

Workshop on Land Application of Biosolids in Virginia 2007

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Recycling Manager



HRSD

- Political subdivision of southeastern Virginia
- Owns and operates 9 major >15 MGD and 3 small <1MGD WWTPs
- Biosolids management
 - Provide diversification & innovation
 - Incineration
 - Composting
 - Land application



Atlantic Plant

- 54 MDG design
- Annual average flow 30 MGD
- Approximately 30,000 wet tons/ year land applied since 1980s
 - 1500 acres per year - Private Sites
 - HRSD Progress Farm



Biosolids Processing

- Conventional mesophilic anaerobic digestion
- Class B
- Centrifuge dewatering
- Temporary hopper storage
- 90 day covered pad storage
- Agricultural land application
- Progress Farm



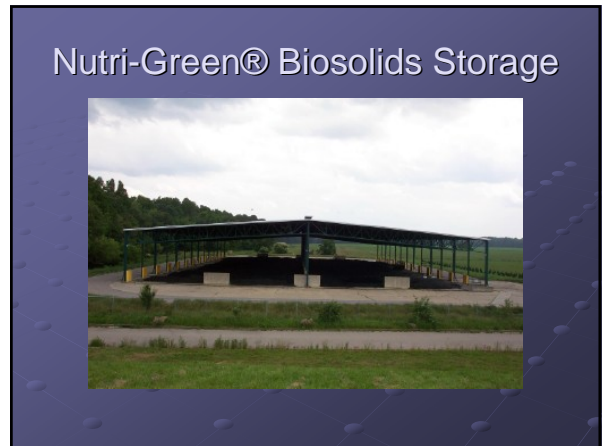
HRSD Land Application Project Goals

- Protect Environment / Public Health
- Maintain 100% Regulatory Compliance
- Be a Good Neighbor
- Use Best Management Practices
- Operate Cost Effectively
- Uphold NBP Code of Good Practice (EMS)



Ocean Lakes High School





HRSD Pilot Study

- 2 year study 1976-78
- Environmental viability
- Cost-effectiveness
- Agencies involved: EPA, USDA, DEQ, VDH, VDAC, VPI, Soil Conservation Service, Local Agriculture Extension

Pilot Area

- 15 acre test plot
 - Soils typical to Tidewater Agriculture
 - poorly drained soils
 - well drained soils
- Wheat and two corn crops grown
- Extensive application rates 10 - 13 dry tons/acre

Pilot Monitoring Program

- Study environmental effects
 - Ground Water
 - Surface Water (Lake Tecumseh/Scopus Creek)
 - Runoff
 - Soils
 - Crops



Monitoring

- 13 monitoring wells
 - 5 at 25 feet deep
 - Bi-monthly monitoring
- Soil monitoring 2 times/year
 - Surface and 3 feet
- Surface runoff and crop tissue analyses
 - compared to local agricultural fields



Pilot Soil Test Results

- Soil system maintained ambient levels
 - bacteriological
 - metal concentrations
 - no contamination or accumulation



Pilot Groundwater Test Results

- 55 constituents analyzed
 - on-site groundwater wells
 - off-site test wells
 - all met potable water quality standards
 - temporary fluctuations - natural cyclic patterns
 - No accumulation
 - No horizontal or vertical movement



Pilot Surface Runoff Results

- Runoff typical of agricultural fields



Pilot Crop Test Results

- Wheat and Corn Yields comparable to locally grown and control plots
- All metals were within natural variations
- Cd levels on special "high application" test plots 90dry ton acre showed minor increases however levels still within natural ranges



Conclusion from 2 year Study

- No adverse environmental effects demonstrated
- 2 year study cannot conclusively predict long-term environmental effects
- Long-term study on larger site needed

Progress Farm

- Baseline (ambient) data established (3 years)
 - 1981-1983
- Monitoring wells (7 total)
 - 6 well pairs (35 ft and 50 ft)
 - top and bottom of groundwater mixing zone
 - 35 foot wells serve as early warning indicators for off-site primary water zone
 - well 7 - 50 ft. no water bearing layer at 35 ft.
- Soil, crop, surface water and runoff analyses
- Frequent biosolids application
 - 1983-2003



Progress Farm Results

- 20 year study
- Biosolids applied frequently
- No adverse environmental or health effects
- Annual crop yields higher
- Improved soil characteristics
 - Organic matter content
 - Moisture holding capacity



Why Recycle Biosolids?

- Replenishes valuable organic matter
- Increases water infiltration and water holding capacity
- Reduces soil compaction
- Increases the ability of soil to hold nutrients
- Reduces soil acidification
- Provides carbon (energy) for beneficial soil microbes

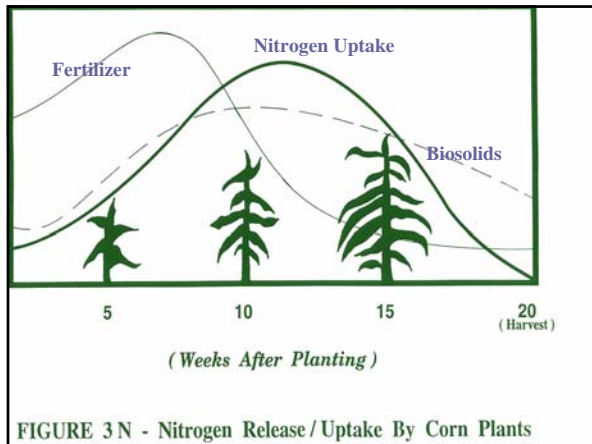
Other Benefits:

- Reduces dependence on chemical fertilizers
- Reduces soil erosion and runoff
- Protects Chesapeake Bay, Tributaries, and Atlantic Ocean
- Provides essential micronutrients
- Sustains agriculture and open space
- Provides cost savings to farmers

Additional Farmer Benefits

- Increases crop yields
 - 20 bushels/acre
- Crops survive dry seasons better
- Replenishes topsoil
- Helps maintain long term productivity
- Provides nutrients when plants need them





Governmental
Accountancy

NUTRIENT VALUE
H.R.S.D. Atlanta WWTP

1st Year
Site T-1457 Field 2
_0.62 Dry Tons Applied per Acre

	LowDT	\$/lb	\$ValueDT	\$/Ac	
Nitrogen	PA-N	33.54	0.22	7.38	34.10
Phosphorus	P ₂ O ₅	42.50	0.28	11.84	54.70
Potash	K ₂ O	4.12	0.16	0.66	3.06
Sulfur	S	60.00	0.19	11.40	52.67
Magnesium	Mg	0.64	0.30	1.98	9.19
Manganese	Mn	0.58	1.18	0.69	3.19
Copper	Cu	0.84	4.17	3.50	16.17
Zinc	Zn	2.91	1.21	3.52	16.26
Lime *	CaCO ₃	180.60	0.018	2.89	13.39
1st Year Total Value				43.87	202.66
2nd Year					
Nitrogen	PA-N	7.81	0.22	1.67	7.72
Phosphorus	P ₂ O ₅	26.34	0.28	7.54	36.08
2nd Year Total Value				9.81	44.40
3rd Year					
Nitrogen	PA-N	3.42	0.22	0.75	3.47
Phosphorus	P ₂ O ₅	18.98	0.28	5.54	23.29
3rd Year Total Value				6.79	26.73

* This value only includes liming potential from the Non-Green Biosolids. The \$ value from any additional lime applied to this site by H.R.S.D. through Ag. Nutrients, Inc. would be added to this total.

POTW Benefits

- Demonstrates environmental stewardship
- Promotes recycling vs disposal
- Lower fuel and energy costs compared to other alternatives (incineration/heat drying)
- Preserves landfill space
- Cost savings to rate payers

HRSD Private Site Application

- Corn, Wheat and Soybeans
- Infrequent application
 - Once in 3 Years
- Agronomic Rate
 - Apply nitrogen requirement for crop
- Nutrient Management
 - Criteria based on soil profiles, yield goals, residual nitrogen - legumes etc.

Application Methods

- Contract operations
 - Surface and sub-surface applications
- State of the art equipment
 - Reduce compaction

Components of a Land Application Program

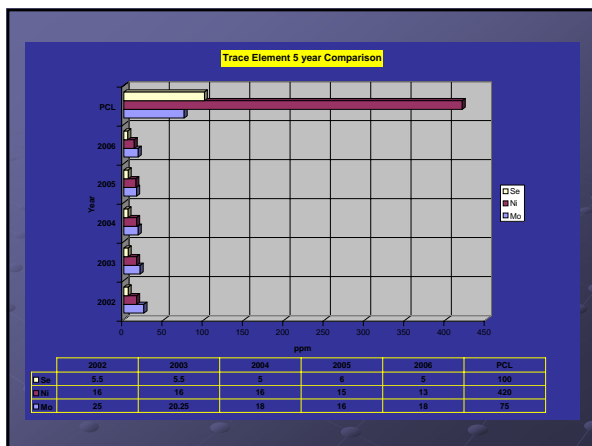
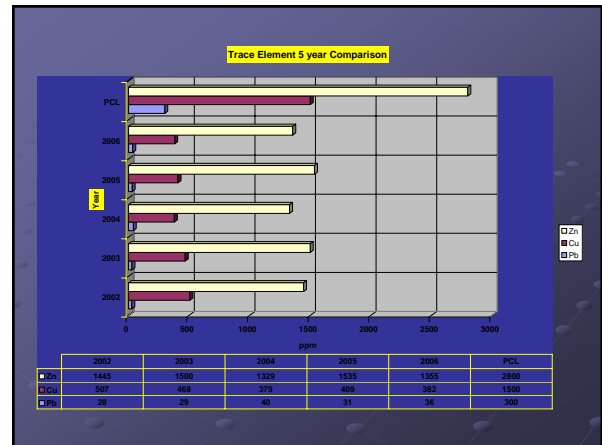
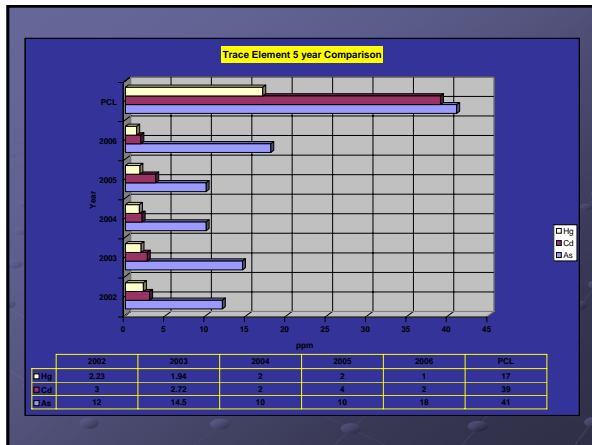
- Land area requirements
- Site selection
- Permitting sites
- Managing operations
- Accessing biosolids characteristics
- Nutrient management
- Field operations
- Monitoring
- Record keeping and reporting
- Ensuring good community relations

Verify Biosolids Characteristics

- Nutrient content (N,P,K, trace minerals)
- Metal content (regulatory limits)
- Pathogen and vector attraction reduction requirements
- Product consistency

Product Consistency

- Review records on biosolids quality
- Determine amount of variability and need for additional analytical testing
- Consistently produce exceptional quality biosolids



Field Operations Checklist

- Verify landowner agreements
- Confirm regulatory approvals for site
- Note any fields deleted since site selected
- Make sure all required maps, soil testing and other analytical monitoring is current

Checklist cont.

- Review farm nutrient management plan and verify proposed agronomic rates
- Review makeup of surrounding areas (residences, other farms, churches, etc.)
- Verify proper buffer zones have been established
- Review contractor housekeeping issues

House Keeping

- Spill prevention and cleanup
- Daily equipment cleaning
- Prompt incorporation of biosolids where appropriate
- Tracking of mud/biosolids onto roadways
- Inspect trucks for tailgate leaks, cleanliness

Odor Mitigation

- Distance to receptors
- Metrological conditions
- Volume of material stored
- Physical features of site

During land application

- Check the area applied versus the volume of biosolids applied to confirm application rate is consistent with target agronomic rate
- Review truck records, weight tickets, tonnage reports



After land application

- Review contractor reports, daily, monthly etc.
- Inspect site for final cleanup
- Prepare farm report
- Farmer follow up
- Work with local extension agents



Available Resources

- USEPA Land Application of Biosolids Process Design Manual
- USEPA A Plain English Guide to the EPA Part 503 Biosolids Rule
- VT Land Application of Biosolids for Agricultural Purposes in Virginia
- National Manual of Good Practice for Biosolids (National Biosolids Partnership)

Other Resources

- Biosolids Use Information Committee _ Greg Evanylo
- Virginia Biosolids Council
www.virginiabiosolids.com
- Mid-Atlantic Biosolids Association (MABA)
Bill Toffey
- National Biosolids Partnership
www.biosolids.org/