WHAT DIFFERENTIATES THE BEST BIOSOLIDS PROGRAMS FROM THE REST

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PURPOSE OF TRIP

• Better understand successful biosolids program
• Learn from successes in the Pacific Northwest
• Bring back lessons learned to Northern California
TWO MAJOR OUTLETS CARRY RISK

Land Application
- Subject to County Supervisor whim and good or bad behavior of hauling and application contractors
- No relationship with farmers, no way of knowing what benefit biosolids provide
  - Agronomic rates; no quantification of benefits

ADC At Landfills
- Current competition for landfill capacity coupled with eventual phasing out of ADC by 2025 at the latest
- No other viable options, should a current option be threatened or go away.
**King County, Washington**

**Similarities**
- Mostly Class B with 5% Compost
- Land app as far as 250 miles round trip

**Differences**
- 30-year partnership with academia
- King County emphasis on marketing
- Compost comes back into Seattle for community gardening and PR
- Eight 50-acre research plots
- Multiple farms requesting biosolids

**Observations**
- Nine dedicated biosolids staff
  - One a proactive spokesperson
  - Got rid of middle man/broker
    - Relationships directly with farmers

**Lessons Learned**
- Components of a low-risk program:
  - Dedicated staff
  - Direct relationships with end users
  - Academic partnerships
  ...not as easy as just slapping on a label
**King County, Washington**

**What's the Risk?**

Working or playing around biosolids or compost made with biosolids poses very little risk, much less than everyday exposure to common products.

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

<table>
<thead>
<tr>
<th>Products</th>
<th>0</th>
<th>200</th>
<th>400</th>
<th>1,000</th>
<th>50,000</th>
<th>100,000</th>
<th>500,000</th>
<th>1,000,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ibuprofen (200 mg)</td>
<td>43,298</td>
<td>77,266</td>
<td>45,412</td>
<td>541,224</td>
<td>431,900</td>
<td>965,819</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over the counter pain reliever</td>
<td>24,507</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Azithromycin (93 mg)</td>
<td></td>
<td></td>
<td></td>
<td>23,309</td>
<td>4,008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prescription antibiotic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triclosan (1 hand wash)</td>
<td></td>
<td>9,775</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimicrobial agent in soaps,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>toothpaste and deodorant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**What About Food?**

For this analysis, wheat fertilized with biosolids was tested for more than 80 chemicals and none were found in the wheat grain.

**Legend**

- Gardener
- Child
- Hiker
- Agricultural worker

**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**

This risk analysis followed the United States Environmental Protection Agency (U.S. EPA) risk assessment methodology.
• Program Costs: $25/ton  
• Public *significantly* values low cost soil amendments made locally  
• Over 100 blue ribbons won from local fairs  
• Exclusion from Organic label not an issue with potting and topsoil products  
• Refusal to give TAGRO mixes to Rec & Park because they wouldn’t pay for it  
• TAGRO staff looked at SF’s ADC practices as “burying money”  
• Tacoma also funded academic research  
  • Over the years, TAGRO users have become the experts

TAGRO Mix: $10/cubic yard  
50% Class A, 25% Sawdust, 25% Sand

TAGRO Top Soil - $23/cubic yard  
60% Mix, 40% Tree Bark

TAGRO Potting Soil: $30/cubic yard  
20% Class A, 20% Sawdust, 60% Tree Bark
SFPUC

- Biosolids disposition addressed through **contractors**
  - Lately, contractors’ trucks turned away by farms and landfills
  - No stability or control over fate
  - No relationship with users
  - Users have no vested interest in program

- Past compost giveaways were extremely successful...
  - But PUC **lacked relationships** with creditable experts that test biosolids and amended soils

TCMA TAGRO

- Everything done **in-house**: complete vertical integration
  - Product delivered by city staff
  - Drivers serve as ambassadors

- Household name: 60% usage
  - Ratepayers pay for program, then buy the resulting products
  - “Like selling ice to an Eskimo”
  - Product associated with flowers and water, not sewage

- Fully utilized their biosolids this year and soil blend **market now exceeds biosolids supply**
Existing Programs

- Starting point was evaluating existing Class A biosolids blending programs
- 3 Existing facilities in North America
  - TAGRO – Tacoma, WA
  - Vancouver and Abbotsford, British Columbia
- Visited sites, studied blend formulations, tested products
- Evaluated marketing strategies, too

Of course, there will be regional differences in acceptability of “bio-soils”

Product Comparison

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>pH</th>
<th>Electrical Conductivity</th>
<th>Total N</th>
<th>Organic N</th>
<th>Nitrate N</th>
<th>Ammonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>8.5</td>
<td>3.8 dS/m</td>
<td>1.5%</td>
<td>1.4%</td>
<td>0.68%</td>
<td>1,200 ppm</td>
</tr>
<tr>
<td>Cured</td>
<td>6.27</td>
<td>4.9 dS/m</td>
<td>1.3%</td>
<td>1.2%</td>
<td>0.82%</td>
<td>240 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>Moisture Content</th>
<th>Organic Matter</th>
<th>Bulk Density</th>
<th>Stability</th>
<th>Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>68.9%</td>
<td>60.8%</td>
<td>51 lbs/ft³</td>
<td>7.0 mg CO₂-C/g OM/day</td>
<td>100/61</td>
</tr>
<tr>
<td>Cured</td>
<td>67.7%</td>
<td>53.1%</td>
<td>55 lbs/ft³</td>
<td>1.9 mg CO₂-C/g OM/day</td>
<td>100/94%</td>
</tr>
</tbody>
</table>

- Still learning about product, more work underway
- Moving towards creating a aging / curing / weathering facility to make a more versatile product
- Minimal change in moisture content because curing was done out of doors (rain)
**Northwest Biosolids Management Association and University of Washington**

1. **Why Partner with Academia?**
   - Biosolids agencies lack credibility.
   - Development of irrefutable talking points
   - Possess a total command of literature—accessible and comprehensive
   - Relationships with professors create a pipeline for staff recruitment

2. **How Do We Partner with Academia?**
   - Offer internships with a lab or research component to grad students. You’ll have access to their professors
   - Information exchange with consortiums like ReNUWIt
Based on this information, how should we perceive our current biosolids program and are there opportunities for improvement?
# How to Incorporate These Lessons

**Have a plan**
- Where are we going?
- How will we get there?

**Partner with Academia**
- Understand our biosolids better
- How do we know enough about and address public concerns with biosolids?

**Foster Familiarity**
- Develop programs and tools that foster biosolids familiarity and convey important messages

**End Users**
- Develop our own relationships with end users of our products

**Develop Staff**
- Hire or internally groom key staff to play proactive roles in biosolids management
2. Partner with Academia

We Need to Better Understand:

A. Safety and Public Perception
   - “Anything we don’t know, we assume the worst”
   - How do we know enough about and address any public concerns with biosolids?
   - Presence of trace compounds does not equal harm
   - Have third party spokespeople/experts on hand to address public inquiries

B. Product Performance of Biosolids in Soil
   - What do biosolids do to soil and how can we quantify?
     - Water holding capacity
     - Organic matter
     - Carbon sequestration
WERF Research on Treatment and Management of Residuals and Biosolids

**Highlights:**

- Almost one-third of WERF’s research is valued at well over $20 million research.
- Research continues in almost half of WERF Operations Optimization, with more under Biosolids. Some of this work has been cooperative agreement between WERF and industries.
- The Biosolids TCR (Targeted Collaborative Research) identified in the WERF-EPA Biosolids Research Subscribers, each contributing between Organics in Biosolids challenge.
- WERF is actively seeking funding partners to move this research forward.

**Risks Associated with Application of Municipal Biosolids to Agricultural Lands in a Canadian Context**

**Literature Review**

**March, 2015**

Hormones, sterols, and fecal indicator bacteria in groundwater, soil, and subsurface drainage following a high single application of municipal biosolids to a field

**2008**

**New Items in the NBMA Resource Library**

**PPCPs research by Dr. Wu**

**December 2012**

**Title:** Dissipation and leaching potential of selected pharmaceutically active compounds in soils amended with biosolids

**Author:** Wu, C., A. L. Sponberg, J.D. Witter, M. Fang, K.P. Czajkowski, and A. Ames

**Source:** Arch. Environ. Contam. Toxicol. 2010 59:343-51

**Abstract:** Biosolids land application is an important pathway introducing pharmaceuticals into the environment. In this work, laboratory column and dissipation experiments were performed using soils of varying properties in order to study the fate and transport of pharmaceutical residues introduced by the land application of biosolids. For experimentation, five pharmaceutically compounds (carbamazepine, diphenhydramine, fluoxetine, diethylamino ethane, and clindamycin) and two metabolites (carbamazepine-10,11-epoxide and norfloxetine) commonly found in biosolids were selected. Leaching experiments indicate that the selected pharmaceuticals have low...
3 Foster Local Familiarity

Develop Communication Pieces and Public Outreach Tools

- Using data sourced from academic and peer reviewed research
Foster Local Familiarity

Develop Programs and Opportunities to Showcase Biosolids

- Conduct a biosolids demonstration at the SFPUC Garden at 7th and Lawton
- With academic, CASA, and EPA partnerships, initiate a brownfield remediation demonstration within SF
- Potential participation in field trials in Marin County, San Mateo County, and at FSSD
**1 Have a Plan: Biosolids Transition Strategy**

Can’t slap a label on it—it’s not that simple

**Biosolids Transition Strategy**

Develop a biosolids end use transition strategy to address shortcomings in the current biosolids management program. The strategy will address three key areas in the biosolids program:

1. **Optimization of Current Program**: Assess available options for management of the SFPUC’s Class B biosolids. This assessment will include a business case evaluation (BCE) of winter biosolids storage. Identify any institutional or other barriers to management plan optimization.

2. **Optimization of End Use of OSP Class A Biosolids**: Identify activities necessary to explore new market uses for the anticipated Class A product from the OSP. This will include an assessment of the Solano County biosolids ordinance and its applicability to the new product. Identification of an implementation plan for demonstration of soil blending with the Class A product will also be included in this task.

3. **Identification of Critical Path Activities for Use of Class A THP Product**: The SEP will generate a Class A THP product upon completion of design and construction of new solids handling facilities. Activities associated with expanded use of this product will be identified (e.g. research needs, market research/sounding, and identification of potential barriers to implementation).

**Components:**
- Technical memorandum detailing optimization of the current program
- Business Case for winter storage associated with the current end use program
- Technical memorandum detailing efforts required to expand use of Class A products at the OSP and SEP
- Timeline of critical path activities for use of Class A THP product
- Power Point slides for two workshops/meetings
QUESTIONS?

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