City of Hamilton Biosolids Management Project

Presentation to Council General Issues Committee

May 11, 2012
Agenda

1. Background
   i. Overview of Biosolids
   ii. Program Milestones (1996 to Current)
   iii. Direction from Last Council Report

2. Project Overview
   i. Overview of Alternatives
   ii. Opportunity

3. Business Case Overview
   i. Overview of PPP Canada
   ii. Business Case Work Plan
   iii. Triple Bottom Line Analysis
   iv. Value for Money Analysis
   v. Summary & Recommendation

4. Procurement Strategy

5. Next Steps
   i. Moving Forward
   ii. Recommendation for Council
Background

• Overview of Biosolids
• Key Program Milestones
• Direction from Council
Overview of Biosolids

- Organic residuals from wastewater treatment with soil-amending attributes
  - Nutrient value (N and P)
  - ~25% solids
  - ~80g/person/day

- Parameters of concern
  - 11 Metals from industrial and domestic sources
  - Trace pathogens, pharmaceuticals
  - Odours

- Must be managed
The following are key program milestones that outline the history and progress made pertaining to the City of Hamilton ("City") identifying a sustainable biosolids management solution:

<table>
<thead>
<tr>
<th>Key Program Milestones</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 City moved from Incineration to Land Application for Biosolids Management</td>
<td>1996</td>
</tr>
<tr>
<td>2 City Completed a Biosolids Master Plan identifying Thermal Reduction as preferred strategy</td>
<td>August 2007</td>
</tr>
<tr>
<td>3 City completed and filed the EA for Biosolids Thermal Reduction</td>
<td>September 2009</td>
</tr>
<tr>
<td>4 City Received Unsolicited proposal from Liberty Energy and undertook due diligence reviews</td>
<td>November 2009 to September 2011</td>
</tr>
<tr>
<td>5 Liberty Energy’s proposal presented to Council and Council directed City to pursue PPP Canada funding and analyze all viable options</td>
<td>May 2011</td>
</tr>
<tr>
<td>6 City applied for and were screened into PPP Canada Funding</td>
<td>November 4, 2011</td>
</tr>
<tr>
<td>7 Staff developing Business Case for PPP Canada Funding</td>
<td>Final Draft completed</td>
</tr>
</tbody>
</table>
Direction from Council to date

- **May 9, 2011**: Council directed City staff to pursue all long term biosolids management options through a competitive process culminating in an application to the PPP Canada Fund.

- **June 30, 2011**: City ‘screened in’ through initial stage of PPP Canada Fund in September 2011 and required to submit a Business Case to PPP Canada

- **December 12, 2011**: Council approved work plan and budget for development of Business Case, as presented by Project Team
Project Overview

- Overview of Alternatives
- Opportunity
Overview of Alternatives – Land Application (Current Practice)

- **Biosolids Treatment**
  - Anaerobically digested and mechanically dewatered at Woodward to a 25% solids content

- **End-Product/Use**
  - Transported by truck to agricultural land where it is applied to the fields
  - Stored off-site during winter months and periods of wet weather when agriculture lands are not accessible
  - 40,000 wet tonnes/year costing approximately $3.5 million annually

- **Benefits**
  - Increases organic content of soils
  - Supplies nutrients and micro-nutrients to soil to enhance plant growth
  - Mature management method
## Risk profile of Land Application has changed since Biosolids Master Plan

<table>
<thead>
<tr>
<th></th>
<th>Previous Regulation (At time of Biosolids Master Plan)</th>
<th>Current Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Applicable Regulations</strong></td>
<td>• Regulated under two Acts – Environmental Protection Act and Nutrient Management Act</td>
<td>• Regulated solely under Nutrient Management Act</td>
</tr>
<tr>
<td></td>
<td>• Clearer definition of application rates, setbacks from environmentally sensitive features and adjacent properties</td>
<td></td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>• 240 days of storage required</td>
<td>• 240 day requirement lifted</td>
</tr>
<tr>
<td></td>
<td>• Capital investment in storage facilities</td>
<td>• Practically speaking, 120 days of storage still needed since biosolids cannot be land applied from December to March</td>
</tr>
<tr>
<td><strong>Application Rate</strong></td>
<td>• Application rate limited to 8 tons per hectare</td>
<td>• May allow for application rate of up to 12 tons per hectare, depending on biosolids quality</td>
</tr>
<tr>
<td></td>
<td>• Finer definition of sub-categories of biosolids, based on pathogen content, metals content, and odour.</td>
<td>• Finer definition of sub-categories of biosolids, based on pathogen content, metals content, and odour.</td>
</tr>
<tr>
<td><strong>Application Frequency</strong></td>
<td>• Frequency of application limited to once per 5 years</td>
<td>• Frequency of application still limited to once per 5 years</td>
</tr>
</tbody>
</table>
Overview of Alternatives – Enhanced Treatment

- **Biosolids Treatment**
  
  Further processing of the Class “B” biosolids to a Class “A” level which may be used in soil and fertilizer products, land applied, used for land reclamation and as a fuel.
  
  - **Alkaline stabilization**: addition of an alkaline material, such as lime, with or without heat,
  
  - **Thermal drying**: addition of heat to evaporate moisture.

- **Benefits**
  
  - Biosolids can be registered under the *Canadian Fertilizer Act* ("CFIA") and marketed for revenue
  
  - Modest volumes to be transported and managed – reduces truck traffic
  
  - City previously had concerns about risks associated with marketing end product. Risks can now be mitigated – improved quality of City’s biosolids, more mature market and PPP model can transfer risks.
Overview of Alternatives – Thermal Reduction

- Process Features
  Oxidation of organic matter by combustion in fluid bed reactor
  • Residual ash is inert
  • Exhaust gas is scrubbed prior to release to the atmosphere as per strict MOE standards
  • Recovered energy is used to generate electricity

- Benefits
  • Volume reduction results in minimal transportation for ash utilization/disposal
  • Greenhouse gas reductions through generating electricity. May be eligible for FIT program
  • Stringent MOE emission regulations results in minimal impact to ambient air quality

- Preferred Strategy as per 2007 Biosolids Master Plan
Summary of Alternatives

Based on an RFI process, City considers that there are 3 Alternatives for this Project:

- **Land Application**
  - Low capital ($0 - $15M), high O&M cost
  - Current method used by City
  - Concerns about long-term sustainability (Logistics vs. Legislation)

- **Enhanced Treatment**
  - Medium capital ($20-$30M), lower O&M
  - Commercial risks due to sale of end product – can be transferred to private sector over a longer term

- **Thermal Reduction (Incineration)**
  - High capital cost ($35-$80M), lower O&M
  - Can generate revenues from electricity for sale under FIT program
  - Was previously recommended as City’s preferred option (Biosolids Master Plan).
Opportunity

City’s Key Objectives:
1. Obtain a long-term (20 to 30 year) Biosolids Management Program that provides cost and performance certainty and affordability; and
2. Ensuring environmental, and social sustainability.

Additional Benefits Include:
- The PPP structure provides a contractual structure that can lock in long term costs while maintaining performance, with City risks that can be transferred and anchored by private capital invested in the Project.
- PPP Canada Funding of up to 25% of capital costs reducing costs to the City in meeting these objectives.
- Provides the City the ability to leverage on an emerging market through innovative opportunities, such as:
  - Ability to profit share in marketing of final biosolids product
  - Ability to enhance City’s existing energy recovery from biosolids program (gas and electricity)
  - Ability to attract world leaders in innovative biosolids management through economic incentive programs
Business Case Overview

- Overview of PPP Canada
- Business Case Overview
- Triple Bottom Line Analysis
- Value for Money Analysis
- Business Case Summary & Recommendation
Overview of PPP Canada Fund

What is PPP Canada?
- A Federal Crown Corporation
- Report to Parliament through the Minister of Finance

Mandate
- To improve the delivery of public infrastructure by achieving better value, timeliness and accountability to taxpayers, through PPPs
- To deliver more PPPs by leveraging incentives, demonstrating success, and providing expertise
- To deliver better PPPs by promoting PPP best-practices and capacity-building

PPP Canada provides funding to eligible PPP projects
- Merit-based program, designed to incent consideration of PPPs in public infrastructure procurements, in order to achieve value for taxpayers and other public benefits
- Maximum 25% of eligible costs
Eligibility for PPP Canada Funding

- **Eligible Infrastructure Categories**
  - 15 categories (9 identified as “priority”)
  - Water and wastewater is identified as a priority eligible category

- **Eligible PPP Models**
  - Must include meaningful private sector involvement in at least two of the following five elements: Design, Build, Operate, Maintain, Finance
  - One structural element must be: Operate, Maintain or Finance
  
  *Maintain = Hard infrastructure and/or soft services
  *Operate = Provide services

- **Merit Criteria**
  - PPP Viability
  - Private Sector Involvement and Risk Transfer
  - PPP Market Development Potential
  - Project Readiness
  - Applicant’s Capacity
## Examples of Projects funded by PPP Canada

<table>
<thead>
<tr>
<th>Project Name and Location</th>
<th>PPP Canada Funding</th>
<th>Procurement Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief Peguis Trail Extension (Manitoba)</td>
<td>$25.0M Fund contribution</td>
<td>DBFM – 30 year</td>
</tr>
<tr>
<td>Lac La Biche Wastewater Treatment Facility (Alberta)</td>
<td>$3.8M Fund contribution</td>
<td>DBOM – 10 year</td>
</tr>
<tr>
<td>Biosolids Management Facility (Sudbury)</td>
<td>$11.0M Fund contribution</td>
<td>DBFOM – 20 year</td>
</tr>
<tr>
<td>Evan Thomas Water and Wastewater Plan (Alberta)</td>
<td>$9.95M Fund contribution</td>
<td>DBFOM – 10 year</td>
</tr>
<tr>
<td>Barrie Transit Facility (Barrie)</td>
<td>$5.8M Fund contribution</td>
<td>DBFOM – 10 year</td>
</tr>
<tr>
<td>AMT – Lachine (Quebec)</td>
<td>$25.0M Fund contribution</td>
<td>DBF</td>
</tr>
<tr>
<td>Downtown Eastside Housing Renewal Project (B.C.)</td>
<td>$29.1M Fund contribution</td>
<td>DBFM - 30 year</td>
</tr>
</tbody>
</table>
PPP’s Within the Canadian Context cont’d

Some Examples

**St Joseph’s Hospital - Hamilton**

**Windsor Essex Parkway**

**MGS Data Centre - Guelph, Ontario**

**Durham Courthouse**
Business Case Overview – Key Components

- Triple Bottom Line Analysis
- Risk Analysis
- Jurisdictional Scan
- Cost estimates / Financial Model
- Market Soundings
- Value for Money Analysis

Required by PPP Canada Business Case
Business Case Overview - Process

Alternatives

- Land Application
- Enhanced Treatment
- Thermal Reduction

Alternatives have been “screened in” through an RFI process

Evaluate Suitability of all Alternatives

Triple Bottom Line and Value for Money Analysis

- Land Application
- Enhanced Treatment
- Thermal Reduction

Which Alternatives best suit the City’s objectives? Are they best delivered via PPP?

“Open” Procurement

Output Based Procurement

Affordability Cap

Enhanced Treatment and Thermal Reduction solutions can compete
## Triple Bottom Line Analysis

Alternatives evaluated based on **Environmental**, **Social**, and **Economic** criteria:

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weighting (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Criteria</strong></td>
<td>40.0</td>
</tr>
<tr>
<td>Reliability Of Performance &amp; Flexibility</td>
<td>5.7</td>
</tr>
<tr>
<td>Demonstrated Technology</td>
<td>5.7</td>
</tr>
<tr>
<td>Impacts During Construction</td>
<td>5.7</td>
</tr>
<tr>
<td>Non-Renewable Fuel Use (Ghg Emissions)</td>
<td>5.7</td>
</tr>
<tr>
<td>Regulatory Risks</td>
<td>5.7</td>
</tr>
<tr>
<td>Impacts On Air, Soil And Surface Ground Water</td>
<td>5.7</td>
</tr>
<tr>
<td>Compatibility With Future Opportunities</td>
<td>5.7</td>
</tr>
<tr>
<td><strong>Social Criteria</strong></td>
<td>30.0</td>
</tr>
<tr>
<td>Air Pollutant Emissions/Noise</td>
<td>9.0</td>
</tr>
<tr>
<td>Odours</td>
<td>9.0</td>
</tr>
<tr>
<td>Traffic/Road Condition/Public Safety</td>
<td>9.0</td>
</tr>
<tr>
<td>Community Impacts during Construction</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Economic Criteria</strong></td>
<td>30.0</td>
</tr>
<tr>
<td>Total Cost to the City</td>
<td>15.0</td>
</tr>
<tr>
<td>Risk Assessment</td>
<td>15.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
Triple Bottom Line Analysis

- Enhanced Treatment and Thermal Reduction were rated highest

- Land Application scored lower overall primarily due to social impacts and risks to the City (measured as part of economic impact)
  - Logistical concerns
    - Very dependent on off-site storage (difficult to site)
    - Limited market of service providers for Hamilton
  - Heavy use of trucking
    - High diesel fuel usage and associated emissions
    - Community impact of truck traffic and odours
  - Less processed end product (Class B, not a Class A fertilizer)

<table>
<thead>
<tr>
<th></th>
<th>Land Application</th>
<th>Enhanced Treatment</th>
<th>Thermal Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Impact</td>
<td>28.6</td>
<td>30.0</td>
<td>34.3</td>
</tr>
<tr>
<td>Social Impact</td>
<td>18.8</td>
<td>22.5</td>
<td>26.3</td>
</tr>
<tr>
<td>Economic Impact</td>
<td>16.5</td>
<td>22.5</td>
<td>16.5</td>
</tr>
<tr>
<td>Total</td>
<td>63.8</td>
<td>75.0</td>
<td>77.0</td>
</tr>
</tbody>
</table>
Triple Bottom Line Analysis

A. Economic Impact

- **Cost:**
  - Land Application - Lowest cost Alternative
  - Enhanced Treatment – Similar cost to Land Application under best case scenario (low cost – pellets sold to market) but up to 30% higher under worst case scenario (high cost – no pellets market considered)
  - Thermal Reduction – Most costly Alternative

**Summary of Cost Analysis of Alternatives (NPV Basis)**
Triple Bottom Line Analysis

Summary

- Enhanced Treatment and Thermal Reduction were rated highest

Enhanced Treatment
- Class “A” end product
- Low emissions
- Low risk to City (through DBFOM model)
- Can be cheaper or more expensive than Land Application by 30% (depending upon end product market)

Thermal Reduction
- Produces non-hazardous end product
- Lowest truck traffic amongst Alternatives
- Controlled emissions
- Highest cost Alternative but lowest risk through DBFOM model

Land Application
- Rated lowest by a significant range
- Highest truck traffic and diesel emissions
- Limited market of land application service providers
- Not suited to DBFOM model
- Lowest cost Alternative but highest risk to the City
What is Value for Money?

- Value for Money is the difference in estimated net present costs between a PPP project delivery model, and the Public Sector Comparator.
- Purpose: Determine whether a project should be done via PPP, or not

**PPP Model (DBFOM)**
- Estimated net present costs to the City of delivering the project based on a PPP model
- For the Biosolids Project – consider DBFOM

**Public Sector Comparator**
- Estimated net present costs to the City of delivering the project based on the public sector’s traditional method of procuring public infrastructure.
- Design-Bid-Build project delivery method.
Value For Money Analysis

- VFM is a comparison of costs of a DBFOM model against a traditional Public Sector Comparator.

- The net present cost of each option includes the following elements:
  - Base Costs
  - Risk Premium
  - Ancillary Costs
  - Financing Costs
  - Risks Retained by the Public Sector

![Components of VFM Diagram]
## Summary of VFM Results

<table>
<thead>
<tr>
<th>Alternative</th>
<th>VFM Summary</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Application</td>
<td><strong>Negative Value for Money</strong></td>
<td>• DBFOM delivery model does not transfer significant risk, due to low private capital and low complexity of construction and operations.</td>
</tr>
<tr>
<td></td>
<td>Estimated savings to City via DBFOM model: -4% to -6%</td>
<td>• Fixed costs related to private finance add costs to DBFOM model and offset limited risk transfer</td>
</tr>
<tr>
<td>Enhanced Treatment</td>
<td><strong>Positive Value for Money</strong></td>
<td>• Savings primarily due to risk transfer benefits</td>
</tr>
<tr>
<td></td>
<td>Estimated savings to City via DBFOM model: 8% - 15%</td>
<td>• Transfer of construction, operations, and maintenance risk to private sector under DBFOM. Key risks can be controlled and mitigated by private sector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Larger private capital requirement – better risk anchoring</td>
</tr>
<tr>
<td>Thermal Reduction</td>
<td><strong>Positive Value for Money</strong></td>
<td>• Savings primarily due to risk transfer benefits</td>
</tr>
<tr>
<td></td>
<td>Estimated savings to City via DBFOM model: 7% - 16%</td>
<td>• Complex project. Robust risk transfer during construction, operations, and maintenance phases through DBFOM delivery model. Key risks can be controlled and mitigated by private sector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Larger private capital requirement – better risk anchoring</td>
</tr>
</tbody>
</table>

## Implications of VFM Results

- Land Application not a good candidate for DBFOM model due to negative VFM
- Enhanced Treatment and Thermal Reduction applicable for DBFOM model and good candidates for PPP Canada funding – Positive VFM
Business Case Summary & Recommendation

- The Triple Bottom Line analysis demonstrates that Enhanced Treatment and Thermal Reduction Alternatives best meet the City’s environmental, social, and economic objectives.
- The Value for Money analysis demonstrates robust value in a DBFOM Project Delivery Model for both Enhanced Treatment and Thermal Reduction.
- Therefore:
  - Recommending an output-based procurement process open to Enhanced Treatment and Thermal Reduction approaches.
  - Design-Build-Finance-Operate-Maintain Project Delivery Model which is eligible for PPP Canada funding.
Procurement Strategy
Procurement Strategy

- **Proposed Approach**
  - Output based procurement process based on performance specifications
  - Bidders to have flexibility to bid on a variety of technologies within the Enhanced Treatment and Thermal Reduction Alternatives to meet output specifications
  - “Let the market decide” approach to allow City to achieve best procurement result

- **Performance Specifications**
  - Requirement to process biosolids to produce Class “A” material or to incinerate them
  - Requirement to accept specified quantity of biosolids per year
  - Compliance with applicable legislation and regulations
  - Performance requirements regarding odour, truck traffic, site management, and reporting

*Performance specifications provided at a high level.*
Procurement Strategy

Two stage procurement process: Request for Qualifications (“RFQ”) and Request for Proposals (“RFP”)

Market Concerns during Procurement Process:

- A novel procurement process will present challenges and risks that need to be considered in development of the procurement strategy.
- The following market concerns have been expressed through the market sounding process and assessed in order to develop mitigating measures:

<table>
<thead>
<tr>
<th>Market Concern</th>
<th>Mitigating Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variability may confuse the market and limit interest</td>
<td>• Provide maximum information upfront at RFQ stage to bidders (through detailed term sheet)</td>
</tr>
<tr>
<td>Increased cost of bidding</td>
<td>• Higher honorarium</td>
</tr>
<tr>
<td></td>
<td>• Costs may be offset through simpler process overall (output based as opposed to highly prescriptive)</td>
</tr>
<tr>
<td>Inability to compete against low cost providers</td>
<td>• Performance specification which requires at least Class A material will eliminate lowest cost providers</td>
</tr>
<tr>
<td>Teaming</td>
<td>• RFQ will provide additional time for teaming to take place</td>
</tr>
</tbody>
</table>
Project delivery team structure
Procurement Strategy

- **Affordability Cap**
  - Will be based on estimated cost of relevant Alternatives, as well as budgetary constraints, to develop an annual affordability limit
  - Will be provided to proponents at the RFP stage in order to add structure and certainty to the procurement process
  - Pass / Fail criterion
  - Challenge proponents to seek out low cost technical solutions that meet output specifications
  - Specific Affordability Cap to be detailed after the City receives response from PPP Canada on the Business Case. Will be presented to Public Works Subcommittee and Council prior to RFQ issue.
Next Steps

• Moving Forward
• Recommendation for Council
Moving Forward – Overall Process Flowchart

All three Alternatives ranked to a set criteria under Social, Environmental and Economics

- Triple Bottom Line → TBL Ranking
- VFM Analysis → PPP Suitability

VFM Determines which of the Alternatives are suitable for a PPP

PPP Eligible?

Yes → Enhanced Treatment and Thermal Reduction

No → Land Application

PPP Business Case

Yes → Council Approves Business Plan?

No → Stay with Land Application

Council Approves one Alt.

Yes → Proceed to Award

No → Is Preferred Strategy Affordable?

Yes → Proceed to Award

No → Council Direction

RFQ

RFP

Alternatives have been “screened in” through an RFI process

Both PPP Approved?

Yes

No

Council Direction

PPP Approved?
Next steps with Council

- **Summer 2012** - The Project Team and Council will wait to see the outcome of the PPP Canada funding decision.

- **Summer/Fall 2012** - Based on the outcome of the PPP Canada funding decision, the Project Team will request Council’s approval to hire advisors and initiate a procurement process for the Project.
  - If the PPP Canada funding application is successful, the Project Team expects to present the procurement plan set out in the Business Case, for approval to proceed with the procurement.
  - If the PPP Canada funding application is unsuccessful, the Project Team may reconsider elements of the procurement plan and will present an amended procurement plan to Council at that time.

- **Short-listing of RFP Proponents (Expected Q2 of 2013)** – Council will approve the short-listing of Proponents for the RFP process. It is anticipated that Council’s decision will be based on the recommendation of a Council Subcommittee.

- **Naming of Preferred Proponent and Contract Award (Expected Q2 of 2014)** – Council will be required to approve the naming of the preferred proponent and the award of the contract. It is anticipated that Council’s decision will be based on the recommendation of a Council Subcommittee.
Recommendation

 That the General Manager of Public Works proceed in submitting the Business Case to PPP Canada for consideration for PPP Canada funding towards the City’s Biosolids Management Project

 That the General Manager of Public Works return to Council after receiving PPP Canada’s response to the Business Case and prior to proceeding towards any subsequent procurement activities