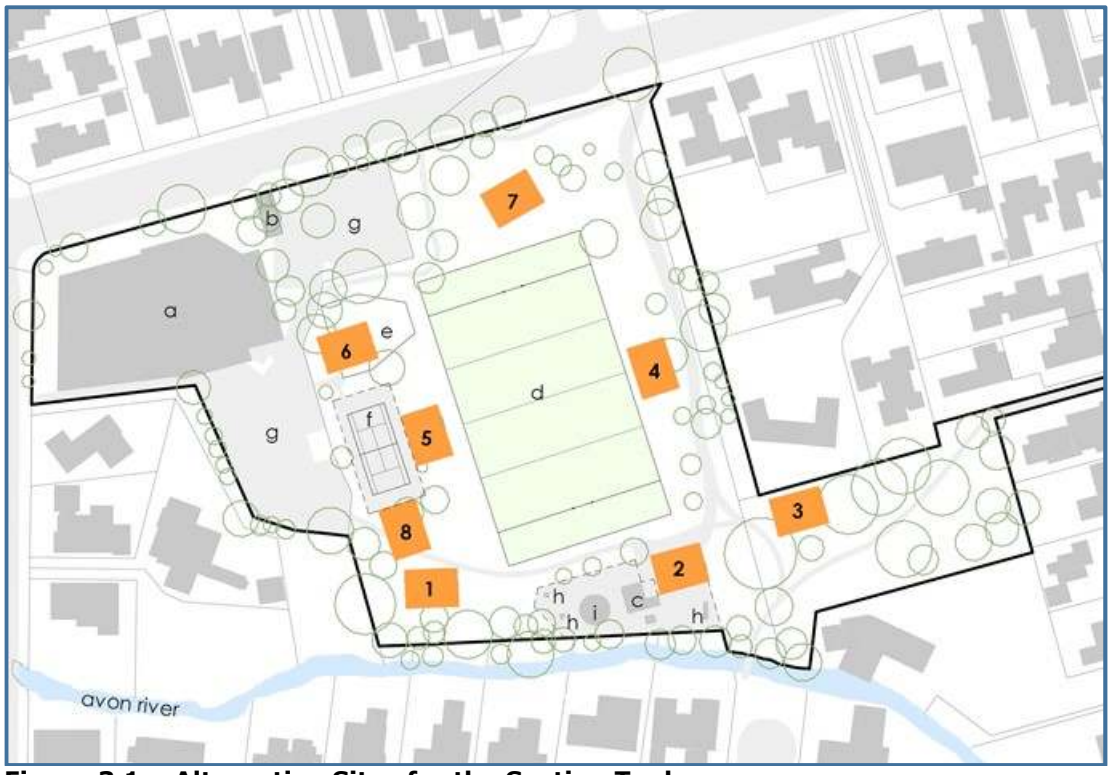

Figure 3.1 – Alternative Sites for the Suction Tank

3.2 Stage 2 Option Assessment

On the 9th of March 2018 the residents of 53 Waiwetu Street submitted a layout with a suggested new site for the proposed Jeffreys Road Suction Tank. The suggested layout is herein referred to as Option 8. The location of Option 8 is shown in Figure 3.1.

This section describes these alternatives in more detail.

3.3 Description of the Options

3.3.1 Option 2 – Near Existing Pump Station

Option 2 is next to the existing pump station building and compound. There are two variations of this option. These are presented in Figure 3.2 below. The difference between them is the shape – one is longer and narrower whereas the other one is a more compact rectangular shape. For the purposes of this report, the more compact option will be assessed as it has the following additional benefits over the other variation of the option:

- It is more compact and will be able to fit snugly close to the existing compound. This makes it more aesthetically pleasing than the longer and narrow option.
- Access to the existing compound can be from the west of the pump station.

- The configuration reduces the encroachment into the rugby pitch or into the existing footpath.
- It consolidates existing compound footprint increasing the Jeffrey Park green space. The existing compound is 760 m^2. With the proposed tank the compound area could possibly be smaller. A net 196 m^2 will be returned to the park.
- Removes unsightly barbed wire compound enclosure.
- The will reduce the existing pump station compound visibility for most park users.
- It will be within the immediate proximity to existing pumping station. This keeps all the infrastructure in one place rather than have it spaced across the reserve.
- The design and construction can include additional facilities such as storage facilities for the rugby teams and shelter for sports spectators.

The impact of Option 2 on the existing trees is discussed in detail in **Appendix C** (Impact on Existing Trees[1]). A full assessment of the pros and cons of the option are presented in Section 4 (Table 4.1).

Figure 3.2– Proposed Option 2

3.3.2 Option 3 – Waiwetu Reserve

Option 3 is within the Waiwetu Reserve. To make the option work, at least four trees (**Appendix C**) will need to be removed. The tank will be adjacent to the 30 Jeffreys Road boundary fence. As shown in the layout the minimum setback distance (10 m) will not be achieved. Figure 3.3 shows the location of the proposed Option 3.

The setback could be achieved by moving the suction tank location southwards as there is sufficient space with the Waiwetu Reserve. However, this would necessitate the removal of more trees. The remaining multitude of trees will provide some screening to the houses on the other side of the reserve. A full assessment of the pros and cons of the site are presented in Section 4 (Table 4.1).

3.3.3 Option 4 – Adjacent to 28A & 30 Jeffreys Road

Option 4 sits within the rugby field and adjacent to 28A and 30 Jeffreys Road. It is also noted that Option 4 could be anywhere along this footpath right up to Jeffreys Road. Figure 3.4 shows the proposed Option 4.

The current proposal is to provide mounding on three sides of the tank so that it is covered from view at the front and the two sides. The proposed landscaping includes provision of soil mounding to create a gentle grade from the ground to a retaining wall that will be 4-5 m from the tank walls. Allowance for some space between the tank wall will be necessary for the tank maintenance. This space will be covered by a grate designed to ensure safety of the park users. The mounding not only provides screening but some useable space where people can sit and watch the rugby matches or for kids to play around.

[1] *Report Prepared by Laurie Gordon (CCC Arborist)*

Figure 3.3 – Proposed Option 3

Figure 3.4 – Proposed Option 4

While the mounding treatment will improve the aesthetics considerably, it does have some operational and social issues associated with it. These include:

- Health and safety issues, for staff, arising from the confined spaces created around the tank.
- Possible health and safety issues park users playing on the mound.
- It will reduce the privacy for some residences long Waiwetu Street and Clyde Road and people sitting on the mounds will be able to look a cross into the residences.

The mounding will result in the tank construction encroaching onto the pitch. This will necessitate the shifting of the pitch westwards as shown in Figure 3.4. The existing footpath would be preserved. The effect of the option on trees is discussed in **Appendix C**.

While there is a list of issues associated with the proposed mounding, it should be noted that the alternative (i.e. no mounding) option at the site has also been taken into account in the assessment to ensure that the sites are not disadvantage in the assessment as a result of cons associated with the mounding.

A full assessment of the pros and cons of the site are presented in Section 4 (Table 4.1).

3.3.4 Option 5 – Near the Tennis Court

Option 5 is located next to the tennis court. Two variations of Option 5 are presented in Figure 3.5. Other variations of Options 5 would be any location that backs up onto the tennis court.

The two variations in Figure 3.5 will encroach onto the pitch and this will necessitate moving the pitch eastwards. Mounding similar to what has been discussed for Option 4 would also be part of the landscaping design. The mounding will be on three sides with the fourth side (the back of the tank) acting as a tennis court wall providing an opportunity for people to use this for tennis practice. The pros and cons of mounding discussed for Option 3 also apply to Option 4. The cons associated with the mounding do not disadvantage the option as the non-mounding option at the site has been taken into accounting in its assessment.

Figure 3.5 – Proposed Option 5

Residents along Waiwetu Street and Clyde Road will also benefit from the screening and will be able to enjoy the landscaping to be incorporated in the design.

The effect of the option on trees is discussed in **Appendix C**. A full assessment of the pros and cons of the site are presented in Section 4 (Table 4.1).

3.3.5 Option 6 – Play Ground

Option 6 is the existing playground site. The suction tank would be built over the playground (Figure 3.6).

The playground would be relocated (e.g. to the north of football pitch i.e. where Option 7 is proposed). The relocation of the playground adds to the cost of this option.

No mounding is proposed with this option. The tank is likely to blend in with the existing library building. The tennis court will provide some screening from the Waiwetu Street and Clyde Road properties.

At least one tree and possibly two trees will require removal. A full assessment of the pros and cons of the site are presented in Section 4 (Table 4.1).

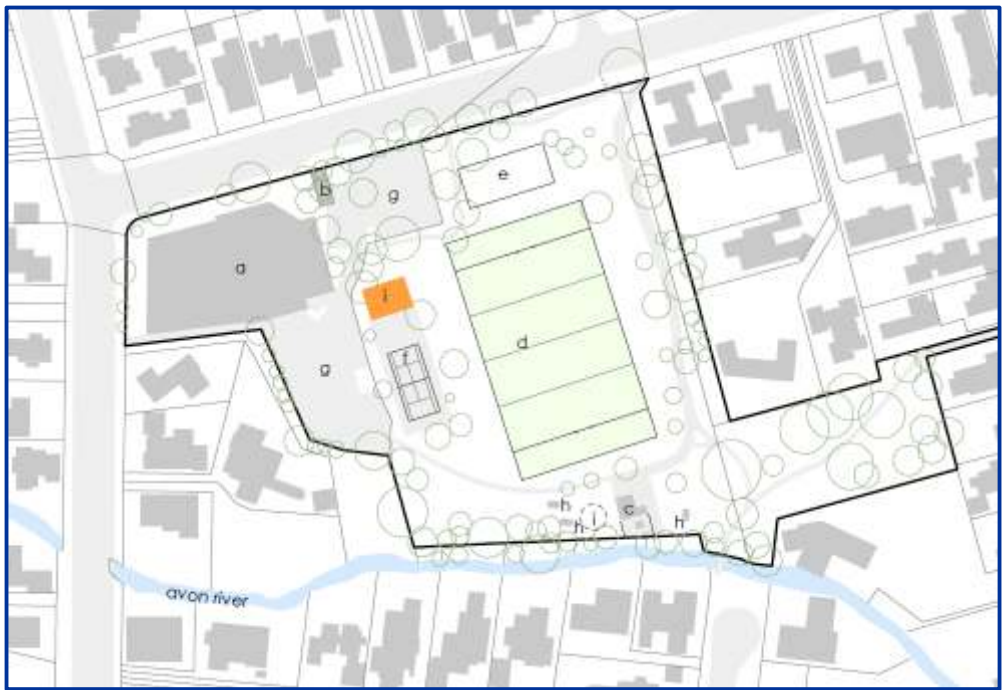

Figure 3.6 – Proposed Option 6

3.3.6 Option 7 – Close to Jeffreys Road

Proposed Option 7 is shown in Figure 3.7 below. This will be between Jeffreys Road and the football pitch.

Figure 3.7 – Proposed Option 7

Mounding is proposed on all four sides as part of the landscaping design to provide some screening and also some community useable space. The pros and cons of mounding discussed for Option 3 also apply to Option 7. The cons associated with the mounding do not disadvantage the option as the non-mounding option at the site has been taken into accounting in its assessment.

Some existing trees will need to be removed to enable the mounding to be done. The mounding will result in some encroachment into the field and this will necessitate moving the field southwards.

A full assessment of the pros and cons of the site are presented in Section 4 (Table 4.1).

3.3.7 Option 8 – Next to the Tennis Court and Close to 190 Clyde Road

As noted in Section 3.3.4, any option that backs onto the tennis court is a variation of Option 5. Two of these variations are shown in Figure 3.5.

On the 9th of March 2018 the residents of 53 Waiwetu Street submitted a layout with a suggested new site for the proposed Jeffreys Road Suction Tank. Figures 3.1 and 3.8 show the location of Option 8.

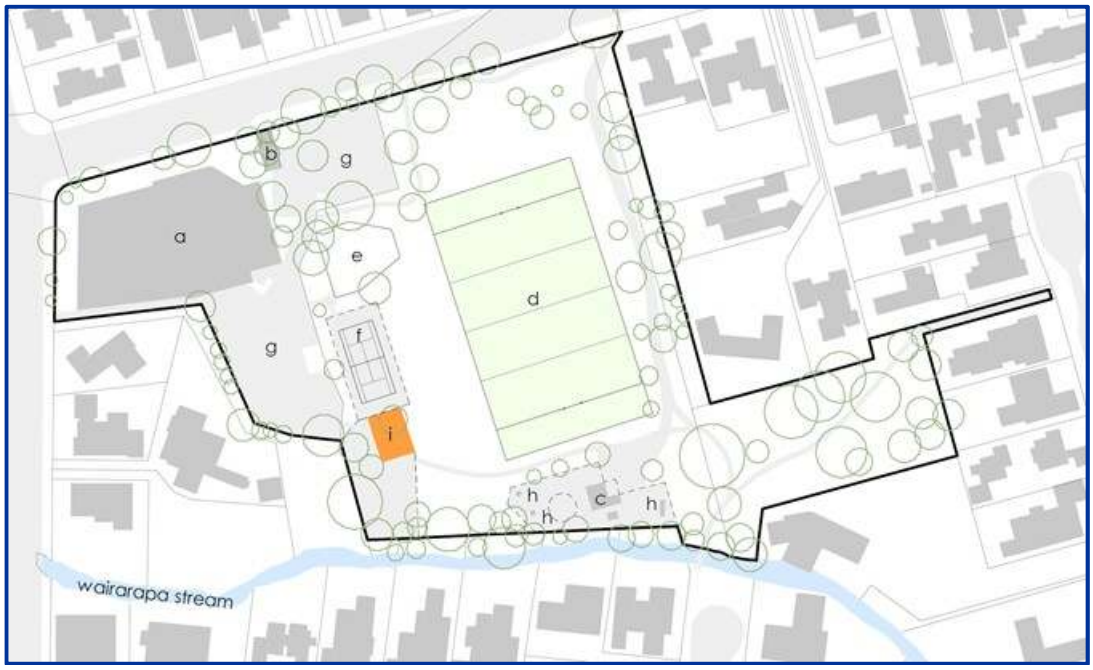

Figure 3.8 – Proposed Option 8

Option 8 backs onto the tennis court and, therefore, by definition it is a variation of Option 5 as noted in Section 3.3.4. To demonstrate this we compared Options 5 and 8 against some basic criteria in Table 3.1. A more detailed list of the criteria is provided in Section 4.

Table 3.1 – Comparison of Option 8 and Option 5 (and its variations).

Criteria	Option 8	Option 5 Variations
It is next to the tennis court with one side being incorporated into the tennis court.	Yes	Yes
The option will require the removal of trees	Yes (1 perhaps 2)	Yes (1 tree)

Criteria	Option 8	Option 5 Variations
Tank height	Reduced to 4 m above ground (0.5 m below ground).	Same
Impact on the sports field	Less than Option 5. But will affect the footpath.	More than Option 8 as this will require the pitch to be changed.
Use of recreation land	Occupies an additional 735 m^2 of park.	Smaller area fenced off for CPTED requirements.
Return of recreation land	No change	No change
CPTED	735 m^2 of new compound fenced off to prevent access to unobserved spaces.	Smaller area fenced off for CPTED
Visual	Southwest corner of park blocked off completely.	Smaller area fenced off.
Opportunities for recreation use	Activation of walls to support recreation.	Activation of walls to support recreation.
Opportunities for existing pump station site	Not in project	Not in project
Impacts during construction	Proximity to neighbour (10m) i.e. 190 Clyde Road	Distance to 190 Clyde Road > 30 m.
Residents directly affected	7 houses	190 Clyde Road will be the most impacted.

Table 3.1 shows that Option 5 and 8 are similar with a few variations. For the purposes of this report we set aside this assumption and assess them as two separate options.

3.4 Summary

The preceding sections have highlighted the basic features associated with alternative options. The key criteria relevant to the assessment are discussed in Section 4.

4 Option Selection Criteria

4.1 Introduction

This section provides commentary of the key criteria affecting site selection. The criteria fall under four broad categories. These are:

- Technical.
- Environmental.
- Social.
- Costs.

4.2 Technical Criteria

4.2.1 Hydraulic Considerations

The further the suction tank is from the existing wellfield the more difficult it will be to fill the tank from the existing wells without improvements to the wells e.g. upgrading or installing larger submersible pumps to provide the hydraulic head necessary to get the water to the suction tank. The converse is true i.e. the closer the suction tank to the well the easier it will be to fill it using the existing equipment. Improvements to the pumps, headworks or pipework to get the water to the suction tank will have a bearing on costs as more work will need to be done as will be the case with the options that are furthest from the existing wells.

Option 2 will be the easiest to integrate with the existing wellfield given the proximity. Options 6 and 7 will present the greatest design challenge to make this work.

4.2.2 Additional Pumping Infrastructure Requirements

As with the hydraulic considerations discussed in Section 4.2.1 the site options furthest from the existing pump station site will have additional infrastructural requirements e.g. pipework.

Delivery pipes will need to be run from the wells to the suction tank to convey water to the suction tank. Additional piping will be required to convey the flows from the suction tank back to the surface pumps (in the existing pump station) for delivery into the wider network.

Options furthest from the pump station may:

(a) Require additional pumps at the suction tank to pump the water back to the surface pumps at the existing site.
(b) Require the shifting of the surface pump station to the new suction tank location in lieu of new surface pumps at the suction tank to pump back to the existing pumps.
(c) Require large diameter pipes from the suction tank to the existing pumping station to meet the existing pumps' Net Positive Suction Head Requirements (NPSHR). This is assuming that pumps are not required at the suction tank to deliver the water back to the surface pumps at the existing pump station.
(d) Upgrading the well pumps in order to be able to deliver the water to the suction tank.

Preliminary assessments indicate that the third option will be feasible even for site Options 6 and 7.

The construction costs for the new pipework (to the suction tank and then from the suction tank back to the surface pumps) from high to low will be in the following order:

1. ***Option 7*** *– because it is furthest from the wells.*
2. ***Option 6*** *– is also quite far from the wells.*
3. ***Option 5 and 4 –*** *because of the relative distance from the wells*
4. ***Options 1, 3 and 8*** *– The cost for these two options will be in the same order as the options are approximately the same distance from the existing pump station.*
5. ***Option 2*** *– Proximity to the existing pump station and wells makes Option 2 the least cost option.*

It should be noted that the above ranking assumes that the construction methodology and costs will be the same across the eight sites.

In addition to the suction and delivery pipework to and from the suction tank, a scour pipe will also be necessary for use when cleaning out the suction tank. The logical outfall is the Wairarapa Stream. A gravity scour pipe to the stream will not work for options furthest from the stream. These will require a pumped scour pipe to be able to empty out into the stream. However, for Option 6 and 7 a gravity scour pipe to the Jeffreys Road street sumps could be assessed for feasibility. This option would only work if (i) the grades permitted and (ii) the discharge rate is limited to the capacity of the street stormwater network.

4.2.3 Geotechnical Assessments

Opus was engaged by the Council to undertake a desktop geotechnical assessment for Options 1, 2, 5 and 7 sites. Option 8 was not assessed as this came in let in the process. However, as noted in Section 3.3.7, Option 8 is close to Option 5. It is also near Option 1. Therefore, it is logical to assume that the geotechnical considerations for Option 8 will be somewhere between those of Options 1 and 5. Figure 4.1 below has been extracted from the Opus memo.

The memo also makes the follows conclusions:

- *Deep site specific geotechnical investigations will be required for detailed design regardless of the location selected due to the size of the suction tank and the variable ground conditions.*
- *Suction tank locations which are further away from the stream are less likely to experience lateral spreading. This means that shallow foundations are more likely to be suitable. As shallow foundations are more cost effective than deep foundations, these locations are preferred to locations nearer to the stream. It is very unlikely that shallow foundations will be suitable for locations 1 and 2.*
- *Based on the liquefaction observations from the Canterbury earthquakes, the liquefaction risk across the reserve is relatively consistent with the exception of Location 7 where the liquefaction risk appears to be lower. This means that total and differential settlements for the suction tank are likely to be less which improves the seismic performance of the tank if it is positioned at location 7. This is subject to site specific testing.*

Table 3 – Geotechnical Assessment Summary

Location	Offset from Wairarapa Stream (m)	Expected Ground Conditions	Geotechnical Risks	Required Geotechnical Investigations for Design	Likely Foundation Types
7	130	CPTs refused on a shallow gravel layer. Underlying ground conditions are unknown.	Liquefaction causing total and differential settlement of the tank.	2 x CPT / DPSH to refusal* 5 x Hand auger / Scala penetrometer	Due to the lack of sufficient site-specific information available it is not possible to determine.
5	70	No site specific information is available.	Liquefaction causing total and differential settlement of the tank.	1 x borehole to 25 m depth 2 x CPT / DPSH to refusal 2 x CPT / DPSH 5 x Hand auger / Scala penetrometer	Due to the lack of sufficient site specific information available it is not possible to determine.
2	20	SILT / SAND to 8.5 m depth with gravels to at least 15 m depth	Liquefaction causing total and differential settlement of the tank. Lateral spreading causing slope instability, stretch, tilting and possible rupture of the tank.	1 x borehole to 25 m depth	Piles. Ground improvements in the form of stone columns or deep soil mixing
1	20	No site specific information is available however it is expected that the ground conditions will be similar to those at Location 2.	Liquefaction causing total and differential settlement of the tank. Lateral spreading causing slope instability, stretch, tilting and possible rupture of the tank.	1 x borehole to 25 m depth 2 x CPT / DPSH to refusal 2 x CPT / DPSH 5 x Hand auger / Scala penetrometer	Piles. Ground improvements in the form of stone columns or deep soil mixing

*If the CPT/DPSH tests show shallow refusals, a borehole investigation will be required to confirm the liquefaction potential of the under laying soils.

Figure 4.1 – Extract of the Geotechnical Assessment by Opus

4.2.4 Complexity of Construction

While a lot of the general construction considerations will be similar across the eight sites, there are some factors that are unique to some options.

The following are some of the construction considerations:

- Sites that are close to the waterway (Options 1 and 2) will likely be more susceptible to lateral spreading than sites that are furthest (Options 6 and 7) as noted by Opus. This indicates the need for more robust foundation engineering requirements.
- For sites close to the waterway (Sites 1, 2, 3 and 8), dewatering may cause adverse environmental effects on the waterway e.g. dry up the stream – stream depletion. The effects will be less for Options 3 and 8 compared to Options 3 and 8.
- Sheet piling will likely be necessary for all sites but the construction requirements for the sites close to the Wairarapa stream will need to be more robust than for sites that are further. Again, for the purposes of this report all the sites are expected to have the same foundation design and construction requirements.

- Noise and vibrations during construction will likely affect the neighbouring properties. The existing reservoir demolition work will also produce noise and dust that could be a nuisance to the neighbouring properties.
- Preloading loading has been discussed with the Opus geotechnical engineers and their comments are "*it is not a suitable means of mitigating against the effects of liquefaction on ground bearing capacity, so should not be considered a viable option at this site*".
- Other construction methods e.g. screw piling still need detailed consideration.
- Options 1 and 8 will be the closest to existing and future residences (e.g. at 190 Clyde Road) and will thus have the greatest construction effects on neighbouring properties.

4.2.5 Site Access for Construction and Post Construction

The only feasible access to all sites during construction will be from Jeffreys Road. For Options 2, 3 and 4 this will be via the existing footpath to the east of the park. Option 1 could also be accessed via the same route (the footpath).

Accessing Options 1, 5, 6 and 8 via the library carpark has also been considered. The entrance to the library carpark is "tight" given the size of the trucks that will be delivering the suction tank panels. There could be risk to private vehicles as the turning radii available are too small.

Thus, direct access to Options 1, 5, 6, 7 and 8 from Jeffreys Road would be the best option. However, this could involve driving over the grass between Jeffreys Road and the sites. The rugby pitch would need to be avoided to prevent damage. The most damage to the grass will be during construction in the winter months when the ground is soggy due to poor drainage.

There could also be a need to prune some trees to enable the trucks to get to any of these sites. A detailed assessment of the impact of construction on trees or trees on construction has been provided by Council Arborist (**Laurie Gordon**). The assessment is provided as **Appendix C**.

4.2.6 Site Size, Geometry and Ease of Access

A site should have sufficient space for the tank dimensions required to achieve the 500 m^3 net storage required. All eight sites have adequate space for a suction tank of various dimensions though for some of these configurations this could be at the expense of other considerations e.g. trees, visual effects and existing facilities e.g. the playground.

The visual effects aside, Options 1, 2, 5, 7 and 8 generally allow a variety of tank configurations with minimal impact on trees and existing facilities. The other options are hindered by the presence of trees or existing amenities e.g. the playground and the rugby pitch.

4.2.7 Site Efficiency

In addition to the pipework, other infrastructure requirements will be the power, telemetry and cabling associated with this. The further the option is from the existing pump station the more expensive the other infrastructural requirements will be. An efficient site is one which will require the least amount (and costs) of additional infrastructure (e.g. power, telemetry and cabling) to make it work.

4.2.8 Site Features - Impact on the Playground and the Playing Field

Impact on the Playing Field

Options 1, 2, 3, 6 and 8 will have no effect on the existing rugby field except during construction when part of the field could be used for access to the site. The outer field grass could be trampled on to access the sites.

Options 4, 5 and 7 will be over part of the existing playing field due to the proposed mounding and these will require shifting and/or reconfiguring the playing field and the irrigation system.

Impact on the Playground

Option 6 will be over the existing playground. This will necessitate rebuilding the playground at a different location as close to the library as possible – possibly where Option 7 (Figure 2.7) is proposed.

Impact on the Footpath

Options 2, 4 and 8 will affect the footpath to the same extent. Option 8 will necessitate the rerouting of the footpath as this will be blocked off from the fencing.

Options 3, 5, 6 and 7 will have little or no impact on the footpath.

4.2.9 Consenting & Authorisations

The consenting requirements will vary between sites. The following are anticipated:

- Foundations below the groundwater table will require dewatering consents from Environment Canterbury. This is likely to be the case primarily for Options 1, 2, 3 and 8 which will likely require deeper foundations that the other options. The requirement is likely to be less for Options 3 and 8 than for Options 1 and 2. However, it is likely that the groundwater conditions will be the same across the area which means dewatering, if required, will be the same across the options. As the sites are contaminated, it is unlikely that the CCC Global consent can be used. Thus, for the purposes of this assessment, it is assumed that a dewatering consent will be required for all the sites.
- No CCC consents will be required if the suction tank is 4 m above the ground level as and the minimum 10 m setback from the private boundaries can be met. This will be the case for all sites except Option 3 which as currently presented is within 10 m of the boundary with 30 Jeffreys Road.
- CCC consents will be required where works are to be done within 2 m of trees that are >10 m high or where protected trees are to be removed. **Appendix C** provides a detailed assessment of the impact on trees.
- Options 3 is within the Waiwetu Reserve. This is a gazetted reserve. Authorisations will be required by the Community Board to use the site for the suction tank.
- The Council will require easements over all the new and existing infrastructure. There will be no easement requirements for Option 2 as the infrastructure will all be within the compound. The easement requirements for Options 1 and 8 will be lower than the options that are further from the existing infrastructure. Option 4 will also have one of the lowest easement requirements as this will be integrated with easements over the existing water mains from the pump station to the network.
- A stormwater discharge consent will be required for Sites 1-2 and 4-8 as discussed in Section 4.3.1.

4.2.10 Landscaping Outcomes

Some sites will have better landscaped outcomes to achieve the overall integration between the site uses, site features and the suction tank. This is referred to as overall site clarity.

It is likely that all sites can be made to achieve a high level of integration. However, for some sites this will be achieved at the expense of other considerations and costs.

Option 2 will provide the greatest integration. All the other options will provide minimal integration.

4.3 Environmental Criteria

4.3.1 Contamination Issues

Jeffreys Reserve appears on the Listed Landuse Register as likely to be contaminated due to past activities. Thus, between Options 2 and 4-8 there is no site that has an advantage over the other sites based on potential contamination. Part of Option 1 appears on the LLUR while the other part of the site is not on the LLUR. Option 3 is in the Waiwetu Reserve which is not listed on the LLUR. Thus, Option 3 will comply with the National Environmental Standards (NES) for contaminated soils.

Option 1-2 and 4-8 will require a preliminary site investigation (PSI) or a detailed site investigation (DSI) to confirm compliance or otherwise with the NES. Worst case is that resource consent may be required if the permitted activity status threshold is not met. The requirement for a consent with these sites should not be given too much weight as the consenting process will likely be based on the permitted activity or restricted discretionary activity threshold basis given the site historical use. It is unlikely that given the likely historical use that the consent conditions would be significant enough to have an impact on the use of the site for a suction tank or to add significant costs to the project.

A site's LLUR status also has a bearing on whether stormwater discharge during the construction process can be discharged under the CCC Global Stormwater consent or whether a separate consent for stormwater discharges would be required. This is a decision that can only be made when the PSI/DSI becomes available. For the purposes of this report it is considered that all the sites except Option 3 will require a separate stormwater discharge consent. Thus, for Options 1-2 and 4-8 no one site is favoured over the other with regards to the stormwater discharge requirements.

4.3.2 Impact on the Existing Waterway

Works on sites close to the waterway will likely have a more adverse effect on the waterway than the options that are further away. One of the possible impacts has been described in Section 4.2.4.

The Wairarapa Stream is a tributary of the Avon River. The Avon River and its tributaries are waterways of ecological significance. Therefore, the proposed works will need comply with the district and regional plans.

Thus, based on this criterion, only Options 6 and 7 would be the most favoured and Options 1 and 2 and possibly 3 and 8 would be the least favoured.

4.4 Social Criteria

4.4.1 Community and Visual Impacts

As noted in Section 2.2.4 there has been some submissions in opposition of the proposed Option 1. One of the main concerns relates to the possible visual impacts of the suction tank on local residents given the original 5 m height proposal (at site Option 1) and proximity to their properties. It is should be noted that the Council now proposes a 4.5 m high suction tank with 0.5 m of the tank below ground level.

The Council views the impacts on the community as very important criterion in this assessment. The key considerations are:

- Visual impacts on the neighbouring properties adjacent to the park.
- Visual impact on other park users. These are people who pass through or come to use the park.
- Impact on the community enjoyment of the park.

- Effects of noise, dust and on health and safety during construction. This also includes possible impacts on private properties during construction e.g. possible effect of sheet piling on people's houses during construction.

Options 1-4 and 8 are likely to have the greatest impacts on the various neighbouring dwellings given the proximity to those private properties. This makes the construction design, architectural and landscaping treatments crucial in mitigating the visual and construction impacts.

Option 6 will most likely have the least visual effects given its distance from neighbouring properties. Option 7 might be considered to have high visual effects by property owners across Jeffreys Road. Option 7 will also be next to a very busy road and thus will likely have visual impacts on most people than any other option although for most of these people it can be argued that the impacts will be temporary as they will be driving past the tank. However, the proposed mounding associated with Options 4-5 and 7 will provide some mitigation to counter the visual effects associated with these site locations. For the sites where no mounding is proposed (Options 1-3 and 6), the architectural treatments provided will need to achieve the same outcomes.

4.4.2 Crime Prevention Through Environmental Design (CPTED) Principles

Christchurch City Council considers the principles of CPTED to be critical in any public infrastructure design considerations. Therefore, these principles are assessed for each option in this report.

Some submissions by the neighbouring residents also noted the need to include CPTED principles in the options assessment. The property owners highlighted past experiences where they were subjected to undesirable social and criminal activities in and around area as a result of the pump station.

The following CPTED principles are included in the options assessment:

- Surveillance and Ensuring Clear Sight Lines – Ability for accessible spaces to be overlooked and ensuring clear sightlines.
- Vandalism – Prevention of opportunities for tagging, etc of structures.
- Ensuring that there is Plenty of Activity – this relates to the level of activity generated by the design. Activity reduces the risk of vandalism and crime.
- Escape routes - The ability for safe movement and connection around the site and opportunities for escape.

4.4.3 Summary of the Pros and Cons for Each Option

Table 4.1 provides a summary of the key pros and cons associated with the options.

4.5 Financial Criteria

All the factors that have been described above will have an impact on the costs. While detailed costs have not been estimated, a high-level assessment of costs has been carried out and these are presented in Figure 4.2. The cost estimates indicate that Options 5 and 6 will be most expensive. The additional playground replacement required with Option 6 adds considerable costs compared to say Option 7.

The cheapest option is Option 1 followed by Option 2. Table 4.2 also presented the costs of the other options relative to Option 2.

Whole life costs were considered. However, for the purposes of this assessment whole life costs were not estimated. The primary reason was that the overall costs were going to be in the same order as the capital costs with Option 7 being the most expensive because of the long distances to the suction tank and the possible

requirement to pump the water from the wells to the suction tank and then back again to the surface pumps. Thus, it was deemed that there was no merit in estimating the whole life costs.

4.6 Summary

The eight sites have pros and cons that make them suitable or unsuitable depending on the criteria being looked at. However, looking at only one criteria or the other results in some biases in the selection of an option.

Section 5 discusses the use of the Multi Criteria Analysis in selecting the preferred option(s).

Table 4.1 – Pros and Cons of Options 1-8 Against the Assessment Criteria

Criteria	Sub-criteria	Option 1 – location presented to the residents	Option 2 – next to the existing pump station	Option 3 – within Waiwetu Reserve	Option 4 – adjacent to 28A & 30 Jeffreys Rd	Option 5 – Next to the Tennis Court	Option 6 - Playground	Option 7 – next to Jeffreys Road	Option 8 – Next to the Tennis Court
Hydraulic Performance	**HP1** – Pipework Requirements	- Small additional pipework required. - A scour pipe to the stream is feasible.	- Least amount of additional pipework required. - A scour pipe to the stream would be feasible.	- Some additional pipework required. This will be more than what's required for Option 1. - A scour pipe to the stream would be feasible.	- Some additional pipework required. This will be more than what's required for Option 3. - A scour pipe to the stream may require some pumping. The ST could discharge into an external sump with a pump and a pressure main to the stream. A well-designed stream outfall will be necessary to protect the stream during discharges.	- More pipework required than Options 1-4. - Careful assessment of the existing surface pumps NPSHR will be necessary. - A scour pipe to the stream may require some pumping. The ST could discharge into an external sump with a pump and a pressure main to the stream. A well-designed stream outfall will be necessary to protect the stream during discharges.	- Moderate-significantly more pipework required than Options 1-5. - Special design to achieve the surface pumps NPSHR. - A scour pipe to the stream may require some pumping. The ST could discharge into an external sump with a pump and a pressure main to the stream. A well-designed stream outfall will be necessary to protect the stream during discharges.	- Significantly more pipework than Options 1-6 required. - Very special design required to achieve the existing surface pumps NPSHR. - Possible requirement for new surface pumps at the suction tank. - A pumped scour pipe to the stream or a controlled gravity pipe to road stormwater network will be required.	- More pipework required than Options 1-2. - Careful assessment of the existing surface pumps NPSHR will necessary. - A scour pipe to the stream may require some pumping. The ST could discharge into an external sump with a pump and a pressure main to the stream. A well-designed stream outfall will be necessary to protect the stream during discharges.
Design & Construction	**DC1** - Suction Tank (ST). Provision of an appropriately sized ST and the ability to choose different tank configurations.	- The site is suitable for STs of different configurations and footprints.	- The site is suitable for STs of different configurations and footprints. - Possible encroachment to the footpath and/or the pitch with some configurations. However, this will be less than would be required for Options 4 and 5. - At least one tree and possibly two trees will require removal.	- Current site is close to the 30 Jeffreys property boundary. - Other configurations may require several large trees to be removed. This is not a hindrance as consents to remove the trees and Community Board approval can be obtained. - Four trees will require removal and two trees will need to be pruned.	- The site is suitable for STs of different configurations and footprints. - The preferred configurations will encroach into the pitch because of the mounding proposed. - This means additional costs for reconfiguring the pitch and the irrigation. - At least one tree will need to be removed and a depending on the mounding a few more could also be affected. The trees are relatively young.	- The site is suitable for STs of different configurations and footprints. - The configurations will encroach into the pitch because of the mounding proposed. This adds to cost of reconfiguring the pitch and the irrigation. - Depending on the selected location within the site area there will be at least one or two trees that could be removed.	- The site is suitable for STs of different configurations and footprints. - Only one tree will need to be removed and at least two trees will require some pruning.	- The site is suitable for STs of different configurations and footprints. - At least one tree will require removal. - The mounding will result in encroachment into the pitch.	- The site is suitable for STs of different configurations and footprints. - Will completely block off the footpath. Footpath rerouting will be required adding to the costs compared to Options 2 and 5 among others.
	DC2 – Well equipment and surface pumps and Electrical/Controls	- Existing well equipment, pumps and controls can be used.	- Existing well equipment, pumps and controls can be used.	- Existing well equipment, pumps and controls can be used.	- Existing well equipment, pumps and could be used with some minor adjustment and possibly additional pumps and controls.	- Same as Option 4.	- Existing well equipment, pumps and could be used but may require significant adjustments and possibly additional pumps, controls, cables and pipes.	- Existing well equipment, pumps and could be used but may require significant adjustments and possibly additional pumps, controls, cables and pipes.	- Same as Option 4.
	DC3 - Complexity of Construction	- 10 months of construction work. - Expected to be TC2-TC3. Deep foundations likely to be required. - High watertable < 1 metres below ground level (mbgl). - Dewatering may cause the stream to dry out. - Construction challenges likely to be the same as Option 2 but greater than Options 3-8.	- Same construction timeframe as Option 1. - TC rating likely to be the same as Option 1. - Same groundwater issues as Option 1. - Dewatering may cause the stream to dry out. - The site is close to the existing pump station building and damage to the PS building possible. - A minimum 3 m perimeter allowance for scaffolding will be required around the tank and this means the outer edge of the ST footprint should be >3 m from the transformer. - Construction challenges likely to be the same as Option 1 but be greater than Options 3-8.	- Same construction timeframe as Option 1. - TC rating likely to be the same as Option 1. - Same groundwater issues as Option 1. - Dewatering – has less impact than Options 1-2 because of distance from the stream. - Construction challenges likely less than Options 1-2 and the same as Option 4-8.	- Same construction timeframe as Option 1. - Possible sallower foundations than Options 1 & 2. - Same groundwater issues as Option 1. - Dewatering – has less impact than Options 1-2 because of the distance from the stream. - Construction challenges likely less than Options 1-2 and the same as Option 3 and 5-8.	- Same construction timeframe as Option 1. - Possible shallower foundations than Options 1 & 2. - Construction challenges likely less than Options 1-2 and the same as Option 3-4 and 6-8. - Dewatering – has less impact than Options 1-2.	- Same construction timeframe as Option 1. - Shallower foundations than Options 1-5. - Construction challenges likely less than Options 1-2 and the same as Option 3-5, 7 and 8. - Dewatering – has less impact than Options 1-2.	- Same construction timeframe as Option 1. - Shallower foundations than Options 1-6. - Construction challenges likely less than Options 1-2 and the same as Option 3- 6 and 8. - Dewatering – has less impact than Options 1-2. -	- Same construction timeframe as Option 1. - Shallower foundations than Options 1-6. - Construction challenges likely less than Options 1-2 and the same as Option 3-4 and 6-7. - Dewatering – has less impact than Options 1-2.
	DC4 – Earthquake Resilience	- Lateral spread risk high.	- Same as Option 1.	- Lateral spread risk high. But less than Options 1 & 2.	- Lateral spread risk lower than Options 1 and 2.	- Lateral spread risk lower than Options 1 and 2.	- Lateral spread risk low. Possibly only worse than Option 7.	- Lowest lateral spread risk.	- Lateral spread risk lower than Options 1 and 2.
Site Features	**SF1** – Site Features	- Proximity to the playing field not an issue. - Existing footpath will need to be shifted slightly.	- Proximity to the playing field not an issue except during construction. However, other tank	- This option does not impact the playing field, the footpaths.	- The tank option encroaches into the playing field.	- Proximity of the playing field affects the playing field. It may need to be shifted.	- Proximity of the playground. Additional costs to relocate the playground possibly to where Option 7 is	- Proximity to the playground not an issue. - ST will encroach into the rugby pitch due to the mounding.	- No changes to the playing field. However, the footpath will be affected.

Criteria	Sub-criteria	Option 1 – location presented to the residents	Option 2 – next to the existing pump station	Option 3 – within Waiwetu Reserve	Option 4 – adjacent to 28A & 30 Jeffreys Rd	Option 5 – Next to the Tennis Court	Option 6 - Playground	Option 7 – next to Jeffreys Road	Option 8 – Next to the Tennis Court
			configuration variations may encroach slightly. - Existing footpath will need to be shifted slightly. - The option results in a more compact compound.				proposed. Relocation of the playground closer to the road increases the danger to children.		
	SF2 – Consenting/Compliance requirements	- Complies with all CCC District Plan requirements e.g. height of structure, boundary setbacks and recession plans. - Dewatering consent required from ECan. - Possible consents for NES compliance. - A stormwater discharge consent will be required via Ecan.	- Same as Option 1.	- Complies with most CCC District Plan requirements e.g. height of structure. - Will not comply with the setback distance and thus consent will be required from CCC. - A consent to remove some established trees or to work close to them will be required. - Dewatering consent required. - Reserve act requirements will be required as the site is designated a reserve (Waiwetu). - Stormwater discharge will be via the CCC Global Consent.	- Same as Option 1.	Same as Option 1.	Same as Option 1.	- Same as Option 1.	Same as Option 1.
	SF3 – Legal Requirements	- Generally, no legal requirements. - Less easement requirements. - Residents have expressed concerns about this option and have engaged legal experts. This will also add to the project costs and timeframes. The outcome of the legal process, should it be pursued, is unknown.	- Generally, no legal requirements. - Least easement requirements. - Residents of 53 Waiwetu Street have expressed concerns with regards to Option 2 and have sought legal counsel.	- The Waiwetu Reserve is a gazetted reserve and there will be a legal process to go through if the tank is to be sited here. - Less easements requirements. - This will add to the cost and the project timeframes. This does not preclude consideration of the option. - Residents have expressed concerns with regards to Option 1. It is possible that this option will face similar opposition and legalities.	- Generally, no legal requirements. - Less easement requirements. - Residents have expressed concerns with regards to Option 1. It is possible that this option will face similar opposition and legalities.	- Generally, no legal requirements. - Moderate easements requirements for the pipes and the tank. - Some residents' submissions expressed concerns with regards this option. It is possible that that this option will face similar opposition and legalities as Option 1.	- Generally, no legal requirements. - Moderate-extensive easement requirements. - A number of residents' submissions seemed to support this location. Legal challenges could be minimal with this option compared to Options 1-5.	- Generally, no legal requirements. - Extensive easement requirements. - However, it is not clear at this stage if residents across Jeffreys Road would be concerned about the location just as residents on the other side are concerned about the location of Option 1. - A number of residents' submissions seemed to support this location. Legal challenges could be minimal with this option compared to Options 1-5.	- Generally, no legal requirements. - Moderate easements requirements. - Some residents' submissions expressed concerns with regards this option. It is possible that that this option will face similar opposition and legalities as Option 1 & 2 as more residents (7) will be affected by this option compared to Option 1.
	SF4 – Site Size and Geometry	- The site is large enough to fit alternative tank layouts/considerations and footprints. - There will be no improvements to the existing compound as this is not part of the project.	- The site is large enough to fit alternative tank layouts/considerations and footprints. - Will also result in a more compact compound and this makes more space available for park use. - Return 196 m^2 of greenspace to the park users.	- Same as Option 1.	- Same as Option 1.	- Same as Option 1.	- Same as Option 1.	- Same as Option 1.	- The site is large enough to fit alternative tank layouts/considerations and footprints. - Occupies 735 m^2 of park area i.e. it takes more area of the park than any other option because of the CPTED requirements. - There will be no improvements to the existing compound as this is not part of the project.
	SF5 – Ease of Site Access	- Site access for maintenance post construction would be via the carpark and/or sealed footpath. - During construction access via the carpark would not be possible with large trucks. These may require the use of footpath from Jeffreys Road to the existing compound and carrying onto the site.	- Same as Option 1.	- Same as Option 1.	- Same as Option 1.	- Site access for maintenance post construction would be via the carpark and sealed footpath. - During construction access via the carpark would not be possible with large trucks. - A new path over the grass between the library and the pitch from Jeffreys Road may need to be established.	- Same as Option 5 though the area that will be used for site access will be less which means more of the park will be available for use during construction.	- Same as Option 6 though the area that will be used for site access will be less which means more of the park will be available for use during construction.	- Same as Option 1.

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		- The large trucks could damage the footpath. Additional budget for remedying the footpath may need to be factored in. The manhole covers can be protected. - The footpath used for access may need to be fenced off during the construction duration for health and safety purposes given the frequency of large vehicular traffic. - Small vehicles can continue to access the site via the carpark during construction. Parts of the carpark may need to be sectioned off so as not to damage private vehicles.				- The main con is that access could be difficult in winter when the grass is wet and susceptible to pugging. - Use of this for access will limit the park usage and damage the grass. - Additional costs to reinstate the grass post construction would need to be factored in.			
	SF6 – Site Efficiency	- Small amount of additional infrastructure required.	- Little or no additional infrastructure required.	- Some additional infrastructure required.	- Some additional infrastructure required.	- More additional infrastructure required than Options 1-4.	- Moderately significantly more infrastructure required than Options 1-5.	- Significantly more infrastructure than Options 1-6 required.	- More additional infrastructure required than Options 1-3 but less than Options 4-7.
	SF7 – Landscaping Outcomes	- Appropriate landscaping treatment can be provided for the tank to be integrated with the surrounding treatments/landscaping.	- Same as Option 1. - The compound will be compact. This reduces the total infrastructure footprint across the Jeffreys Reserve. - Will also result in a more compact compound and this makes more space available for park use. - Return 196 m^2 of greenspace to the park users.	- Same as Option 1. - There will be no improvements to the existing compound as this is not part of the project.	- Same as Option 1. For Option 4 this also includes possibly mounding up the land around the tank which will conceal the tank and also provides an area where people can sit and kids can play. - There will be no improvements to the existing compound as this is not part of the project.	- Same as Option 4. - There will be no improvements to the existing compound as this is not part of the project.	- Same as Option 1. - There will be no improvements to the existing compound as this is not part of the project.	- Same as Option 4. - There will be no improvements to the existing compound as this is not part of the project.	- Same as Option 1. - Occupies 735 m^2 of park area i.e. it takes more area of the park than any other option because of the CPTED requirements. - There will be no improvements to the existing compound as this is not part of the project. -
Environmental Considerations	**EC1** – Site Contamination	- Part of the site is on the LLUR. Site contamination investigations will be required. NES consent application may be needed depending on the outcome.	- The site is on the LLUR. Site contamination investigations will be required. NES consent application may be needed depending on the outcome.	- The site is not contaminated and therefore there will be no NES issues to consider.	- Same as Option 2.	- Same as Option 2.	- Same as Option 2.	- Same as Option 2.	- Same as Option 2.
	EC2 - Impact on the waterway	- Dewatering may cause the stream to dry out.	- Dewatering may cause the stream to dry out.	- Dewatering – has less impact than Options 1-2 because of distance from the stream.	- Dewatering – has less impact than Options 1-2 because of the distance from the stream.	- Dewatering – has less impact than Options 1-2.	- Dewatering – has less impact than Options 1-2.	- Dewatering – has less impact than Options 1-2. -	- Dewatering – has less impact than Options 1-2.
Community & Visual Impact	**VA1** – Visual Impact on Neighbours	- The tank height will be 4 m above ground level (magl). While this may not completely address residents' concerns it will provide some mitigation. - The 4 magl tank could still affect views of the park. The tank will be visible from a number of the dwellings along Waiwetu Street. These include 45A, 45-50 Waiwetu with 45, 45A and 47 Waiwetu having direct views. 184/184A/190 Clyde Road could also have direct views to the tank. The tank will be more visible to 2-storey dwellings than 1-storey dwellings. - Concerns by residents that the "dead areas" behind	- The 4 magl tank could affect views of the park for 53 Waiwetu Street and possibly #50 Waiwetu St. - It is noted that these are 1-storey dwellings. - The boundary screening with 53 Waiwetu St was removed and the property looks into the existing compound. The tank will directly block its views to the park. - Council could opt to screen its side of the fence. - The tank could also be visible from other properties. However, it will not directly affect their views to the park and so concerns will likely be around sight of the structure.	- The tank will be 4 magl. While this may not completely address residents' concerns it will provide some mitigation. - The 4 magl tank could be imposing for 30 and 30B Jeffreys Rd and to some extent 23 and 25-31 Thornycroft St. - Concerns by residents that the "dead areas" between behind the tank might attractive some undesirable elements. Landscaping design would need to address these concerns e.g. by fencing. - While the trees within Waiwetu Reserve will provide some screening, the existing gaps will	- The residents' views of the park will be affected. - The tank will also likely to be considered to be imposing given the proximity to the dwellings even through the minimum setback distances will be met. - The 4 magl tank could be imposing for 30 and 30B Jeffreys Rd. - The Waiwetu St properties' views will not be directly affected. However, they will be able to see the additional structure in the park. - There will be no dead spaces as the footpath at the back will be maintained.	- Properties mostly likely to be affected are 190 Clyde Road, 45, 45A and 47 Waiwetu Street. - However, the tank will be further from the dwellings than in Option 1. - The approx. 40 m distance will ensure that the 4 magl tank will have reduced impact on the park views from these properties. This takes into account the screening along most of the boundaries between the park and these properties. - The proposed mounding and landscaping would provide some mitigation.	- The tank will be almost 90 m from the Waiwetu properties (45 and 45A), 53 m from the 190 Clyde Road boundary and at least 60 m the properties along Jeffreys Road across the road. - Considerably low visual impact on these properties. - The tank would blend in with the existing library buildings. - Trees around the site would provide some screening from the library and from the road. - Further landscaping will enhance the tank views.	- The tank will be at least 130 m from the Waiwetu properties and 40 m from the Jeffreys Rd properties. - Considerably low visual impact on the Waiwetu and Clyde Road properties. - Fully visible from 5-28A Jeffreys Rd. But the road provides a significant buffer disconnect the tank from the street. - The Jeffreys Rd properties will still have various angled views of the park. - The proposed mounding and landscaping would provide some mitigation.	- Properties mostly likely to be affected are 190 Clyde Road, 45, 45A and 47 Waiwetu Street. - However, the tank will be further from the dwellings than in Option 1.

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		the tank might attract some undesirable elements. Landscaping design would need to address these concerns e.g. by fencing and planting trees. - While the trees within the park boundary will provide some screening, the existing gaps will make the tank visible from the dwellings. - While the gaps could be closed out by more plantings, this may not be desirable for the residents as views of the park could be permanently blocked out affecting the views to the park. - Additional plantings would also need to be assessed for effectiveness against the CPTED principles i.e. consider landscaping e.g. fencing to screen out the back areas.	- The compound would be fenced with only the front of the tank excluded. This would exclude undesirable elements. - CPTED principles would be fully met. - Enhanced architectural designed structures for the public to celebrate	make the tank visible from the dwellings. - While the gaps could be closed out by more plantings, this may not be desirable for the residents as views of the reserve may be important to them. - Additional plantings would also need to be assessed for effectiveness against the CPTED principles i.e. consider landscaping e.g. fencing to screen out the back areas.	- The proposed mounding and landscaping would provide some mitigation. -				
	VA2 – Visual Impact on Other Park Users	- The tank will be tucked away and will have minimal visual impact on other park users. - Further landscaping treatments can reduce the visual impact on other park users.	- The tank will be integrated with the existing pump station compound. - The site will be more compact and fenced in and additional landscaping treatments can make the tank less visible. - Existing compound footprint is 760 m^2. The resulting compound will result in approximately 196 m^2 being given back to the park. This will reduce the visual impacts when compared to the other options. - Tank blocks compound visibility from most parts of the park.	- The tank will be tucked away and will have minimal visual impact on other park users. - Further landscaping treatments can reduce the visual impact on other park users.	- The tank will be clearly visible at the proposed location. - Further landscaping treatments can reduce the visual impact on other park users. - The proposed mounding and landscaping would provide some mitigation.	- Same as Option 4.	- Same as Option 4.	- The tank will be clearly visible at the proposed location and it will encroach onto the pitch. - The proposed mounding and landscaping would provide some mitigation.	- The tank will be less visible that at Option 4. - Visual effects will almost be the same as Option 1. - No landscape pergola buffer. - However, to meet the CPTED requirements the tank will be fenced in taking a total of 735 m^2 from the park. This will be noticeable to the park users.
	VA3 – Impact on Community Enjoyment of the Park or Existing Facilities	- The site is used for rugby practice warm-ups. Other sites could be used for the same with minimal inconvenience. - It is understood (from the residents' submissions) that some families use the site for picnics. - The proposed landscaping will provide additional sitting overlooking the rugby pitch.	- The existing sitting bench will not be affected. Can be integrated with the landscaping of the suction tank. - The proposed landscaping will provide additional sitting overlooking the rugby pitch. - Approximately 196 m^2 will be given to the park. This means there will be more space for recreational purposes. - Allows for the activation of the walls to support community recreation. - Opportunity to provide shade and storage facilities for the rugby clubs.	- Impact on park users likely to be minimal. The tank will be far from most park uses. - There will be no additional sitting arising from the landscaping as there is no benefit given the location of the tank relative to the pitch. - The existing walkway to Thornycroft Street will not be affected.	- The proposed landscaping will provide additional sitting overlooking the rugby pitch. - The proposed mounding and landscaping would provide some mitigation. - The footprint will take valuable park space and reduce the area for community enjoyment.	- The proposed landscaping will provide additional sitting overlooking the rugby pitch. - Tennis court users will not be affected both during and after construction. They may enjoy the additional benefit of a backwall for tennis practice as the tank wall could form one side of the court. - A basketball half court for practice shootings could be integrated into the design and landscaping. - There could be reduced park area available for use if access to the construction site is via the grass from Jeffreys Rd. - The proposed mounding and landscaping would provide some mitigation.	- No existing footpaths will be affected by this option. - The proposed landscaping will provide additional sitting overlooking the rugby pitch. - Parents coming to the library take a short stroll to the playground with their kids. However, the alternative location e.g. site Option 7 site is still within the same range. - If the replacement playground is not built first, this will be a major inconvenience to the locals. We assume that the replacement playground will be prior to the decommissioning of the existing. - There could be reduced park area available for use if access to the	- No existing footpaths will be affected by this option. - The proposed landscaping will provide additional sitting overlooking the rugby pitch. - There could be reduced park area available for use if access to the construction site is via the grass from Jeffreys Rd. - The proposed mounding and landscaping would provide some mitigation. - The footprint will take valuable park space and reduce the area for community enjoyment.	- Tennis court users will not be affected both during and after construction. They may enjoy the additional benefit of a backwall for tennis practice as the tank wall could form one side of the court. - A basketball half court for practice shootings could be integrated into the design and landscaping. - There could be reduced park area available for use if access to the construction site is via the grass from Jeffreys Rd. - The proposed mounding and landscaping would provide some mitigation. - To meet the CPTED requirements the site will be fenced off removing up

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						- The footprint will take valuable park space and reduce the area for community enjoyment.	construction site is via the grass from Jeffreys Rd. - The footprint will take valuable park space and reduce the area for community enjoyment as the replacement playground area will reduce the park area available for general enjoyment.		to 735 m^2 from public access.
	VA4 – Traffic, Noise, dust, Health & Safety	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise will have an impact at least on properties along Waiwetu Street and 182-188 Clyde Road. - Dust will be an issue for at least some of these properties both during the demolition of the existing tank and the construction of the new tank. 23 Thornycroft will also be affected by dust during the tank removal. - Dust management measures can be effectively implemented to managed dust migration. - Dust generated during the demolition of the existing tank can be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise will have an impact on at least properties along Waiwetu Street, 23 Thornycroft Street, 28-30 Jeffreys Road. - Dust will be an issue for at least some of the same properties both during the demolition of the existing tank and the construction of the new tank. 23 Thornycroft will also be affected by dust during the tank removal. - Dust generated during the demolition of the existing tank could be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise will have an impact on some properties along Waiwetu Street, 23-33 Thornycroft Street, 28-30 Jeffreys Road. - Dust will be an issue for at least some of the same properties both during the demolition of the existing tank and the construction of the new tank. 23 Thornycroft will also be affected by dust during the tank removal. - Dust generated during the demolition of the existing tank could be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise will have an impact on at least 28- 30 Jeffreys Road, possibly some of the properties along Waiwetu Street and Thornycroft Street. - Dust will be an issue for at least some of the same properties both during the demolition of the existing tank and the construction of the new tank. 23 Thornycroft will also be affected by dust during the tank removal. - Dust generated during the demolition of the existing tank could be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise will have an impact on properties along Waiwetu Street and 182-188 Clyde Street. - Dust associated with tank removal will possibly affect the Waiwetu Street properties and 23 Thornycroft Street. Dust associated with the construction could have an impact on 182-188 Clyde Road properties and possibly some of the Waiwetu properties. The library could also experience some of the noise and dust. - Dust generated during the demolition of the existing tank could be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise could possibly be heard by people at some of the properties along Waiwetu Street and 182-188 Clyde Street and the library. - Dust associated with tank removal will possibly affect the Waiwetu Street properties and 23 Thornycroft Street. Dust associated with the construction will have minimal impact on private properties. - Dust generated during the demolition of the existing tank could be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.	- Same as Option 6.	- 2 months of loud noise to remove the existing tank, need for heavy vehicle access. - Noise associated with construction noise will have an impact on properties along Waiwetu Street and 182-188 Clyde Street. - Dust associated with tank removal will possibly affect the Waiwetu Street properties and 23 Thornycroft Street. Dust associated with the construction could have an impact on 182-188 Clyde Road properties and possibly some of the Waiwetu properties. The library could also experience some of the noise and dust. - Dust generated during the demolition of the existing tank could be mitigated to reduce potential effects on the above properties. - The impact of noise on neighbouring properties could be mitigated by restrictions in operating hours and proper scheduling of worst of the noise generating works.
CPTED Principles	**CP1** – Surveillance and Ensuring Clear Sight Lines – Ability for accessible spaces to be overlooked and ensuring clear sightlines.	- There will be a 5-10 m passive area between the tank and the boundary fence. This could attract undesirable elements as this area will be hidden from view from the rest of the park. This could increase crime for the locals, unauthorised camping, loitering and other illicit activities. - Properties mostly affected are likely to be 184/184A/190 Clyde Road, 45, 45A and 47 Waiwetu Street. - Landscaping could also be used to manage the passive areas. - Fencing could address this concern.	- The tank and the compound would be fenced in. This will exclude undesirable elements. - Landscaping could also be used to manage the passive areas. - The more compact compound will open up more space for the park (approximately 196 m^2) and increase escape routes and reduce the passive areas around the park. Therefore, no sightline issues. - The distance between the tank site and Waiwetu Reserve will be reduced from 28 m to 20 m. But visibility will still be plenty.	- Some passive areas could be created at this location. - This could attract undesirable elements as this area will be hidden from view from the rest of the park. This could increase crime for the locals, unauthorised camping, loitering and other illicit activities. - Properties mostly affected are likely to be 28-30 Jeffreys Rd, 23, 27-33 Thornycroft St. - Landscaping could also be used to manage the passive areas. - Fencing could address this concern.	- There will be no passive areas as the tank will be fully visible from all sides including the carpark, the library and rest of the park. - Properties mostly affected are likely to be 28A and 30 Jeffreys Road. - The existing footpath will run at the back of the tank.	- There will be no passive areas as the tank will be fully visible from all sides including the carpark, the library and rest of the park. - Properties mostly affected are likely to be 190 Clyde Road, 45, 45A and 47 Waiwetu Street. - However, the tank will be further from the dwellings than in Option 1. - Landscaping could also be used to manage the passive areas.	- There will be no passive areas as the tank will be fully visible from all sides including the carpark, the library, the road and rest of the park.	- There will be no passive areas as the tank will be fully visible from all sides including the carpark, the library, the road, and rest of the park.	- There will be passive areas as the tank back will create some "dead spots" i.e. sightlines will be blocked. This will require fencing to reduce access. - The fencing will result in a total area of 735 m^2 being removed from public access. - Properties mostly affected are likely to be 190 Clyde Road, 45, 45A and 47 Waiwetu Street. - However, the tank will be further from most dwellings than in Option 1 but will still be close to 10 m of the 190 Clyde Road boundary. - The fencing around the tank will result in a 40 m deep entrapment around the carpark.

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	CP2 - Vandalism – Prevention of opportunities for tagging, etc of structures.	- Vandalism & tagging is possible.	- Vandalism less likely as the compound will be fenced in. - Tagging is possible on the front of the building.	- Vandalism and tagging is possible.	- Tagging is less likely since the tank is proposed to have some mounding around it. - Vandalism also less likely.	- Similar to Option 4.	- Similar to Option 4.	- Similar to Option 4.	- Vandalism less likely as the compound will be fenced in. - Tagging is possible on the front of the building.
	CP3 – Ensuring that there is Plenty of Activity – this relates to the level of activity generated by the design.	- The design does not encourage as much activity as the tank will be a standard alone structure and not integrated to the rest of the park.	- The site will be fenced in. Some additional sitting benches can be included at the front of the tank. - The more compact compound will open up more space for the park and increase escape routes.	- The design does not encourage as much activity as the tank will be a standard alone structure and not integrated to the rest of the park. -	- The design encourages plenty of activity around the tank. - The footpath will be retained.	- The design encourages plenty of activity around the tank. - One tank wall could be used for tennis practice and possibly a basketball practice area.	- The design encourages plenty of activity around the tank. - Some additional sitting benches can be included at the front of the tank.	- The design encourages plenty of activity around the tank. - Some additional sitting benches can be included at the front of the tank.	- The design does not encourage plenty of activity around the tank. The tank will have to be fenced off resulting in a 735 m^2 compound. This reduces the area of the park available to the wider park than any other option. - One tank wall could be used for tennis practice and possibly a basketball practice area.
	CP4 – Escape routes - The ability for safe movement and connection around the site and opportunities for escape.	- Escape routes only available at the front. - The back areas pose a danger.	- The compound will be fenced. - The more compact compound will open up more space for the park and increase escape routes.	- Escape routes only available at the front. - . - Locating the tank here will reduce the escape routes and create some "dead" spaces to the north east of the tank.	- This will be open on all sides and no opportunity for entrapment.	- Same as Option 4.	- Same as Option 4.	- Same as Option 4.	- Same as Option 1.
Costs	**CC1** - Capital Costs	- **High costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Low costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. Total Cost = **$2,570,700**	- **High costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Lowest costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. Total Cost = **$2,680,700**	- **High-Moderate costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Moderate - High costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. Total Cost = **$2,700,500**	- **Moderate costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Moderate costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. Total Cost = **$3,065,700**	- **Moderate-low costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Low to moderate costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. Total Cost = **$3,041,500**	- **Lower costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Higher costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. ○ New playground. Total Cost = **$3,088,800**	- **Lowest costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. - **Highest costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. ○ Rehabilitation of the playing field. Total Cost = **$3,146,000**	- **Moderate-low costs for:** ○ Ground improvement requirements. ○ Dewatering. ○ Piling. ○ Fencing to carve off the 735 m^2 compound. - **Low-moderate costs for:** ○ Additional pipework to and from the tank and the scour pipes. ○ Pumping to get the water to the suction tank. Total Cost = **$2,788,500**

Table 4.2 – Capital Cost Estimates

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
Consenting	$30,000	$30,000	$75,000	$30,000	$30,000	$30,000	$30,000	$30,000
Design & Construction Monitoring	$325,000	$325,000	$325,000	$350,000	$350,000	$350,000	$350,000	$350,000
Geotech investigation	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Procurement & Project Management	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000
Construction								
Foundation Construction	$400,000	$450,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000
Suction tank (500 cu. m, 4 m high)	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000	$700,000
Retaining Wall embarkment for Mounded Tanks				$200,000	$200,000		$200,000	
Architectural Treatment for Exposed Tanks	$100,000	$150,000	$100,000			$100,000		$100,000
Demolition of existing tank	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
Pipeworks	$100,000	$80,000	$150,000	$200,000	$200,000	$240,000	$300,000	$150,000
Electrical Upgrade	$30,000	$15,000	$30,000	$50,000	$50,000	$60,000	$70,000	$50,000
Pumps	$90,000	$80,000	$100,000	$110,000	$110,000	$120,000	$130,000	$90,000
Software upgrade	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
Starters (2 nos)	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
Enclosure	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$200,000
Wellheads (2 nos)	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
Suction Tank Scour Pipe	$12,000	$12,000	$60,000	$32,000	$15,000	$48,000	$70,000	$15,000
Rehabilitation of the Playground	$0	$0	$0	$0	$0	$200,000	$0	$0
Rehabilitation of the Playing Field and the Irrigation	$30,000	$30,000	$0	$200,000	$200,000	$50,000	$100,000	$30,000
Rehabilitation of the Footpath	$10,000	$10,000	$5,000	$5,000	$0	$0	$0	$10,000
Tidying up of existing pump station	$15,000	$50,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Landscaping of pump station area	$25,000	$35,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
Estimated budget	**$2,337,000**	**$2,437,000**	**$2,455,000**	**$2,787,000**	**$2,765,000**	**$2,808,000**	**$2,860,000**	**$2,535,000**
Contingency (10%)	$233,700	$243,700	$245,500	$278,700	$276,500	$280,800	$286,000	$253,500
Total Cost Estimate	**$2,570,700**	**$2,680,700**	**$2,700,500**	**$3,065,700**	**$3,041,500**	**$3,088,800**	**$3,146,000**	**$2,788,500**
Cost difference	**-$110,000**	**$0**	**$19,800**	**$385,000**	**$360,800**	**$408,100**	**$465,300**	**$107,800**
%age Cost Difference	**-4.1%**	**0.0%**	**0.7%**	**14.4%**	**13.5%**	**15.2%**	**17.4%**	**4.0%**

5 Multi Criteria Analysis (MCA)

5.1 Key Issues for Each Option

The selection of the Jeffreys Suction Tank site cannot be based on any one criteria alone. If this were the case, based on the cost criteria the order of preference of the options from lowest cost to the most expensive (Table 4.2) would be:

- Option 1 – the site original proposed and presented to the residents.
- Option 2 – the existing pump station sites.
- Option 3 – the Waiwetu Reserve option.
- Option 8 – the next to the tennis court and close to Option 1.
- Option 5 – the tennis court site.
- Option 4 – the site adjacent to 28A-30 Jeffreys Road;
- Option 6 – the playground option.
- Option 7 – the site close to Jeffreys Road.

To help remove these biases, a Multi Criteria Analysis (MCA) was applied. This is described in some detail below.

5.2 Introduction to Multi Criteria Analysis

The use of multi-criteria analysis (MCA) can provide a reliable methodology to rank alternatives where there are complex set of criteria to be considered. It refers to making decisions in the presence of multiple conflicting criteria.

5.3 MCA Methodology

The following process has been applied in this report:

- The options described in the previous sections were collated.
- A set of primary criteria and sub-criteria (Section 5.4) by which the options could be evaluated were defined (Table 5.1).
- Scores were assigned to each option against a criterion. The possible scores for each option are presented in Table 5.2.
- The primary criteria and sub-criteria were weighted to reflect their perceived importance against each option.
- The overall 'scores' for each scenario were computed.
- The options were ranked on the basis of the weighted scores with the option that had the highest total score being the preferred option.

5.4 Assessment Criteria and Sub-Criteria

The MCA criteria were determined based on broad cost (Financial) based and non-cost (Environmental, Technical and Social) based categories. Sub-criteria were generated for each of the main criteria and these were similar to the factors that were used in Table 4.1 to compare the options. From the four primary criteria (financial, technical, social and environmental) a total of 23 sub-criteria were generated. Table 5.1 gives the criteria and the sub-criteria. Table 5.1 also defines the possible scores for each sub-criterion.

The MCA spreadsheet was distributed to the project team (Prawindra Mukhia (Project Director – CCC), Crispin Schurr (CCC), Chris Greenshields (CCC) and Tony Gordon (Opus)) for comments.

Table 5.1 – List of Criteria, Sub-Criteria and Definitions

	Criteria	Sub-criteria	Definition	Measurement
Technical	Hydraulic Performance	**HP1** – Pipework Requirements	The quantity of additional pipes to supply the tanks.	- Significant effort for connectivity i.e. Pipework >75m = 0-49. - Moderately significant effort for connectivity i.e. pipework >50m<75m = 50-75. - Moderate effort for connectivity i.e. pipework >25m<50m = 76-99. - Minimal effort for connectivity i.e. pipework less than 25 m = 100.
	Design & Construction	**DC1** - Suction Tank (ST)	Provision of an appropriately sized ST and the ability to choose different tank configurations.	- Site only allows one configuration = 0-49. - Site allows 1-2 configurations = 50-75. - Site allows >2 tank configurations = 76-100.
		DC2 – Wells, pumps and Electrical/Controls	Ability to use existing equipment.	If the existing equipment can be used with no additional equipment the option scores 100 if some of the existing equipment can used and some enhancements are required, the option scores 50-99. If significant additional equipment is required, the option scores 0-49.
		DC3 - Complexity of Construction	The degree to which the construction process will affect the project outcomes.	Very complex = 0-49; Moderate to low complexity = 50-99; Least complex option =100. If the respondent does not think there are sufficient differences between the options they can all be scored a 100.
		DC4 – Earthquake Resilience	Extent to which the site is affected by lateral spreading.	- If the site is within 10 m of the stream = 0; If the site is within 10-20 m of the stream = >0-49; If the site is 20-40 m = 50-99; If the site is >40 m = 100.
	Site Features	**SF1** – Site Features	The extent to which the option will encroach into the existing amenities or other sites features.	- Site features have potential to prohibit development of site and limit tank options = 0. - Will require compromise/ mitigation in order to be workable = >0-49. - No or few constraints or limitation to the tank options = 50-100.
		SF2 – Consenting/Compliance requirements	The complexity of the consenting requirements.	- Significant cost and/or effort = 0-49; Moderate cost and/or effort = 50-75; None or Minor cost and/or effort = 76-100
		SF3 – Legal Requirements	The legal requirements necessary to enable the option to happen.	The complexity of the necessary legal requirements to make the option happen. E.g. Gazetted Reserves (e.g. Site 3) would score 0-49. Moderate legal requirements = >50-75; Minor or no legal requirements = 76-100.
		SF4 – Site Sze and Geometry	Effect of site size and geometry.	- Site size and geometry does not lend itself for use = 0; Significant modifications to make site useable = >0-49; Some modifications to make site useable = >50-75; Minor modifications to make site useable = 76-99; No modifications = 100.
		SF5 – Ease of Site Access	Ease of access of the site for repairs and maintenance.	- Significant difficulties to access for construction, operation & maintenance = 0 - Access for construction, operation & maintenance can be achieved with some compromise = >0-49 - Good access for construction, operation & maintenance = 50-100
		SF6 – Site Efficiency	Availability of ancillary services e.g. power, telemetry etc. The further the site is from the existing pump station the more difficulty it will be to use ancillary services.	- Significant works required to provide the ancillary services = 0; - Moderate works to provide ancillary services = >0-49. - Minor or no works required to provide ancillary services = 50-100
		SF7 – Landscaping Outcomes	Ease with which the overall clarity i.e. relationship between the path network, and the play features can be achieved.	- High need for landscaping to make the site work and achieve clarity = 0-49. - Moderate level of landscaping to make it the site work and achieve clarity = 50-75. - Minimal level of landscaping to make the option appealing and achieve clarity = 76-100.
Environmental	Environmental Considerations	**EC1** – Site Contamination	LLUR considerations and consentability.	Significant contamination of site likely to preclude development = 0-49 Some contamination of site but mitigation measures would ensure acceptability = 50-99 None = 100
		EC2 - Impact on the waterway	Environmental effects arising from the proximity of the construction on the waterway. E.g. impact of dewatering on the stream.	Dewatering required and will affect the waterway = 0-49; Dewatering required with a medium impact on the waterway = 50-75; Dewatering with low impact on the waterway = 76-99; Dewatering required with no effect on the waterway = 100
Social	Community & Visual Impact	**VA1** – Visual Impact on Neighbours	This relates to people with properties around the proposed site.	Very High =0, medium >0-49, Low 50-99, None = 100.
		VA2 – Visual Impact on Other Park Users	This is in relation to people who come to the park for enjoyment.	Very High =0, medium >0-49, Low 50-99, None = 100.
		VA3 – Impact on Community Enjoyment of the Park or Existing Facilities	The extent to which the option affects on going enjoyment of the park.	No changes to the amenities (or fully replaceable) people come to the park for = 100, Reduction in the size of the amenity = >0-99. Complete loss of the amenity (i.e. no replacement) = 0
		VA4 – Traffic, Noise, dust, Health & Safety	The extent to which the construction work will affect the neighbours.	- Distance from centre of site to receptor short < 50 m) or significant mitigation required = 0-49 - Distance from centre of site to receptor moderate (50-100 m) or minimal mitigation needed = 50-75. - Distance from the centre of the site to receptor is > 100 m or no mitigation is required = 76-100.
	CPTED Principles	**CP1** – Surveillance and Ensuring Clear Sight Lines	Ability for accessible spaces to be overlooked and ensuring clear sightlines.	Very High =100, medium >50-99, Low >0-49, None = 0.
		CP2 – Tagging	Prevention of opportunities for tagging, etc of structures.	Very High =100, medium >50-99, Low >0-49, None = 0.
		CP3 – Ensuring that there is Plenty of Activity	Level of activity generated by the design	Very High =100, medium >50-99, Low >0-49, None = 0.
		CP4 – Escape Routes	The ability for safe movement and connections around the site and opportunities for escape.	Very High =100, medium >50-99, Low >0-49, None = 0.
Financial	Costs	**CC1** - Capital Costs	Capital costs	Least costs option = 100. Most expensive to less expensive = 0-99.

Notes:

- *At least one option should score a 100 for each sub-criterion. All the other options can be scored from 0-100.*
- *The worst option does not necessarily score a 0 per sub-criterion i.e. the lowest score across a sub-criterion does not necessarily need to be 0.*
- *If the respondent does not think there are sufficient differences between the options they can all be scored a 100.*
- *A score between 0-100 does not necessarily need to be a multiple of 5 or 10. It can be any value e.g. 7, 29, 91 etc.*

5.5 Stage 1 MCA Analysis

5.5.1 Assessment Process

During the Stage 1 MCA analysis there were seven options (Options 1-7) being assessed.

A workshop was held on the 27th of October 2017 and in attendance were all the project team members. The purpose of the workshop was to work through the sub-criteria with the intention of coming to an agreement on the preliminary list of the sub-criteria and their definitions.

A second workshop was held on the 14th of November 2017 by the same team members. The purpose of the second meeting was to finalise the list of criteria and sub-criteria and to clearly define what each sub-criterion meant. The clarity of the definitions was essential to the weighting and scoring process.

An important outcome from the meeting was the agreement to give the highest weight to the Social Criteria given the possible impacts on residents on neighbouring properties and people using the park. A weight of 50% was allocated to the Social Criteria. The assessor where then free to allocate the remaining 50% across the other three criteria.

The MCA spreadsheet was sent to each of the project team members with instructions to score the options and the sub-criteria. Below is summary of the instructions given to the team members:

- Decide and allocate the percentage weighting of each of the main criteria (Technical, Environmental, Social and Financial). The total percentages allocated to the four categories had to add up to 100%.
- For each criterion, allocate the percentage of the perceived importance of the sub-criteria. The total percentages allocated to the sub-criterion under each criterion had to add up to 100%.
- Then score each sub-criterion using the scoring guidelines in Table 5.1. The score could be any number between 0 and 100 depending on the assessor's ranking of the sub-criteria. In following the scoring guidelines, the following comments had to be taken into account:
  - *At least one option should score a 100 for each sub-criterion. All the other options can be scored from 0-100.*
  - *The worst option does not necessarily score a 0 per sub-criterion i.e. the lowest score across a sub-criterion does not necessarily need to be 0.*
  - *A score between 0-100 does not necessarily need to be a multiple of 5 or 10. It can be any value e.g. 7, 29, 91 etc.*

5.5.2 Stage 1 MCA Results

Table 5.2 provides the average scores (%ages) allocated to the primary criteria by the MCA assessors. As per the instructions given as part of the MCA, the Social Criteria was fixed at 50% and hence the average percentage weight remained at 50%. The Technical Criteria had the second highest average weight at 24%.

Table 5.2 – Stage 1 Scores for the Primary Criteria

Criteria	Mean
Technical	24%
Environmental	12%
Social	50%
Financial	14%

Table 5.3 summarises the MCA scores for each of the seven Stage 1 options.

Table 5.3 – Stage 1 MCA Scoring Results

Criteria	Score	Ranking
Option 1	57.46	6
Option 2	69.32	1
Option 3	52.77	5
Option 4	49.31	7
Option 5	65.12	3
Option 6	63.20	4
Option 7	65.36	2

Based on the MCA analysis, the order of preference was:

- Option 2 – at the existing pump station.
- Option 7 – next to Jeffreys Road.
- Option 5 – next to the tennis court.
- Option 6 – where the playground is located.
- Option 3 – in Waiwetu Reserve.
- Option 1 – the site option that was presented to the residents.
- Option 4 – adjacent to 28A and 30 Jeffreys Road.

5.6 Stage 2 MCA Analysis

5.6.1 Assessment Process

As noted in Section 3.3.7, on the 9th of March 2018 the residents of 53 Waiwetu Street submitted a layout with a suggested new site for the proposed Jeffreys Road Suction Tank.

The introduction of the new option did not necessitate any changes to the criteria and sub-criteria. The original instruction to give a weight of 50% to the Social Criteria was retained.

The same instructions for scoring applied in Stage 1 were adopted in Stage 2 analysis.

5.6.2 Stage 2 MCA Results

Table 5.4 provides the average scores (%ages) allocated to the primary criteria by the MCA assessors during the Stage 2 assessment.

Table 5.4 – Stage 2 Scores for the Primary Criteria

Criteria	Mean
Technical	26%
Environmental	10%
Social	50%
Financial	14%

Table 5.5 summarises the MCA scores for each of the eight Stage 2 options.

Table 5.5 – Stage 2 MCA Scoring Results

Criteria	Score	Ranking
Option 1	61.24	5
Option 2	76.95	1
Option 3	56.72	7
Option 4	55.72	8
Option 5	66.48	3
Option 6	63.86	4

Criteria	Score	Ranking
Option 7	66.61	2
Option 8	58.29	6

Based on the Stage 2 MCA analysis, the order of preference was:

- Option 2 – at the existing pump station.
- Option 7 – next to Jeffreys Road.
- Option 5 – next to the tennis court.
- Option 6 – where the playground is located.
- Option 1 – the site option that was presented to the residents.
- Option 8 – next to tennis court – new option suggested by residents.
- Option 3 – in Waiwetu Reserve.
- Option 4 – adjacent to 28A and 30 Jeffreys Road.

5.7 Sensitivity Analysis

A sensitivity analysis was carried out by varying the weights assigned (by all respondents) to the high percentage sub criteria (finance and visual impacts on neighbours). Table 5.6 gives the sensitivity analyses scores adopted. Scenario 1 provides the average MCA scores that generated the results in Table 5.5. Scenarios 2-5 are the changes made to the base scenario scores to test the sensitivity of the results to the scores.

Table 5.6 – Scores Adopted for the Sensitivity Analyses

	Technical	Env	Social	Financial	Total
Scenario 1	26%	10%	50%	14%	100%
Scenario 2	30%	5%	25%	40%	100%
Scenario 3	30%	5%	45%	20%	100%
Scenario 4	50%	10%	10%	30%	100%
Scenario 5	10%	50%	20%	20%	100%

Table 5.7 below provides the results of the MCA sensitivity analyses.

Table 5.7 – Sensitivity Analysis Results

Scenario		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
1	Score	61.24	76.95	56.72	55.72	66.48	63.86	66.61	58.29
	Rank	5	1	7	8	3	4	2	6
2	Score	75.27	80.34	66.78	56.24	63.07	58.96	56.14	62.26
	Rank	2	1	3	7	4	6	8	5
3	Score	64.6	78.1	58.2	55.3	65.3	62.0	64.0	58.6
	Rank	3	1	7	8	2	5	4	6
4	Score	75.2	79.5	65.1	57.5	62.8	60.4	58.6	63.2
	Rank	2	1	3	8	5	6	7	4
5	Score	58.5	61.4	63.6	61.5	64.5	63.4	62.5	62.0
	Rank	8	7	2	6	1	3	4	5

Table 5.7 shows that Option 2 still scored better than any other option after increasing or decreasing the percentages allocated to the four criteria. The greatest impact on the outcome was the actual scores assigned by the individual respondents to the high value sub-criteria.

Figure 5.1 is a graphical representation of the information provided in Table 5.7.

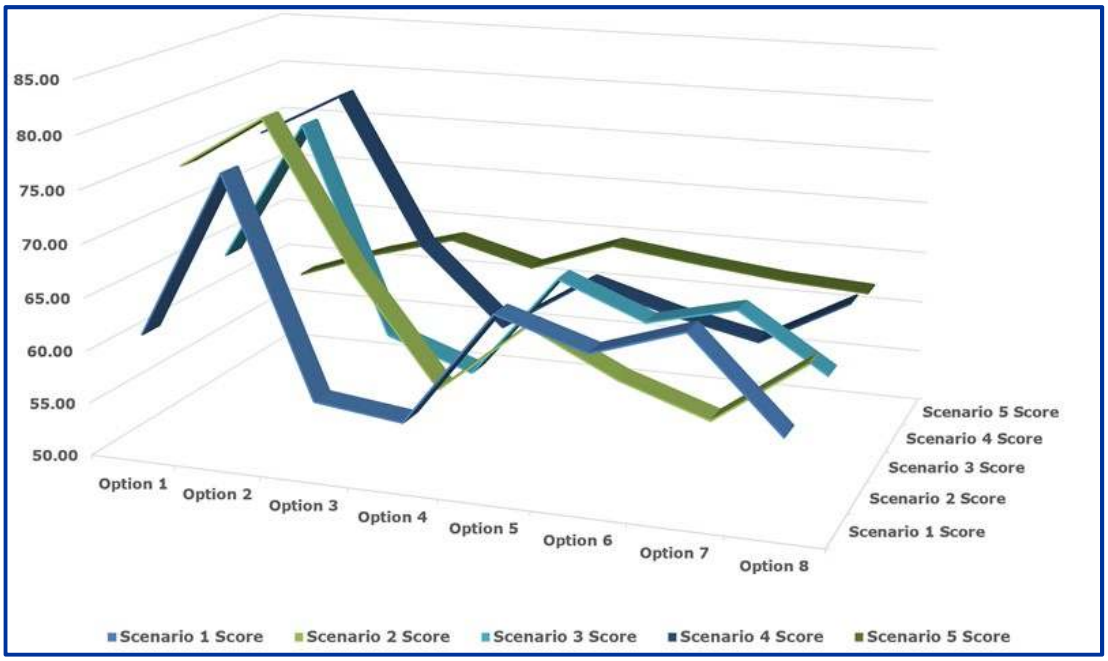

Figure 5.1 – Graphical Presentation of the MCA Scores and Weights.

The conclusion drawn was that changing the individual percentages did not change the recommendation of Option 2 as the preferred option under most score/weight combinations. Scenarios 1-4 showed Option 2 as the preferred option. This was not the case with Scenario 5.

Scenario 5 resulted in Option 2 being less preferred than most options including Option 8 which came in at 5 compared to 7 for Scenario 2. In Scenario 5 the environmental criterion was assumed to make up 50% of the weighting and as Options 1 and 2 are closer to the stream than Option 5, Option 8 or most other options they scored poorly ranking 8th and 7th respectively. Scenario 5 is considered to be an extreme case as the environmental issues associated with the construction of the suction tank and the impact of the stream can be mitigated. Therefore, the 50% weight is unrealistic. Furthermore, allocating a 50% weight to the environmental criterion negates the importance of the possible effects on neighbouring properties.

6 Conclusions and Recommendations

6.1 Conclusions and Recommendations

Two MCA analysis have been carried out since October 2017. The first assessment (Stage 1 MCA) was used to assess the initial list of seven alternative sites. The second MCA (Stage 2 MCA) was used to assess the Stage 1 options plus the eighth site suggested by the residents of 53 Waiwetu Street.

Table 6.1 summarises the results of the two MCA analyses.

Table 6.1 – Summary of the Stage 1 and Stage 2 MCA Assessments

Criteria	Stage 1 Ranking	Stage 2 Ranking
Option 1	6	5
Option 2	1	1
Option 3	5	7
Option 4	7	8
Option 5	3	3
Option 6	4	4
Option 7	2	2
Option 8		6

Eight options have been investigated in detail. The top three options based on the MCA are:

- **Option 2** – at the existing pump station.
- **Option 7** – next to Jeffreys Road.
- **Option 5** – next to the tennis court.

Option 8 recommended by the residents of 53 Waiwetu came in at 5 out of the 8 options.

Option 2 is recommended for implementation. It should be noted that while Options 5 and 7 scored well using the MCA, their capital costs (Table 4.2) are 13-17% (i.e. $361K-$465K) more than Option 2. Any departure from the adoption of Option 2 will need to be supported by a very strong case in order to justify the expenditure of an extra $361-$465K of the ratepayers' money. Option 8 costs $107K more than Option 2.

Appendix A Memo Outlining The Consultation Work

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TO	**Christchurch City Council** Three Waters – Delivery Unit 53 Hereford Street,
ATTENTION	**Prawindra Mukhia**
FROM	Victor Mthamo
DATE	3 January 2018
FILE	Jeffreys Suction Tank
SUBJECT	**Jeffreys Suction Tanks – Project Timelines**

1. Introduction

1.1. Project Background and Purpose

The Jeffreys Pump Station is located at 18 Jeffreys Road, Fendalton. Some parts of the Jeffreys Pump Station such as the suction tank and some wells were damaged during the February 2011 earthquake. While parts of the infrastructure (e.g. the wells) have been restored or upgraded, the suction tank has been offline since that time limiting its potential contribution (e.g. sand removal, flow buffering capabilities and storage) to the water supply network.

This memo has been prepared to document and summarises the project activities and consultation work carried out to date.

2. Project Initiation (March 2016 – April 2016)

2.1. Reasons for the Project

The suction tank replacement project was initiated in March 2016 when an assessment was carried out to weigh up the options to repair or replace the suction tank. It was considered that the cost to repair the existing 200 m^3 tank was going to be considerable given the extent of the damage and the design/construction of the existing tank.

2.2. Basis for the 250 m^3 Suction Tank

While a repair of the 200 m^3 would bring back the suction tank online, the result was not going to achieve Council's overall objectives for the network which included provision of buffer storage, sand settlement and optimising the equalisation of flows from the wells on site. Thus, the long-term benefits of replacing the tank outweighed the immediate benefits from repairing the tank. A new tank based on the standard CCC 250 m^3 capacity reservoir design was recommended and proposed in the project brief in April 2016.

The Council initiated the project to design and construct a replacement 250 m^3 suction tank in April 2016.

3. Proposal for a 500 m^3 Suction Tank (June 2016 – March 2017)

3.1. Basis for the Change to a 500 m^3 Suction Tank

After the project initiation, the project control group (PCG) reconsidered the size of the suction tank taking into account a number of factors and the cost benefits of a 250 m^3 suction tank

vis-à-vis a 500 m^3 suction tank. The following were the basis for the suggested changes to the tank size:

- A 500 m^3 suction tank would provide sufficient additional buffer storage to make the most of the potential flow capacities from the Jeffreys Pump Station wells than what could be achieved with a 250 m^3 suction tank.
- A 500 m^3 suction tank would provide additional sand settlement (than a 250 m^3 suction tank) to provide better water quality.
- The larger suction tank is more beneficial for chlorination than a 250 m^3 suction tank should the need for chlorination arise.
- A 500 m^3 tank would future proof the network requirements for the next 50-100 years than a 250 m^3 suction tank would. Future proofing includes capacities associated with any future legislative requirements for fluoridation.
- The cost benefit of the increase in size was considered to be acceptable enough for the change to a larger suction tank to be made.

3.2. Consequences of the Change to 500 m^3 Suction Tank

The proposal for a 500 m^3 was adopted and preliminary layouts were prepared, and these included the pros and cons for various tank shapes.

Suction Tank Shape

Several suction tank configurations (e.g. rectangular vs circular vs square and different tank heights) were considered to assess whether the footprint would still permit the use of the current suction tank site. The rectangular shape was considered to be the most preferred on the basis of the following factors:

- Efficiency and efficacy of the sand removal. The tank options with the longest flow path offers better sand removal.
- The longest flow path also offered the longest contact time in case chlorination was required.

Based on the above considerations, a rectangular tank was chosen.

Suction Tank Location

However, with the change to a 500 m^3 suction tank, the site of the current tank became too small to fit a larger tank. Two suction tank locations were considered for the proposed 500 m^3 tank. This was the existing suction tank location and a second location known as Site 1 (shown in **Attachment 1**).

4. Consultation Processes May 2017 – December 2017)

Having decided on the shape and size of the suction tank, the project team initiated the consultation processes, and these are outlined in detailed in the following sections.

4.1. Engangement with the Residents – May and June 2017

On 31 May 2017 Opus Consultants sent out a letter to the residents along Waiwetu Street. The letter advised the residents of the proposed suction tank replacement within the south-eastern corner of the Jeffreys Reserve. The letter also proposed a meeting with the residents to collate their opinions on the proposed project.

A meeting with the residents was held on 13 June 2017. This involved a formal sit-down at 47 Waiwetu Street and then a site walkover. The list of attendees is presented in the table below.

Table 1 – List of the 13 June Resident Meeting Attendees

Brenda and David Anderson	53 Waiwetu St
Irma and James Buchan	51 Waiwetu St
Douglas and Gillian Price	47 Waiwetu St
Meaghan Kelliher	45 Waiwetu St
Prawindra Mukhia	Project Manager, CCC
Phillipa Upton	Engagement Advisor CCC
Hock Yeo	Engineer, Opus
Tony Gordon	Engineer, Opus
Stephanie Brown	Planner, Opus (as Gemma off sick)

The following are the key issues that were discussed:

- The tank size and location.
- Consenting and regulatory requirements.
- Construction methodologies.

The main residents concerns and suggestions were:

- The tank height and impact on visual effects and whether this could be mitigated by partially burying the tank.
- Consideration of a different location that was further from the residences.

At the end of the meeting Opus and the Council agreed to take into consideration the concerns raised with the view to providing the appropriate mitigation.

A copy of the minutes of the meeting is provided as **Attachment 2**.

4.2. Engangement with the Community Board – August/September 2017

Informal Meeting with the Community Board (7 August 2017)

The project team had an informal meeting with some members of the Community Board (CB) on the 7th of August 2017. The purpose of the meeting was to inform them about the purpose of the project and plan. A PowerPoint presentation was made, and this covered the following items:

- The Background
- The Options
- The Comparison
- The Design
- Community Engagement
- Timelines
- Summary

The proposal presented to the CB was for a 500 m^3 suction tank. Two tank locations were presented to the board. These were:

- A 500 m^3 tank below the ground level at the existing suction tank site.
- A 500 m^3 tank above ground level at Site 1.

The pros and cons for the two sites were also detailed in the PowerPoint presentation. Site 1 was considerably better than the existing site over a number of criteria e.g. cost, constructability, consenting and other technical considerations. For this reason, the project team was in favour of Option 1.

It was recommended that the project team make a formal presentation of the plan to the full Community Board and the following next steps were defined:

- Contact adjacent neighbours.
- 3 week Have Your Say consultation.
- Liaise/inform interested/affected stakeholders.
- Letter drop residents.
- Fendalton library display.

Formal Meeting with the Community Board (25th September 2017)

A formal presentation of the project and the next steps was presented to the Community Board on the 25th of September 2017 using the PowerPoint presentation.

The Community Board accepted the Site 1 location and the plan and advised project team to proceed with the community engagement process.

4.3. Further Residents Consultation - October 2017

Limited Notification and Consultation (4 October 2017)

The project team organised a "Heads-Up" meeting with residents whose properties were adjacent to the proposed tank location (Site 1) and who were likely to be affected the most by the proposal.

This meeting was held on the 4th of October 2017. The key features of the meeting were:

- Introduction of the proposal and concept drawings.
- Feedback from the residents. The concerns raised were primarily about visual effects on 45 And 45A Waiwetu and the need for adequate mitigation e.g. through screening and or coloured concrete. One resident had strong concerns about the visual effects from Jeffreys Road across the park and suggested options such as earth banking, water feature and mural as ways to disguise the tank.

The residents were also notified of (i) the proposed Have Your Say campaign, (ii) the proposed drop in session and open meeting to be held on the 18th of October 2017.

The residents agreed to formally lodge their concerns via the Have Your Say process.

Have Your Say Campaign (6-23 October 2017)

The Council "Have Your Say" process started on the 6th of October 2017 and ended on the 25th of October 2017.

The immediate residents and all other parties with an interest on the project or the park had the opportunity to make submissions for or against the project or to suggest changes that would ensure that their concerns were addressed.

Drop-in Session and Open Meeting (18 October 2017)

A residents meeting was organised for the 18th of October and this was to be followed by a drop-in session. The purpose of these were two-fold:

- To explain the project in detail to all interested parties and the immediate residents to assist them with their "Have Your Say" submissions and answer any questions that the attendees might have.
- Collate further feedback from the residents in addition to the formal feedback that was to come via the "Have Your Say" process.

The main issues that came up for discussion related to:

- Consideration of alternative sites.
- Consideration of design and construction options e.g. buried tanks vs above ground tanks.
- Concerns over the loss of amenity values for the affected residents.
- Concerns over CPTED issues.

End of the Have Your Say Campaign (23 October 2017)
At the end of the Have Your Say submission period a total of xxx submissions were received for and against the project with some of the submissions suggesting alternative solutions to various aspects of the project to make the project more acceptable to them.

5. Post Consultation Period (November- December 2017)

5.1. Addressing Submissions Received
Post the Have Your Say submission period the project staff collated all the submission received and provided comments/responses to the concerns raised and also acknowledged changes that could be incorporated into the project design.

One of the main issues raised was consideration of alternative sites and mitigation of the visual impacts.

5.2. Consideration of Alternative Sites
The Council has embarked on a site options assessment study covering a total of seven alternative sites. The site assessment report is still in draft form but has made some preliminary recommendations on which of the seven sites assessed would be best for the suction tank given:

- Social considerations and all the residents' comments and concerns.
- Technical considerations.
- Environmental considerations.
- Financial considerations.

5.3. Advice to the Community Board on Progress (5th December 2017)
The project team met informally with some members of the Community Board on the 5th of December 2017 to:

- Update them on the process being undertaken by the project team to respond to the residence concerns raised via the Have Your Say process.
- Also advise them of the further site assessment work that was been carried out and the preliminary results from the work.

6. Next Steps

The project team is scheduled to make a presentation to the Community Board in their February 2018 meeting to advise them of progress on (i) responding to the residents' submissions and (ii) details of alternative site solutions.

ATTACHMENT 1 – EXISTING AND PROPOSED SITE 1 TANK LOCATIONS

ATTACHMENT 2 – MINUTES OF THE RESIDENTS MEETING HELD ON THE 13 OF JUNE 2017

DRAFT RECORD OF MEETING

File: 3c1456.00	**Sheet:** 1 of 3	**Date:** 13 June 2017	**Time:** 10:00am
Subject	Jeffreys Road proposed Water Reservoir – meeting with Waiwetu St property owners to discuss concept		
Location	47 Waiwetu St and park	**Minutes By:**	S Brown

	Persons Present	Organisation	Copy Received
1.	Brenda and David Anderson	53 Waiwetu St	
2.	Irma and James Buchan	51 Waiwetu St	
3.	Douglas and Gillian Price	47 Waiwetu St	
4.	Meaghan Kelliher	45 Waiwetu St	
5.	Prawindra Mukhia	Project Manager, CCC	
6.	Phillipa Upton	Engagement Advisor CCC	
7.	Hock Yeo	Engineer, Opus	
8.	Tony Gordon	Engineer, Opus	
9.	Stephanie Brown	Planner, Opus (as Gemma off sick)	

Item	Discussion and Action	By Whom	By When
1	**Background** • CCC has stopped using shallow wells for drinking water for health reasons. Deeper wells provide greater security regarding the quality of the water. There are now 4 deep wells on the Jeffreys Pump Station site that are over 100m deep. • The existing water suction tank has been damaged by the earthquake. It cannot be repaired to the required standards and will have to be replaced. It is currently empty and not in use. • Compliance to current design standards requires a larger suction tank (around 500 cubic metres) for a number of reasons. • The aim is to have construction completed by the end of June 2018 • The plan sent with the letter is only a concept – no design has been done • Current tank is approx. 2.0m high above ground and adjacent building approx. 3.0m high	Note all	
2	**Questions / Discussion** There were a series of questions asked of CCC/Opus about options for the design and location of the tank. Residents' main concern is the visual effect of a new tank – height is the key issue.	Note all	

Item	Discussion and Action	By Whom	By When
	Burying Tank Could it be buried? How low could it go? What is the concern about 'security' with a buried tank? *Response*: The current tank is partially buried. Yes, it is possible to partially bury the tank but there are risks. Risk of foul water ingress into the buried tank and contamination of stored water. Council has spent considerable amount of funds in drilling deep wells to avoid contamination of wells. Council needs to also avoid suction tank water contamination. Other risks for below ground tank are: - deeper puts increased pressure on the tank with more lateral spread pressure - increased cost - excavation below ground requires sheet piling and dewatering **Tank size and shape** Is there a particular tank size CCC want? Is there are particular shape required? *Response:* CCC aim is for a 500m^3 tank – to comply with current design requirements. Similar capacity suction tank is being built at another Pump Station site which has only 2 wells. 5.7m height shown on the concept is a tank size from another site. Final design will look into available area and height requirements. Post meeting note: the site that was referred to is the Gardners Road Pump Station. **Tank location** Note that concern about effects on the stream but is there an option to push the tank north in the direction of the park? Also could the playing fields be moved further north? *Response*: If moved to the north, need to consider the large number of park users. Council is consulting with the stakeholders. Initial indication is that Parks personnel do not want to see the footpath moved but can consider for existing planting in front of wire fence to be a more narrowed strip. **Construction** Concerned about construction noise and disruption. *Response* –A below ground installation requires sheet piling which would generate noise and vibration. Sheet piling works could take several weeks.		

Item	Discussion and Action	By Whom	By When
	An above ground tank will have less construction noise. The construction period could be around 6 months. **Noise** Confirmed that noise from current pump house would be the same following installation of the new tank.		
3	**Resource consents** Explained by Steph that resource consent is required as the concept as shown is within the 10m setback from the boundary and within the 'recession plane'. Those present at the meeting would be considered as an affected party and written approval would be required from them. Any written approval would have property owners signing plans that clearly show what would be built including plants (species and location).		
4	**Photos** Steph took some photos from upstairs and view from outside at ground level. Aim is to mark up what certain tank heights would look like. Not best time of day to take photos as directly into the sun. If needed, option provided to go back at a better time. Discussion when at park was that owners did not want a tank higher than the current tank.		
5	**Discussion when at the park** Focussed on where the tank could go, height and plantings that could be used to screen it. Meaghan – looking for planting along west side of current fence. View is from upstairs balcony. The further north the new tank goes on the site the more she will see it from her property. Brenda and David – do not want to see any planting in front of their place where there is currently a gap in planting.		
6	**Other matters** Clemence Drilling – David commented that there is still signage up. Does this mean that there is more drilling still be to done? Concerned given the noise/disruption that went on for some time. *Response* –This could be because they still need to connect up the pipes between the wells. There is no more drilling required for the wells. Pipe in stream bank It was pointed out that there is a pipe from the Council site to the stream bank that over the summer discharged regularly into the stream. *Response* – CCC to investigate why water coming from pipe.	CCC	End June
7	**Next steps** CCC/Opus to go away and think about everything that was heard / discussed and come back with a revised concept for discussion.	CCC / Opus	End June

Appendix B Residents' Concerns/Feedback

8393	I found the turn around for comment after the Wednesday, October 18 information evening restrictively short, especially as there was a holiday weekend in between this evening, and any comments were due on the public holiday. I also find the sense of urgency puzzling as the damage to the existing tank happened during the Canterbury earthquakes some years ago. I do not understand why this is not a publicly notified consent as such a structure in a reserve affects the amenities of the area and thus has the potential to adversely affect property values. The new tank is a change of use on existing reserve land. I feel I am an affected party on that basis. The structure does not fit within the aesthetics of a reserve. It is oversized in terms of height and on that basis will dominate an attractive corner of the existing reserve. It does not appear to be a sympathetic design for a recreational area. The structure will also create a significant Health and Safety hazard as it is designed. The minimal timber veneer with its stairwell will easily be encroached and is far too high for youth or other unsanctioned people to be on should they decide to climb up. Existing attractive vegetation will have to be removed if the tank is placed as per plan. The plan appears to indicate a concrete panel structure. These panels will require some sort of cranage to be erected. Access will need to be arranged and looks likely to be destructive to existing landscaping. I am concerned that the existing pump station and tank will be left as is and would like to see a completed plan for this existing area after the new tank is erected. I would like to see something more sympathetic to the ambience of a reserve designed for this area.
8217	1. The Submitter opposes the proposed site for the Jeffreys Road Replacement Tank (the Replacement Tank) Reasons: 2. The proposed site is opposed for the following reasons: 2.1 the Replacement Tank will have significant adverse visual effects on residents whose properties back onto the reserve; 2.2 the proposed site is adjacent to Wairarapa Stream and the ground conditions are unsuitable for the Replacement Tank; 2.3 the proposed site is inconsistent with the guidelines for crime prevention through environmental design (CPTED principles); 2.4 the proposed site is used by the local rugby club every Sunday morning all season to run drills and warm ups; and 2.5 there are other sites within the reserve that will not have a significant adverse visual effect on residents whose properties back onto the reserve or the public. Visual Effects 3. The Replacement Tank will have a significant adverse effect on the view from the houses and gardens located at 45 and 45A Waiwetu Street. Both houses are two storied and have large windows looking out to the reserve. It is evident that the houses have been designed and sited to allow the occupants to enjoy the view of the reserve. The view from almost every room in the house located at 45 Waietu Street will be of the Replacement Tank. The trees between the proposed site and the houses looking out to the reserve will not disguise or shield the Replacement Tank and many of the existing trees are deciduous. 4. The visual assessment undertaken as part of the assessment of the proposed site does not accurately illustrate the effect the Replacement Tank will have on the view from adjacent houses. The views from the properties at 45 and 45A and 184/184A/190 Clyde Road will be completely compromised (refer to attached plan marked B) 5. Additional planting has been proposed however this would be inconsistent with the CPTED principles (discussed below at paragraphs 10-12). 6. The properties adjacent to the Wairarapa Stream all suffered severe damage as a result of the 2010 and 2011 earthquakes. The house at 184/184A/190 Clyde Road has not yet been repaired and it is likely it will be rebuilt closer to the rear of the sections (significantly closer to the proposed site) as this is the most stable part of the property. 7. Due to the geotechnical issues affecting the proposed site the foundation design for the Replacement Tank is likely to need to be very robust. The works required to install the foundation pose a threat to the adjacent properties. When the two new wells were drilled to the east of the proposed site parts of the river bank fell into the Wairarapa Stream. Earthquake repairs had been completed on the house at 45 Waiwetu Street just prior to the well drilling. The drilling has caused cracks in the kitchen cabinets and stair joins and gib throughout the house now has hairline fractures. The outside concrete and boundary walls have also developed cracks. 8. It is likely that works at the proposed site, which is much closer to the houses at 45 and 45A Waiwetu Street, will cause significant damage. 9. The initial geotechnical assessment undertaken on behalf of the Council indicates that the risk of damage from lateral spreading in an earthquake decreases with distance from the Wairarapa Stream, however the report notes the risk will only be significantly reduced at a distance of 20 metres from the stream. Given this it is difficult to understand why the Council would consider locating the Replacement Tank at the proposed site, which is only 13 metres from the Wairarapa Stream.
8214	The new tank should be partly underground. It should be possible to have about 1/2 above ground and 1/2 underground
8213	I have been a resident opposite the park for 20 years so hope my concerns are considered. The present tank has coped adequately so why change it? 1. Blot on the landscape. The larger tank will of course be seen from residents including myself around the park. The 2 white marking posts indicate the height and breadth of space taken. No amount of planting will camouflage it and does it contravene height restrictions. The size of it will be exploited by the freedom campers and homeless and truants that plagued the park for years and recently abated with the banner at the front of the car-park we residents requested. The proposed tank will be a beacon for illegal behaviour. 2. The proposed 4 wells will overburden the source of water in the area. You will get a severely depleted water table and stream level affecting all stream life and enjoyment. 3. Access to 4 wells will mean that the residents watering their berms x2 daily will think nothing of watering x3 daily. Use water wisely.
8154	What will happen to the old water-tank? What will happen to the old site? I think it is VERY important to think about the consequences of throwing away old tanks and old sites.

8153	I consider the proposed positioning of the replacement water tank is going to be far too intrusive. I feel this could be made less so by: 1. Positioning closer to the southern & western boundaries. There is a very good existing screen of largely evergreen shrubs & trees between the neighbours to the South & West. You refer to a 10 metre setback from boundaries. I measured 11.4 m from the outlined proposed site to the southern boundary. I suggest this measurement could be reduced 3-5 m making for a less intrusive structure & enabling the retention of the existing pathway. 2. Reducing the height of the proposed tank by placing a proportion, say one half in ground. This will be a very obtrusive structure if built to the proposed height of 5m. I was appalled by the time taken to repair the existing tank & pumping equipment post the 2011 earthquake. As a result, appalled also by the amount of water wasted by being diverted into the neighbouring stream.
8152	The proposed site spoils the park like feeling and look. Hopefully the old tank will be demolished and disposed of. A better site would be by the entrance to Thornycroft St
8135	Having been a regular visitor to one of the properties adjacent to the new structure position I think it would be better placed away from residential properties to minimize the incidences of anti social or criminal activities in the area between the tank and the residential properties. There have been incidents in the past when the area had trees and shrubs between the park and the fence with undesirable behaviour which was addressed by clearing the area to a thin border approximately 5 years ago. The new structure position proposal and surrounding greenery would encourage a renewal of these activities which had included lighting of fires creating danger to neighbouring properties. Therefore positioning the structure away from the houses would be preferable.
8132	Please see the attached document. Please also e-mail any correspondence in this respect.
8131	I have concerns about the risk of criminal activity created by the the secluded space between the water tank and trees. An alternative location, reducing this risk and eliminating the eyesore for any residents, should be sought.
8130	Building - We have no objection to the design of the building. Location - In hindsite and after further discussion & consideration with our riverside neighbours, we would endorse the relocation of the tank to that submitted in the submission by Sarah Watson, Solicitor, for and on behalf of the "Jeffreys Reserve Residents Group". Reloction of the Tank to either of the proposed sites near Jeffreys Rd (as per that submission). 1. This would not affect any residents on the park boundaries. 2. Would/could serve as a dual purpose sports facility alongside the tennis court. 3. The Councils proposed site, would then be retained and preserved as a delightful tree lined corner of the Park facility with all its peacefulness for all to enjoy.
8128	I do not support the proposed location of this tank for the following reasons: There has been no proper consideration of the effects on the landscape, local residents, amenity of the park, crime prevention or the earthquake risk next to the river 1. Landscape - the tank is very high and ugly, and does not blend into the environment. There are other sites that could fit more architecturally with the library buildings, for example, and a reduction in height is recommended to blend in to other buildings. 2. Local residents - the position of the tank will block and spoil the open park view for several residents (ourselves especially), and we have houses that are designed with full height glass to look over the park. There are other sites that do not affect anyone's view from their homes, and could be more acceptable 3. Amenity - the current site reduces the available usable park area for users of the park without bringing any advantages to mitigate. A site near the current car park and playground could provide additional sporting amenity with sports walls and extra court space that might be a benefit to the local park users. 4. Crime prevention - the proposed location will create a dangerous secluded environment to attract local vagabonds and drug users, and will replicate the problem that was seen in this corner a few years ago before the bushes were removed. An alternative site without the need for surrounding bushes would not be a risk 5. The proximity to the river, where the land is known to be earthquake prone (see damage to all the houses along this stretch of river) will create unnecessary risk both for the sustainability of the tank, and a concern for the immediate residents which are downhill from the tank, and 6m below the water level. The tank needs to be at least 20 metres from the river to reduce the risk. Additionally, I think the consultation process has been very deceptive, especially since the leaflet that was circulated to our houses (those directly affected by the new location) made no mention that the site had been moved from the existing location, and it was only by luck that we happened to hear about it through our neighbour. Additionally, the drawings are not to scale and misrepresent the size and effects of the proposal. We have the impression that the council are trying to rush through a planning permission quickly and are trying to avoid
8122	Jeffreys Reserve - Replacement water tank Comments: 1.I support the general placement shown for a large â€˜suction tank' for the water supply system. 2.The draft concept plan identifies the tank volume needed is 500m3. However, the volume of 14.5m x 11.3 m x 5m is 819m3. I do not believe the walls will be 2m thick. Why are the dimensions so large for the specified required volume? 3.A round tank would fit better into the same corner. Why is a round tank not being considered? 4.There is security fencing around the existing tank. Why is there no similar secure fencing proposed? 5.What detailed provision is proposed to restrict access to hidden areas behind? Planting with dense spiked vegetation may be better than simply â€œmore plantingâ€. This needs to be a no-go area. 6.Why is a handrail needed around the whole roof when access only appears needed to a limited area? Why not an industrial building access suitably isolated? 7.If there is to be a rectangular building, the east elevation wall has potential as a tennis practice area if provided with an appropriate sealed area.
8114	The proposed fence-line structure recreates an environment conducive to undesirable behaviour in this park.
8099	Whilst I'm all for progress the 5 m height of the proposed water tank is not fitting in with the current environment. Why not place it half underground and half above ground. The location marked on the actual ground in the park is not as per the visuals created. The visuals have it blending into the corner better but the reality is that the tank is very close to the tennis courts. The proposal also says this is a replacement tank implying that the existing tank will be replaced. This however doesn't seem to be the case as all the visuals show that the existing tank is staying. In summary I think the information and visuals have used somewhat an artistic license and my support would be limited to something more like 2-2.5 m high

8098	In the past there has been a lot of anti-social activities in the park. This was reduced by removing some of the planting. This change will introduce a new area of seclusion which will attract people who are inclined towards unlawful night time activities and increase the likelihood of nasty debris. This will be an unwelcome eyesore for the residents and consideration should be given to locating the tank to blend with the existing library building.
8078	I think the main one is the risk of criminal activity created by the secluded space between the water tank and the trees. We used to have real problems in the park before they took out a lot of the planting, with vagabonds, fires, and nasty debris related to night-time activities. We think it should be moved to a location where it doesn't cause criminal problems, or create an eyesore for any residents, and we have some ideas that would blend in well with the library, without reducing green space, while creating some sporting amenities along its walls.
8062	I am against the current proposal, and support the residents plan to relocate the water tank away from their properties. If there is to be an above ground water tank, surely it can be incorporated into Jefferies Park in a way which is more beneficial to all.
8045	NO TO THE CURRENT PLAN
8023	This Council should explore entirely different sites for this tank. It soesn't belong in the reserve. It's unsightly and detracts from its suroundings. It is occasionally an attractor of people who have no business there.
8010	I am against the suggested location of the replacement water tank because of the adverse effects this will create to homeowners bordering the park who purchased their properties with every expectation that they would continue to have a view out over the park rather than a view of the replacement water tank. I understand an alternative location has been suggested and this makes sense to me.
7989	I write to express my concerns regarding the proposed new 500 cubic metre suction tank. For clarity my submission is supportive of the upgrade or replacement of a new tank but not for the proposed location. Therefore my submission is only supportive if a more appropriate location is proposed or found. The proposed location looks to be the easy option and one focused more on cost than the long term benefits for the community. For a number of reasons I believe serious consideration should be given to locating the tank at alternative locations: - Firstly I believe the tank as proposed takes away valuable parkland space. I would not like to see a precedent set of new buildings and plant consuming existing parklands. - With the existing tanks and buildings becoming redundant then I would like to see the council consider using the existing compound. I appreciate this may have cost implications, however I believe the long term benefits to the community outway short term cost. -A second alternative is utilising the existing carpark at the rear of the library. The new tank being 500m2 would comfortably fit in the space leaving plenty of parking spaces in the rear and many more car parking facilities alongside Jeffreys Rd. The rear car parking space must be greater than 5000m2. Therefore the 500m2 required for the building is less than 1/5th of the current space. The CCC holds a strong view of encouraging the community to move from car to cycles. This could be a good example of CCC leading by example and moving the parking dependency away from its staff. Even if just a small percentage of the overall parking requirements. -I do not believe that a 6metre high, concrete structure will "blend" (CCC description) into the environment nor will it "nestle" into the southwest corner. - Visually a 6 metre high concrete structure, including handrails, will be visually imposing and detract from the green environment currently enjoyed. -Lastly I believe the large structure will be inviting to undesirables who may choose to drink, smoke, graffiti, and sleep in the bushes. Bringing rubbish, broken glass, condoms, and other natural consequences as a result of supplying out of sight areas, behind the building, that invite such inappropriate activity to a family dominated community environment. Ultimately the community pay's either way, therefore the community voice should hold significant weight in any decision made.
7978	I am against the current proposal. Firstly, the current 6 meter high design will reduce the amenity of adjacent properties by having access and view of the park impacted. Secondly, the existing trees provide an area along the fence line in which an adult is able to easily stand and groups are often seen loitering there. Placing the structure with its extra planting would further seclude this area (which is currently partially visible from the field and wouldn't be if this plan goes ahead) and would go against CPTED standards and create a problem which is only currently being managed. Other options that do not impact adjacent properties and does not increase the risk of crime would be more amenable, such as an underground tank.
7959	I am not keen on the idea. Its a shame to take up that corner as it is often used for picnics. There has never been any attempt to disguise the old tank which is a terrible eye sore so I would like to know whats planned for that area. Your "after" photo shows the old tank area looking the same!! Why cant you put a new tank in the park area near Thoryncroft Street?
7945	AGAINST: Proposed location would increase the risk of criminal activity created by the secluded space between the water tank and the trees. Preferred location would be in keeping with the existing Jeffreys Reserve structures (Library)

7906	I am opposed to the prospective revamp of the water tower as it is too intrusive (read too tall) for the houses backing onto the park. Can it no be flatter and wider or moved to the 'service' side of the park - ie near the current playground
7904	I am AGAINST the placement of the proposed water tank at Jeffreys Park. I believe the size and position will detract from the dwellings in the area.
7902	A 6 metre high structure will have a huge impact on the river boundary residents who bought their properties with the opportunity for a parklike outlook. Surely this structure could be moved closer to the library where it will have less impact on residents. Tucking it in the corner of the park I would have thought would invite crime. It is a big structure to be able to hide behind, light fires, smoke, drink alcohol, commit rape etc. Why not place it in the current position of the playground using the walls as another opportunity for children to play i.e a tennis volleyboard or basketball hoop or both and relocate the playground to the otherwise very wet area of the park. You would be able to clearly see all sides from this aspect.
7882	I do Not support the current city council plan.
7867	This is a poorly chosen location - it will lead to crime/vandalism between the tank and boundary.
7813	I vote no to the proposed water tank replacement as it will encourage people to sleep rough, undesirable behaviour which is not a safe environment for people using the park especially children. It has been a lot safer and cleaner with no rubbish or condoms around the existing area.
7704	I am against the proposal of the Replacement Watertank. It blocks the views from the properties behind the tank. We understand that this can be relocated and actually used constructively over by the playground. It could become a great sports resource with a tennis volleying wall and a half basketball court. In the time I have lived in Waiwetu St, I have seen the increase in users at Jeffreys Park. The tennis court is used a lot and basketball is the fastest growing sport in NZ and I know it would be a fabulous resource.
7666	Alternatives need to be considered. Suggest adjacent to library on current children's playground
7664	I am against the proposed height and location of the water tank. By locating a high sided structure away from boundary fences, neighbouring properties will be unfairly impacted as well as encouraging anti social behaviour in the area around the water tank. This would pose a risk to the high number of groups of children that use the park for sporting and recreational uses. Why is the tank not being located closer to the library in the current playground area where the only impact will be on car park users and the library. The current playground is in need of an upgrade anyway and it would be more logical for long term spending to run the 2 projects in tandem.
7598	I agree with the placement of the new water tank. It is tucked away in the corner, and it is near other utilities such as the carpark, tennis court and library. It is also away from both playgrounds. It will also be an easy place for construction workers and maintenance workers to access the tank, without having to go down an alleyway or across a bridge. The chosen location is the best possible location in Jeffrey's Reserve for a replacement water tank.

Appendix C Assessment of the Impact on Trees (Prepared by Laurie Gordon)

Jeffreys Reserve Suction Tank – Effects on Trees (P2)

- The site location may require some tree pruning, and possible relocation of juvenile tree (which does not require community board approval).
- It would be best to keep as far away from the trees as possible to keep the works outside of the driplines of the trees.
- Some of the trees near the boundary are more than 10m in height, but if the works are more than 5m from the base of the trees then a resource consent for the trees will not be required.
- Clearance pruning of trees along the access road will be required.
- Locations of any pipes and cables in relation to trees will require confirmation.

Jeffreys Reserve Suction Tank – Effects on Trees (P3)

- The site location will require the removal of one tree for the footprint and possibly a second tree (to be confirmed).
- The removal of both trees will require parks unit and community board approval.
- Resource consent for the tree removals will not be required, as both are less than 10m in height and not within the waterway setback (more than 10m from the waterway edge).
- Clearance pruning of trees along the access road will be required.

Jeffreys Reserve Suction Tank – Effects on Trees (P4)

- The site location will require the removal of two trees and a smaller cabbage tree for the footprint, plus a possible tree removal for access (in poor condition).
- The removal of the trees will require parks unit and community board approval.
- The trees are less than 10m in height and not within the waterway setback (more than 10m from the waterway edge), so a resource consent will not be required for the removal of the trees.
- Clearance pruning of trees along the access road will be required.

Jeffreys Reserve Suction Tank – Effects on Trees (P5)

- The site location is likely to require the removal of at least four trees for the footprint, plus a possible tree removal for access (in poor condition) and possible extensive pruning of remaining trees for the works and site access.
- The extent of pruning would require approval from the parks unit.
- The removal of the trees will require parks unit and community board approval.
- A resource consent will be required for the removal of four trees as they are more than 10m in height, plus possible works within 5m of trees that are more than 10m in height.
- Clearance pruning of trees along the access road will be required.
- Locations of any pipes and cables in relation to trees will require confirmation.

Jeffreys Reserve Suction Tank – Effects on Trees (P6)

- The site location will require the removal of one tree, plus the possible removal of two trees for the relocation of the sports field and one tree due to the mound.
- The removal of the trees will require parks unit and community board approval.
- A resource consent would not be required for the tree removals, if all are less than 10m in height (tree height requires confirmation).
- The mound will be within the vicinity of five trees. One tree may require removal, and the potential effects on the remaining trees are to be confirmed.
- The earthworks for the mound will require a resource consent, if within 5m of one tree that is more than 10m in height.
- Clearance pruning of trees along the access road will be required.
- Locations of any pipes and cables in relation to trees will require confirmation.

Jeffreys Reserve Suction Tank – Effects on Trees (P7)

- The site location will require the removal of one tree, plus the possible removal of one tree for the relocation of the sports field (in poor condition).
- The removal of the trees will require parks unit and community board approval.
- A resource consent would not be required for the tree removals, if less than 10m in height (the height of one tree requires confirmation).
- The earthworks for the mound will require a resource consent, if within 5m of one tree that is more than 10m in height (tree heights and potential effects require confirmation).
- Clearance pruning of trees along the access road will be required.
- Locations of any pipes and cables in relation to trees will require confirmation.

Jeffreys Reserve Suction Tank – Effects on Trees (P8)

- The site location will require the removal of one tree, plus the possible removal of one tree due to the mound, and one tree for the relocation of the sports field (in poor condition).
- The removal of the trees will require parks unit and community board approval.
- A resource consent would not be required for the tree removals, as they are less than 10m in height.
- The earthworks for the mound will require a resource consent, if within 5m of two trees that are more than 10m in height (tree height requires confirmation).
- Clearance pruning of one tree for the works may be required.
- Clearance pruning of trees along the access road will be required.
- Locations of any pipes and cables in relation to trees will require confirmation.
- The tree that is north of the site and shown as a possible tree removal is not shown on the P8 drawing.

Jeffreys Reserve Suction Tank – Effects on Trees (P9)

- The site location will require the removal of at least one tree, plus the possible clearance pruning of remaining trees for the works and site access.
- The tree removals will require parks unit and community board approval.
- A resource consent will be required for the removal of one tree as it is more than 10m in height, plus possible works within 5m of trees that are more than 10m in height.
- Clearance pruning of trees for access will be required, which may be significant for some trees within the car park (if the car park is used).
- Locations of any pipes and cables in relation to trees will require confirmation.

Jeffreys Reserve Suction Tank – Effects on Trees (P10)

- The site location will require the removal of one tree (unless the tree can be relocated).
- The mound will be within the vicinity of approximately eight trees. Five trees may require removal, and the potential effects on the remaining trees are to be confirmed.
- The removal of the trees will require parks unit and community board approval.
- The earthworks for the mound will require a resource consent, if within 5m of three trees that are more than 10m in height (tree height requires confirmation).
- Clearance pruning of trees for access will be required.
- Locations of any pipes and cables in relation to trees will require confirmation.