Development of a Waste Diversion Strategy for Dalhousie University

Atlantic Canada Waste Diversion Conference
Halifax, NS

October 16, 2014
Presentation Overview

- Dalhousie University – Halifax and Bible Hill
- Project Objectives
- Waste Stream Forecast
- Identification of Candidate Improvements
- Development of Two Management Scenarios
- Next Steps
- Q & A
Dalhousie University - Halifax

Quick facts
• Founded 1818
• 16,085 FTE students, ~2,200 in residence
• ~7,100 faculty and staff
• 110 buildings, 4.8M ft²
• 10 residences, 4 dining halls
• Medical research facilities
Dalhousie University – Bible Hill

Quick facts
- NSAC founded 1905
- 890 FTE students, 240 in residence
- 63 faculty, 266 staff
- 3 residences, 1 dining hall
- Dairy cattle, sheep, chickens and mink
Project Objectives

• Develop a 25 year Solid Waste Management Plan for Dalhousie University
  – Incorporate findings from previous “in-house” evaluations
  – Engage university staff currently involved in waste management activities
  – Identify best practices from other relevant institutions
  – Acknowledge Dal’s 75% (by weight) diversion target (currently ~60%)
  – Objective of a “cost neutral” (Net Present Value) outcome
Waste Stream Forecast

**Quantity**
- 2012 tonnage records
- “FTE” = full time equivalent student population
- Use of Dal’s student growth forecast; ~2%/year
- No change for faculty/staff #
- Annual per capita waste generation growth = GDP (~2%)

**Halifax Campuses**
- 2014: 1,376 tonnes/year
- 2038: 3,821 tonnes/year

**Agricultural Campus**
- 2014: 358 tonnes/year
- 2038: 993 tonnes/year

**Quality**
- HAZARDOUS, 2%
- UNIVERSAL WASTE, 2%
- C & D, 6%
- GLASS, 2%
- METAL, 2%
- PLASTIC, 8%
- ORGANICS, 30%

**Halifax Campuses**
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**Agricultural Campus**
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Identification of Candidate Improvements

- Review of previous in-house reports
  - Student reports with oversight from the Office of Sustainability, variety of waste management topics
- Assembly of best practices
  - Web search, select interviews
- Staff consultations
  - Project initiation meeting and two interactive workshops
- Site visits
Identification of Candidate Improvements

• **System Governance & Management (SGM)**
  – Centralize and clarify roles & responsibilities
  – Standardize waste system record keeping (quantities & costs)
  – Define a practical, defendable methodology to track diversion performance
  – Establish a multi-stakeholder waste/resource management group
  – Consolidate user education efforts under one authority
Identification of Candidate Improvements

• Procurement (P)
  – Clarify requirements and educate staff on sustainability considerations when making purchasing decisions
  – Conduct regular audits of procurement decisions
  – Centralize furniture procurement to encourage on-campus reuse and discourage purchasing of low cost/short life items.
  – Centralize the procurement of lab reagents
Identification of Candidate Improvements

• User Education and Awareness (UEA)
  – Enhance waste management info presentation in student orientation packages
  – Post student volunteers/guides at “PROG” bins for the first two weeks in September
  – Develop a single, engaging web location for Dal waste management info
  – Assign a Floor/House Environmental Leader in each residence
  – Create a Dal waste management/diversion “brand”, including consistent images & signage
Identification of Candidate Improvements

• **Collection & Transfer (CT)**
  – Phased-in deployment of consistent “PROG” bins across all campuses
  – Remove garbage containers from offices and classrooms; hallway containers only (building on Agricultural Campus efforts)
  – Drop offs for cell phones, batteries and ewaste (via stewardship programs)
  – Dumpster security provisions; signage, locks and cameras
  – Enforce collection contract weighing requirements
Identification of Candidate Improvements

• Reuse & Recycling (RR)
  – Glass crusher to process lab glass for use in select university construction projects
  – On-line chemical reagents reuse/sharing inventory
  – Water bottle filling stations & disposable water bottle ban
  – Specification of select reused materials in capitals works projects (tire-derived aggregate, shingle grit in asphalt, crushed concrete)
  – On-site baling of OCC
Identification of Candidate Improvements

• Composting & Organics Management (COM)
  – Anaerobic Digestion (AD) pilot project at the Agricultural Campus
  – Biodiesel pilot project using food services cooking oil
  – Exterior “Green Cone” composting units at select locations (York)
  – Further evaluation of on-site aerobic kitchen organics composting units (Mt. Allison, McGill)
Identification of Candidate Improvements

• Scoring of Candidate Actions
  – Ranking of 51 “long list” actions completed in consultation with Dal staff

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Avg Score</th>
<th>Rank</th>
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<tbody>
<tr>
<td>Relative Cost</td>
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<tr>
<td>Reliability</td>
<td>3.2</td>
<td>2</td>
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<tr>
<td>Landfill Diversion Rate</td>
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<tr>
<td>Community Leadership/ Enhancing Sustainability</td>
<td>4.2</td>
<td>4</td>
</tr>
<tr>
<td>Social Acceptability</td>
<td>4.2</td>
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<tr>
<td>Operational Complexity</td>
<td>4.4</td>
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</table>
Development of Two Management Scenarios

• **Enhanced Performance (EP)**
  – Select “best value” actions to improve overall program diversion performance (*safe, tried and true*)
  – Top half of the long list ranking

• **Optimal Performance (OP)**
  – Enhanced Performance actions *plus* progressive, high-profile measures to distinguish Dal amongst its post-secondary peers (*some risk, leading edge*)
  – Bottom half of the long list ranking
Development of Two Management Scenarios

• “Bundling” of individual actions into larger, comprehensive management program actions
  – 12 Enhanced Scenario actions (tried and true)
  – 12 Optimal Scenario actions (leading edge)

• Implementation requirements (responsibilities, performance measurement, costs) identified for each Scenario action
<table>
<thead>
<tr>
<th>Action Item No.</th>
<th>Action Name</th>
<th>Est. Capital Cost</th>
<th>Est. E/I Cost</th>
<th>Est. Annual O/M Cost</th>
<th>NPV² (2014$ @ 6% for 25 Years)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Establish a Battery and Ewaste Management Program</td>
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<td>$5,000</td>
<td>($10,000)</td>
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<td>2</td>
<td>Standardize Material Collection Containers - Phase 1</td>
<td>$66,000</td>
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<td>3</td>
<td>Implement Improvements to Current Waste Collection Program</td>
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<td>$2,000</td>
<td>($21,000)</td>
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<td>4</td>
<td>Finalize Evaluation of Stationary Compactor MSW Collection Option</td>
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<td>5</td>
<td>Update Existing Procurement Procedures</td>
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<td>$8,000</td>
<td>$0</td>
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<tr>
<td>6</td>
<td>Investigate Establishment of Onsite Contractor-supplied OCC Baler at Studley Campus</td>
<td></td>
<td>$2,000</td>
<td>$0</td>
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<td>7</td>
<td>Process Halifax Campus' Lab Glass Using an On-Site Crusher</td>
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<td>$9,000</td>
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<td>8</td>
<td>Clarify and Consolidate Waste Management System Roles and Responsibilities</td>
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<td>Establish a Waste Management System Performance Tracking Protocol</td>
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<td>Initiate an Enhanced User Orientation/Education Program</td>
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<td>11</td>
<td>Update Waste Diversion/Program Signage</td>
<td></td>
<td>$10,000</td>
<td>$0</td>
<td>($10,000)</td>
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<td>12</td>
<td>Enhance Current Level of Local Community Engagement on Waste Management Issues</td>
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<td>$2,000</td>
<td>$0</td>
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<tr>
<td></td>
<td><strong>TOTAL ENHANCED PERFORMANCE (EP) SCENARIO</strong></td>
<td><strong>$66,000</strong></td>
<td><strong>$64,000</strong></td>
<td><strong>$64,000</strong></td>
<td><strong>($1,016,000)</strong></td>
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**2024 “EP” Performance**
- Diversion Rate: 67%
- Disposal Rate: 33 kg/FTE/year

Estimated Reduction in MSW Disposal Cost versus Status Quo³ $848,000

25 Year Net Present Value of Enhanced Performance Scenario **($168,000)**

**Benefit/Cost Ratio** 0.83
<table>
<thead>
<tr>
<th>Action Item No.</th>
<th>Action Name</th>
<th>Est. Capital Cost</th>
<th>Est. E/I Cost</th>
<th>Est. Annual O/M Cost</th>
<th>NPV $ (2014@6% for 25 Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COM-1 Conduct an AD Pilot Project at the Agricultural Campus</td>
<td>$30,000</td>
<td>$2,000</td>
<td>$10,000</td>
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<td>2</td>
<td>COM-2 Conduct a Pilot Project to Make Cooking Oil Biodiesel for Dalhousie Vehicles</td>
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<td>$7,000</td>
<td>$9,000</td>
<td>($21,000)</td>
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<td>3</td>
<td>COM-3 Install Organics Collection/Digester Units at Select Campus Locations</td>
<td>$1,600</td>
<td>$3,000</td>
<td>$1,000</td>
<td>($13,000)</td>
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<tr>
<td>4</td>
<td>COM-4 Establish an On-site Mechanized Composting Unit(s) at Studley Campus</td>
<td>$380,000</td>
<td>$61,000</td>
<td>$20,000</td>
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<td>5</td>
<td>CT-5 Standardize Material Collection Containers - Phase 2</td>
<td>$46,000</td>
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<td>6</td>
<td>CT-6 Establish a New Purpose-Built Sorting Location at the Studley Campus</td>
<td>$74,000</td>
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<td>7</td>
<td>CT-7 Install Solar Powered Garbage Collection/Compactor Units at Select Campus Locations</td>
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<td>$500</td>
<td>($27,000)</td>
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<td>8</td>
<td>CT-8 Install Dumpster Monitoring Cameras at Select Halifax Campus Locations</td>
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<td>$8,000</td>
<td>$0</td>
<td>($6,000)</td>
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<tr>
<td>9</td>
<td>CT-9 Evaluate Contractor Haul Option for HRM Campus Paper and Organics</td>
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<td>$0</td>
<td>($2,000)</td>
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<td>10</td>
<td>P-2 Consolidate the Procurement and Use of Research Chemicals</td>
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<td>$4,000</td>
<td>($13,000)</td>
<td>$125,000</td>
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<td>11</td>
<td>RR-3 Establish Water Bottle Filling Stations at Select Campus Locations</td>
<td>$60,000</td>
<td>$3,000</td>
<td>$0</td>
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<td>12</td>
<td>RR-4 Undertake all OCC Baling and Marketing Activities Using Dal Resources</td>
<td>-</td>
<td>$2,000</td>
<td>$5,000</td>
<td>($45,000)</td>
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<td></td>
<td><strong>TOTAL OPTIMAL PERFORMANCE (OP) SCENARIO</strong></td>
<td><strong>$616,600</strong></td>
<td><strong>$112,000</strong></td>
<td><strong>$32,500</strong></td>
<td><strong>($672,000)</strong></td>
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</table>

Implementation of Enhanced & Optimal Performance Scenarios

- Total Incremental Cost: **($1,688,000)**
- Estimated Reduction in MSW Disposal Cost versus Status Quo: **$2,162,000**
- 25 Year Net Present Value of Enhanced & Optimal Performance Scenarios: **$474,000**
- Benefit/Cost Ratio: **1.28**

2024 “OP” Performance
- Diversion Rate: 72%
- Disposal Rate: 28 kg/FTE/year
Next Steps

• Acknowledging “law of diminishing returns” + the current costs of diversion

• Dalhousie Implementation Committee; Waste Management Coordinator
  – Development of initial 5 year Implementation Program
  – Performance monitoring/annual reports
  – Five year mark; first Master Plan and Implementation Program review
Thank you for your attention!

Contact:

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