REGIONAL BIOSOLIDS STRATEGY
LOWER NORTH ISLAND

FACT SHEET 1:
WHAT ARE BIOSOLIDS?

BIOSOLIDS OR SLUDGE?

Wastewater solids are the solid waste produced as a by-product of municipal wastewater treatment, commonly called 'sludge'. The quality of sludge is highly variable, ranging from raw sludge to more processed sludges which are termed 'biosolids'.

Biosolids are sludges that have been treated and/or stabilised to the extent that they are able to be safely and beneficially applied to land. This determination is based on criteria outlined within the "Guidelines for the safe application of biosolids to land in New Zealand"[1].

BIOSOLIDS AND SLUDGES AS SOIL CONDITIONERS

Sludges are carbon-rich and contain high concentrations of valuable nutrients (N, P, trace elements) that can have fertiliser value[2], especially in degraded environments. However, as it is a by-product of human excreta and household waste (i.e. greywater) it can be a vehicle for contaminants such as trace metals, organic contaminants and human pathogens. While these contaminants present challenges, the waste material offers opportunities for use. Through stabilisation processes it is possible to yield products (biosolids) that are considered safe for use on land[1,2,3,4] and that can improve soil productivity[2].

NOT ALL SLUDGE IS CREATED EQUAL

Numerous parameters affect the 'quality' of a sludge and in turn impact its potential for future use as biosolids. These include:

- Wastewater source, i.e. domestic or trade waste;
- Wastewater treatment; and
- Stabilisation.

As mentioned, sludges contain a combination of organic material, nutrients and contaminants. The most likely contaminants to be found at high levels in sludge are trace metals zinc (Zn), copper (Cu) and cadmium (Cd). *E. coli* is often present (an indicator for pathogenic bacteria) and is most likely to be elevated in fresh pond or WWTP sludge but reduced in more stabilised products[5].

INFLUENCING FACTORS

Several variables can be used as predictors of sludge quality, these include:

- Inputs from trade or industrial wastes which could elevate trace metal contaminants[5];
- Oxidation pond sludges differ in quality depending on location within the treatment sequence[5]. i.e. primary ponds contain higher organic matter, ammonium and trace metals;
- Wastewater from predominantly residential inputs will likely result in sludge that meets current trace metal limits for Grade Bb biosolids[1];
- Pond sludges that have been geobagged are more stable than sludges accumulated and stored in oxidation ponds[5]; and
- Blended stabilised and/or composted sludges are likely to meet guideline limits for contaminants if adequate dilution of metals is achieved[3].

SLUDGE QUALITY DETERMINES END-USE POTENTIAL

The stabilisation of a sludge product and/or elevated metals are the most likely factors to limit beneficial use options[6], although further treatment of the sludge to achieve a grade Aa-Bb biosolid is often still possible[3] (e.g. composting with green waste or

blending with other wastewater solids to dilute the metals). Determining the preferred end-use should be a major driver for deciding on a treatment pathway.

Case studies of sludges from throughout the Lower North Island have indicated some predictability of sludge quality based on its source. The table below summarise commonalities noted from analysis of 18 varying sludges.

SOURCE	GRADING	NOTES
Oxidation Pond – Primary Treatment	Likely Exceeds Grade Ab	- ↑ Heavy metals likely exceed grade b limit in one or more - ↑ *E. coli* - ↑ Sufficient plant available N and organic matter.
Oxidation Pond – Secondary treatment	Likely Grade Ab	- ↑ Heavy metals may exceed grade b limits for one or more - ↑ Sufficient plant available N and organic matter.
Aged oxidation pond sludge	Likely Grade Ab	- ↑ Heavy metals, likely below grade b limits - ↓ Nutrients may offer little fertiliser value to soils.
Fresh WWTP sludge	Likely grade Bb or greater	- ↑ Heavy metals may exceed grade b limit in one or more - ↑ *E. coli* - ↑ Sufficient plant available N and organic matter.
Composted biosolids	Grade Aa	- ↑ Sufficient plant available N and organic matter. - Dilution of heavy metals reduce below guideline limits

Key:
No restrictions to use
Land application would require restrictions/consent
Not suitable for land application in present state.

BACKGROUND

The Regional Biosolids Strategy – Lower North Island is a collaborative project funded by the Waste Minimisation Fund. Ten lower North Island Councils have worked in partnership with Lowe Environmental Impact and research partners to develop a biosolids strategy that includes the potential collective management of sludge, focussing on beneficial use.

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1. NZWWA. (2003). Guidelines for the safe application of biosolids to land in New Zealand. Ministry for the Environment (New Zealand Water and Wastes Association).
2. Report 10 of the Regional Biosolids Strategy: Biosolids Processing Trials; Biosolids field trial final report.
3. Report 9 of the Regional Biosolids Strategy: Biosolids Processing Trials; Biosolids composting trial final report.
4. Fact sheet 3 of the Regional Biosolids Strategy: Beneficial Use of Biosolids
5. Reports 1 and 2 of the Regional Biosolids Strategy: Gaps Analysis and Qualitative Assessments.
6. Report 13 of the Regional Biosolids Strategy: Potential End-Use Options for the Lower North Island