Strategic Review of Wastewater Solids Management

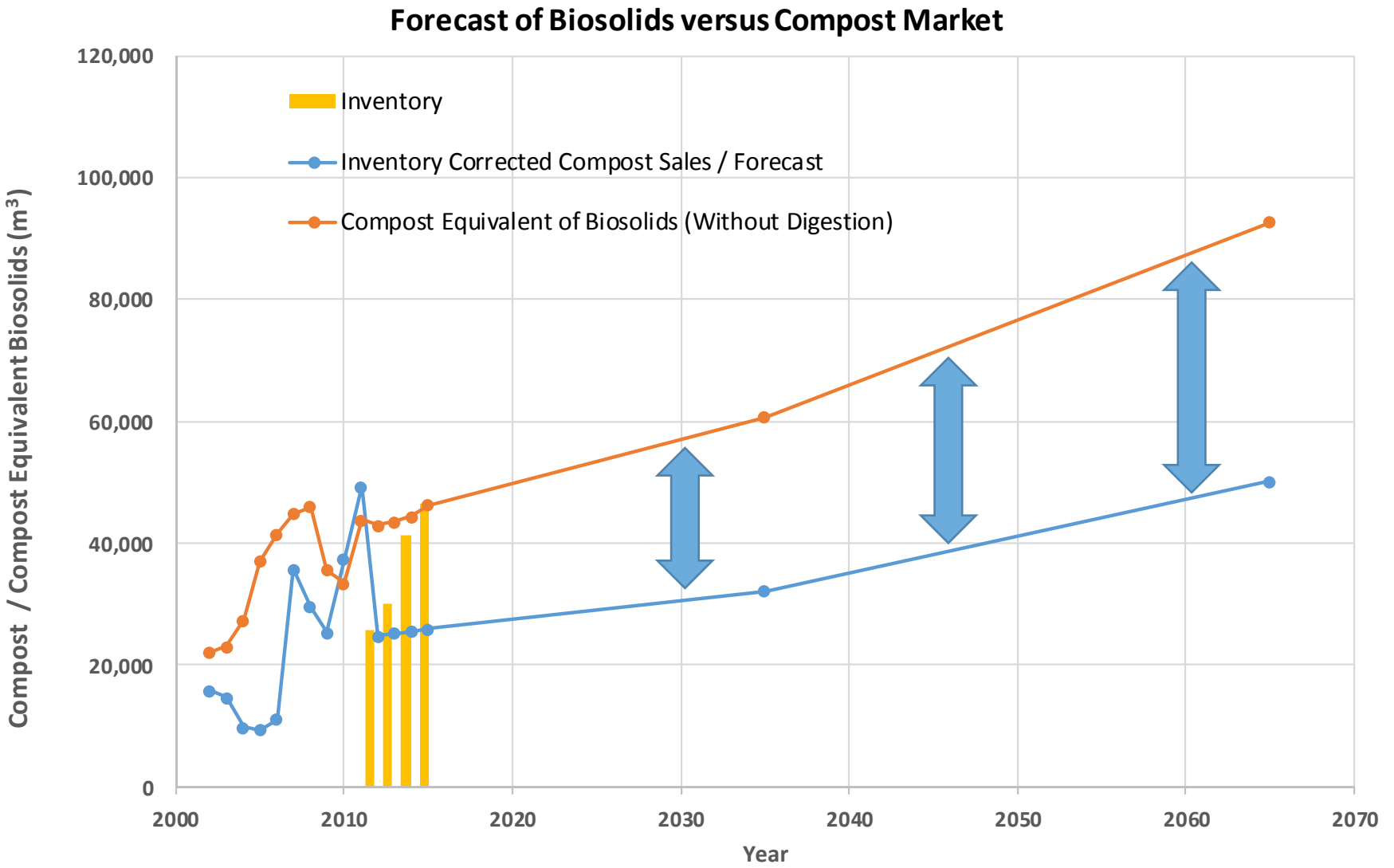
Okanagan Basin Stewardship Council

April 13th, 2017

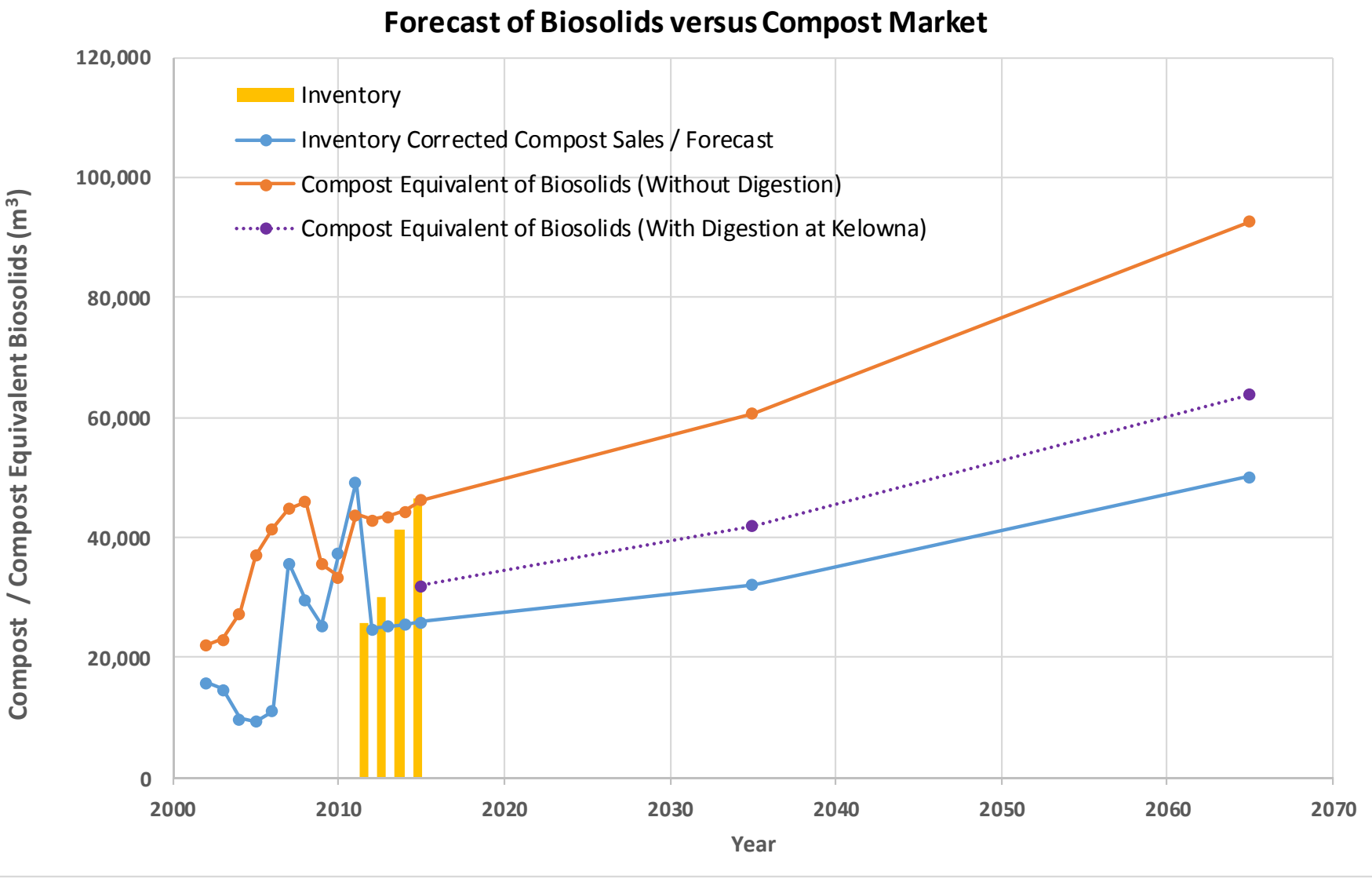
"Why"

- Commonage Facility is near or at capacity
- OgoGrow® inventory is increasing
- Kelowna and Vernon are continuing to grow
- Cities are planning for growth

Market versus Production



Example Result



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Project Objective

- Look at ALL Options
- Identify and Assess RISKS
- Present defendable recommendation for next steps

Where We Are At

- Still in the planning/evaluation stages
- All considerations will be undergoing an evaluation process

Biosolids Management Study – Work Plan

TM-1

- Analysis of historical and forecast production;
- Technology Screening; and
- Initial criteria discussion.

Workshop A

TM-2

- Summary of Workshop A;
- Short-list of Options,

TM-3

- Review of **markets** and **risks**.

Public Engagement

we are here

TM-4

Final Evaluation & Recommendation

TM-1 Technology Summary

Management Options Reviewed

- **Pre-treatment –** 4 methods considered
  - Digestion - 45% reduction in mass
  - Thermal drying - 90% reduction in volume
  - Lime stabilization - 0% reduction in mass
  - Chemical (Chlorine Dioxide) - 0% reduction in mass

- **Final Disposal –** 3 methods considered:
  - Compost Sales (i.e. OgoGrow);
  - Soil Amendment;
  - Thermal Destruction:
    - Incineration, Gasification, Pyrolysis.

Workshop A

- Who?
  - City of Kelowna Staff
  - City of Vernon Staff
  - Technology Experts

- What?
  - Review Indicative **Costs**
  - Review of Market **Risks**

TM-2 Evaluation Results

Wastewater Solids Short-List

- Five schematics involving a combination of:
  - **3 pre-treatment options**:
    - *Digestion (at Kelowna WWTP)*
    - *Thermal Drying*
    - *Chemical Pre-Treatment*
  - **2 outlet options**:
    - *Soil Amendment*
    - *Composting*

- Technologies Dropped
  - Incineration
  - Gasification
  - Pyrolysis
  - Digestion at Vernon *(to be confirmed)*

Evaluation Criteria

- 17 evaluation criteria were aggregated to 7

Group	Criteria	
Cost	• Capital • 20 Year Present Worth Operation and Maintenance	• Annual Operation and Maintenance • Total Lifecycle
Environmental	• Air Quality/Odour • Greenhouse Gas Emissions • Soil Quality	• Water Quality • Spillage Potential • Waste Streams
Social	• Public Acceptance and Perception	• Integration and Zoning
Risk	• Markets • Regulatory	• Funding / Economic
Operation	• Operability / Ease of Operation • Synergy Potential • Longevity	• Flexibility • Expandability • Staffing

- Odour
- Environmental Quality - Air, Water, and Soil
- **Social (Public Acceptance and Perception)**
- Market Risks - Supply and Demand
- Regulatory and Bylaw Risk
- Environmental Risks
- Operations

Anaerobic Digestion

- Pre-dewatering.
- 45% mass destruction.
- Generates biogas

Thermal Drying

- 90% reduction in volume
- Burns biogas or natural gas
- Finished product can be used as fertilizer or manufactured soil

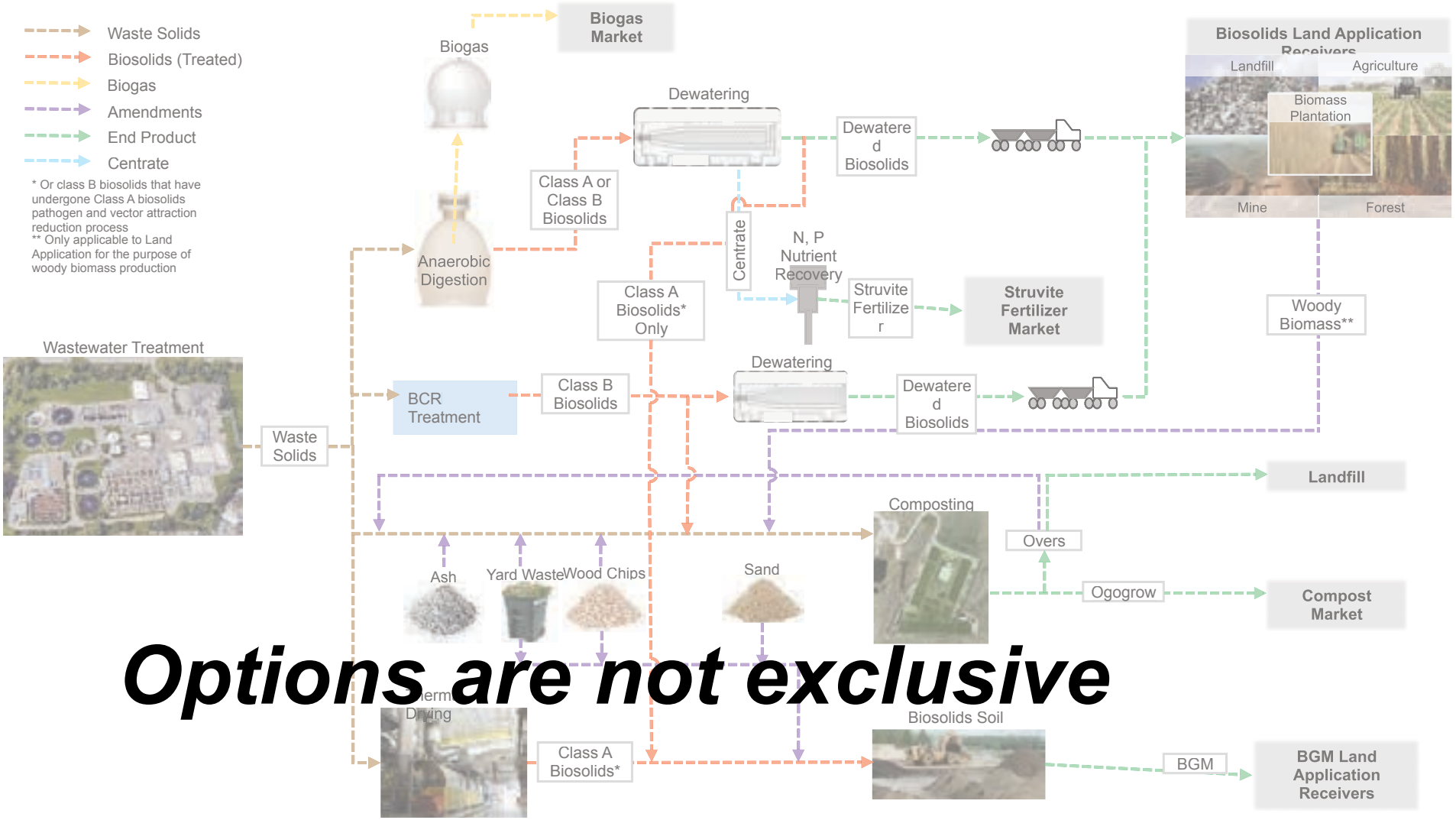
Lime Stabilization

- pH pasturization
- Chemical reaction releases heat that kills pathogens and inhibits regrowth
- Can produce ammonia
- 0% reduction in mass

Chemical Stabilization (Chlorine Dioxide)

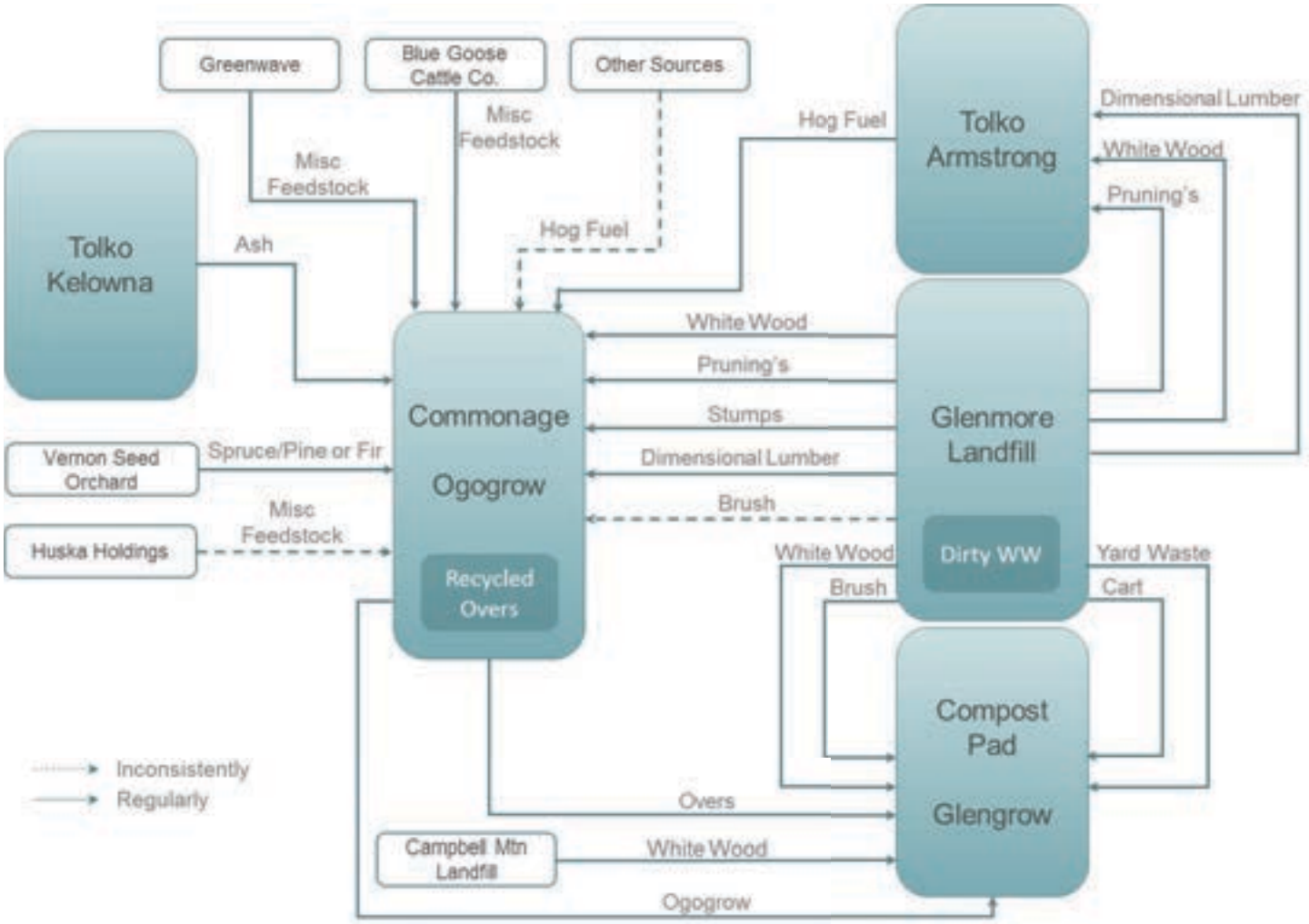
- 0% reduction in mass
- Injected at point of dewatering
- Shortens time required to compost wastewater solids
- Helps manage odour

"Roadmap" of Options

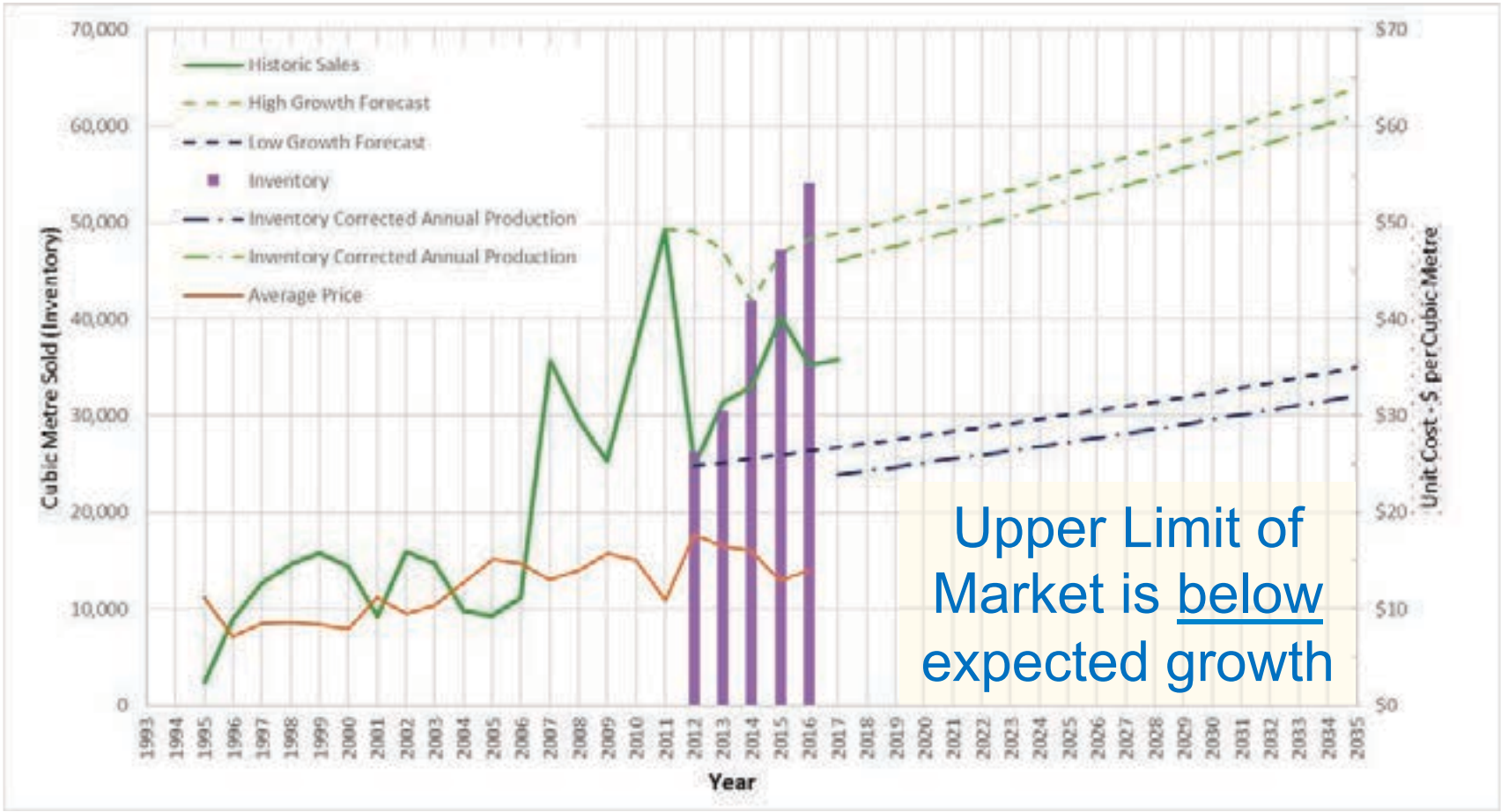


TM-3 Market Review

Wood Chip Suppliers



Compost Consumer Market

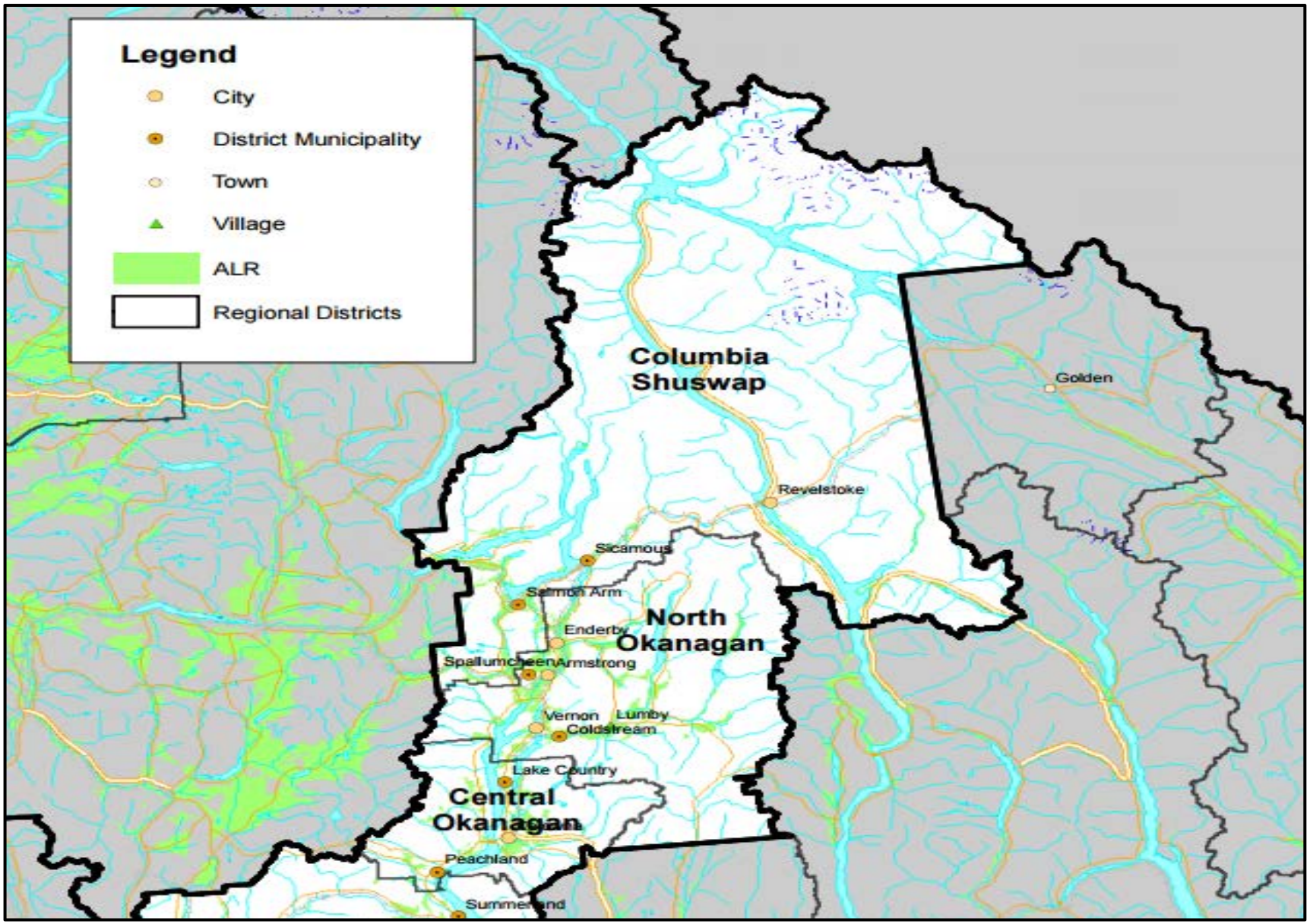


Soil Amendment Markets

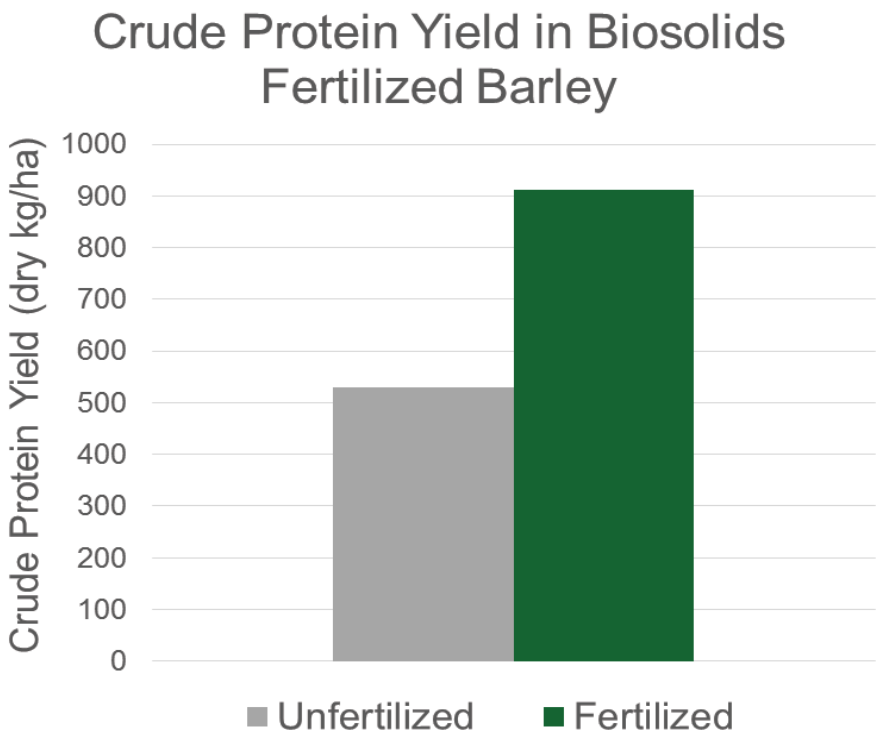
- Examples of biosolids markets

Market	Description
Agriculture	Fertilization – 400 km radius
Forestry	Fertilization – 150 km radius
Fabricated Soil	Product – Regional Parks/Residential
Reclamation	Mine/Gravel Pits – 200 km radius
Landfill Covers	Landfill closure
Biomass Wood Lot	Purpose grown woody biomass

Agricultural Land

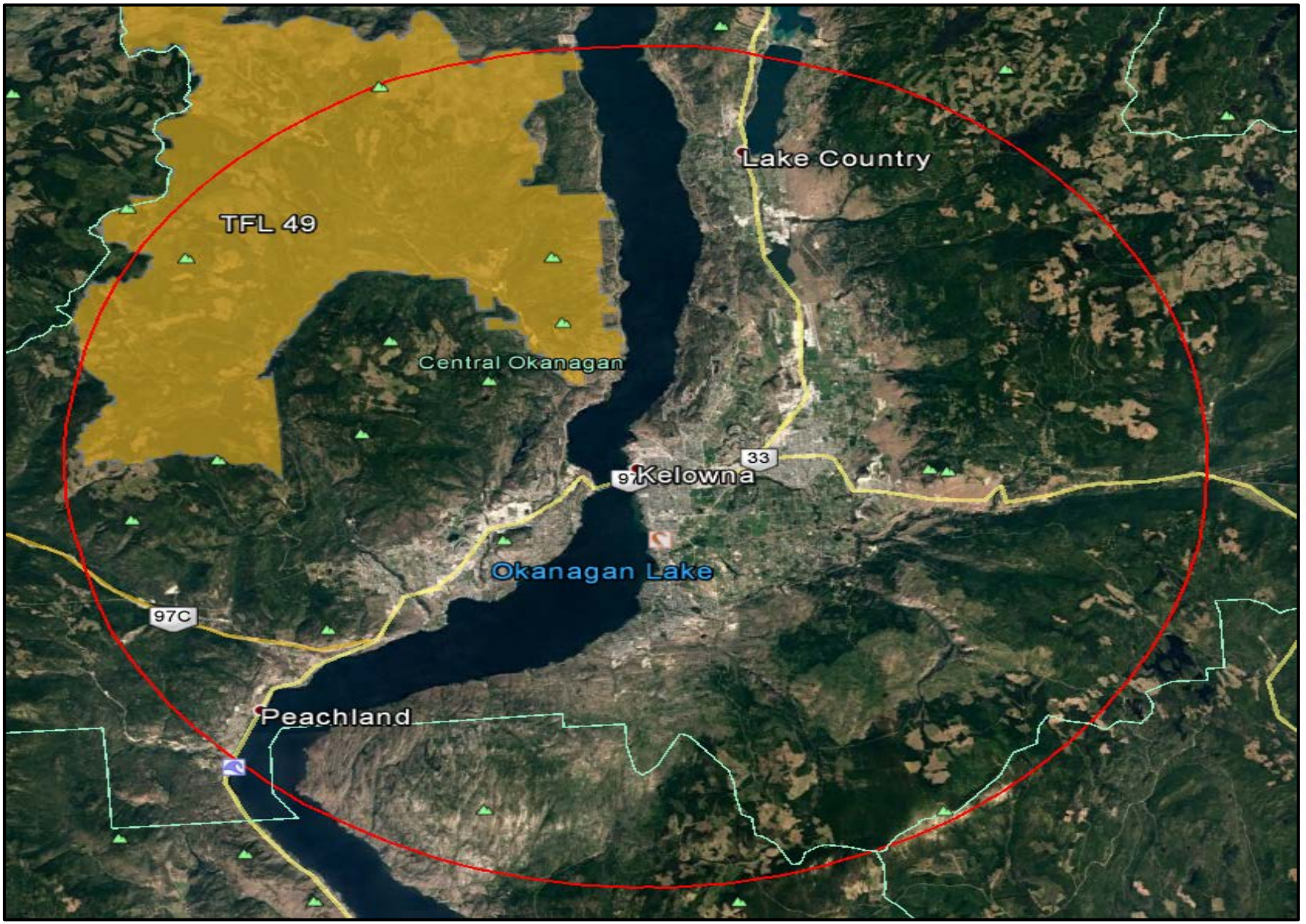


Agricultural Land

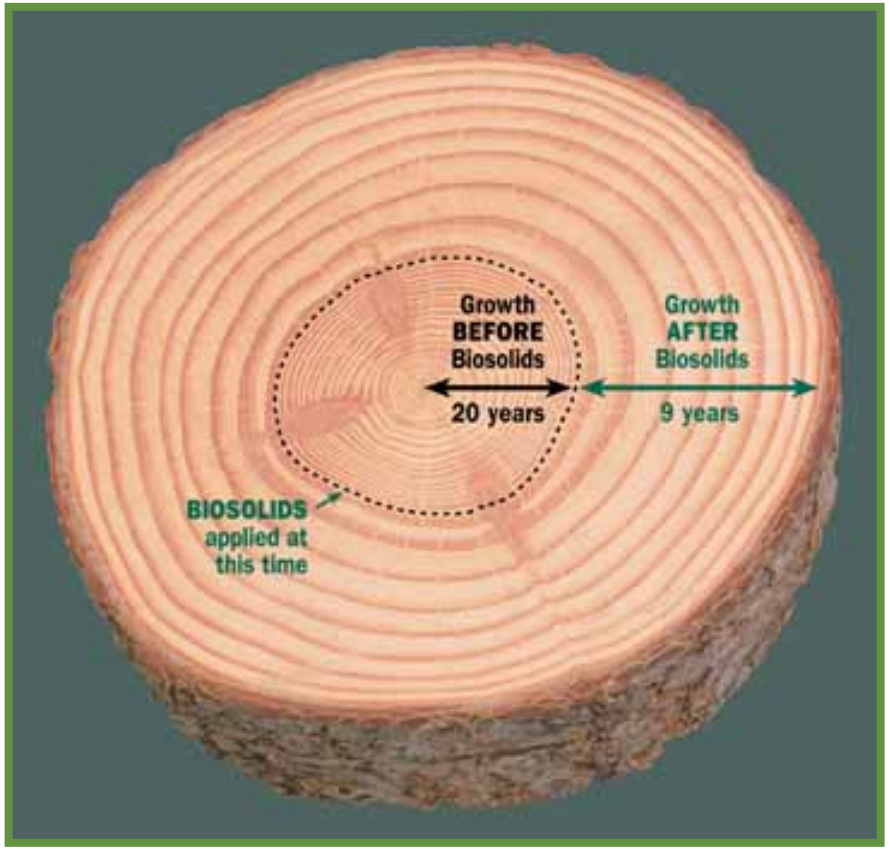


Biosolids applied to agricultural land (above). Biosolids fertilized barley has a very significant increase in crude protein in comparison to unfertilized barley (left).

Forestry


TFL 49
Lake Country
Central Okanagan
33
97
Kelowna
Okanagan Lake
97C
Peachland

Forestry

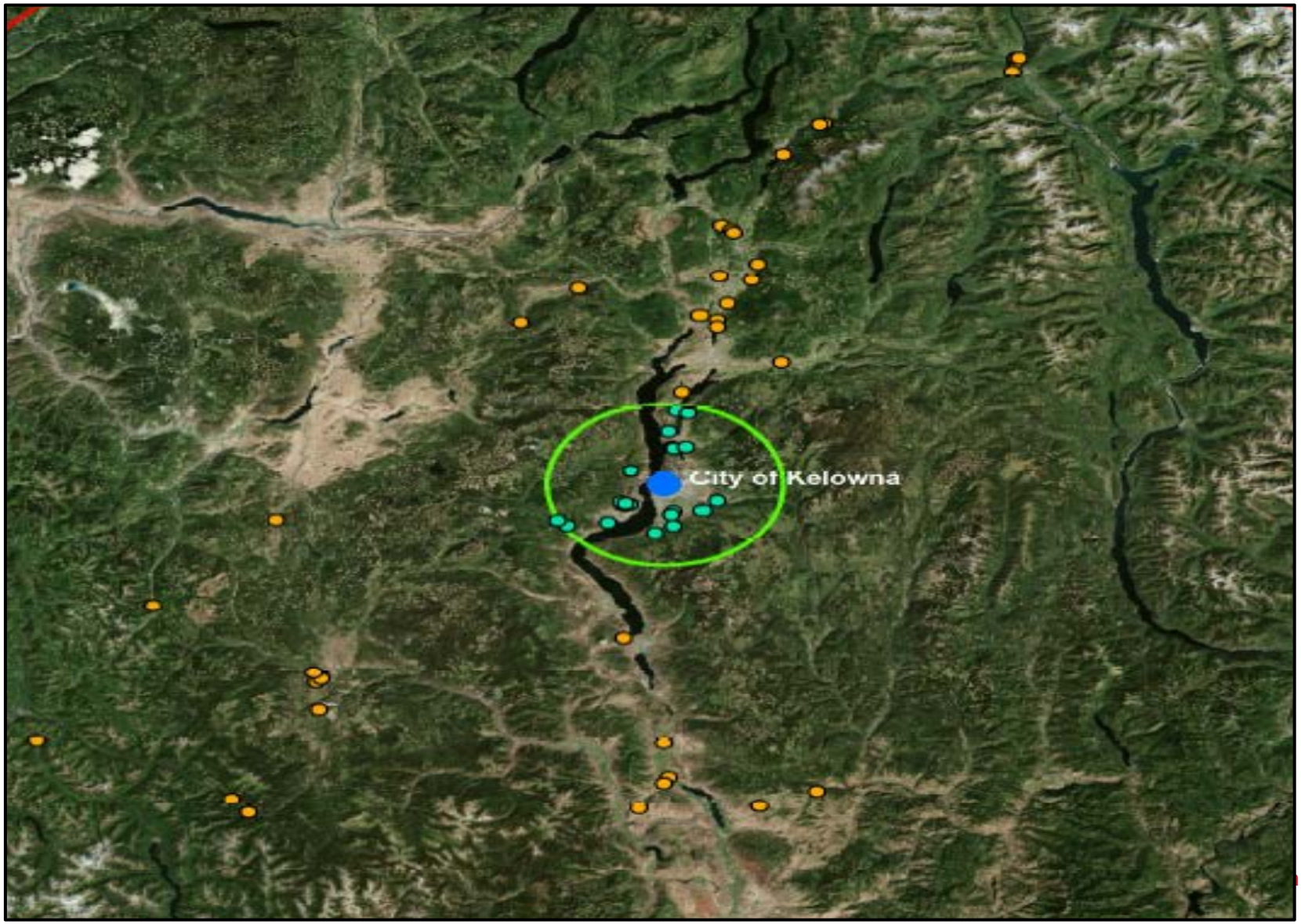


Biosolids forest fertilization (above). Significant increase in tree diameter can be seen in the tree rings after biosolids fertilization (left).

Fabricated Soil

A combination of biosolids, sand and wood waste is used to create a fabricated soil. The fabricated soil is sold to landscapers and used on playing fields, highway right of ways and community gardens.

Reclamation



Reclamation

Aggregate pit reclamation near 97C Highway, BC. Biosolids add organic matter and nutrients to initiate soil formation. Before biosolids applications photo (left) to the photo taken following biosolids application (right)

Reclamation

Mineral mine reclamation of a tailings pond near Princeton, BC. Biosolids is applied to the very fine crushed rock that lacks organic matter to start soil development and sustain vegetation. Before biosolids applications photo (left) to the photo taken following biosolids application (right)

Landfill Closure

Biosolids are used in landfill closures. Biosolids-based "biocovers" treat methane produced by landfills reducing GHG emissions.

Biomass Woodlot

Biosolids fertilize woody biomass plantations on a short rotation to provide carbon feedstock for composting

Biomass Woodlot

Each coppice results in additional woody biomass (left), tree growth starts from rootless cuttings planted in rows (right)

Year 1

Year 2

Year 3

Area 1




Area 2



Area 3

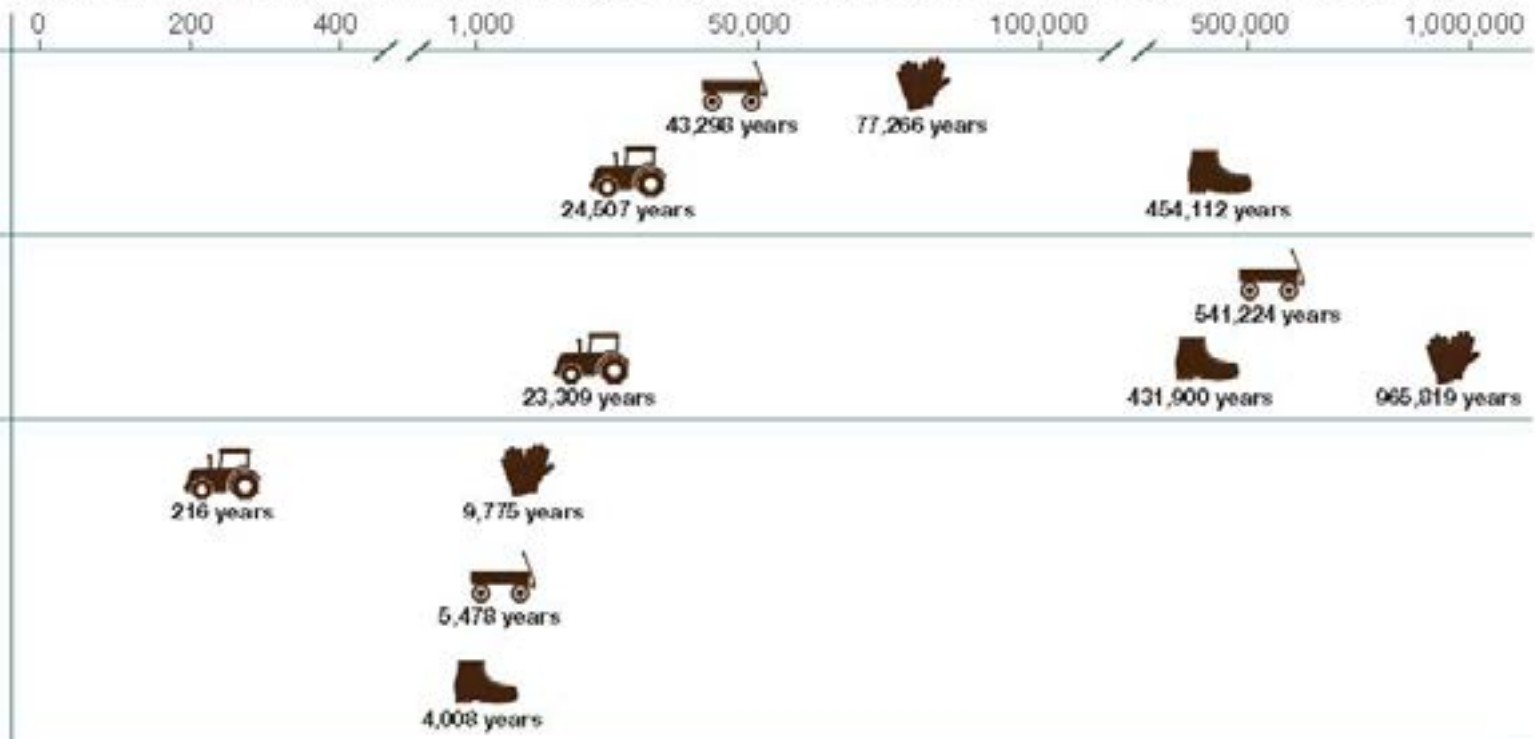
- **Three Years to Steady State!**


Application Type	Application Area Available (ha)	Biosolids Required (dt)	Biosolids Production[a] (dt/yr)	Return Interval (yrs)
Agricultural	420,126	4,201,260	3,650	1,151
			9,125	460
Forestry	30,056	450,840	3,650	123
			9,125	49
Fabricated Soil	190	10,260	3,650	3
			9,125	1
Reclamation	130	39,000	3,650	11
			9,125	4
Landfill Closure	150	27,180	3,650	7
			9,125	3
Biomass Woodlot	150	scaleable	3,650	20
	365		9,125	20

WHAT'S THE RISK?

It would take many lifetimes of working or playing around biosolids or compost made with biosolids to equal everyday exposure to many common products.

Number of **YEARS** of contact with biosolids or compost made with biosolids required to reach the equivalent of one dose or exposure.



LEGEND

- Gardener
- Child
- Hiker
- Agricultural worker

details on reverse

WHAT IS A RISK ANALYSIS?

A risk analysis estimates the risk to human health by examining how harmful a chemical is (toxicity) and the amount of contact with that chemical (exposure).

RISK = TOXICITY x EXPOSURE

Chemicals with high toxicity and high exposure have higher risk, while chemicals with low toxicity and low exposure have lower risk.

This risk analysis followed the United States Environmental Protection Agency (U.S. EPA) risk assessment methodology.

WHAT ABOUT FOOD?

For this analysis, wheat fertilized with biosolids was tested for over 80 compounds in pharmaceuticals and personal care products and none were found in the wheat grain.

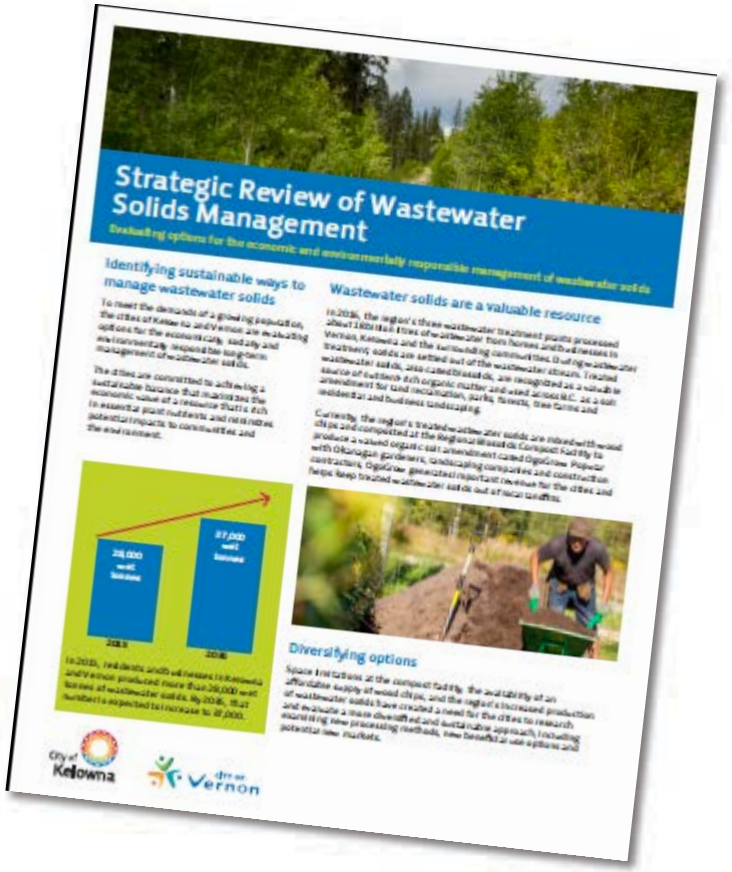
Public Engagement

Engagement Goal

- Provide Councils with community and stakeholder feedback to inform decision-making related to wastewater solids management planning

Communication Activities

- Create fact sheet
- Publish web content
- Distribute media release
- Promote online survey
  - Email, social media, newspaper



Engagement Activities

- **On-line survey** (paper copies also available)
- **Face-to-face meetings**:
  - First Nations (Westbank and Okanagan)
  - Okanagan Basin Water Board – Stewardship Council
  - Kelowna Agriculture Advisory Committee
  - RDNO
  - RDCO
  - Fortis BC
  - Interior Health
  - Ministry of Environment
  - Residents near Commonage Facility

Engagement Schedule

- April 10th – Launch webpages and survey
- April 13th – Present to Stewardship Council
- April – Meetings with select residents
- April/May – Meetings with remaining stakeholders
- May 12th – Close survey
- June 26th – Report to Councils

TM-4 Final Evaluation

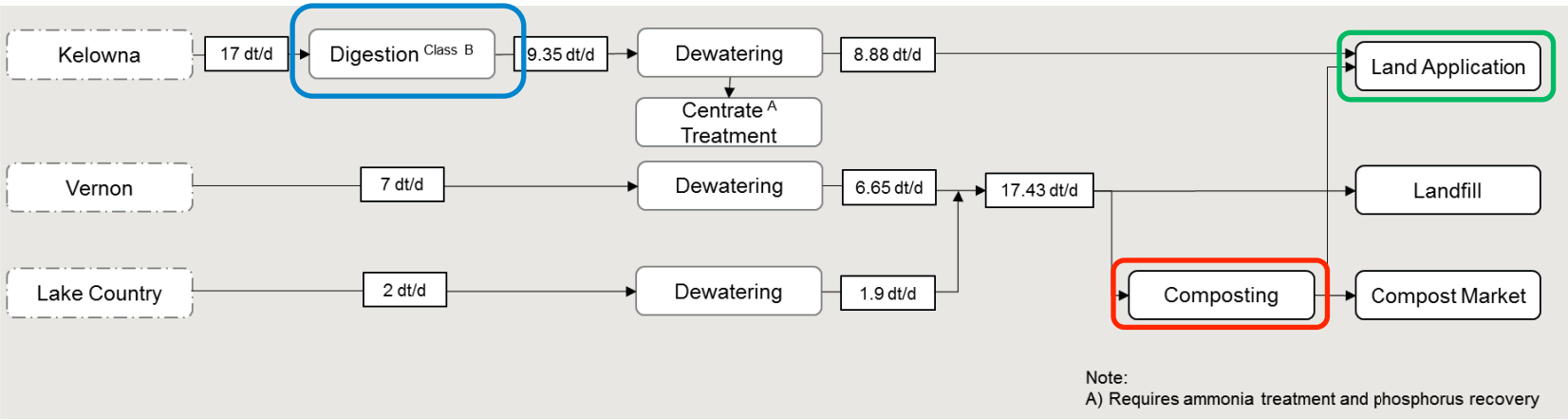
Management Recommendation

- **Summary of Final 5 Options / Combinations**
  - Capital and Operating Costs
  - Triple-bottom-line Comparison using Criteria
  - Relative Risk Analysis
- **Financial Model**
  - How costs will be shared between Kelowna Vernon
- **Staged Approach**
  - Recommendation will be a staged approach
  - Options requiring further study will be identified

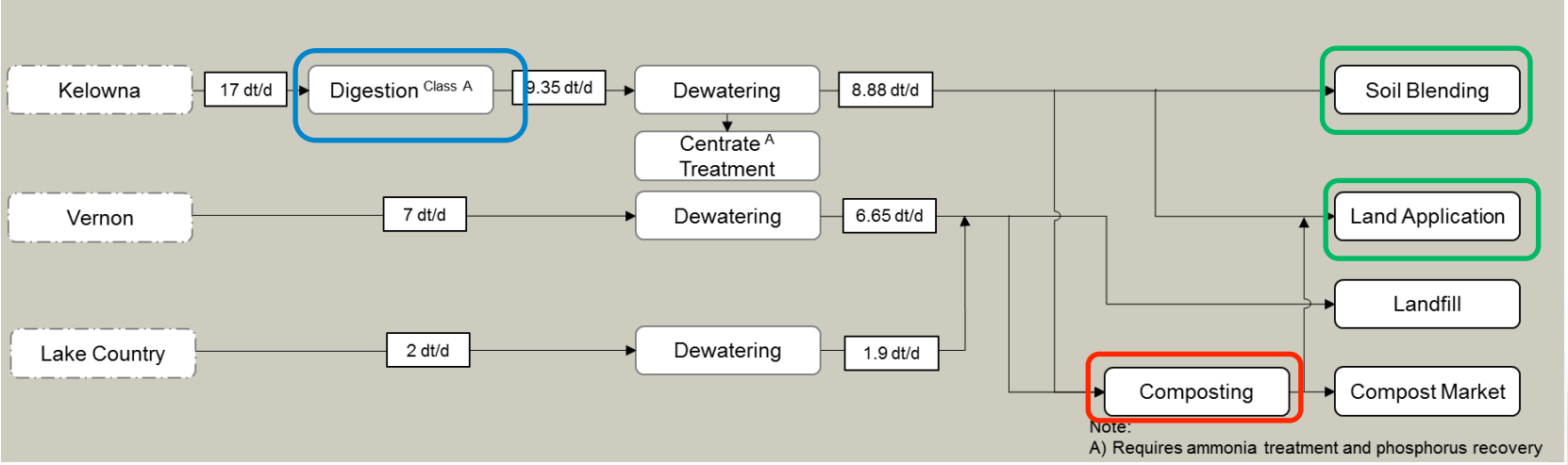
OPUS

Thank You

Proposed Alternative 1

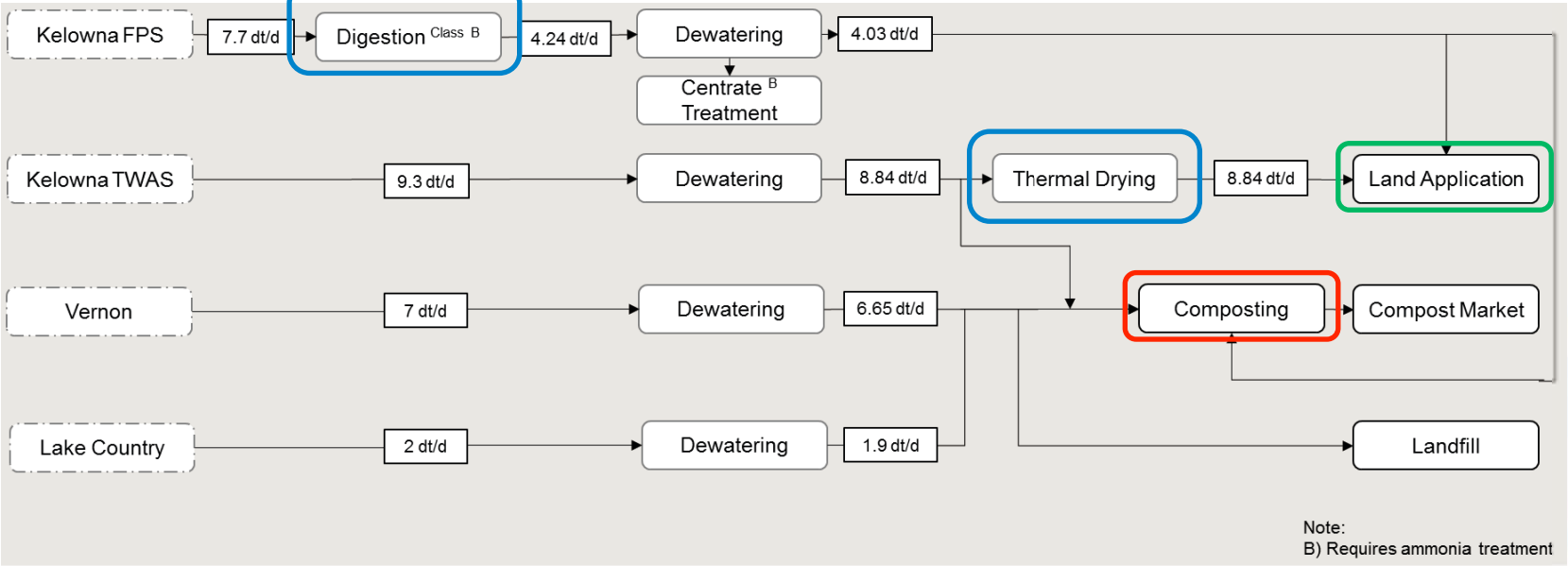


Proposed Alternative 2

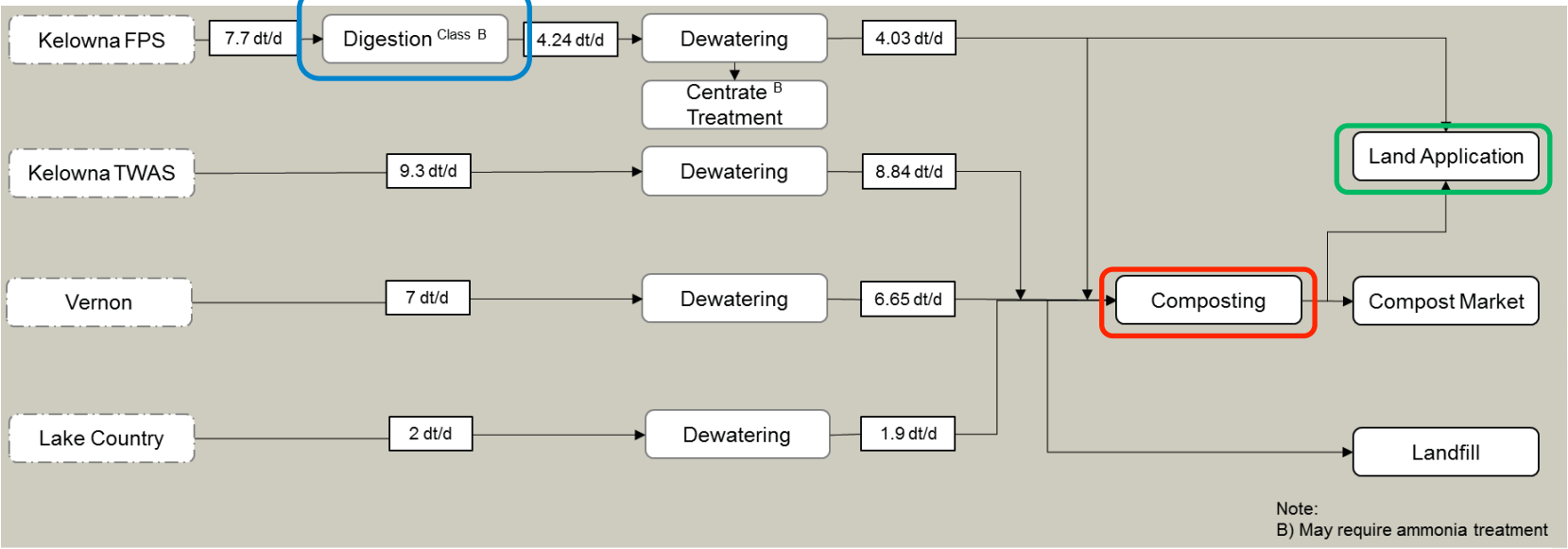


- Specific technology has not been selected, additional work would be undertaken to evaluate specific technologies.
- Potential advantages include improved biogas recovery and reduced mass treated biosolids produced.

Proposed Alternative 3

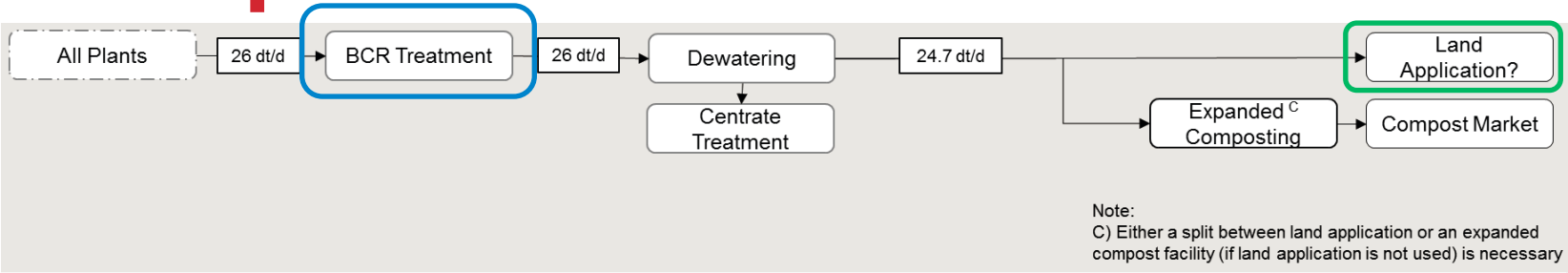


Proposed Alternative 4



- This alternative is same as alternative 3 with regards to the pre-treatment of the FPS; TWAS is dewatered only prior to composting (no drying).

Proposed Alternative 5



- BCR treatment ahead of the composting, and either an expansion to the compost or a mandatory diversion of excess to land application.
- Requires further study.