REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

Report 4: A Draft Strategy for the Collective Management of Biosolids – Lower North Island

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Regional Biosolids Strategy – Lower North Island

Report 4: A Draft Strategy for the Collective Management of Biosolids – Lower North Island

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1 EXECUTIVE SUMMARY

1.1 Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and beneficial end-use. The strategy is led and co-ordinated by a collaborative management team of Lowe Environmental Impact (LEI), Massey University and The Institute of Environmental Science and Research Ltd (ESR).

A stock-take and gaps analysis was undertaken in year 1 (Stage 1 Gap analysis; Task 1a Desk top study, and Task 1b Site visits and field investigations) of this research programme and highlighted the scale of the sludge problem in the region as well as areas where councils could potentially work together to manage their sludge (Stage 2 Opportunities to Work Together; Task 2a Opportunities to Work Together). Initial 'straw-men' strategies (Stage 4 Scenario Evaluation;
Task 4a Development of 'straw men' scenarios and 4b Workshop Discussion) were developed and progressed through discussion to the development of draft strategies for the collective management of biosolids for the Lower North Island.

1.2 Scope

The purpose of this report is to summarise the findings of the project so far and highlight how this information has been used to develop a draft strategy for collective management of biosolids for the Lower North Island. This report addresses Activity 3 Biosolids Strategy: Produce a Finalised Draft Strategy for circulation to Council and MfE.

1.3 Key Findings

- A draft strategy for the potential collective approach for sludge management (Lower North Island) has been developed through the collaboration between project partners (LEI, Massey and ESR) and ten Lower North Island councils.
- A general overview of the developed strategy is presented as well as more specific details of how this strategy applies to different regions.
- The strategy has a focus on collective management and beneficial end-use and has sought to incorporate variations for different regions requirements.
- Presentation of the strategy to Council Partners (by email and at the Governance Group meeting 18th September 2018) was well received and minor amendments were made to the strategy diagrams.
- Council Partners would like to see the inclusion of cost comparisons and end-use options in the final strategy document.
- Councils are committed to working together and to developing sustainable end-uses for their sludge
- Supplementary information for a strategy could include
    - Shared regulatory framework
    - Practical guidelines for analysis
    - Community engagement frameworks
    - A framework for the continued sharing of knowledge

2 INTRODUCTION

2.1 Background

Ten lower North Island councils are working in partnership to develop a biosolids strategy that includes a potential collective approach for sludge management and the development of a beneficial end-use programme. The strategy is led and co-ordinated by Lowe Environmental Impact (LEI) along with partners from The Institute of Environmental Science and Research Ltd (ESR) and Massey University (the project team). It aims to consider economies of scale and alternatives for discharge and beneficial use of biosolids which are affordable, sustainable and provide targeted solutions that are consistent with national waste minimisation strategies.

2.2 Project progress

Initial stages of the project undertook a stocktake and gaps analysis (Stage 1 Gaps analysis) to determine the scale of the current sludge problem for each district (Figure 2.1). From the gaps analysis, potential areas for collaboration and common problems faced by all councils were identified (Stage 2: Opportunities to Work Together, Figure 2.2).

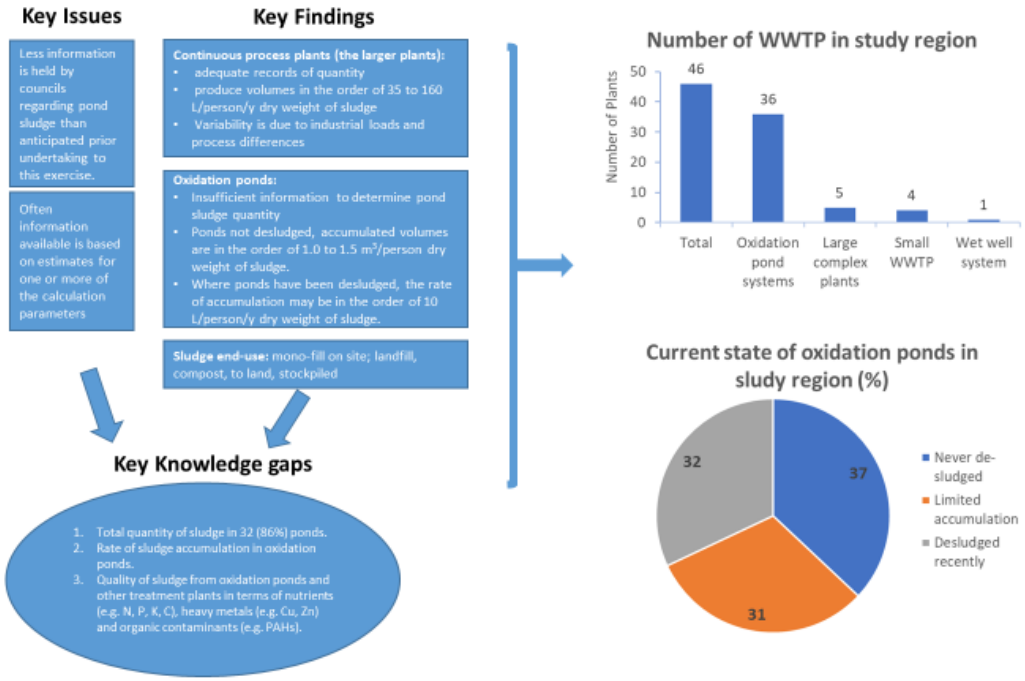

Figure 2.1: A summary of findings from Stage 1 Gaps analysis

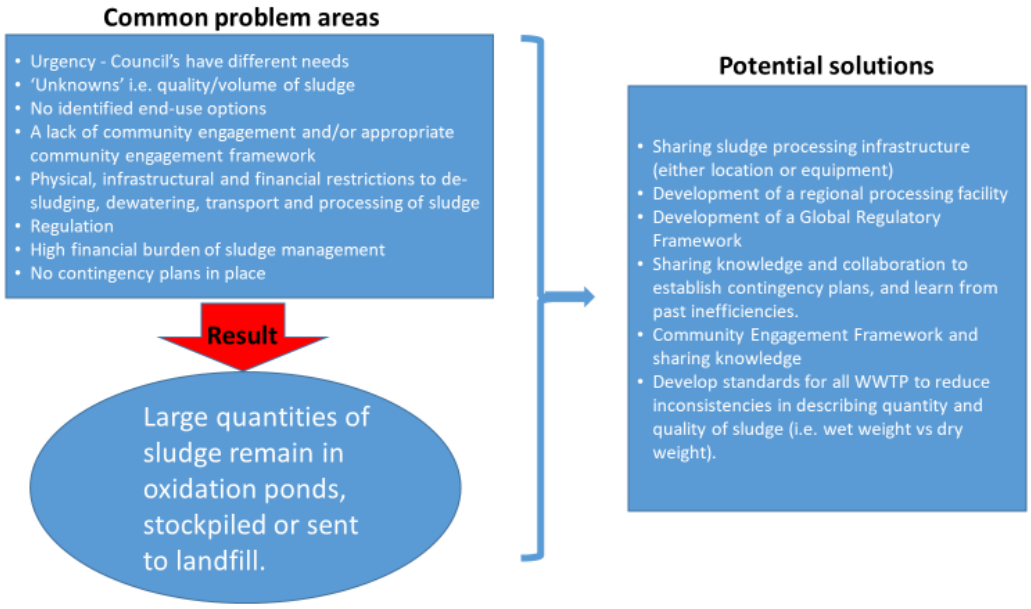

Figure 2.2: A summary of findings from Stage 2, Opportunities to work together.

2.3 Strategy Development

Together with the project team, representatives from 10 lower North Island Councils assessed the collated information to formulate possible scenarios for how councils might work together to manage biosolids in the region. During this stage (Stage 4 Scenario evaluation, Task 4a Development of 'straw men' scenarios), three chosen scenarios were outlined and compared. These three scenarios can be seen in Section 3 of this report. A workshop was held between Council and Project partners (1st December 2017) to evaluate these scenarios and the resulting discussions formed the basis of a draft strategy (Stage 5 Draft Strategy, Task 5b Development of a Draft Strategy (Section 4)).

2.4 Draft Strategy for Collective Biosolids Management

The purpose of this report is to address Stage 5 Draft Strategy (Task 5b Development of a Draft Strategy), by presenting a draft strategy for review (Section 4) followed by information that is seen as essential to include in a final strategy (Section 5). A strategy summary (Figure 4.1) and region-specific flow diagrams (Figures 4.2-4.7) with associated costings will be pulled together with supplementary information as outlined in section 5 to allow partner councils to determine the preferred way forward for a final collective biosolids strategy.

3 STRAWMEN SCENARIO EVALUATION – STAGE 4

3.1 Straw Men Scenarios – Overview

Discussions between member councils and the project team (MfE Regional Biosolids Strategy Governance Group Meeting, 1st December 2017) identified three scenarios for initial investigation. A brief outline of these scenarios can be seen in figure 3.1.

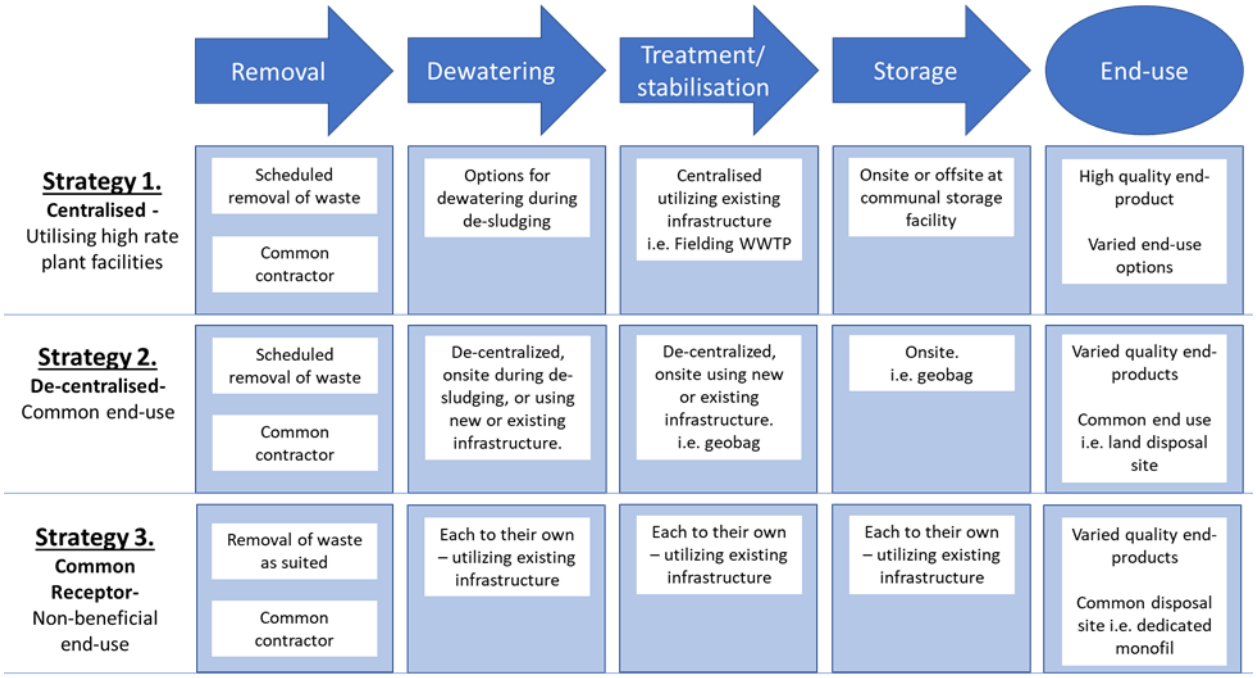

Figure 3.1: Overview of three potential collective strategies for the Lower North Island.

The three scenarios were chosen to cover a broad range of options but were not intended to reflect all possible scenarios for collective management. A final strategy may use all/part or a combination of the strategies 1-3 above as determined to be most beneficial. These strategies were further broken down and estimated costings applied for comparison. Diagrammatic representations of these three strategies can be seen in Figures 3.2-3.4 below. Detailed pros and cons tables for each strategy were developed to aid discussion (Appendix A).

There are commonalities between strategies evident. In particular, all three make use of a potential 'common contractor' for either de-sludging, de-watering or transportation. Utilising a common contractor was seen to have potential to reduce associated costs and improve efficiency/streamline processes.

The principle basis of **Strategy 1** (Figure 3.2) is the communal use of existing infrastructure at an identified high rate WWTP for the dewatering and treatment/stabilisation of sludge from smaller community WWTPs. It was determined that by utilising one (or more) main treatment facility the chance of producing a high-quality end-product with greater potential for re-use is more likely. In this scenario a 'high quality end-product' is defined as meeting Grade A in the current NZ Guidelines for the Safe Application of Biosolids to Land (NZWWA, 2003).

Strategy 2 (Figure 3.3) focuses on independent treatment but with a common end-use; in this case a communal land discharge site is suggested. The main driver for Strategy 2 is a common, beneficial end-use with less associated costs than landfill or independent discharge. Geobags have been highlighted as a valuable de-watering and stabilising technique (Stage 1 T2b, Site and field investigations) and have been recommended here.

Strategy 3 (Figure 3.4) represents the 'status quo' in terms of discharge practice in many cases. Including the use of a common contractor and utilising one preferred discharge site (i.e. Bonny Glen or Levin landfill) may reduce associated costs through a reduction in consenting requirements and reduced landfill fees.

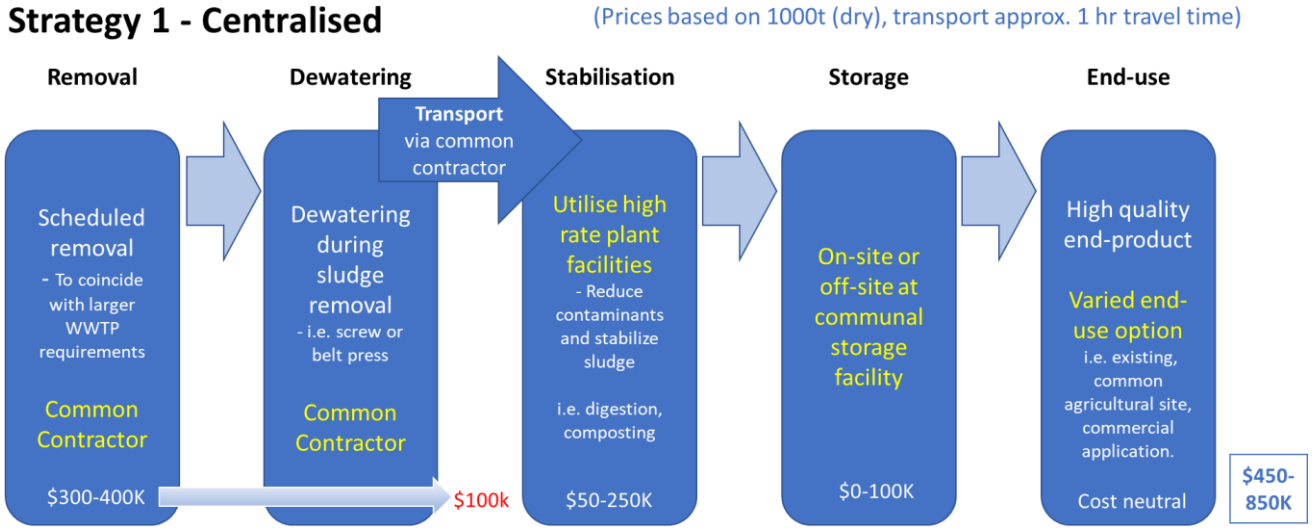

Figure 3.2. Overview of 'strategy 1: Centralised treatment' for collective management of biosolids for the Lower North Island.

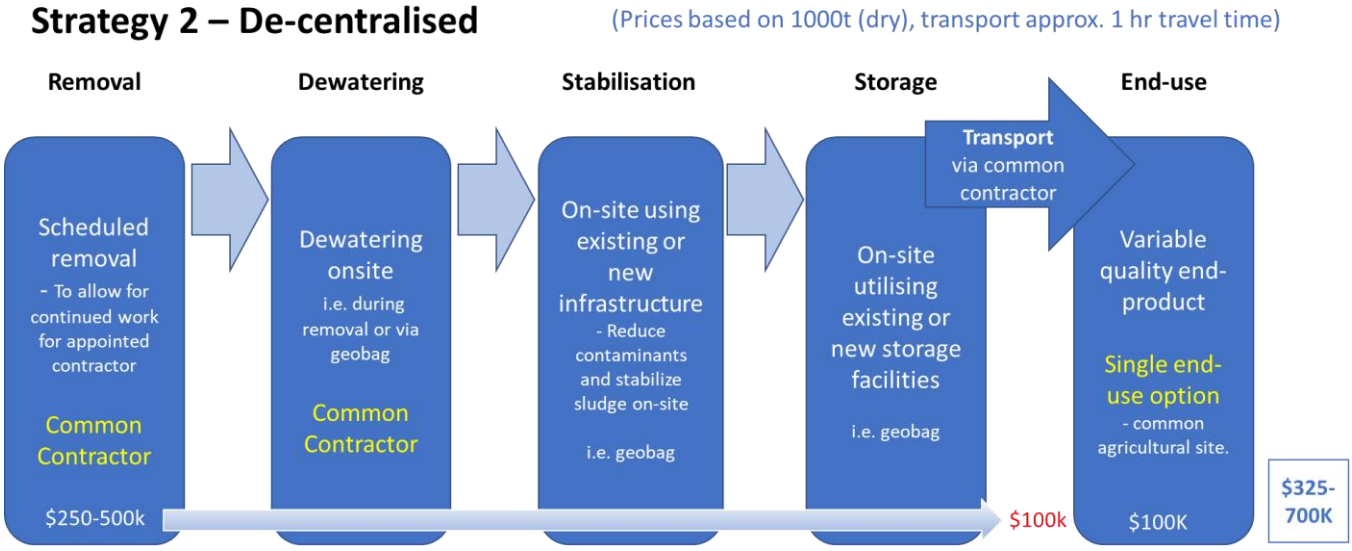

Figure 3.3. Overview of 'strategy 2: De-centralised treatment' for collective management of biosolids for the Lower North Island.

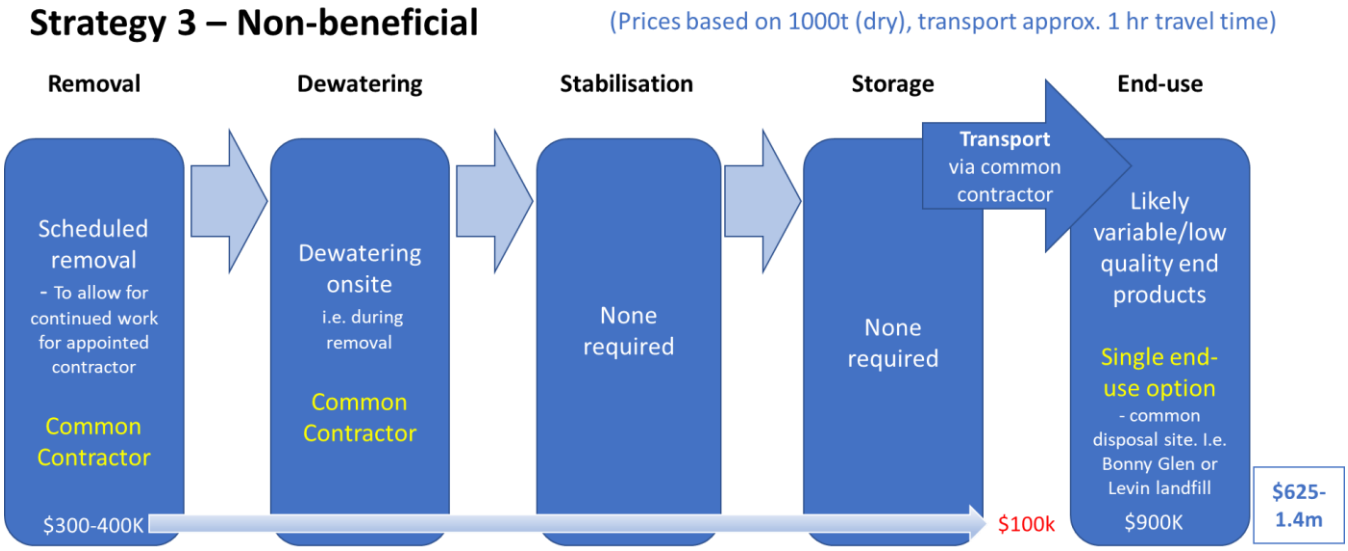

Figure 3.4. Overview of 'strategy 3: Non-beneficial' for collective management of biosolids for the Lower North Island.

4 DRAFT REGIONAL BIOSOLIDS STRATEGY

4.1 Introduction

A draft strategy for the potential collective approach for sludge management (Lower North Island) has been developed through the collaboration between project partners (LEI, Massey University and ESR) and ten lower North Island councils. A general overview of the developed strategy is presented in Figure 4.1, with more specific details of how this strategy applies to different regions in Figures 4.2 - 4.7.

The strategy has a focus on collective management and beneficial end-use and has sought to incorporate variations for different regions requirements. The following sections (Sections 4.2 – 4.7) provide diagrammatic representation and further explanation of these strategies.

The diagrams to follow include pathways that highlight where the previously discussed 'straw-man' scenarios (Section 3) fit into the new strategies. These are observed as follows:

Strategy 1 – Centralised	Orange
Strategy 2 – De-centralised	Blue
Strategy 3 – Non-beneficial end-use	Green

4.2 Strategy overview

Figure 4.1 provides a general overview of the proposed collective strategy for the region. This flow diagram is intended to be brief, by showing only the main pathways, and does not outline all the possible scenarios. For further information of council specific strategies see sections 4.3 – 4.8.

Each stage within the pathways will be discussed along with end-use definitions and options.

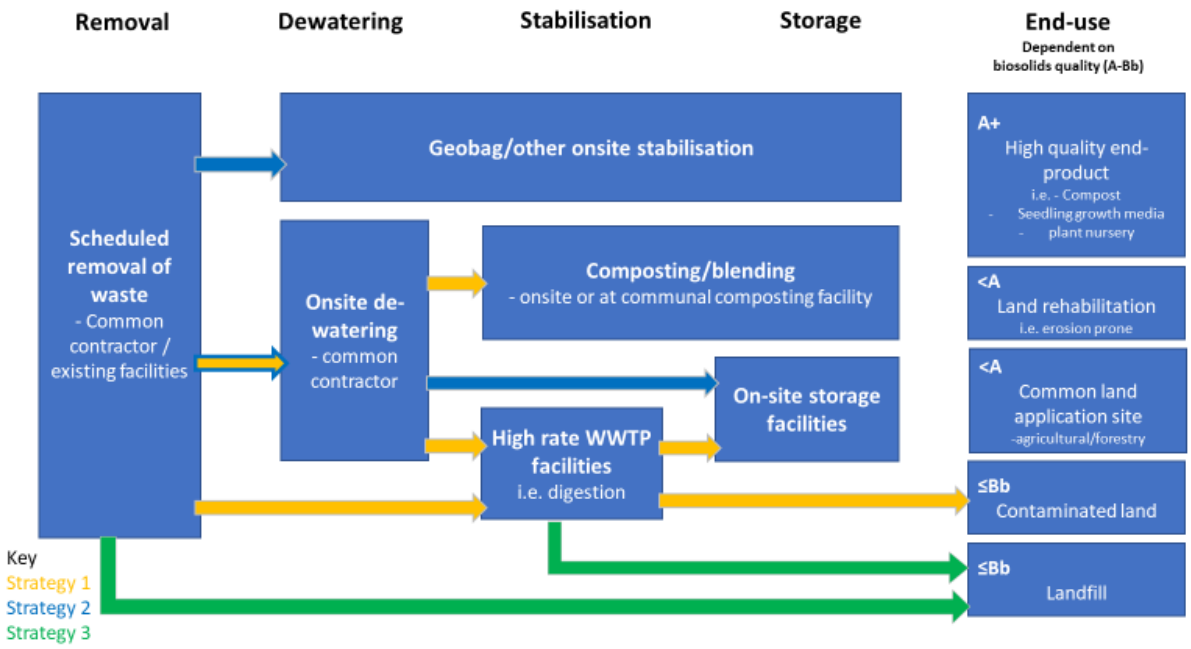

Figure 4.1. An overview of the potential Lower North Island Regional Biosolids Strategy

4.2.1 Removal

Removal will vary according to the current infrastructure and practices at each individual WWTP. High rate plants utilise clarifiers and removal is ongoing. Whilst a common contractor is likely to be beneficial to those needing desludging of oxidation ponds or removal of on-site stockpiled sludge.

4.2.2 Dewatering

There are two main processes for de-watering on-site; mechanical or passive. In a situation where geobagging is determined to be the most beneficial technique for stabilisation, dewatering will be passive and will occur as part of the treatment process (in geobags). However, if transport of sludge is required, onsite mechanical de-watering could be achieved via a common contractor at the time of desludging.

For high rate WWTP, dewatering is likely to be part of existing treatment plant processes. The level to which sludge requires dewatering is dependent on the determined end-use, and in some instances current practices for drying sludge may be deemed redundant if the identified end-use option does not have a requirement for it.

For example: KCDC historically heat treat sludge for ease of transport and to reduce moisture for transfer to landfill. If the current heat treatment processes were made redundant, it may

introduce more potential end-uses and remove an unnecessary cost. i.e. sludge can be transferred to a composting site directly from the digester with no requirement for heat treatment.

4.2.3 Stabilisation

Three primary stabilisation mechanisms have been identified. These include; on-site geobagging of oxidation pond sludge, utilising existing infrastructure (high rate treatment facilities, i.e. digestion) and existing composting facilities at two main sites (MDC and PNCC). The level of stabilisation required is directly related to the chosen end-use. It is clear that in order to choose a pathway for stabilisation there are three main questions to be answered before processing should commence.

1. What facilities are available? i.e. existing treatment facilities, space for geobagging, access to composting
2. Is there more benefit to using independent or collective stabilisation?
3. What is the identified end-use and desired end-product quality?

4.2.4 Storage

In the case of geobags, storage is in combination with stabilisation. In all other cases storage will be determined by end-use and space availability.

4.2.5 End-use

All end-use options can be achieved either individually or collectively. There may be a benefit to working collectively in many instances (lesser economies of scale) and this is reflected in the following diagrams (Figs. 4.2 – 4.8). It has been made clear through the strategy development process that determining the preferred end-use is a major driver for deciding on a treatment pathway. By determining end-use first, councils can avoid treating sludge to a higher grade than is necessary, and in turn reduce associated costs. In addition, requirements for consenting (costs) are determined by end-use and biosolids quality requirements.

<u>High quality end-product</u>
Many options for high quality end-products have been discussed and councils expressed an interest in the potential for beneficial re-use and possible generation of revenue. For a high-quality end-product sludge must be treated/stabilised to grade A as described in the NZ Biosolids guidelines (NZWWA, 2003). If treatment is sufficient there are numerous potential end-uses i.e. commercial composts, native plant nurseries or seedling growth media. To treat sludge to such a quality it is likely that composting or blending of sludge will be required.

<u>Land rehabilitation</u>
Land rehabilitation focuses on non-productive land that is nutrient depleted, low quality soil or erosion prone. By amending low quality soils with biosolids it can improve fertility, soil structure and/or help to reduce erosion. Sludges for land rehabilitation do not need to be treated to grade

a (grade b is sufficient[1]) as long as necessary restrictions are put in place. A communal site for land rehabilitation can reduce costs by enabling a single resource consent as well as potentially improving unproductive land (i.e. sand dunes) for future use.

Common land application site

A shared land application site would enable a single resource consent which would be more cost-effective than multiple individual sites. In the examples given, a common land application site is defined to be either agricultural or forestry, where biosolids will be used as a valuable source of nutrients for plant growth. Biosolids for this end-use need to be above a grade B and the level of stabilisation depends on whether the application site is forestry or agriculture, as well as whether there is access by people or livestock. A site will need to be identified before the requirement for stabilisation can be determined.

Contaminated land application

Application of biosolids to contaminated land is not considered a means to 'dispose' of contaminated sludge to already contaminated sites. The addition of biosolids to sites that are contaminated can help to re-condition soil and reduce leaching of existing contaminants. In addition, a lower grade of biosolids (≤ grade B) can be applied given that the site will not be used for food production and it is easy to maintain restrictions on land use or access by people. In some cases, councils have large amounts of land that are already un-useable that may be appropriate for biosolids application.

Landfill

Landfill disposal is the least sustainable in terms of waste minimisation. In many instances landfill disposal is already common-practice, so it would cause little disruption to processes or change. However, based on the estimated costs (strategy 3; non-beneficial) it is also one of the most expensive disposal methods. There is the potential for council partners to agree to dispose waste to a nominated landfill for reduced rates. It is considered that this would be a temporary solution as landfill space will run out in time and costs will become prohibitive.

[1] Grade B sludge contain higher levels of potentially pathogenic organisms and higher levels of contaminants (e.g. heavy metals), activity constraints and site management is required and can be found in the Guidelines for the Safe Application of Biosolids to Land in New Zealand (NZWWA, 2003).

4.3 Manawatu District Council/ Rangitikei District Council

Manawatu District Council (MDC)/ Rangitikei District Council oversees 14 small to medium WWTP's consisting primarily of oxidation pond systems and the Fielding WWTP. The Fielding WWTP is a high rate treatment facility consisting of digestors as well as on-site composting. During discussions it was proposed that collective treatment could be achieved by Fielding WWTP accepting other facilities oxidation pond sludge which is reflected in the strategy (Figure 4.2). Oxidation pond sludge and stockpiled sludge is covered in section 4.7.

4.3.1 Proposed Strategy for MDC

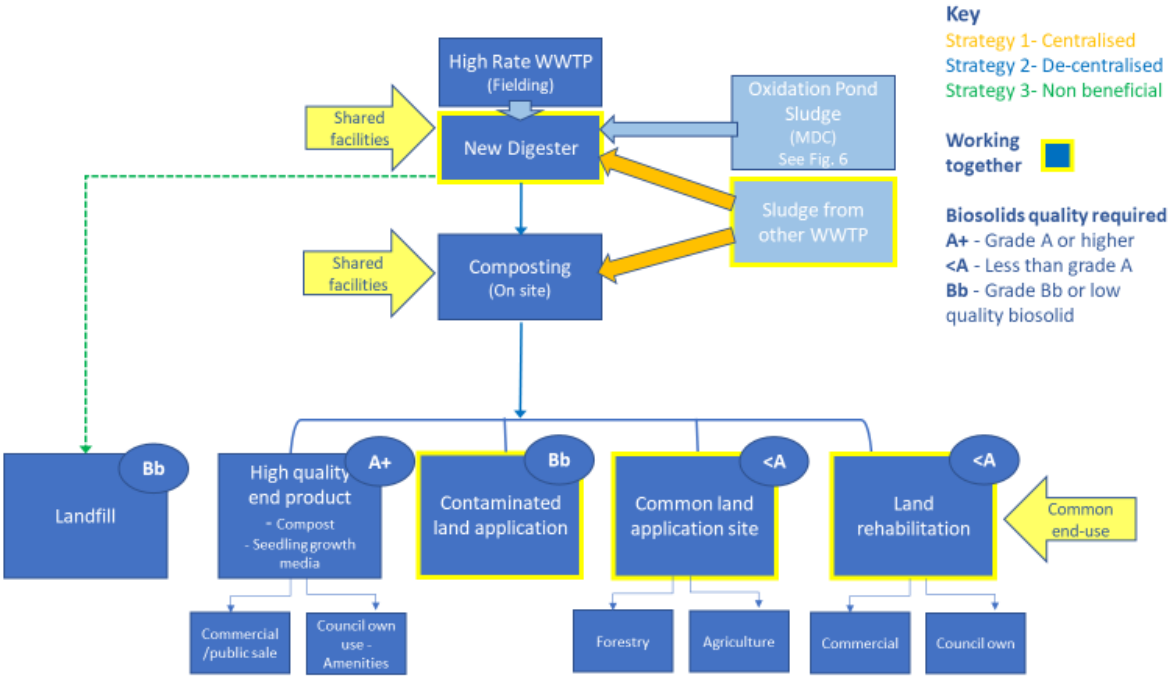

Figure 4.2. A Potential Draft Biosolids Strategy for the Manawatu/Rangitiki District Council – Fielding WWTP

4.4 Horowhenua District Council

Horowhenua District Council (HDC) manage 5 small to medium WWTP's consisting primarily of oxidation pond systems and the Levin WWTP. The Levin WWTP is a high rate plant that generates digested sludge which is landfilled on a weekly basis. Many collective management options are available for the Levin WWTP as can be seen in the strategy below. Oxidation pond sludge and stockpiled sludge is covered in section 4.7.

4.4.1 Proposed Strategy for HDC

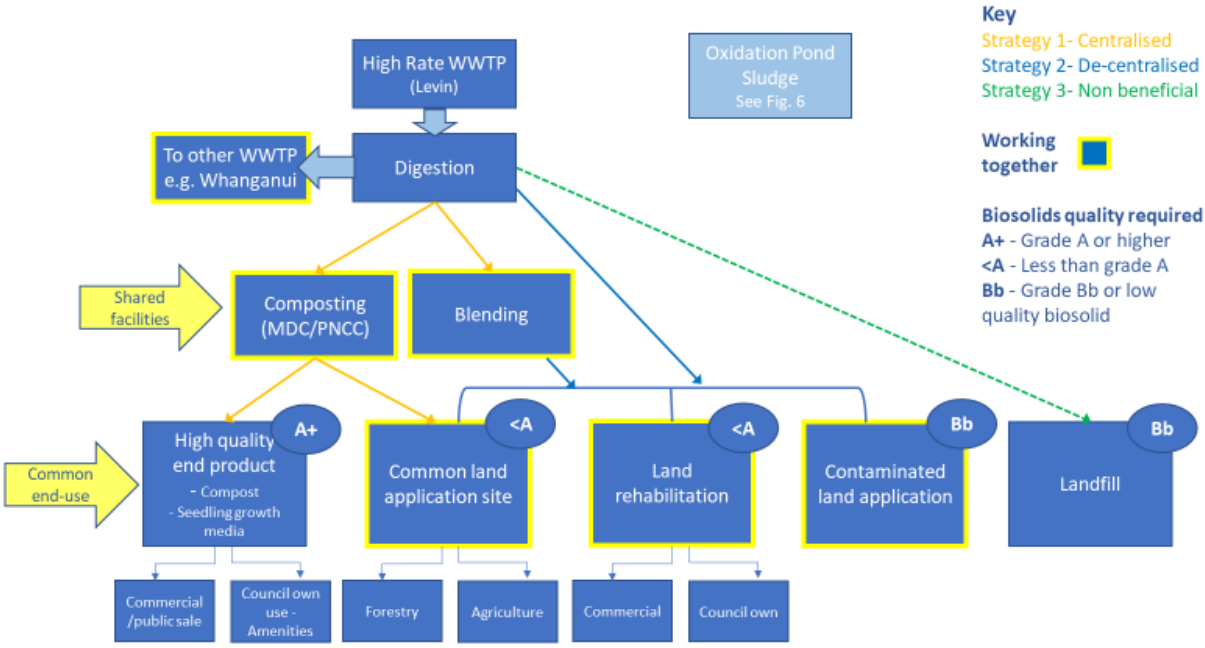

Figure 4.3. A Potential Draft Biosolids Strategy for the Horowhenua District Council – Levin WWTP

4.5 Whanganui District Council

Whanganui District Council (WDC) sludge is processed at Airport Road WWTP. Airport Road WWTP is a high rate plant with de-watering and thermal drying facilities. Sludge from the WWTP is currently stored on-site, however, this space will soon run out. Options for end-use for this sludge is presented in the strategy (Figure 4.4), as well as the potential for WDC to accept sludge from other WWTP for the purpose of treatment to a better-quality product.

4.5.1 Proposed Strategy For WDC

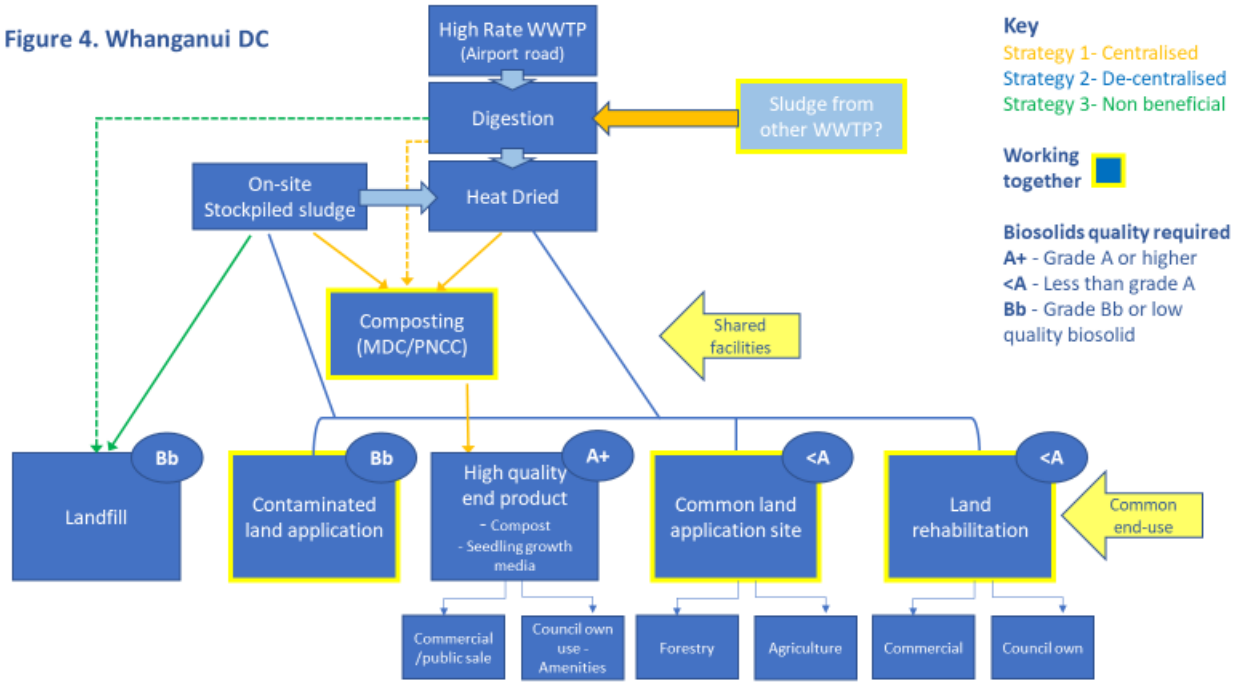

Figure 4.4. A Potential Draft Biosolids Strategy for the Whanganui District Council – Airport Road WWTP

4.6 Palmerston North City Council

Palmerston North City Council (PNCC) process all sludge at the Totara Road WWTP. Totara Road is a high rate treatment plant, digested sludge is dewatered and then composted before transporting to landfill where it is used for topping. There may be capacity for PNCC to accept other WWTP sludge into either the treatment facilities or composting process as is reflected in figure 4.5.

4.6.1 Proposed Strategy for PNCC

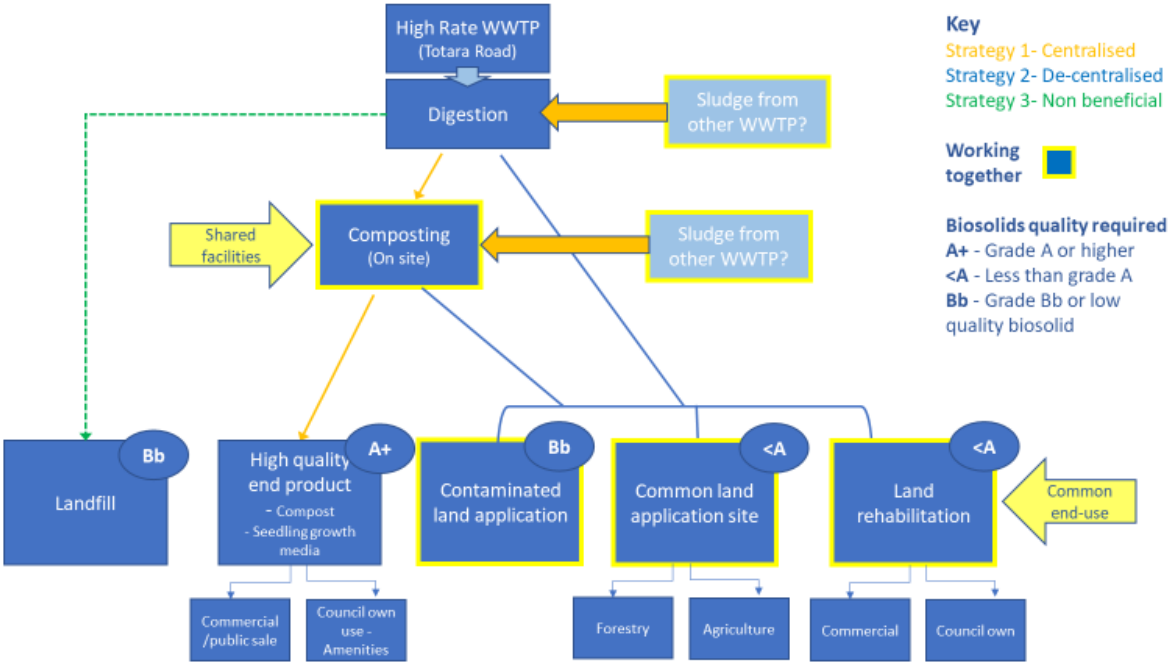

Figure 4.5. A Potential Draft Biosolids Strategy for Palmerston North City Council – Totara Road WWTP

4.7 Kapiti Coast District Council

The Kapiti Coast District Council (KCDC) has two WWTP's, Paraparaumu and Otaki. Paraparaumu WWTP is a high rate treatment plant producing heat treated biosolids that currently goes to landfill. The ponds at Otaki WWTP are used for processing the liquid content only, with the primary sludge processed by clarifier, centrifuged and transported by tanker to the Paraparaumu WWTP where it is processed with the inlet flow. Old sludge remains onsite at Paraparaumu in six decommissioned oxidation ponds. Strategy 4.7 can be applied to this sludge depending on its quality.

4.7.1 Proposed Strategy for KCDC

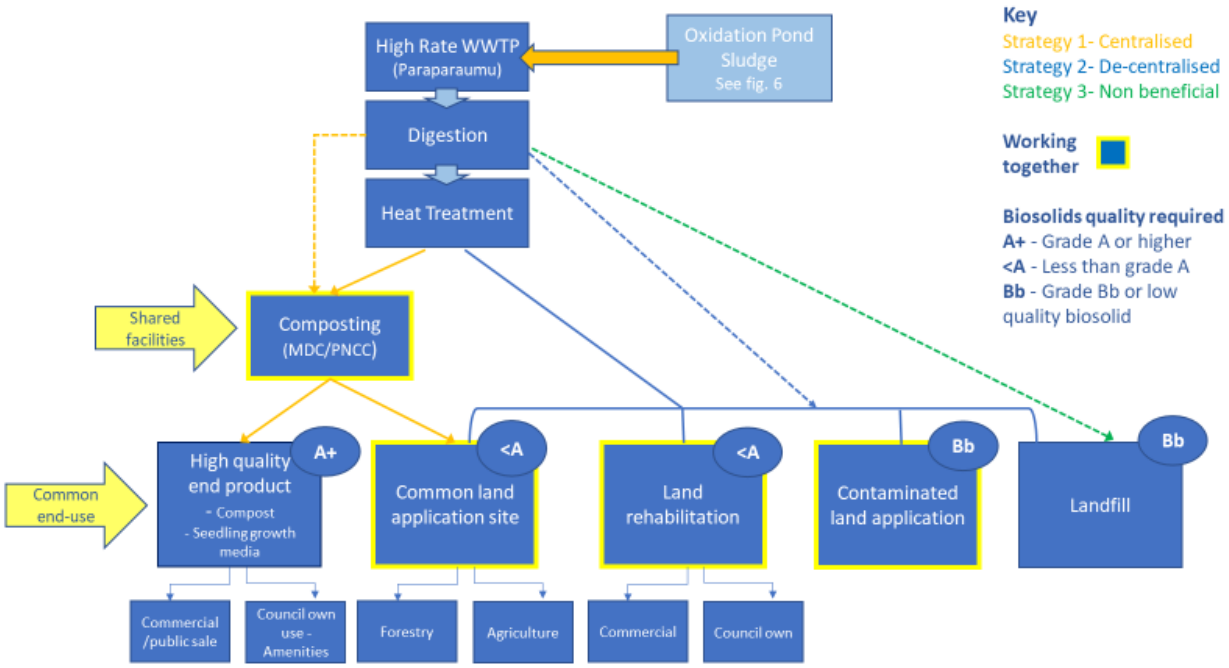

Figure 4.6. A Potential Draft Biosolids Strategy for Kapiti Coast District Council – Paraparaumu WWTP

4.8 Lower North Island Oxidation Ponds Systems

Within the study region there are several wastewater treatment plants that rely primarily/solely on oxidation pond systems for wastewater treatment. As such, many require management of oxidation pond sludge in varying stages/states of maturity, moisture and quality. The Councils and WWTPs who require oxidation pond sludge management are as follows:

- Masterton District Council – 4 sites
- Horowhenua District Council – 5 sites
- Manawatu District Council – 14 sites
- Tararua District Council – 7 sites
- Ruapehu District Council – 5 sites

In addition, many WWTP have stockpiled sludge on-site. Where it is deemed necessary for this sludge to be moved off-site it can be treated as dewatered sludge/geobag sludge for the purpose of strategy 4.7 (depending on sludge quality and moisture content). There are numerous means for collective management of oxidation pond sludge and these are outlined in Figure 4.7.

4.8.1 Proposed Strategy for oxidation pond and stockpiled sludge

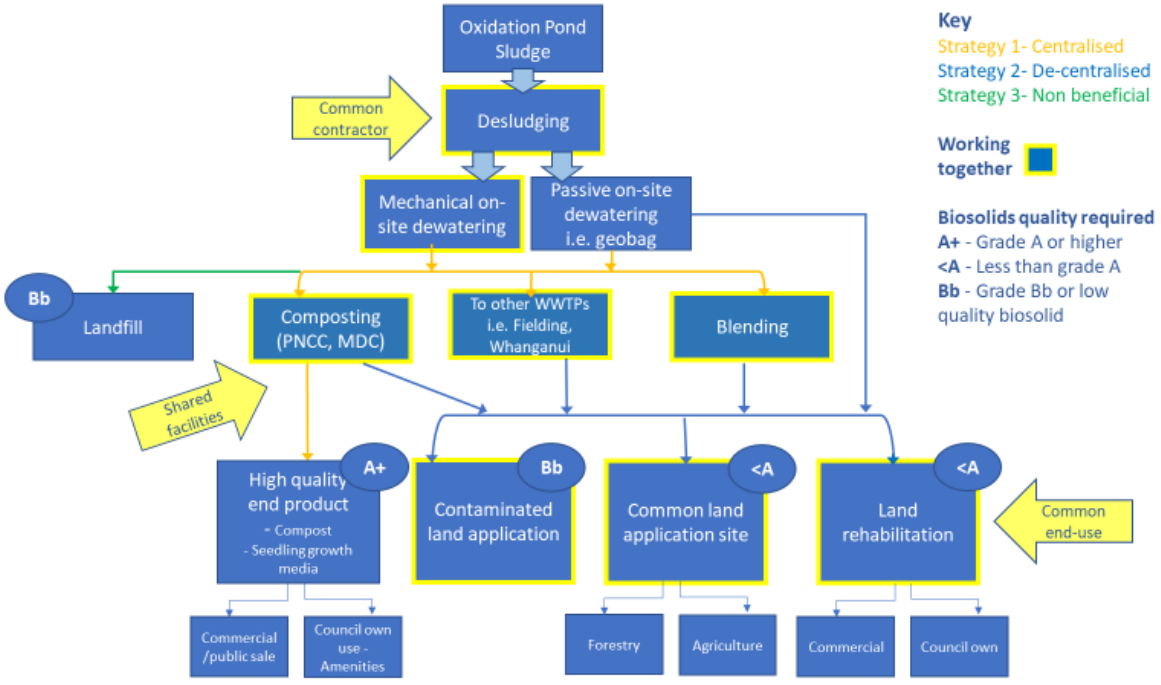

Figure 4.7. A Potential Draft Biosolids Strategy for Oxidation Pond Sludge

5 REGIONAL STRATEGY – SUPPLEMENTARY INFORMATION

5.1 Introduction

A final joint biosolids regional strategy document may include a number of supplementary documents that represent a 'toolbox' for better working together and streamlining of processes. Some of the suggested supplementary information is outlined in sections 5.2-5.5 below. Included in this section are components that were indicated to be of interest to Partner Councils in the Governance meeting (GG Meeting, 18 Sep 2018) and considered to them to be essential to include in the final strategy.

5.2 Suggested by Council Partners

It was determined through discussions (GG Meeting, 18 Sep 2018) that Councils see a number of aspects as essential to include in a final strategy document. These items are outlined below.

5.2.1 Financial comparisons

Council would like to see a better breakdown of costs associated with each pathway. The cost (and economies of scale) is a likely driver for determining end-use. If working together shows evidence of being financially beneficial then that will significantly influence Council decisions.

5.2.2 End-use options

Whilst there have been several end-use options explored through the strategy development, Council Partners suggested that it would be useful to have a full list of potential end-use options available for the region.

5.3 Continued Sharing of Knowledge

A final biosolids strategy may include a 'Strategy for Shared Knowledge'. Within every strategy scenario there is a need for continuous sharing of knowledge. A protocol for maintaining this may include the following:

- Frequent meetings. Suggestions for a yearly meeting of council representatives (e.g. GG) where discussion on recent changes and requirements can be carried out; this may facilitate cost reductions and encourage working together and keep councils up to date with new/decommissioned equipment or opportunities that they may not have been aware of.
- Collation of data. It is suggested that there needs to be a central location where up to date information on sludge quality and quantity at each site can be documented for easy reference. It is important that the knowledge gained through the regional biosolids strategy development be maintained to understand future requirements for biosolids management. A central repository for this information could be Horizons Regional Council.

5.4 Shared Approach to Managing the Regional Regulatory Framework

It has been identified through the strategy development process that consenting and regulatory requirements are one of the most prohibitive costs associated with biosolids management. The project team have suggested that a final strategy should include a shared approach to managing the current regional regulatory framework that would allow individual councils to work together in obtaining consents to reduce overall cost to individual councils.

It has been suggested that Horizons RC may be able to develop this framework.

5.5 Community/iwi Engagement Frameworks

A satisfactory understanding of the processes and requirements when working with iwi and community groups is essential. A community engagement framework would be beneficial before strategies for regional biosolids re-use can be finalised, however, through the process of this project it has been noted that there is no 'on size fits all' strategy for community engagement. One thing that is universal is that it is fundamental to the success of any strategy that the community engagement process begins before any physical aspects of the discharge system are put into practice or implemented. Any engagement framework established needs to be fluid, with the ability to adapt to differing communities, in particular taking into account local and regional iwi views and concerns. It should always be a process of working together to develop a strategy and not a process of developing a strategy to be presented for consideration.

5.6 Guidelines

A final strategy should include a guideline document explaining processes and procedures for managing biosolids in the region. This should be a document that is applicable to all councils.

The guidelines should suggest ways to streamline processes and have consistency across councils. It will include a protocol that includes universal procedures, processes, reporting units and suggested testing requirements (i.e. frequency and what to test) to eliminate discrepancies between councils and allow for better comparisons and identification of opportunities to work together. There is the potential to reduce analytical costs if councils coordinate analysis requirements and use a common analytical location (laboratory).

A guideline document could include suggested protocols/procedures for; desludging, sampling, analysis, dewatering, transport, regulation (application for consents etc), geobagging and include specifics around units and standard reporting requirements, potential costs.

Councils should all use the same guidelines when looking at biosolids re-use.

6 CONCLUSIONS

Through the sharing of information and discussion the Project Team has been able to develop a draft strategy for the collective management of biosolids for the Lower North Island. The 'Collective Biosolids Strategy' has a focus on sustainable end-use of biosolids and highlights the potential benefits of District and Regional Councils working together. All councils in the study region face the same problem of what to do with their biosolids, many have sludge that is in oxidation ponds or stockpiled and in need of management, whilst others have end-use practices that are not sustainable long-term (landfill). This study shines a light on an important waste management issue and provides potential long-term solutions for the study region.

7 APPENDICES

Appendix A. Pros and cons identified for straw men scenario strategies 1-3

APPENDIX A

Pros and cons identified for straw men scenario strategies 1-3

Table A.1. Potential pros and cons for strategy 1

Strategy 1 - Centralised	Pros	Cons
Removal	Utilising a common contractor for removal and transport will reduce associated costs improve efficiency/streamline processes. Potential to de-water sludge during removal or using existing infrastructure at Fielding WWTP	Transporting wet sludge (no onsite drying) would increase transportation costs.
Treatment/stabilisation	Using existing infrastructure at Fielding WWTP, no need for development of new infrastructure. No requirement for onsite space for individual WWTP to treat waste. Using high-level treatment facilities and tertiary treatment measures (composting) will likely produce a higher quality end-product with more options for re-use.	Removal must be scheduled (staggered) to ensure centralized facilities receive continuous supply, not to overburden infrastructure. Waste will need to move across Rohe. - Concern to iwi
Storage and end-use	No requirement for individual onsite storage space. Re-use of waste is in-line with current waste minimisation strategies.	Variable end-uses may be less reliable, risk having a product that cannot be moved.

	Positive environmental impacts associated with recycling organic waste.	

Table A.2. Potential pros and cons for strategy 2

Strategy 2 – De-centralised	Pros	Cons
Removal	Utilising a common contractor for removal and transport will reduce associated costs and improve efficiency/streamline processes Onsite dewatering via geobag will reduce transport costs – dry sludge will be less bulky and weigh less than wet sludge	Onsite dewatering requires new equipment/infrastructure in some cases.
Treatment/stabilisation	Removal of sludge from oxidation ponds directly to on-site treatment facility (i.e. geobag) requires minimal transportation and less restrictions i.e. transport of 'biohazardous waste' requires permits etc.	Individual onsite dewatering and treatment/stabilisation requires each WWTP to have sufficient space (i.e. on-site geobags), infrastructure and will incur significant costs
Storage and end-use	Common end use (i.e. common land disposal site) may allow for one global consent which will reduce consenting costs to individual councils. Potential blending onsite of different quality sludges may dilute contaminants in lesser quality sludges to below guideline limits, reducing initial treatment requirements. Re-use of waste is in-line with current waste minimisation strategies. Positive environmental impacts from recycling nutrients to land.	One disposal/reuse location will mean waste will need to move across Rohe. - Concern to iwi - May influence treatment requirements/processes

Table A.3. Potential pros and cons for strategy 3

Strategy 3 – Non-beneficial	Pros	Cons
Removal	Utilising a common contractor for removal and transport will reduce associated costs and improve efficiency/streamlining	Transporting un-treated sludge may incur hazardous waste restrictions.
Treatment/stabilisation	No advanced treatment or stabilisation is required - reduced associated costs	
Storage and end-use	May be financial benefits to using a common disposal site (i.e. negotiated fees). Requirements for consents are less restrictive. No major change to status-quo/less 'red tape'	Transporting sludge across Rohe may occur. Non-beneficial end-use has no environmental benefits and is not in line with current waste management strategies. High costs associated with disposal of sludge to landfill. Not a long-term solution as landfill space will eventually decline. Potential for landfill ceasing to take the material. i.e. strategy is vulnerable if only one end-use is defined Potential cost for new disposal facility once existing one is exhausted


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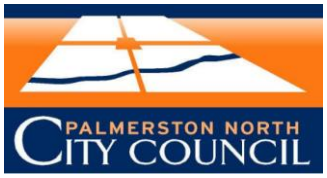
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