KODIAK CITY COUNCIL

WORK SESSION AGENDA

Monday, February 18, 2013

Kodiak Island Borough Conference Room
7 p.m.

Work sessions are informal meetings of the City Council where Councilmembers review the upcoming regular meeting agenda packet and seek or receive information from staff. Although additional items not listed on the work session agenda are sometimes discussed when introduced by the Mayor, Council, or staff, no formal action is taken at work sessions and items that require formal Council action are placed on a regular Council meeting agenda. Public comments at work sessions are NOT considered part of the official record. Public comments intended for the "official record" should be made at a regular City Council meeting.

Discussion Items

1. Public Comments (limited to 3 minutes)

2. Discussion of Biosolids Disposal

Land Application and Composting of Biosolids

What are biosolids?

Every day, wastewater treatment facilities across the country treat billions of gallons of wastewater generated by homes and businesses. The treatment process produces liquid effluent that is discharged to water bodies or reused as well as a byproduct of solid residues (sewage sludge) that must be managed in an environmentally responsible manner. Although the terms "biosolids" and "sewage sludge" are often used interchangeably, they are not the same. With further treatment, sewage sludge can yield biosolids, which is defined by the U.S. Environmental Protection Agency (EPA) as "*nutrient-rich organic materials resulting from the treatment of domestic sewage in a treatment facility... that can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.*"[1]

What are the various options to manage solid residuals?

Approximately 7,100,000 dry tons of solid residuals are generated each year from the treatment process at the more than 16,000 municipal wastewater treatment facilities in the U.S.[2] Since most U.S. wastewater treatment facilities are publicly owned and operated, management options are decided by local professionals. Behind the scenes, they must balance the needs of their communities for sanitation and public health protection with environmentally sound and sustainable methods of residuals management. Approximately 55% of the total residuals generated each year are further treated and land applied as biosolids. Other management options include incineration/processing for energy recovery or landfill disposal. [3]

Are biosolids treated before they are land applied?

Biosolids that are land applied have been treated to minimize odors and to reduce or eliminate pathogens. There are two classes of biosolids that are land applied, referred to as Class B and Class A. Class B biosolids are treated to achieve significant (i.e., 99%) pathogen reduction and subject to site use and access restrictions, and Class A biosolids are disinfected to a level that inactivates pathogens and are subject to fewer site-specific controls. If, in addition, heavy metal concentrations are sufficiently low, Class A biosolids can be bagged and distributed for home garden use without further regulation—referred to as Class A, EQ (exceptional quality) biosolids.[4] Composted biosolids generally achieve Class A, EQ status.

What are some of the benefits of biosolids land application?

The benefits of biosolids for both soil and vegetation are numerous and well recognized.[6] Biosolids provide primary nutrients (nitrogen and phosphorous) and secondary nutrients such as calcium, iron, magnesium and zinc. Also, the use of biosolids increases crop yields and maintains nutrients in the root zone and unlike chemical fertilizers, biosolids provide nitrogen that is released slowly over the growing season as the nutrient is mineralized and made available for plant uptake.[7] Land application of biosolids can also offer net greenhouse gas benefits by recycling carbon to the soil and fertilizing vegetation for further carbon dioxide capture.[8]

What is the federal regulation that governs the management of biosolids and how was it developed?

The federal regulation governing the management of biosolids is 40 CFR Part 503 and is based on the 1987 Clean Water Act amendments that directed EPA to research and promulgate regulations for use and disposal of sewage sludge.[9] EPA undertook a comprehensive process to study land application and other biosolids management practices. Based on the results of its risk assessment, EPA identified and set numeric limits for the nine trace elements (heavy metals), which have high enough potential risk to require monitoring. EPA also mandated that treatment facilities use at least one of several alternative technologies to significantly decrease or eliminate levels of pathogens in biosolids.[10]

Do states implement their own land application programs?

Land application is widely practiced in the U.S. In fact after EPA issued the Part 503 rule in 1993, most states implemented complementary land application programs to strengthen oversight and safety of the practice. Only nine states have no biosolids specific regulations and rely exclusively on Part 503.

What is the scientific basis for biosolids land application?

The broad weight of scientific evidence and opinion supports recycling biosolids to land as an environmentally responsible method of reuse when managed utilizing best practices and in compliance with the Part 503 rule. Federal policies supporting and promoting the beneficial recycling of biosolids are based upon science demonstrating the safety and benefits of such recycling. These policies are not driven by economics, and the choice to recycle biosolids remains a state or local decision.

Has EPA requested any independent studies to determine if the science supports biosolids land application?

Since the implementation of Part 503 rule, two reports of the National Research Council (NRC) of the National Academy of Sciences have considered whether land application of biosolids is safe and beneficial. In 1996, the NRC published *Use of Reclaimed Water and Sewage Sludge in Food Crop Production,* which concluded that the application of biosolids to farmland—when practiced in accordance with existing federal guidelines and regulations—presents negligible risk to the consumer, to crop production, and to the environment. The report concluded that current technology to remove pollutants from wastewater, coupled with existing regulations and guidelines governing the use of reclaimed wastewater and sludge in crop production, are adequate to protect human health and the environment.[11] In 2000, EPA asked the NRC to review the science and methods supporting Part 503 to address concerns regarding human health impacts of land application of biosolids. As a result of its "search for evidence on human health effects related to biosolids," the NRC's 2002 report concluded that "there is no documented scientific evidence that the Part 503 rule has failed to protect public health"; "[a] causal association between biosolids exposures and adverse health outcomes has not been documented"; and "there are no scientifically documented outbreaks or excess illnesses that have occurred from microorganisms in treated biosolids."[12] The NRC also observed that "persistent uncertainties" regarding the safety of land application necessitate more scientific research, but it did not call for any specific changes to Part 503. EPA continues to reevaluate the adequacy of the Part 503 regulations and has not found a need to establish more stringent requirements or regulate additional pollutants.

Did EPA assess trace metals and chemicals in biosolids?

After reviewing over 200 specific compounds and elements from an initial candidate list of thousands, EPA targeted at least 22 constituents for a formal risk assessment to examine the quantities of the metals and chemicals in biosolids, their toxicity, routes of potential exposure to humans and the environment, and many other factors. The risk assessment ultimately determined that limits were advisable for nine trace elements (arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc), primarily to protect against toxic effects to plants and entry into the food chain.[13] A four-year study by the U.S. Geological Survey (USGS) of Denver Metro Wastewater Reclamation District land application sites measured the effects of the application of Class B biosolids on the nutrient and metal content of soils, groundwater, and surface waters and found that "soil data indicated that biosolids have no measurable effect on the concentrations of constituents monitored." Further, the study did not establish any adverse biosolids-related effects on soils, crops, or groundwater on or near the biosolids application site.[14]

How do biosolids programs and regulations reduce or mitigate the risk of these trace metals and chemicals?

Current biosolids programs mitigate the risk of chemicals and trace metals in several ways. Federal guidelines limit the amount of biosolids that may be applied to the land, which ensures that metal concentrations on biosolids-amended soils do not exceed safe levels. Trace chemicals that on occasion have been identified in biosolids have not been found in environmentally or toxicologically significant amounts; and, the trace amounts of these substances that may be present typically bind to soil constituents, limiting human exposure. [15] Industrial pretreatment programs required under the Clean Water Act also reduce or eliminate many hazardous chemicals entering the treatment facility.[16]

What does the scientific literature state about the potential risk of these contaminants?

A 2005 literature review on the issue of trace contaminants concluded that, "because of the capacity of land-based systems to buffer the potential toxic effects of waste-associated organic contaminants and to contribute to their assimilation into the soil, the majority of studies conclude that they pose little or no risk to the environment when applied appropriately."[17]

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How are pathogens in biosolids regulated?

As established by the Part 503 rule, treatment of biosolids to Class B or Class A standards eliminates 99% or more of the pathogens that may exist in sewage sludge. Ongoing research has continued to validate a technology-driven approach to reducing or eliminating pathogens in biosolids and shows low risk for the transmission of pathogens from land application sites to surrounding residents. No scientific studies have demonstrated any link between the existence of human pathogens in biosolids and illnesses in nearby residents. The conclusion that application of biosolids utilizing best management practices poses negligible health risks from pathogens is based on scientific understanding about pathogen survivability in the environment. Many pathogens do not survive passage through the collection and treatment system and through the additional treatment processes that further disinfect solids and effluent.[18] Further, pathogens are enteric organisms that prefer and need the conditions inside the human body to thrive.

What does the scientific literature conclude about pathogens in biosolids?

A recent review of biosolids pathogen research literature stated that "the overall conclusion we have reached based on all of our land-application studies over the past two decades and an in depth review of other relevant land application studies is that land application of Class B biosolids is sustainable. Specifically, the risks to human health posed by many microbiological entities within biosolids have been shown to be low if current EPA regulatory guidelines are followed. In addition, risks from indirect exposures such as aerosolized pathogens or contaminated groundwaters appear to be particularly low."[19] This conclusion is consistent with the practical experience in the wastewater treatment sector where exposure to biosolids has not been associated with illness.[20] Microbial risk assessment and control remains a priority for the scientific community, however, and pathogen-related issues continue to be closely monitored.[21]

What is the potential for contamination of water resources from biosolids land application?

Like any nutrient-rich fertilizer, biosolids should be applied in ways that minimize risk of leaching of nutrients or other constituents to groundwater or runoff to nearby surface waters. Current land application programs have been successful in minimizing these risks through regulation and best management practices. For example, the amount of biosolids applied to a field is limited to the amount needed to meet the nitrogen requirement of the crop grown (referred to as the agronomic rate); biosolids may not be applied within a 10 meter setback from waterbodies; state regulations typically require site specific data on proposed land application sites so that sites with shallow water tables or inappropriate soils will be precluded [22]; and additional state requirements include limits on maximum slopes, prohibition on application during significant precipitation, and bans on biosolids application on standing water or wetlands.

Have there been long-term studies on ground water safety where biosolids have been land-applied?

Studies have concluded that there are no impacts on groundwater quality at properly managed biosolids application sites. For example, a 1999 study reported that after 20 years of land application, tests of deep wells at an agricultural research site demonstrated no evidence of nitrate leaching and negligible fecal coliform concentrations.[23] Also, a 2008 literature survey concluded that "groundwater contamination from land application of biosolids does not appear to be likely."[24]

Can odors from biosolids land-applied sites cause health problems?

No data has shown that odors from biosolids cause toxicological effects on individuals.[25] Most odors in biosolids are caused by sulfur compounds that only cause toxic effects in concentrations vastly greater than that which triggers a smell. Further, gases with a possible toxic effect are not present in biosolids in concentrations that would endanger nearby residents. Although there has not been any observed health risks, site and process-specific stabilization or vector attraction reduction criteria are essential. Accordingly, local agencies invest significant resources for odor control.

What is being done to address complaints of alleged health impacts from individuals living near land-application sites?

The Water Environment Research Foundation (WERF) has produced a draft investigative protocol entitled, *Epidemiologic Surveillance and Investigation of Illness Reported by Neighbors of Biosolids Land Application*.[26] The protocol was developed for medical providers and public health officials to use when citizens report health symptoms that they attribute to the application of soil amendments such as fertilizer, biosolids, animal manures, and food residuals. The goal is to provide a practical, objective, and reliable protocol that will be broadly implemented.

How do biosolids differ from other fertilizers?

Biosolids offer a sound alternative to chemical and manure-based fertilizers, which are often untreated or minimally treated before field application. Pathogen concentrations are magnitudes higher in untreated manures than in biosolids and, unlike biosolids, pathogen concentrations in manures are not strictly regulated.[27] Since they are unregulated, manure-based fertilizers may pose a greater risk of transmitting pathogens or trace organic constituents such as antibiotics to soil or humans. Many chemical fertilizers are petroleum-based products, which increases the costs to farmers and contributes to the release of greenhouse gas emissions in the production cycle.

Are there federal and state regulations for other fertilizers?

Federal and state requirements for biosolids are significantly more stringent than the controls over the use of chemical fertilizers and manures. In many cases, untreated manure and chemical fertilizers may legally be applied in the setback areas where biosolids land application is prohibited.

Why compost biosolids?

According to the EPA[28], composting is a viable, beneficial option in biosolids management. It is a proven method for pathogen reduction and results in a product that is easy to handle, store, and use. The end product is usually a Class A, humus-like material without detectable levels of pathogens that can be applied as a soil conditioner and fertilizer to gardens, food and feed crops, and rangelands. This compost provides large quantities of organic matter and nutrients (such as nitrogen and phosphorus) to the soil, improves soil texture, and elevates soil exchange capacity, all characteristics of a good organic fertilizer. Biosolids compost is safe to use[29] and generally has a high degree of acceptability by the public, making it a good alternative to other bulk and bagged products available to homeowners, landscapers, farmers, and ranchers.

How is biosolids compost regulated and is it safe?

Composting of biosolids is an approved "Process to Further Reduce Pathogens (PRFP)" under EPA's Part 503 biosolids regulations. Applying compost in accordance with Part 503 poses little risk to the environment or public health.[30] In fact the use of biosolids compost can have a positive impact on the environment. In addition to soil improving characteristics, reduced dependence on inorganic fertilizers can significantly decrease nitrate contamination of ground and surface waters often associated with use of inorganic fertilizers.

Are pathogens present in biosolids compost?

Composting is not a sterilization process and a properly composted product maintains an active population of beneficial microorganisms that compete against the pathogenic members. Composting biosolids reduces bacterial and viral pathogens to non-detectable levels if the temperature of the compost is maintained at greater than 55° C for three days or more.

Do odors from biosolids compost pose a health risk?

Odors from a composting operation can be a nuisance and a potential irritant but there is no documented link to health risks. In fact, offensive odors from composting sites are the primary source of public opposition to the practice. Although research shows that biosolids odors do not pose a health threat, many experts in the field of biosolids recycling believe that biosolids generating and processing facilities have an ethical responsibility to control odors and protect nearby residents from exposure to such nuisances. Recently, a better understanding of the generation of compost odors has allowed engineers to develop means of capturing and treating these odors so that emissions from composting facilities do not create offsite odor nuisance conditions.

Are there any initiatives to develop and implement best management practices for biosolids recycling?

Wastewater treatment professionals are committed to promoting environmental stewardship and best management practices by utilities for their biosolids management programs. The Water Environment Federation (WEF) publishes technical books, peer reviewed journal articles and technical practice bulletins on issues relating to biosolids. WEF also sponsors annual conferences on biosolids management practices. Wastewater professionals also strongly support research to further understanding of sound biosolids management practices to ensure that these remain protective of public health and the environment. The Water Environment Research Foundation conducts on-going scientific research on biosolids management questions. In addition to these efforts, WEF, the National Association of Clean Water Agencies and the EPA founded the National Biosolids Partnership (NBP) to promote biosolids best management practices. The Partnership has created a certified environmental management system (EMS) for biosolids programs that exemplifies the steps being taken at the local level to ensure biosolids quality and public participation in biosolids management decisions. Congress has provided support for this effort since 1999.

About WEF

Formed in 1928, the Water Environment Federation (WEF) is a not-for-profit technical and educational organization with 36,000 individual members and 75 affiliated Member Associations representing water quality professionals around the world. WEF and its Member Associations proudly work to achieve our mission of preserving and enhancing the global water environment.

Water Environment Federation
601 Wythe Street
Alexandria, VA 22314
1-703-684-2400
www.wef.org

References

1 EPA, Biosolids: Frequently Asked Questions, http://www.epa.gov/owm/mtb/biosolids/genqa.htm (last visited May 30, 2008), see also, EPA, Biosolids Recycling: Beneficial Technology for a Better Environment (1994).

2 2004 U.S. EPA data

3 North East Biosolids and Residuals Association (NEBRA), *A National Biosolids Regulation, Quality, End Use & Disposal Survey* (2007); www.nebiosolids.org.

4 40 C.F.R. § 503.10(g) (2008).

5 Ibid. NEBRA.

6 Eliot Epstein, *Land Application of Sewage Sludge and Biosolids* 143-158 (2003).

7 See generally Gary Pierzynski, *Soils and Environmental Quality* 174-80 (3d ed. 2005); Gary Pierzynski, *Plant Nutrient Aspects of Sewage Sludge, in Sewage Sludge: Land Utilization and the Environment* 21 (C.E. Clapp et al., eds. 1994).

8 Sally Brown & Peggy Leonard, *Biosolids and Global Warming: Evaluating the Management Impacts*, BioCycle, Aug. 2004, at 54, 58 (conducting a carbon accounting of the King County, WA, biosolids program and finding that "using biosolids as a substitute for commercial fertilizers results in a net savings in CO_2 for both agricultural and forest application sites," even without including the potential for biosolids to increase carbon reserves in soil).

9 Water Quality Act of 1987, Pub. L. No. 100-4, § 405, 101 Stat. 7, 72 (1987) (codified at 33 U.S.C. § 1345).

10 EPA, Standards for the Use or Disposal of Sewage Sludge, 58 Fed. Reg. 9,248 (Feb. 19, 1993)

11 National Research Council (NRC), *Use of Reclaimed Water and Sewage Sludge in Food Crop Production* (1996).

12 NRC, National Biosolids Applied to Land: Advancing Standards and Practices (2002).

13 EPA, *A Guide to the Biosolids Risk Assessments for the Part 503 Rule* (1995).

14 Tracy J.B. Yager, et.al., U.S. Geological Survey Scientific Investigations Report, *Effects of Surface Applications of Biosolids on Soil, Crops, Groundwater, and Streambed Sediment Near Deer Trail, Colorado*, 1999-2003, 5289 (2004).

15 Ian Pepper et al, *Environmental and Pollution Science* 459 (2nd. ed. 2006) See also R.Y. Surampalli et al., *Long-term Land Application of Biosolids—A Case Study*, 57 Water Sci. & Tech 345, 349 (2008) (finding "the cumulative metal loading rates after 10 years of biosolids application were far less than USEPA limits") Gregory Evanylo et al., *Bioavailability of Heavy Metals in Biosolids Amended Soil*, 37 Comm'n in Soil Sci. & Plant Analysis 2157, 2163 (2006) (finding that crops grown in biosolid-amended soils had higher metal concentrations than a control, but that metal concentrations in all plants were within the values observed for uncontaminated soils); Rufus Chaney, *Trace Metal Movement: Soil-Plant Systems and Bioavailability of Biosolids-Applied Metals in Sewage Sludge: Land Utilization and the Environment* (1994).

16 Clean Water Act §§ 301(b)(2), 304(g) (33 U.S.C. §§ 1311(b)(2), 1314(g)); and, National Ass'n of Clean Water Agencies (NACWA), *Biosolids Management: Options, Opportunities and Challenges* 10-13 (2006) (case studies of reduction of metals in influent and biosolids in Los Angeles and greater Cleveland).

17 Michael Overcash et al., *Beneficial Reuse and Sustainability: The Fate of Organic Compounds in Land-Applied Waste*, 34 J. Envtl. Quality 29, 30 (2005).

18 Raina M. Maier et al., *Environmental Microbiology* 512-13 (2000).

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19 Ian Pepper, Huruy Zerzghi, John P. Brooks, and Charles P. Gerba, *Sustainability of Land Application of Class B Biosolids*, J. Envtl. Quality 37, 58-67 (2008).

20 Studies demonstrate that workers at wastewater treatment facilities, highly exposed to untreated sewage and biosolids, do not have significantly higher rates of illness than similar unexposed workers. California State Water Resources Control Board, *Statewide Program Environmental Impact Review (EIR) covering General Waste Discharge Requirements for Biosolids Land Application* (2004), ("Studies of the incidence of disease among wastewater personnel have indicated that they have no greater incidence of disease than the population in general."). Similarly, no differences have been found in the health of farm families from farms using biosolids compared to the health of families on farms not using biosolids. *Id*.

21 For example, Water Environment Research Foundation is studying pathogen reactivation and regrowth.

22 The extent to which biosolids affect groundwater or surface water quality depends upon "a wide range of factors, including climate, topography, land use, soil characteristics, and the chemical composition and application rate of the biosolids" and therefore requires case-by-case analysis. Kathryn J. Draeger et al., Water Env't Research Found., *Watershed Effects of Biosolids Land Application: Literature Review* 2-8 (1999). This is true of any fertilizer. *Id.*

23 See, e.g. Draeger et al., supra, at 3-13 (1999).

24 Ibid. *Sustainability in Land Application of Biosolids* (2008)

25 *See* Paul Chrostowki & Sarah Foster, *Odor Perception and Health Effects*, 76th Annual Water Environment Federation Technical Exhibition and Conference Workshop (2003). A 2004 literature review of the health effects of odors from municipal wastewater operations presented five reasons to conclude that odors do not cause illness: (1) odors do not cause signs of illness in healthy individuals; (2) odor acceptability varies with circumstances of exposure and the meaning people associate with the exposure; (3) below toxic levels of exposure, symptoms associated with odors involve no pathology; (4) symptoms are reduced almost immediately when the source of an odor is removed; and (5) nonphysical variables, such as anxiety and stress, seem to mediate symptoms from odors. William S. Cain and J. Enrique Cometto-Muñiz, Water Env't Research Found., *Identifying and Controlling Odor in the Municipal Wastewater Environment* 6-1 (2004).

26 http://www.werf.org/AM/CustomSource/Downloads/uGetExecutiveSummary.cfm?FILE=06HHE5PP.pdf&ContentFileID=4741

27 Lynne H. Moss et al., *Comparing the Characteristics, Risks and Benefits of Soil Amendments and Fertilizers Used in Agriculture*, 16th Annual Water Environment Federation Residuals and Biosolids Management Conference 14 (2002).

28 U.S. EPA Biosolids Technology Fact Sheet: Use of Composting for Biosolids Management

29 Ibid U.S. EPA Biosolids Technology Fact Sheet: Use of Composting for Biosolids Management

30 Hay, J.C., 1996. "Pathogen Destruction and Biosolids Composting." *BioCycle, Journal of Waste Recycling,* 37(6):67-72.

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Lee County, Florida — windrow composting inside fabric structures.

BIOCYCLE NATIONWIDE SURVEY

BIOSOLIDS COMPOSTING IN THE UNITED STATES — 2010 UPDATE

BioCycle and the North East Biosolids & Residuals Association joined forces to update the list of biosolids composting facilities around the country, identifying a total of 265 projects.

Part I

Ned Beecher and Nora Goldstein

BIOCYCLE first published a survey report on biosolids composting in the United States in 1983. Twenty-seven years ago, the survey identified a total of 61 "full-time" projects, with another 29 expected to begin within a year. The national survey skipped a year and was conducted again in 1985, and then annually through 1998 (see "Biosolids Composting In The United States," January 1999). By that point, there were 321 projects in the U.S., with 274 operating facilities.

In May of this year, following an inquiry about the number of biosolids composting operations in the U.S. — and not being able to provide an accurate estimate — we decided to conduct the nationwide survey once again. The process took a number of months, but the results are encouraging. *BioCycle*'s 16th Nationwide Survey, done in collaboration with the North East Biosolids & Residuals Association (NEBRA), identified a total of 265 biosolids composting projects in the United States, with a total of 258 in operation.

Table 1 summarizes the composting methods utilized at the operating biosolids composting facilities. Similar to the 1998 data, the most utilized composting method

Table 1. Summary of composting methods utilized by U.S. projects

System Type	
Aerated static pile	108
Windrow	83
In-vessel	46
Aerated windrow[1]	8
Static pile	4
Enclosed aerated static pile[2]	4
Vermicomposting	1
Not specified[3]	9
Total projects	265

[1]Windrow on in-slab aeration system. [2]Engineered tarp enclosure with aeration. [3]Unable to confirm composting method utilized.

Guide To Table 2

COMPOSTING METHODS:

ASP=Aerated static pile; AW=Aerated windrow; Enc. ASP=Covered, aerated pile (using proprietary technology); MASP=Modified aerobic static pile (combining AW and static pile) that utilizes a catalyst

VENDORS CITED:

Mixers: Kuhn-Knight; Luck Now; Roto-Mix; Supreme International
Windrow Turners: Backhus; KW (Resource Recovery International); Scarab; Wildcat
In-Vessel – Agitated Bay: CSC Paygro; Siemens International Process Systems; Transform
In-Vessel – Tunnels: Engineered Compost Systems (ECS); Gicom; Green Mountain Technologies; Waste Solutions (WS)
Enclosed ASP: ECS; GORE Cover; Managed Organic Recycling (MOR)
Other: Bedminster (Rotary drum); American Bio Tech (ABT) and Purac (vertical silo)

is aerated static pile (total of 108), followed by windrow composting (83). There are 46 facilities using in-vessel systems, with the remainder employing aerated windrows (windrows built on a floor with aeration trenches), static piles, enclosed aerated static piles (engineered technology using tarps and forced aeration) or vermicomposting. And interestingly, the number of projects in construction is almost identical (6 in 1998 and 5 in 2010).

The primary difference between the 1998 and 2010 data is the number of projects in development (permitting, design/bidding, planning, consideration and pilot). In 1998, *BioCycle* found a total of 47 projects in development. In 2010, only one project is in planning and there is one pilot. The difference could be attributed in large part to the 12-year gap in data gathering. Conducting a survey annually creates the ability to track projects through the various stages of development. It also provides an opportunity to create a fairly extensive network of contacts within the biosolids composting community — state agencies, municipal governments and consulting engineers, as well as individual project managers.

In 2010, *BioCycle* and NEBRA focused initially at the state agency level, contacting state biosolids coordinators and asking them to review the list of biosolids composting projects identified in their state in 1998. Most states were able to update the listings, noting facilities still in operation, those no longer operating and any new projects. In almost every case, data was only provided on operating facilities versus projects in development. We also contacted projects directly to confirm and elaborate on the information we had. Assistance also was provided by the U.S. EPA regional biosolids coordinators. Fi-

Table 2. 2010 BioCycle/NEBRA survey of U.S. biosolids composting projects

State/Location	*Status/Operator*	*Biosolids Quantity (dry tons/yr)*	*Composting Method*
ALASKA			
Fairbanks	Operational (Golden Heart Utilities)	1,525	ASP
ARIZONA			
Apache Junction: Superstition Mountain CFD	Operational		Windrow
Pinetop-Lakeside	Operational		In-vessel (Bedminster); AW
Vicksburg	Operational (Synagro Arizona Soils Compost)	16,210	Windrow
ARKANSAS			
Bentonville	Operational		Windrow (Scarab)
Eureka Springs	Operational		Windrow
Hot Springs	Operational		ASP
N. Little Rock	Operational (American Composting)		Windrow
CALIFORNIA			
Arcata	Operational	192	ASP
Chino: Inland Empire Util. Agency	Operational	37,500	ASP (In-building)
Dos Palos: Central Valley	Operational (Synagro Technologies)	13,880	Windrow
Fortuna	Operational	112	Windrow
Las Virgenes	Operational	1,586	In-vessel (Siemens IPS)
Los Angeles: Griffith Park	Operational	1,250	ASP
Los Angeles Cty. San. District	Construction	25,000	Enc. ASP (GORE)
Lost Hills	Operational (Liberty Compost)	64,062	Windrow
Morro Bay	Operational	91	Windrow
Ojai Valley	Operational (San Joaquin)	557	Windrow
Redland	Operational (One Stop Landscape Supply)	3,186	Windrow
Santa Maria	Operational (Engel & Gray)	2,686	Windrow (Scarab)
Santa Rosa	Operational	934	In-vessel
South Kern	Operational (Synagro Technologies)	41,465	ASP[1]
COLORADO			
Clear Creek Cty.: Climax Mine	Operational (Parker Ag)	1,000	ASP
Delta WWTP	Operational	250	Windrow
Fountain: Midway Landfill	Operational (Waste Management of CO and A-1 Organics)		Windrow (MASP)
Glenwood Springs	Operational (South Canyon Solid Waste)	500	AW
Granby	Operational	100	In-vessel (ECS[2]; Luck Now)
Gunnison	Operational		ASP
Keenesburg/Rattler Ridge[3]	Operational (A-1 Organics)		Windrow (MASP)
Pitkin County	Operational		ASP
Platteville	Operational (A-1 Organics)		Windrow
Silt	Operational		AW
Summit County Resource Allocation Park	Operational	5.5	Windrow (MASP)
Tri-Lakes	Operational		ASP
Vail: Upper Eagle Valley	Operational		ASP
Woodland Park	Operational		ASP
CONNECTICUT			
Fairfield	Operational	650	In-vessel (Siemens IPS; Kuhn)
DELAWARE			
Milford	Operational (Blessings Greenhouse)		Windrow
Seaford	Operational	106	ASP
FLORIDA			
Lee County	Operational	2,850	Windrow (Backhus; Roto-Mix)
Miami-Dade Water Sewer: South Plant	Operational (seasonal)		ASP
Ocala	Operational (CompostUSA)		AW
Okahumpka	Operational (C&C Peat)	4,722	Windrow
Reedy Creek	Operational	2,900	ASP and windrow (Scarab)
Sarasota	Operational		In-vessel (Purac)

nally, *BioCycle* queried equipment vendors for project updates. We greatly appreciate everyone's assistance in providing information. We also welcome feedback on the 2010 data, e.g., facilities missed or ones included that are no longer in operation. Please send updates to Celeste Madtes (csuedit@jgpress.com).

NATIONAL OVERVIEW

Table 2 provides the state-by-state breakdown of biosolids composting projects in the U.S. The "Guide To Table 2" sidebar explains what the abbreviations stand for as well as provides the full company names of the vendors cited. In the second column of Table 2 ("Status"), when a company name is noted after the term "Operational," it indicates that this private entity owns and operates the facility or is the operator contracted by the municipal agency. If no company name is listed, the facility is owned and operated by the public agency.

Based on the survey data, we estimate that 7.8 percent of the biosolids generated in the U.S. are composted. This number is based on the actual dry tons/year provided by facilities (477,009 dry tons/year), plus an estimate to account for the facilities not providing tonnage data (82,546 dry tons/year). That total was used as the basis to calculate our national estimate of 562,000 dry tons/year of biosolids composted. A national survey on biosolids end use and disposal, conducted by NEBRA in collaboration with several other entities (see "Biosolids Management In The U.S.," March 2008), calculated that a total of 7,180,000 dry tons of biosolids were generated in the U.S. in 2004. This national number was used to calculate the *BioCycle*/NEBRA estimate of 7.8 percent.

In terms of geographic distribution of projects, 44 of the 50 states have biosolids composting projects. The six states with no biosolids composing reported are Alabama, Illinois, Louisiana, Minnesota, Mississippi and Nebraska. (Wisconsin does not have a full-scale project, but a pilot is being conducted by the Appleton Wastewater Treatment Plant in conjunction with the Outagamie County Department of Solid Waste.)

Of the 44 states reporting biosolids composting projects, the number per state breaks down as follows: 26 states have less than 5 projects; 9 states have between 5 and 10 projects; 7 have between 10 and 20 projects. Two states have more than 20 projects — New York (25) and Washington (24).

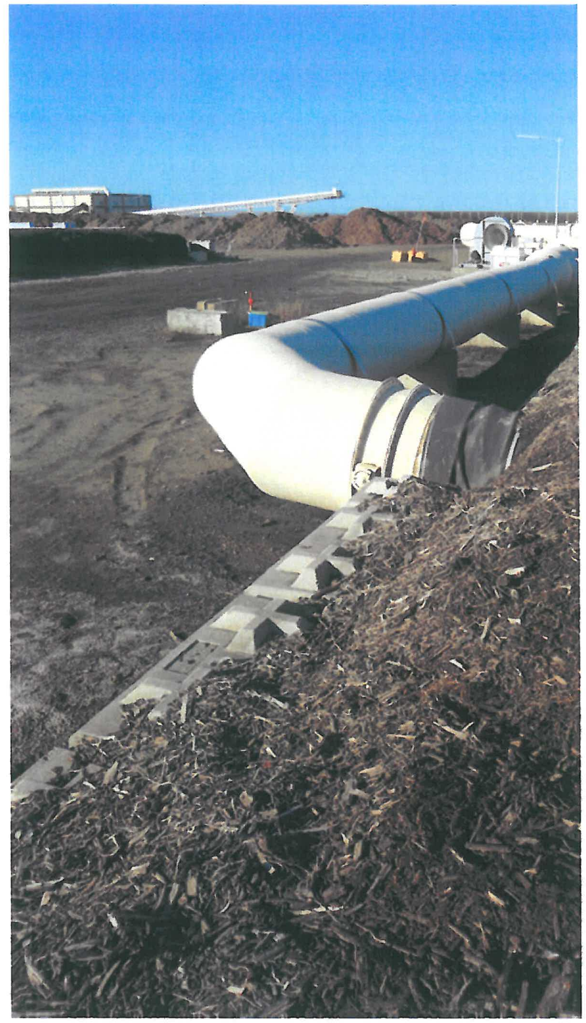
Aside from a few states, there is no obvious link between the climate and the composting method. Many years ago, the trend was toward windrow composting in the Central and Southwest states, and in-vessel and aerated static piles in the Northeast, Mid-Atlantic and the Pacific Northwest. While climate still plays a role, other factors such as emissions regula-

Table 2. 2010 BioCycle/NEBRA survey of U.S. biosolids composting projects (cont'd.)

State/Location	*Status/Operator*	*Biosolids Quantity (dry tons/yr)*	*Composting Method*
GEORGIA			
Alto	Operational (Wilcorp Environmental)		Windrow (Backhus)
Dalton Utilities	Operational (Harvest Farms)		In-vessel
Noonan Utilities	Operational		n/a
Plains	Operational (ERTH Products)	8,400	ASP
HAWAII			
Maui Eko Compost	Operational (EKO Compost)	3,090	ASP
U.S. Navy Barbers Point	Operational (One Stop Landscape Supply)	990	ASP
IDAHO			
Coeur d'Alene	Operational	840	ASP
Lewiston	Operational (EKO Systems)		ASP
INDIANA			
Angola	Operational (Soil Solutions)		Windrow (Backhus)
Elkhart	Operational		Windrow
South Bend	Operational		Windrow
IOWA			
Davenport	Operational	5,500	ASP (In-building)
KANSAS			
Olathe	Operational	850	Windrow
Topeka: Oakland WWTP	Operational	2,400	Windrow
KENTUCKY			
Franklin	Operational (Triple M Land Farms)		Windrow
Louisville: Headden Septic Tank Service	Construction		Windrow
Paducah	Operational		Windrow (Scarab)
West Liberty	Operational		Windrow
MAINE			
Kennebunk	Operational (Nest and Sons, Inc.)	160	ASP
Kennebunkport	Operational	62	ASP
Kingfield	Operational		ASP
Lewiston-Auburn	Operational	2,169	In-vessel
Lincoln Sanitary District	Operational	114	ASP
Old Town	Operational	154	ASP
Paris Utility District	Operational	84	ASP
Rockland	Operational (Interstate Septic Systems Inc.)		In-vessel
Rumford-Mexico	Operational	416	ASP
Scarborough	Operational	506	ASP
Unity: Hawk Ridge	Operational (New England Organics)	8,500	In-vessel (Gicom)
Wilton	Operational	39	ASP
Yarmouth	Operational	132	ASP (In-building)
MARYLAND			
Aberdeen	Operational		ASP
Baltimore City/Orgro/ Veolia Water	Operational	5,720	In-vessel (CSC Paygro)
Havre de Grace	Operational	300	ASP
Perryville	Operational (Maryland Environmental Service)		ASP
MASSACHUSETTS			
Barre	Operational	60	ASP
Bridgewater	Operational	304	ASP
Dartmouth	Operational	900	In-vessel (Siemens IPS)
Ipswich	Operational (Agresource)	~1,000	ASP
Marlborough	Operational (WeCare Organics)	2,064	In-vessel (Bedminster); AW
Nantucket	Operational		In-vessel (Bedminster); AW
Northbridge	Operational		n/a
Pepperell	Operational	140	Static pile
Somerset	Operational	1,360	ASP
Southbridge	Operational (Veolia)	5,355	ASP
Williamstown/Hoosuc	Operational	5,100	ASP
MICHIGAN			
Ishpeming	Operational	2,000	In-vessel (ECS²; Kuhn)
Midland	Operational	70	Windrow (summer only)

Table 2. 2010 BioCycle/NEBRA survey of U.S. biosolids composting projects (cont'd.)

State/Location	Status/Operator	Biosolids Quantity (dry tons/yr)	Composting Method
MISSOURI			
Kansas City	Operational		Windrow
Nixa	Operational		ASP
Sedalia	Operational	320	ASP (ECS4)
Springfield	Operational		Windrow
St. Peters	Operational	1,320	ASP (ECS5)
MONTANA			
Big Sky	Operational	130	In-vessel (ECS)
Butte/Silver Bow	Operational (Big Butte Compost)	4,000	AW
Hamilton	Operational	50	Windrow (Roto-Mix)
Kalispell	Operational (Glacier Cold, LLC)	50	ASP
Livingston	Operational	200	In-vessel (ECS)
Missoula	Operational (EKO Compost)		ASP
NEBRASKA			
Beatrice	Operational		Windrow (Brown Bear)
Grand Island	Operational		Windrow (Wildcat)
Holdredge	Operational		Windrow
Kearney	Operational		Windrow (Wildcat)
Lexington	Operational		Windrow (Wildcat)
Omaha (for city of Bellevue)	Operational		Windrow
NEVADA			
Bently Agrowdynamics	Operational	2,767	Windrow
NEW HAMPSHIRE			
Claremont	Operational		ASP
Dover	Operational		ASP
Merrimack	Operational	1,841	In-vessel (Siemens IPS)
Milford	Operational		ASP
NEW JERSEY			
Buena Borough	Operational		ASP
Burlington County	Operational	9,500	In-vessel (Siemens IPS)
Cape May County MUA	Operational	3,300	In-vessel (Purac)
Ocean County Util. Authority	Operational	9,500	Windrow (Scarab)
Sussux County MUA	Operational		ASP
NEW MEXICO			
Albuquerque	Operational		Windrow (Scarab)
Artesia	Operational	200	Windrow (Brown Bear)
Belen	Operational		Windrow (Brown Bear)
Carlsbad	Operational	153	Windrow
Clovis	Operational		Windrow (Scarab)
Farmington	Operational		Windrow
Hobbs	Operational		Windrow
Los Alamos County	Operational		Windrow
Roswell	Operational		Static pile
Santa Ana Pueblo	Operational		Windrow
Santa Fe	Operational		Windrow (Scarab; Roto-Mix)
Tucumcari	Operational		Windrow
NEW YORK			
Arcade	Operational	65	In-vessel
Attica	Operational	180	ASP
Bath	Operational	2,000	In-vessel (Transform; Supreme)
Chenago Cty.	Operational	230	ASP
Clifton Springs	Operational	40	ASP
Delaware Cty. Co-Composting	Operational	7,000	In-vessel (Conporec/ Siemens IPS)
Endicott	Operational	488	ASP
Ft. Edwards: Washington County SD 11	Operational	600	ASP
Gowanda	Operational	149	ASP (In-building; ECS1)
Greene	Operational	12	In-vessel
Lockport	Operational	786	In-vessel (Siemens IPS)
Madison County	Operational	65	ASP (Kuhn)
Manchester-Shortsville	Operational	73	ASP
Medina	Operational	62	ASP
Mt. Morris	Operational	70	Windrow



South Kern, California — aerated static pile composting with biofiltration of process air.

tions, siting and public perception, advancements in process control and availability of bulking agents may dictate technology decisions. For example, air quality management districts in California have been tightening their rules on VOCs and related emissions from composting facilities over the past decade. As a result, some facilities in climates that typically lend themselves to open-air windrow composting — but located in air districts with severe noncompliance — are utilizing aerated static piles with negative air flow and biofiltration, or enclosed aerated static piles with proprietary aeration and cover technologies.

The most common bulking agents (amendments) used in biosolids composting are wood chips made from yard trimmings or recycled wood waste. Some facilities report using sawdust; several also blend in ash from boiler plants or incinerators.

PRIDE IN THE PRODUCT

While gathering information from project managers, we noted consistent enthusiasm about the biosolids compost product. This enthusiasm carried over to facility websites (mostly found by searching on the city or town, then clicking on "wastewater

treatment"). Links to "compost" showed detailed instructions on using the compost, described various blends available and their various applications, pricing, hours of operation and photos of the product being used and the results.

While some facilities give their compost away at no charge, most sell the compost and blends at varying prices. For example, the city of Denton, Texas, which composts about 3,200 dry tons/year of biosolids, sells its finished compost in bulk for $25/cubic yard (cy). The price range reported by facilities is from $6 to $30+/cy. The value of biosolids compost is well-recognized in professional markets, commanding fairly high prices, typically in various soil blends and engineered soils. End uses include golf course design, athletic field construction, high-profile landscaping projects and state Departments of Transportation roadside applications (e.g., for vegetation establishment, slope stabilization and plantings).

Having a paying market for the biosolids compost is an expected outcome of most projects today. For example, one fairly new project in Stafford County, Virginia, operated by the Rappahannock Regional Solid Waste Management Board, set out these market establishment goals for its finished product, Rappa-Grow: "To produce a high quality soil amendment made from biosolids and shredded yard waste; To sell 20 five-gallon buckets of finished compost each week for the first year, ultimately diverting 4,000 tons of biosolids and selling up to 1,000 tons of compost annually; and To teach 225 residents how to compost and divert more than 100 tons of organic waste from the landfill each year."

In one state, a satisfied biosolids compost user (a grower) sent a brief note to the treatment plant commending the nice results experienced in using the city's biosolids compost. "If you told me the compost would help this much I would think you were blowing smoke," he wrote. "But I guess I can't think that way. I soil tested the field. The organic matter and the calcium change are awesome!"

GENERAL TRENDS, CURRENT OBSTACLES

Findings of the BioCycle/NEBRA survey of biosolids composting projects in the U.S. indicate that this management method for wastewater treatment solids is holding its own. The total number of projects is slightly lower in 2010 than in 1998, but new facilities are opening and some existing ones are expanding.

Table 2. 2010 BioCycle/NEBRA survey of U.S. biosolids composting projects (cont'd.)

State/Location	*Status/Operator*	*Biosolids Quantity (dry tons/yr)*	*Composting Method*
NEW YORK (cont'd.)			
Newfane	Operational	293	In-vessel
Ontario	Operational (LBD Enterprises)	53	ASP
Rockland County	Operational	5,600	In-vessel (Siemens IPS)
Schenectady	Operational	2,086	In-vessel (ABT)
Sodus	Operational	20	n/a
Wappinger Falls: Tri-Municipal Sewage	Operational	220	In-vessel
Waterville	Operational	250	ASP
Webster	Operational	112	ASP
Weedsport	Operational	36	AW
Yorktown Heights	Operational	300	ASP
NORTH CAROLINA			
Banner Elk	Operational		n/a
Beech Mountain	Operational		ASP
Burlington	Operational		Windrow
Burnsville	Operational		ASP
Dallas	Operational (Earth Farms, LLC)		Windrow (Backhus)
Delway	Operational (McGill Environmental)		ASP (In-building)
City of Goldsboro	Operational	640	In-vessel (Siemens IPS; Roto-Mix)
Hickory-Catawba	Operational	3,129	In-vessel
Lexington	Operational		ASP
Merry Oaks	Operational (McGill Environmental)		ASP (In-building)
Morganton	Operational		ASP
Rockingham	Operational		ASP
Shelby	Operational	4,818	In-vessel (Siemens IPS)
Valdese	Operational		ASP
OHIO			
Akron	Operational	13,000	In-vessel (Paygro)
Columbus	Operational	9,000	ASP
Hamilton WWTP	Operational	1,400	In-vessel (WS)
Lake County: Mentor WWTF	Operational	2,500	ASP
OKLAHOMA			
Ardmore	Operational	520	In-vessel (Siemens IPS; Roto-Mix)
Grove	Operational		Windrow (Brown Bear)
Oklahoma City-North Canadian	Operational		Windrow
Tahlequah	Operational		Windrow
Yukon	Operational		Windrow
OREGON			
Grants Pass: Redwood Sewer District	Operational	769	AW
Klamath Falls	Operational	400	ASP
Newberg	Operational	682	In-vessel (WS)
PENNSYLVANIA			
Athens: Valley Joint Authority	Operational	350	ASP
Centre County: University Area Joint Authority	Operational	2,500	In-vessel (Siemens IPS)
Indiana	Operational	50	ASP (In-building) (Roto-Mix)
Manheim	Operational (J.P. Mascaro)		ASP
Mansfield	Operational		AW
Mechanicsburg	Construction	220	ASP
Springettsbury Twp.	Operational		ASP
Tremont	Operational		Windrow
West Hanover Township	Operational (WeCare Organics)	229	Vermicomposting (Vermitech)
RHODE ISLAND			
Bristol	Operational	475	In-vessel (Siemens IPS)
SOUTH CAROLINA			
Florence	Operational		ASP
Grand Strand Water & Sewer/ Myrtle Beach	Operational	700	ASP
Kingstree	Operational (Williamsburg Recycling)	1,600	In-vessel

Table 2. 2010 BioCycle/NEBRA survey of U.S. biosolids composting projects (cont'd.)

State/Location	Status/Operator	Biosolids Quantity (dry tons/yr)	Composting Method
SOUTH DAKOTA			
Rapid City	Operational	2,100	In-vessel (Siemens IPS)
TENNESSEE			
La Follette	Operational	~200	ASP
Sevierville: Sevier SWA	Operational	4,015	In-vessel (Bedminster); Windrow
TEXAS			
Austin: Hornsby Bend WWTP	Operational	6,000	Windrow (Scarab)
Austin: LCRA Highland Lakes	Operational		Windrow
Belton: Brazos River Authority	Operational		Windrow (Scarab)
Bryan	Operational		Windrow (Scarab)
Copperas Cove	Operational		Windrow (Scarab)
Denton	Operational	3,200	Windrow (Scarab)
McAllen	Operational		Windrow (Scarab)
San Antonio: Leon Creek	Operational (Garden-Ville/Texas Disp.)	17,600	Windrow (Scarab)
San Antonio: New Earth Soils	Operational	18,700	Windrow (Backhus)
Texarkana	Operational	1,294	Windrow (KW)
UTAH			
American Fork: Timpanogos Spec. Serv. District	Operational		Enc. ASP (GORE)
Brigham City	Operational		Windrow
Central Davis County	Operational		Windrow (Roto-Mix)
Central Weber	Operational		Windrow
Coalville	Operational		Windrow
Orem	Operational		ASP
Park City: Snydersville Basin	Operational		ASP
Provo	Operational		Windrow
Salt Lake City: Central Valley	Construction		Enc. ASP/Windrow (MOR, Transform, Scarab, Roto-Mix)
South Davis County	Operational		ASP/Windrow
Springville	Operational		Windrow
St. George	Operational		Windrow
Syracuse: North Davis Sewer District	Operational	2,500	Windrow
Tremonton	Operational		ASP
West Jordan: South Valley WRF	Operational		Windrow (Scarab)
VERMONT			
Bennington	Operational	160	In-vessel (Siemens IPS)
Springfield	Operational	150	ASP
Wilmington	Operational	12	In-vessel (Green Mountain)
VIRGINIA			
Franklin	Operational		ASP
Harrisonburg/Rockingham	Operational	4,250	ASP
Livingston	Operational		ASP (Kuhn; ECS[6])
Luray	Operational		n/a
New Market	Operational		ASP
Spotsylvania County	Operational	12,000	ASP (Kuhn)
Stafford: Rappahannock Regional SWMB	Operational		Windrow
Virginia Beach: HamptonRoads San. District	Operational	4,180	ASP
Waverly	Operational (McGill Environmental)		ASP (In-building)
WASHINGTON			
Arlington	Operational	500	ASP (ECS[7])
Benton County: Horn Rapids Landfill	Planning	748	n/a
Chelan County	Operational	139	Windrow
Cheney	Operational	260	ASP (In-building; Roto-Mix)
Columbia County	Operational		n/a
Entiat	Operational	25	Windrow
Everett	Operational	500	Enc. ASP (ECS)
Forks: Olympic Corrections Center WWTP	Operational	10	ASP

"Growth in the biosolids composting market continues to be steady," says Tim O'Neil, president of Engineered Compost Systems in Seattle, Washington. "We continue to see more of a market for biosolids composting in places with reasonable access to amendment to mix with the biosolids. One of the biggest challenges we see is competition from cogeneration — burning wood for energy."

O'Neil adds that although there is flexibility in the types of bulking agent used for composting with biosolids, the bottom line is the biology of the system. "You can skimp, but only to a certain point," he says. "We have people who use a relatively low ratio of carbon amendments to biosolids. Having a system that is thermally efficient means that they can hit PFRP (Process to Further Reduce Pathogens), but it doesn't mean they will have a nice smelling compost. With agitated systems, you can get away with a little less amendment, but with static systems you need the bulking agent for the structure."

In many parts of the country, land application of Class B biosolids is still a lower cost option than composting. In other places, relatively low landfill tipping fees are drawing in more biosolids, especially when access to land application sites decreases due to land development and/or public opposition to current beneficial use practices.

What is abundantly clear from the conversations we had with composting facili-

St. Peters, Missouri — aerated static pile composting with stationary mixer to blend biosolids and ground yard trimmings.

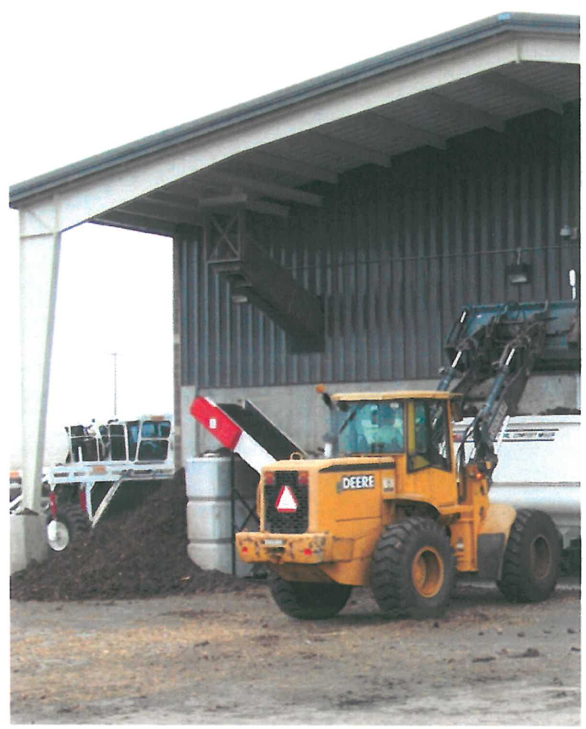


Table 2. 2010 BioCycle/NEBRA survey of U.S. biosolids composting projects (cont'd.)

State/Location	Status/Operator	Biosolids Quantity (dry tons/yr)	Composting Method
WASHINGTON (cont'd.)			
Fort Lewis	Operational (JBLM)	539	ASP
Granite Falls	Operational	72	AW
Kingston	Operational (Emu Topsoil)		ASP (Roto-Mix)
Laconner	Operational		ASP
Langley	Operational		Static pile
Lynden	Operational	320	ASP (ECS[7])
Monroe	Operational		Static pile
Morton	Operational		n/a
Normandy Park: Miller Creek WWTP	Operational		ASP
Ocean Shores	Operational	100	In-vessel (ECS[6])
Omak	Operational	160	In-vessel (ECS[6])
Port Angeles	Operational	1,460	ASP (ECS[7])
Port Townsend	Operational	279	ASP (Roto-Mix)
Seattle	Operational (GroCo)		Static pile
Spokane	Construction (Barr-Tech)		Enc. ASP (ECS)
Westport	Operational	100	In-vessel (ECS)
WEST VIRGINIA			
Brooke County	Operational (J.P. Mascaro)		ASP
Wetzel County	Operational (J.P. Mascaro)		ASP
WISCONSIN			
Appleton WWTP and Outagamie County DSW	Pilot		n/a
WYOMING			
Gillette	Operational	750	ASP/Windrow
Sheridan	Operational	200	ASP/Windrow

[1]ECS radio frequency teleprobes. [2]Stationary vessel with reversing aeration. [3]Incorporating feedstocks from Platteville in Spring 2011. [4]ASP with CompDog™ pipeless aeration. [5]ASP with reversing and in-slab aeration, bunker walls. [6]Containerized vessels with reversing aeration. [7]Reversing and in-slab aeration.

ty operators is that they are having a positive experience with their facilities, both in terms of their operations and the quality — and widespread popularity — of their end products. Whereas in 1998 there were more stories related to challenges with odor emissions, this survey did not find that being reported. The level of knowledge about how to effectively control odors and troubleshoot other operational challenges (e.g., too wet, too dry) is high, and there are plenty of veteran composters in most states who can assist their colleagues when problems arise. Clearly, the successful track record of facilities operating for decades builds greater confidence in the process and product. Additionally, vendors of composting equipment, who also now have decades of experience under their belts with biosolids composting, are an ongoing source of assistance — as are new products and technologies to improve process control and product quality.

One trend to track is more regionalization of biosolids composting, with larger facilities designed to process biosolids from other treatment plants in their area. Part II in the January 2011 issue will explore that trend in more depth based on interviews with several of these larger projects.

A GOOD DECISION

Sharing the experience of the City of Ishpeming, Michigan is not only a positive note to end on, but a sign of what we believe will be happening more over the next few years. Ishpeming needed to find another biosolids management alternative when a long-term agreement with an area landfill came to an end in 2009. "We had a good arrangement for many years with a local landfill," says Deborah Pellow, Director of Wastewater Treatment for the City of Ishpeming. "We took their leachate and treated it at a reduced cost, and they took our biosolids for free. We were notified in early 2009 that the arrangement would end in 2010, as the landfill would be treating its leachate on site in aerated lagoons."

City officials had decided before this point that they wanted to switch to a process that yielded a Class A, Exceptional Quality biosolids product. It had focused its evaluations on biosolids drying systems. Ultimately, they decided to go with in-vessel composting, using Engineered Compost System's stationary vessels (the full story will be included in Part II). From a cost perspective, says Pellow, a rough calculation shows that composting is about half the cost of what the city would have paid in tipping fees to continue disposal at the landfill. "Plus, we have a product that is very reusable and we can sell it," she exclaims. ■

Ned Beecher is Executive Director of the Northeast Biosolids & Residuals Association (www.nebiosolids.org). Nora Goldstein is Editor of BioCycle.

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ADVANCING COMPOSTING, ORGANICS RECYCLING & RENEWABLE ENERGY
419 State Avenue, Emmaus, PA 18049-3097
610-967-4135 • www.biocycle.net

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THE STATE of ALASKA

GOVERNOR SEAN PARNELL

Department of Environmental Conservation

DIVISION OF ENVIRONMENTAL HEALTH
Solid Waste Program

555 Cordova Street
Anchorage, Alaska 99501
Main: 907.269.7622
fax: 907.269.7600

Certified Mail #7008 1830 0003 5208 3837
Return Receipt Requested

December 3, 2012

Mr. Mark Kozak
Public Works Director
City of Kodiak
2410 Mill Bay Road
Kodiak, AK 99615

Subject: City of Kodiak – Temporary Biosolids Storage Plan

Dear Mr. Kozak:

The Alaska Department of Environmental Conservation (ADEC) has reviewed the plan, dated November 8, 2012, submitted by the City of Kodiak (Kodiak) for the temporary storage of treated sewage sludge (biosolids) generated by the Kodiak Wastewater Treatment Plant and the United Stated Coast Guard (USCG) Wastewater Treatment Plant. The biosolids will be stored at a location approximately 5 miles west of Kodiak, on the USCG base, off Anton Larsen Bay Road, latitude 57.333°, Longitude -153.532°. Alternately, the plan includes a location at Gibson Cove in Kodiak, latitude 57.775°, longitude -152.452°.

Project Description

The project consists of temporary storage of pressed sewage solids, that have been treated with lime to kill pathogens, in a series of lined containment cells at the site. Each cell will also be covered to eliminate additional infiltration of water. Any water that collects in the cells will be managed to maintain at least one foot of freeboard at all times. Kodiak will monitor the facility at least weekly to ensure that the cells are properly maintained. The biosolids will be removed to a permitted composting facility for further treatment, or disposed at the landfill.

Any release of biosolids to land must be immediately cleaned up, and reported to ADEC within 48 hours of the release.

Approval

ADEC here by approves the Kodiak plan for temporary storage of biosolids. All biosolids and the storage facility must be removed within one year of this approval.

Reporting Requirements

In order for ADEC to track the opening and closure of waste storage facilities, ADEC requires the following:

- Provide ADEC with written notification of waste storage activities (email is acceptable) within 7 days after waste storage begins at the site.
  If the ADEC has not received notice that storage has begun at the site within one year of this approval date, the approval is withdrawn and we will close the file.

- At closure, perform a visual site inspection to confirm the removal of all waste.

- Submit a site closure report to the ADEC in writing (email is acceptable) within 7 days of closure of the site.

- The closure report must include:
  - the total volume of biosolids stored
  - final biosolids disposal locations
  - photographs showing the storage facility while it was in operation and after it was removed.

Any person who disagrees with this decision may request an adjudicatory hearing in accordance with 18 AAC 15.195 - 18 AAC 15.340 or an informal review by the Division Director in accordance with 18 AAC 15.185. **Informal review requests** must be delivered to the Division Director, Alaska Department of Environmental Conservation, 555 Cordova Street, Anchorage, AK 99501 within 15 days of the permit decision. **Adjudicatory hearing requests** must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, Juneau, Alaska 99801, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived. More information regarding submitting a request for an informal review or adjudicatory hearing may be found at www.dec.state.ak.us/commish/ReviewGuidance.htm. Even if an adjudicatory hearing has been requested and granted, all permit conditions remain in effect unless a stay has been granted.
Please contact me at (907) 269-7622 or by email at lori.aldrich@alaska.gov if you have any comments, questions, and for notifications.

Sincerely,

LoriAldrich
Solid Waste Program Coordinator

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CITY OF KODIAK
COMPOSTING AGREEMENT
CONTRACT NO. 205796

This Agreement ("Agreement") is entered into this 30th day of October, 2012 (the "Effective Date"), by and between the City of Kodiak, an Alaska municipal corporation (the "City") and Quayanna Development Corporation, an Alaska corporation ("QDC").

RECITALS

WHEREAS, the City owns and operates a wastewater treatment facility as part of its sanitary sewer utility; and

WHEREAS, periodically bio-solids must be removed from the City's wastewater treatment facility and disposed of; and

WHEREAS, the City has disposed of the bio-solids by delivering them to the Kodiak Island Borough landfill, but the Borough will no longer accept bio-solids at its landfill after December 15, 2012; and

WHEREAS, QDC has offered to accept the bio-solids from the City for composting under the terms and conditions in this agreement; and

WHEREAS, QDC is qualified to provide the services specified in this Agreement and, subject to the terms and conditions set forth in this Agreement, QDC desires to provide such services;

WHEREAS, composting the bio-solids is a waste utilization process that will benefit the public health and welfare and the environment by reducing the volume of material that is disposed of in the Borough landfill and allowing the reuse of this material when converted to compost.

NOW THEREFORE, in consideration of the premises and the mutual covenants contained herein, the City and QDC hereby agree as follows:

AGREEMENT

1.0 Definitions. In this Agreement:

"ADEC" means the Alaska Department of Environmental Conservation.

"Bio-solids" means 'sewage sludge" as defined in 40 C.F.R. §503.9(w) which have less than the Maximum Allowable Amounts of Arsenic, Cadmium, Chromium, Copper, Lead, Mercury Molybdenum, Nickel, Selenium, and Zinc as defined in the EPA Part 503 regulations pertaining to bio-solids pollutant limits, and can be composted using the Aerated Static Pile System to produce a Class A compost with an unrestricted status.

"City" means the City of Kodiak, an Alaska municipal corporation.

"Commencement Date" means the first day of the first month that begins after the date as of which QDC gives Notice to the City that QDC is ready to receive and compost Bio-solids at the Site.

"Notice" means notice given in the manner prescribed in Section 24.

"Operational Plan" means the plan approved by ADEC under which QDC will receive and compost Bio-solids at the Site. Upon ADEC approval of the plan, it shall be attached to this Agreement and incorporated by reference herein.

"QDC" means Quayanna Development Corporation, an Alaska corporation

"Site" means real property located within 25 road miles of the City's Wastewater Treatment facility, and designated by QDC from time to time and approved by ADEC and other regulatory authorities for the composting of Bio-solids under this Agreement.

2.0 Scope of Work.

2.1. Upon the execution of this Agreement, QDC shall proceed with due diligence to acquire all governmental permits required to provide its services under this Agreement. Without limiting the generality of the foregoing, QDC shall obtain an ADEC permit to operate a composting facility at the Site no later than December 15th, 2012. Commencing no later than December 15, 2012 QDC shall have obtained all governmental permits required for it to receive and compost Bio-solids as provided in this section. ODC shall give written Notice to the City promptly if at any time it expects not to be able to obtain a required permit on or before December 15, 2012. In the event QDC is unable to obtain all required permits and approvals in a timely manner, this agreement shall terminate automatically without penalty or other liability of any kind to either party.

2.2. On and after the Commencement Date, the City will make weekly deliveries of Bio-solids to the Site for composting, subject to the testing requirements in this subsection. Before the first delivery of Bio-solids under this Agreement, the first delivery in each of the next four calendar quarters, and the first delivery in each following year, the City shall test the Bio-solids for pollutants and report the results of the test to QDC. The City shall not deliver any Bio-solids which test results show to exceed the limit for any pollutant that appears in Table H under 18 AAC 60.510.

2.3 Under the terms of this Agreement QDC agrees to annually receive up to 3,500 cubic yards of Bio-solids from the City. The quantity of Bio-solids in each weekly delivery shall not generally exceed seventy five (75) cubic yards. Delivery of the Bio-solids to QDC at the Site will be complete when City employees or contractors have deposited the Bio-solids at the location on the Site designated by a QDC employee.

2.4 Upon the delivery of Bio-solids to the Site, title to the Bio-solids shall transfer from the City to QDC without further action on the part of either party. QDC will receive the delivered Bio-solids in "as is condition, and without warranty of the City of any kind, express or implied, except that the Bio-solids do not exceed the limit for any pollutant that appears in Table H under 18 AAC 60.510.

2.5 QDC shall receive and compost in accordance with its Operational Plan all Bio-solids delivered by the City to the Site in accordance with Section 2.3.

2.6 The Operational Plan shall provide for the storage on the Site of Bio-solids awaiting composting, in quantities sufficient to allow the City to make deliveries of Bio-solids in accordance with Section 2.3 in spite of any interruption in the composting process.

2.7 QDC shall conduct all of its operations at the Site in a safe and sanitary manner, in accordance with all requirements of the Operational Plan. QDC shall keep the Site free from trash, litter and debris. QDC shall conduct its operations at the Site in a manner that does not subject persons or property located outside the boundaries of the Site to excessive odor, noise, vibration or dust. QDC shall not permit any conditions on the Site to exist that constitute a nuisance.

3.0 Term of Agreement

Unless earlier terminated as provided for in Section 8.0, this Agreement shall take effect on the Effective Date and continue in effect for a period of five (5) years after the Commencement Date.

4.0 Contract Price

4.1 The City shall pay QDC an annual fee of three hundred thirty two thousand two hundred fifty dollars ($332,250) for the services that QDC performs under this Agreement. The annual fee shall be payable as provided in Sections 4.2 and 4.3.

4.2 On the Effective Date, the City shall pay QDC the sum of sixty six thousand four hundred fifty dollars ($66,450). On the Commencement Date, and on the first day of the next eleven (11) months, the City shall pay QDC the sum of twenty two thousand one hundred fifty dollars ($22,150).

4.3 Commencing on the first anniversary of the Commencement Date, and on the first day of each month during the remainder of the term of this Agreement, the City shall pay QDC the sum of twenty seven thousand six hundred eighty seven and 50/100 dollars ($27,687.50).

5.0 Project Manager and City Representative

5.1 QDC shall designate in a Notice to the City a single individual to act as the project manager (the "Project Manager"). The Project Manager shall ensure QDC's compliance with, and shall coordinate appropriate schedules in connection with, QDC's obligations hereunder. QDC may change the individual designated hereunder by providing the City with advance Notice designating the new individual authorized to act as the Project Manager.

5.2 The City shall designate in a Notice to QDC a single individual to act as the City's authorized representative for purposes of this Agreement (the "City Representative"). Such individual (a) must be authorized to act on the City's behalf with respect to all matters relating to this Agreement; (b) shall ensure the City's compliance with its responsibilities under this Agreement; and (c) shall coordinate appropriate schedules in connection with QDC's services under this Agreement. The City may change the individual designated hereunder by providing QDC with advance Notice designating the new individual authorized to act as the City Representative.

6.0 Changes

6.1 The scope and schedule of services provided under this Agreement may be changed from time to time by a written change order (a "Change Order") mutually agreed upon and signed by duly authorized representatives of each of the parties. Changes causing a modification to the Contract Price not exceeding $15,000 are subject to approval on behalf of the City by the City Manager. Changes causing a modification to the Contract Price exceeding $15,000 are subject to approval on behalf of the City by its City Council.

6.2 Upon receipt of a written request from QDC, in the event federal health care legislation creates a large enough financial impact on QDC so as to impact the ability to continue this contract, the City may agree to reopen discussions on select provisions of this contract.

7.0 Informal Dispute Resolution

7.1 The parties to this Agreement shall exercise their best efforts to negotiate and settle promptly any dispute that may arise with respect to this Agreement in accordance with the provisions set forth in this Section 7.0.

7.2 If either party (the "Disputing Party") disputes any provision of this Agreement, or the interpretation thereof, or any conduct by the other party under this Agreement, that party shall bring the matter to the attention of the other party at the earliest possible time in order to resolve such dispute.

7.3 If such dispute is not resolved by the employees responsible for the subject matter of the dispute within ten (10) business days, the Disputing Party shall deliver to the first level of representatives below a written statement (a "Dispute Notice") describing the dispute in detail, including any time commitment and any fees or other costs involved.

7.4 Receipt by the first level of representatives of a Dispute Notice shall commence a time period within which the respective representatives must exercise their best efforts to resolve the dispute. If the respective representatives cannot resolve the dispute within the given time period, the dispute shall be escalated to the next higher level of representatives in the sequence as set forth below. If the parties are unable to resolve the dispute in accordance with the escalation procedures set forth below, the parties may assert their rights under this Agreement.

Escalation Timetable (Business Days)	QDC Representative	City Representative
0 to 5th	Project Manager	City Representative
6th to 10th	Executive Director	City Manager

7.5 Notwithstanding the fact that the parties may be attempting to resolve a dispute in accordance with the informal dispute resolution procedures set forth in Section 7.0, the parties shall continue without delay to perform all their respective responsibilities under this Agreement that are not affected by the dispute.

7.6 Notwithstanding the foregoing, either party may, before or during the exercise of the informal dispute resolution procedures set forth in Section 7.0, apply to a court having jurisdiction for a temporary restraining order or preliminary injunction where such relief is necessary to protect its interests pending completion of such informal dispute resolution procedures.

7.7 The foregoing provisions relating to Informal Dispute Resolution are aspirational in nature. They are not intended to be treated as administrative remedies which must be completed or exhausted as a prerequisite to the filing of a lawsuit nor shall a failure or alleged failure to invoke or comply with them be regarded as a waiver of any rights or remedies otherwise available to a party to this agreement.

8.0 Termination

8.1 This Agreement may be terminated with at least 180 days written notice by either party.

8.2 Termination for Default. Subject to completion of the dispute resolution procedures set forth in Section 7.0, in the event that either party hereto materially defaults in the performance of any of its obligations hereunder, the other party may, at its option, terminate this Agreement by providing the defaulting party thirty (30) days' prior written Notice of termination, which notice shall identify and describe with specificity the basis for such termination. If, prior to the expiration of such notice period, the defaulting party cures such default to the satisfaction of the non-defaulting party (as evidenced by written Notice delivered by the non-defaulting party), termination shall not take place.

8.3 Termination Without Cause. The City may terminate this Agreement without cause by providing QDC at least thirty (30) days' prior written Notice of termination.

9.0 Consequences of Termination.

9.1 Upon termination of this Agreement for whatever reason, QDC shall be under no further obligation to provide services hereunder.

9.2 In the event of termination by the City for convenience under Section 8.3 hereof, the City shall cause payments to be made to QDC within thirty (30) days after the effective date of termination for all costs and expenses incurred prior to the effective date of the termination. The City shall pay QDC an early termination fee sum according to the following:

If termination occurs in calendar year:	2012, then City will pay QDC $440,000
	2013, then City will pay QDC $367,000
	2014, then City will pay QDC $285,000
	2015, then City will pay QDC $215,000
	2016, then City will pay QDC $140,000
	2017, then City will pay QDC $70,000

9.3 All provisions of this Agreement that by their nature would reasonably be expected to continue after the termination of this Agreement shall survive the termination of this Agreement.

10.0 Indemnification and Insurance

10.1 QDC agrees to protect, defend, indemnify, and save the City, its agents, officials, employees, or any firm, company, organization, or individual to whom the City may be contracted, harmless from and against any and all claims, demands, actions, and causes of action of which QDC is given prompt notification and over which QDC is given control to resolve (the "Indemnified Matters), which may arise on account of illness, disease, loss of property, services, wages, death or personal injuries resulting from QOC's negligence or intentional misconduct in the performance of the services hereunder. QDC agrees to further indemnify the City for all reasonable expenses and attorney's fees incurred by the City in connection with the Indemnified Matters. Notwithstanding the foregoing, in no event shall "Indemnified Matters" be interpreted as including, nor shall QDC have any obligation to indemnify or hold the City harmless from, any claims, demands, actions, causes of action or other costs or damages to the extent the same arise out of or are attributable to the sole negligence or fault of the City, its agents or employees, or to the strict liability of the same.

10.2 QDC shall procure and maintain in effect during the term of this Agreement the following insurance coverages with an insurance company or companies authorized to do business in the State of Alaska:

10.2.1 Workers' Compensation and Employers Liability insurance in accordance with the laws of the State of Alaska.

10.2.2 Comprehensive General Liability and Broad Form Comprehensive General Liability or Commercial General Liability including bodily injury, personal injury, and property damage in the amount of a combined single limit of One Million Dollars ($1,000,000), each occurrence, and Two Million Dollars ($2,000,000) in aggregate limit.

10.2.3 Comprehensive Auto Liability including bodily injury, personal injury and property damage in the amount of a combined single limit of One Million Dollars ($1,000,000). Coverage must include all motor vehicles utilized by QDC in connection with its performance of the services hereunder.

The City shall be named as an additional insured under the policies of Comprehensive General Liability and Comprehensive Auto Liability insurance. Each of the insurance policies required above shall include a waiver of subrogation against the City. Thirty (30) days prior written notice will be given to the City in the event of any material change in or cancellation of any required insurance policy.

10.3 QDC shall give prompt written notice to the City of all known losses, damages, or injuries to any person or to property of the City or third persons that may be in any way related to the services being provided hereunder or for which a claim might be made against the City. QDC shall promptly report to the City all such claims that QDC has noticed, whether related to matters insured or uninsured. No settlement or payment for any claim for loss, injury or damage or other matter as to which the City may be charged with an obligation to make any payment or reimbursement shall be made by QDC without the prior written approval of the City.

11.0 Non-Discrimination

QDC agrees that in performing its tasks under this Agreement, it shall not discriminate against any worker, employee, or applicant, or any member of the public, because of age, race, sex, creed, color, religion, or national origin, nor otherwise commit an unfair employment practice in violation of any state or federal law.

12.0 Conflict of Interest

QDC warrants that, to the best of its knowledge and belief, no person except bona fide employees, agents, consultants or representatives of QDC or any of its subcontractors has been employed or retained to solicit or secure this Agreement

13.0 Independent Contractor Status

The City and QDC are independent contractors under this Agreement, and nothing herein shall be construed to create a partnership, joint venture, or agency relationship between the parties hereto. Neither party shall have any authority to enter into agreements of any kind on behalf of the other and shall have no power or authority to bind or obligate the other in any manner to any third party. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purpose whatsoever. Each party hereto represents that it is acting on its own behalf and is not acting as an agent for or on behalf of any third party.

14.0 Assignment

Neither party hereto may assign its rights or obligations under this Agreement without the prior written consent of the other party, which consent shall not be unreasonably withheld; provided, however, that QDC may assign this Agreement to its successor in connection with a sale of its business without obtaining consent of any party. Subject to the foregoing, each and every covenant, term, provision and agreement contained in this Agreement shall be binding upon and inure to the benefit of the parties' permitted successors, executors, representatives, administrators and assigns.

15.0 Third Party Beneficiaries

This Agreement is entered into for the sole benefit of the City and QDC and, where permitted above, their permitted successors, executors, representatives, administrators and assigns. Nothing in this Agreement shall be construed as giving any benefits, rights, remedies or claims to any other person, firm, corporation or other entity, including without limitation the general public or any member thereof, or to authorize anyone not a party to this Agreement to maintain a suit for personal injuries, property damage, or any other relief in law or equity in connection with this Agreement.

16.0 Governing Law

All questions concerning the validity, operation, interpretation, construction and enforcement of any terms, covenants or conditions of this Agreement shall in all respects be governed by and determined in accordance with the laws of the State of Alaska without giving effect to the choice of law principles thereof.

17.0 Venue

All legal proceedings brought in connection with this Agreement may be brought in the trial courts for the State of Alaska at Kodiak, Alaska. Each party hereby agrees to submit to the personal jurisdiction of those courts for any lawsuits filed there against such party arising under or in connection with this Agreement.

18.0 Advice of Counsel

Each party hereto has been afforded the opportunity to consult with counsel of its choice before entering into this Agreement.

19.0 Amendment

No amendment or other modification of this Agreement shall be valid unless pursuant to a written instrument referencing this Agreement signed by duly authorized representatives of each of the parties hereto.

20.0 Waiver

In order to be effective, any waiver of any right, benefit or power hereunder must be in writing and signed by an authorized representative of the party against whom enforcement of such waiver would be sought, it being intended that the conduct or failure to act of either party shall imply no waiver. Neither party shall by mere lapse of time without giving notice or taking other action hereunder be deemed to have waived any breach by the other party of any of the provisions of this Agreement. No waiver of any right, benefit or power hereunder on a specific occasion shall be applicable to any facts or circumstances other than the facts and circumstances specifically addressed by such waiver or to any future events, even if such future events involve facts and circumstances substantially similar to those specifically addressed by such waiver. No waiver of any right, benefit or power hereunder shall constitute, or be deemed to constitute, a waiver of any other right, benefit or power hereunder. Unless otherwise specifically set forth herein, neither party shall be required to give notice to the other party, or to any other third party, to enforce strict adherence to all terms of this Agreement.

21.0 Force Majeure

Neither party will be liable for any failure or delay in the performance of its obligations under this Agreement (and the failure or delay will not be deemed a default of this Agreement or grounds for termination) if both of the following conditions are satisfied: (1) the failure or delay could not have been prevented by reasonable precautions, and cannot reasonably be circumvented by the non-performing party through the use of alternate sources, work-around plans, or other means; and (2) the failure or delay is caused, directly or indirectly, by reason of fire or other casualty or accident; strikes or labor disputes; inability to procure raw materials, equipment, power or supplies; war, terrorism or other violence; any law, order, proclamation, regulation, ordinance, demand, or requirement of any governmental agency or intergovernmental body other than a party hereto; or any other act or condition beyond the reasonable control of the non-performing party. Upon the occurrence of an event which satisfies both of the above conditions (a "Force Majeure Event"), the non-performing party will be excused from any further performance of those obligations under this Agreement affected by the Force Majeure Event for as long as (a) the Force Majeure Event continues; and (b) the non-performing party continues to use commercially reasonable efforts to recommence performance whenever and to whatever extent possible without delay. Upon the occurrence of a Force Majeure Event, the non-performing party will immediately notify the other party by telephone (to be confirmed by written notice within two (2) business days of the failure or delay) of the occurrence of a Force Majeure Event and will describe in reasonable detail the nature of the Force Majeure Event.

22.0 Severability

If any provision of this Agreement shall for any reason be held to be invalid, illegal, unenforceable, or in conflict with any law of a federal, state, or local government having jurisdiction over this Agreement, such provision shall be construed so as to make it enforceable to the greatest extent permitted, such provision shall remain in effect to the greatest extent permitted and the remaining provisions of this Agreement shall remain in full force and effect.

23.0 Entire Agreement

This Agreement sets forth the final, complete and exclusive agreement and understanding between QDC and the City relating to the subject matter hereof and supersedes all other communications between the parties (oral or written) relating to the subject matter hereof. No affirmation, representation or warranty relating to the subject matter hereof by any employee, agent or other representative of a party shall bind the party or be enforceable by the other party unless specifically set forth in this Agreement.

24.0 Notices

All notices, requests, demands, or other communications required or permitted to be given hereunder must be in writing and must be addressed to the parties at their respective addresses set forth below and shall be deemed to have been duly given when (a) delivered in person; (b) sent by email transmission indicating receipt at the email address where sent, (c) one (1) business day after being deposited with a reputable overnight air courier service; or (d) three (3) business days after being deposited with the United States Postal Service, for delivery by certified or registered mail, postage pre-paid and return receipt requested. All notices and other communications regarding default or termination of this Agreement shall be delivered by hand or sent by certified mail, postage pre-paid and return receipt requested. Either party may from time to time change the notice address set forth below by delivering notice to the other party in accordance with this section setting forth the new address and the date on which it will become effective.

If to QDC:
Quayanna Development Corporation
Attention: Executive Director
11801 Middle Bay Drive
Kodiak, Alaska 99615
plarc@alaska.net

If to the City:
City of Kodiak
Attention: City Manager
710 Mill Bay Road
Kodiak, Alaska 99615
akniaziowski@city.kodiak.ak.us

25.0 Construction

The paragraph and section headings used in this Agreement or in any exhibit hereto are for convenience and ease of reference only, and do not define, limit, augment, or describe the scope, content or intent of this Agreement. Any term referencing time, days or period for performance shall be deemed calendar days and not business days, unless otherwise expressly provided herein.

26.0 Counterparts

This Agreement may be signed in two or more counterparts, each of which shall constitute an original, and all of which together shall constitute one and the same document.

IN WITNESS WHEREOF, the parties have hereunto set their hands as set forth below.

City of Kodiak

By: [signature]
Aimée Kniaziowski
City Manager

Quayanna Development Corporation

By: [signature]
Peter J. Olsen
Executive Director

FIRST AMENDMENT TO
COMPOSTING AGREEMENT

THIS FIRST AMENDMENT TO COMPOSTING AGREEMENT (this "Amendment") is entered into as of December 14, 2012, by and between the City of Kodiak, an Alaska municipal corporation (the "City") and Quayanna Development Corporation, an Alaska corporation ("QDC")

WHEREAS, the parties entered into a Composting Agreement as of October 30, 2012 (the "Agreement"); and

WHEREAS, the parties intended that QDC would commence composting operations under the Agreement on or about December 15, 2012; and

WHEREAS, delays in permitting require the parties to establish a temporary solution for composting bio-solids from the City's wastewater treatment facility.

NOW, THEREFORE, in consideration of the foregoing Recitals (which are incorporated herein by this reference), the mutual covenants and conditions hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Purchaser and Seller hereby agree as follows:

1. **Definition of "Borough."** Section 1.0 is amended by adding the following definition, "Borough" means the Kodiak Island Borough, an Alaska municipal corporation.

2. **Definition of "Operational Plan."** The definition of "Operational Plan" in Section 1.0 is amended to read, "Operational Plan" means either (i) for composting at the Borough landfill, the amended operating permit for the Borough landfill and the agreement between the City and Borough regarding the composting of Bio-solids at the Borough landfill; or (ii) for composting at any other Site, the plan approved by ADEC under which QDC will receive and compost Bio-solids at the Site. Upon ADEC approval of the plan, it shall be attached to this Agreement and incorporated by reference herein.

3. **Definition of "Site."** The definition of "Site" in Section 1.0 is amended to read, "Site" means real property located either (i) at the Borough landfill that the Borough has designated for use as a site for the composting of Bio-solids under this Agreement; or (ii) within approximately 25 road miles of the City's wastewater treatment facility, and designated by QDC from time to time and approved by ADEC and other regulatory authorities for the composting of Bio-solids under this Agreement.

4. **Time for Performance.** Section 2.1 is amended by changing the date, "December 15, 2012" everywhere that it appears to "September 15, 2013."

5. Termination. Section 8.1 is amended to read, "This Agreement may be terminated with at least 60 days written notice by either party."

6. Affirmation of Agreement. Except as expressly amended herein, all terms and conditions of the Agreement as originally executed shall remain in full force and effect.

IN WITNESS WHEREOF, the parties have hereunto set their hands as set forth below.

City of Kodiak	Quayanna Development Corporation
By:	By:
Aimée Kniaziowski	Peter J. Olsen,
City Manager	Executive Director

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Quayanna Development Corporation
11801 Middle Bay Drive
Kodiak, Alaska 99615
TEL : (907) 487-2291
CELL : (907) 317-0083
e-mail : plarc@alaska.net

January 6, 2012

Ms. Aimee Kniaziowski, City Manager
City of Kodiak
710 Mill Bay Road, Room 219
Kodiak, Alaska 99615

RE: Composting of Sewage Treatment Plant Biosolids

Dear Ms. Kniaziowski:

This letter is to confirm our interest in working with the City of Kodiak towards a long term composting program for the biosolids produced at the sewage treatment plant. It is our understanding that the Kodiak Island Borough landfill has informed the City that the landfill expects to curtail acceptance of biosolids in 2012. The City has conducted a study to determine the feasibility of composting the biosolids much as other communities in Alaska and elsewhere do. The study determined that composting is a viable option for the processing and disposal of the biosolids.

The study identified the need for several thousand yards of wood chips and other suitable materials on an annual basis to compost the volume of biosolids produced at the Kodiak facility. There currently is no reliable source for that volume of material. Our company has actively engaged in promoting woody biomass as a long term sustainable resource for wood fuel projects. Integral to the wood fuel efforts is the local production of wood chips on a commercial basis. QDC has been in discussions with various local forest landowners to secure the harvest and salvage rights to logging residues and other woody biomass sources. These discussions are expected to lead to arrangements that will enable our company to offer composting services to the City.

Based on the informal discussions between the City and QDC, we are comfortable with the City's verbal representations that composting is a viable process to dispose of the biosolids and that the City will seriously entertain such services if they were offered to you on reasonable terms. QDC has therefore made the development of a composting program a high priority in 2012.

It is our goal to offer contract composting services to the City on a long term basis at rates that are reasonable. Our ability to offer these services is dependent on securing property suitable for these purposes, and the necessary volume of wood fiber. The terms upon which these two major items will have a major impact on the prices we will be able to offer for composting. QDC is actively engaged with local landowners in this regard and we are optimistic that we can secure these in a timely fashion and on terms that will enable the project to move forward. It is our goal to secure the necessary land, woody materials, and equipment such that composting could commence by late summer or fall of 2012. At this early date there are obviously any number of occurrences that may influence this timetable, part of which is the administrative processes both parties will need to complete. The attached DRAFT Memorandum of Understanding is intended to provide a framework for future discussions and information dissemination for stakeholders and other interested parties.

QDC enthusiastically looks forward to putting this project together with the City of Kodiak. We are always open to discussing potential solutions to the challenges of putting this composting program together with you.

Sincerely,

QUAYANNA DEVELOPMENT CORPORATION

Peter J. Olsen, Executive Director

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MEMORANDUM

TO: Mayor Selby and Assembly Members

Through: Bud Cassidy, Interim Borough Manager

CC: Mayor Branson and City Council Members

FROM: Aimée Kniaziowski, City Manager

DATE: December 13, 2012

RE: Joint City-Borough Solution of Temporary Agreement to Create Class B Compost from Biosolids at an Approved Location at the Current Landfill

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This memo is being written at the request of the Borough Manager following a meeting between City and Borough staff yesterday at which the preferred temporary solution for the continued disposal of biosolids at the KIB landfill was discussed.

As you know, the sewage sludge processed through the wastewater treatment plant (biosolids) has been disposed of at the existing landfill for many years. The City and Borough discussed the possibility that the landfill may not be able to take biosolids due to the landfill expansion project over the course of several years and signed a Memorandum of Agreement (MOA) on this issue in August of 2007 (see attached). In keeping our part of the agreement, the City has spent a considerable amount of time and money to identify solutions for the disposal of the biosolids at a location other than the landfill since that time. After several studies, it was determined that composting was the most viable and affordable option for the disposition of biosolids. The City began to work on composting options with a private contractor about a year ago.

The City was provided formal notification on June 5, 2012, (see attached) that the landfill would no longer take biosolids from the wastewater treatment plant as of December 15, 2012. The City continued working with Quayanna Development Corporation (QDC) on a plan to compost biosolids into Class A EQ compost at a location to be determined by the contractor. The City Council approved the contract with QDC in October to compost at a site in Middle Bay. The agreement required QDC, to have a permit in place and be able to accept biosolids at the identified site by the Borough's December 15 deadline. QDC submitted an application to the State Department of Environmental Conservation to compost at the industrially zoned, leased site at Middle Bay. Due to the public comments and concerns expressed to DEC during the public comment period, the comment period has been extended to January 18 and it is likely to take longer to receive a permit for a composting operation at that location.

The City and QDC also explored other suitably zoned locations for composting and identified a back-up short term solution to stockpile biosolids using DEC's approved method until a permit to compost to Class A EQ standards can be issued to the contractor. The City identified one stockpile sight at the USCG Base and the other at Gibson Cove. This short-term option is not preferred no matter the site, due to operational and cost considerations.

City and Borough staff and the contractor have been working to find both a short- and long-term solution to allow for the safe and affordable disposal of the community's biosolids while waiting for completion of the DEC permitting process. A short-term solution has been offered by Borough staff that the City and QDC agree is a very good solution. The Borough has identified an area on top of the existing unlined landfill of approximately 27,700 square feet that could be made available to compost biosolids into Class B compost which would then be disposed of in the landfill to fill voids and help shape the contours in preparation for final cover and closure. The area is adequate to produce the Class B type compost without creating a backlog of compost. The operational plan submitted by the City's contractor says the process will produce approximately 240 cubic yards of unscreened compost or roughly 125 cubic yards of screened compost per week.

The City is willing to enter into an agreement to utilize the identified space at the top of the landfill at a cost that is substantially less than fair market value for industrially zoned land, given the fact that it is located at the top of an actively worked, unlined landfill cell. The City is comfortable with having the land agreement or MOA in place from December through August 2013 when the landfill crew will need to return to that area to work. The City will approve the agreement, deliver the biosolids to the site, and utilize QDC to make the compost and dispose of it within the landfill as directed by landfill staff. DEC has already indicated support for this activity and will allow it to occur as part of the landfill operation. The City and QDC have prepared an operation plan that outlines the operational aspects of this process, including safety and all other aspects of making the Class B compost at the location to meet Borough and DEC requirements.

I understand that Borough requirements will include a formal approval action by the Assembly as well as a public hearing even though the agreement to use this land by the City and its contractor is short-term, it is considered a 'disposal" of Borough property for a public purpose per KIB Code 18.20.160. Until the Assembly has completed the approval process and proper agreements are in place, Borough staff is willing to accept biosolids at the landfill at the existing disposal rate and allow the biosolids to be stockpiled there.

Both government staffs have worked diligently to come up with this short-term team-based solution that will benefit the community and ratepayers. I believe our staffs and mayors fully support a mutually beneficial outcome such as this and request the Assembly to proceed with the process to allow for implementation of this solution. This will give the City and QDC time to implement the plan to compost biosolids into the Class A EQ product as originally planned.

Kodiak Island Borough

Office of the Borough Manager
710 Mill Bay Road
Kodiak, Alaska 99615
Phone (907) 486-9300
email: rgifford@kodiakak.us

JUN 2012
Received

June 5, 2012

Aimée Kniaziowski, City Manager
710 Mill Bay Road
Kodiak, Alaska 99615

Re: Biosolid Disposal at KIB Landfill

Dear Ms. Kniaziowski:

Thank you for attending our meeting of June 1, 2012 to discuss issues related to the Borough challenges related to sludge placement in the landfill. As the landfill nears its permitted capacity, it becomes problematic to accept sludge. The landfill has experienced increased volumes of sludge recently causing a backlog. This condition creates operational difficulties at the active face of the landfill. The city has indicated that it has not yet fully developed alternative disposal options for biosolids.

As the Borough transitions its municipal solid waste (MSW) disposal operations to the soon to be constructed expansion cell, we anticipate a period of one year when the Borough will be unable to accept any sludge. In accordance with the MOA between the City of Kodiak and Kodiak Island Borough dated 8-14-07, consider this the required six month notification that the Borough will be unable to accept sewage sludge at the landfill after December 15, 2012. In the interest of cooperation, the Borough agrees to work around the operational challenges and accept the increased volumes of sludge experienced recently.

If the Borough can be of any assistance in your efforts to develop alternative options for disposal of sewage sludge, please contact Woody Koning, Director Engineering & Facilities at 486-9343.

Sincerely,
KODIAK ISLAND ***BOROUGH***

Rick Gifford
Borough Manager

RG:ljw
Cc: Woody Koning, Director Engineering & Facilities

MEMORANDUM OF AGREEMENT
Delivery of City of Kodiak Wastewater Treatment Plant Sludge to the Kodiak Island Borough Landfill

The purpose of this Memorandum of Agreement (MOA) is to identify the general responsibilities of the City of Kodiak and the Kodiak Island Borough

Kodiak Island Borough will:

- Continue to accept sludge from the City of Kodiak Wastewater Treatment Plant at the Kodiak Island Landfill unless or until operations at the landfill preclude KIB'S ability to accept.
- In the event that the Kodiak Island Borough determines that they can no longer accept sludge from the City of Kodiak Wastewater Treatment Plant, the City will be provided with a minimum of six months notice of the determination.
- Work in cooperation with the City of Kodiak to utilize as much sludge as possible with the least amount of stock piling on site.

City of Kodiak will:

- Continue the current adjusted treatment process in an effort to improve sludge handling characteristics to make it easier for landfill operators to place sludge.
- Continue the addition of increased lime ratios that has improved sludge consistency and made it drier and easier for co-disposal.
- Continue efforts to increase the percent solids and improve sludge handling characteristics.
- Continue to pursue alternative options for sewage sludge disposal.

Rick L. Gifford, Manager
KodiakIsland Borough

Attest: Borough Clerk
Nova M. Javier, CMC

Date 8/14/07

Linda Freed, Manager
City of Kodiak

Attest: City Clerk
Debra L. Marlar, CMC

8/14/07
Date

KODIAK ISLAND BOROUGH
ALASKA ★ 1963

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MEMORANDUM OF UNDERSTANDING
BETWEEN
QUAYANNA DEVELOPMENT CORPORATION
AND THE
CITY OF KODIAK

This MEMORANDUM OF UNDERSTANDING is hereby made and entered into by and between the CITY OF KODIAK, hereinafter referred to as CITY and QUAYANNA DEVELOPMENT CORPORATION, hereinafter referred to as QDC.

A. PURPOSE:

The purpose of this MOU is to continue to develop and expand a framework of cooperation between CITY and QDC to develop a composting program that processes bio-solids produced from the City of Kodiak Sewage Treatment Plant.

B. CITY SHALL:

I. Collaborate with QDC to develop a mutually acceptable contract terms between the CITY and QDC for a long term bio-solid composting program.
II. Provide information and data to QDC regarding bio-solid production and chemical/physical composition statistics that the CITY has on file.
III. Cooperate with and support efforts for QDC to secure grant funding that will support the development and operation of a composting program.

C. QDC SHALL:

I. Endeavor to offer contract composting services to the CITY.
II. Secure long terms sources of woody biomass and other suitable composting mediums for the purpose of composting bio-solids produced at the CITY Sewage Treatment Plant.
III. Secure real estate property rights that will allow composting of Sewage Treatment Plant bio-solids.

D. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

1. NEW PROJECT. Composting of sewage treatment plant bio-solids is a proven method to process bio-solids. The process is new to Kodiak however, and no composting infrastructure currently exists. A commercial composting project will have to be assembled from scratch.

2. RATES. It is the intent of QDC to provide contract composting services to the CITY at reasonable rates. QDC's ability to offer reasonable rates is significantly influenced by the property and woody biomass costs QDC will experience. Both QDC and CITY understand that high composting rates may result in the project to become uneconomical to implement.

3. SIMILAR INCENTIVES. QDC and CITY recognize that both parties have an incentive to share data and other information that may help the project proceed on an economical basis.

4. TERMINATION. Either party, upon thirty (30) days written notice, may terminate the agreement in whole, or in part, at any time before the date of expiration.

5. PRINCIPAL CONTACTS. The principal contacts for this instrument are:

CITY:

Ms. Aimee Kniaziowski, City Manager
City of Kodiak
710 Mill Bay Road, Room 219
Kodiak, Alaska 99615

QDC:

Peter J. Olsen, Executive Director
11801 Middle Bay Drive
Kodiak, Alaska 99615

6. NON-BINDING DOCUMENT. This agreement is neither a legally binding nor a funds obligation document. Each party shall be fiscally responsible for their own portion work performed under the MOU.

7. LIABILITIES. It is understood that neither party to this Memorandum of Understanding is the agent of the other and neither is liable for the wrongful acts or negligence of the other. Each party shall be responsible for its negligent acts or omissions and those of its officers, employees, agents or students (if applicable), howsoever caused, to the extent allowed by their respective state laws.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the last written date below.

FOR **CITY:**

Date: 2/3/2012

Ms. Aimee Kniaziowski, City Manager
City of Kodiak

FOR **QDC**:

Date: 2/7/2012

Peter J. Olsen, Executive Director
Quayanna Development Corporation

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City of Kodiak

Biosolids Composting Pilot Test

Cory Hinds, P.E.

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Introduction

- Biosolids: dewatered sewage sludge
- Secondary treatment plant with 2,500 tons of dewatered biosolids annually
- Biosolids are currently lime-stabilized and co-disposed with municipal solid waste in landfill
- Management options include:
  - co-disposal with municipal solid waste
  - Cannibal® digestion then co-disposal
  - incineration
  - land disposal
  - composting

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Background: Kodiak Landfill

- Operated by Kodiak Island Borough (KIB)
- Existing LF, active since 1950s is nearing capacity
- KIB currently estimates ~9 to 12 mo. remaining
- New lined landfill (lateral expansion) Cell 1 scheduled for construction in 2011
- Biosolids accounts for 10 to 20% of total annual
- KIB notified City that they may stop accepting sludge as landfill nears capacity

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Project Need

- Continued landfill disposal is uncertain
- City looking for alternative management option

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Biosolids Management Alternatives

Management options studied in 2008

- Cannibal® process
- Incineration
- Composting

➢ Composting was lowest cost alternative

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Unanswered Questions on Composting

- Will it work in Kodiak's climate?
- How much wood chips would be required?
- How long will it take?
- How much space would it take?
- Can moisture be controlled?
- Can odors be controlled?
- What are man-power requirements?
- How much would it cost?
- What would Kodiak do with the compost?

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Composting Pilot Test

- Composting pilot study proposed in late 2008, started in June 2009
- Active composting and testing completed in 2009, final screening in 2010
- Additional research on unanswered questions documented in Technical Memos
- Final summary report with Technical Memos in April 2010

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Scope of Pilot Test

- One week's worth of biosolids (~30 cy)
- Available wood chips from Kodiak
- Aerated static pile method
- Conduct test at WWTP
- Most pilot equipment purchased at discount from another project and shipped to site
- City personnel conducted the pilot test with guidance from CH2M HILL

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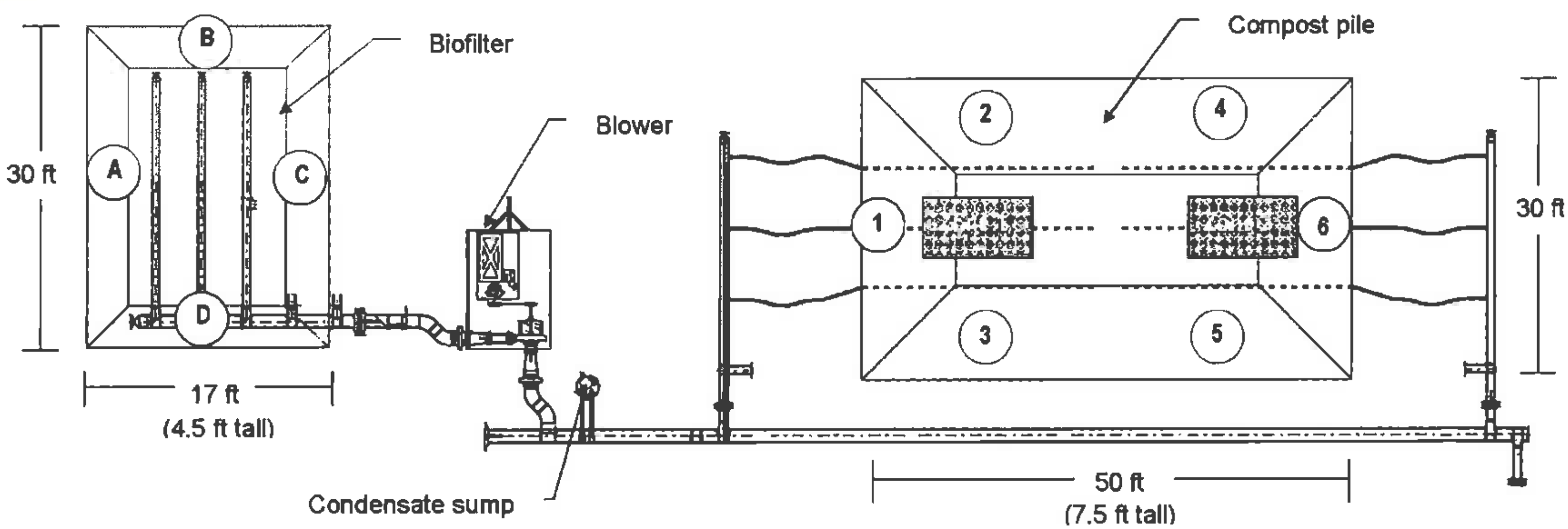
Aerated Static Pile Composting

- Negative aeration using blower
- Perforated piping under compost pile
- Condensate sump
- Biofilter
- CH2M HILL C:N Lite portable system



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Setup of Pilot Equipment

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Building the Compost Pile

- City rented a chipper and made wood chips
- Initial mixing with loader buckets
- Assemble the pile
- Odor complaints
- Newspaper article "What's that smell?"

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Compost Pile at Startup

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Monitoring and Regulating the Pile

- Check the moisture content (55% to 65%)
- Monitor temperatures (long temp probes)
- Add water
  - lawn sprinkler
- Adjust air flow
  - butterfly valves
  - variable frequency drive recommended

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Watering the Pile – Lawn Sprinklers

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EPA Time and Temp Requirements

TABLE 1 PART 503 TIME AND TEMPERATURE REQUIREMENTS FOR BIOSOLIDS COMPOSTING

Product	Regulatory Requirements
Class A	**Aerated static pile or in-vessel:** 55 C for at least 3 days **Windrow:** 55 C for at least 15 days with 5 turns
Class B	40 C or higher for five days during which temperature exceed 55 C for at least four hours

Source: 40 CFR Part 503.

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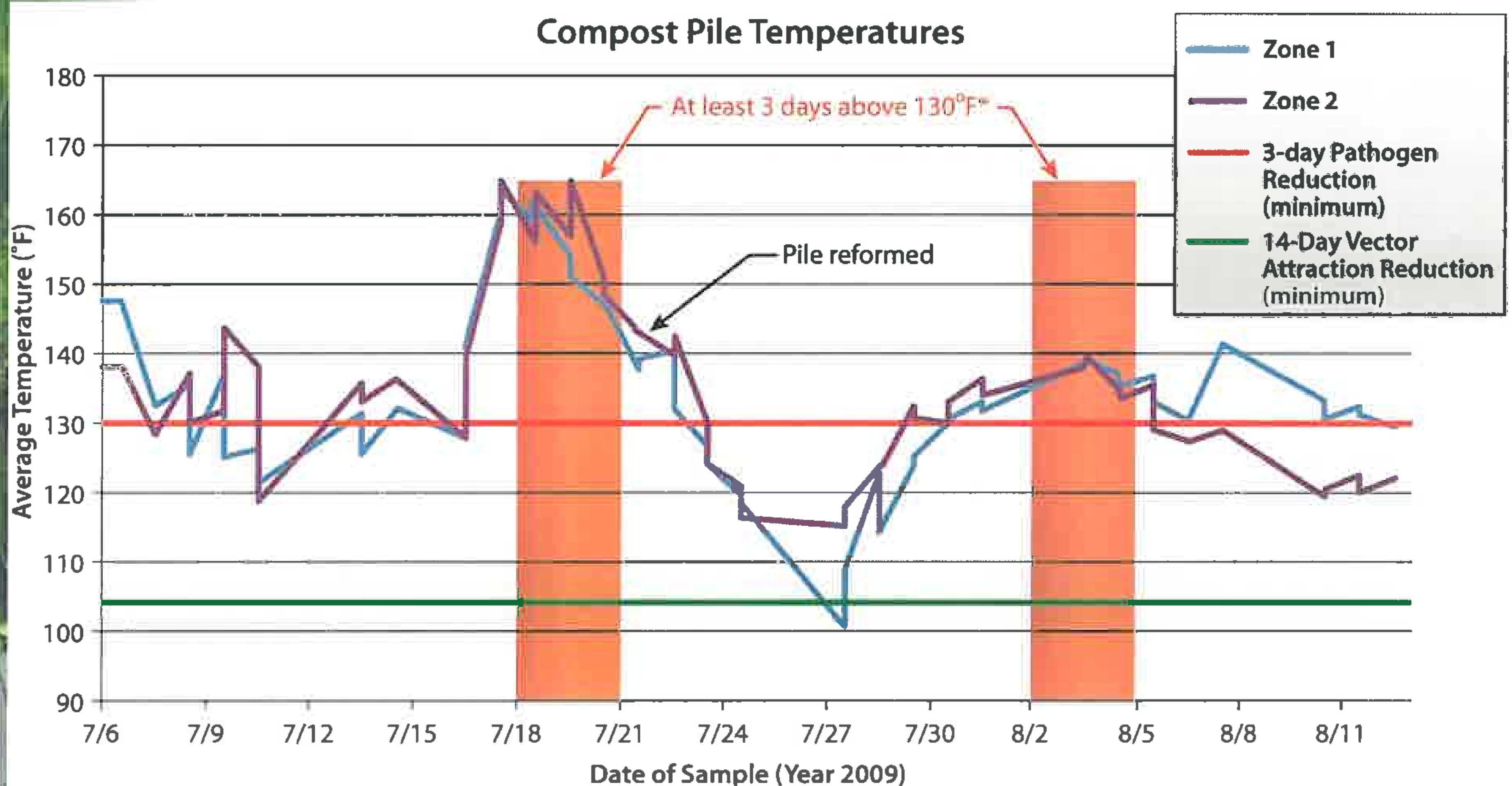
Requirements for Unrestricted Use

- Pathogen kill
  - 130 degrees °F (55 °C)or higher for 3 consecutive days
  - Verified with testing
- Vector reduction
  - 104°F (40°C) for 14 consecutive days, with an average temperature higher than 113°F (45°C)
- Metals concentrations below acceptable limits

Pilot Test – Temperature Results



* Regulatory requirement

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Curing Phase

- Stabilize the compost

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Compost Lab Results - Pathogens

Pathogens	Results	Unit	EPA Limit
Fecal Coliform	12	MPN/g	< 1000 MPN/g
Salmonella	< 3	MPN/4g	< 3 MPN/4g

g = gram
MPN = most probable number

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Compost Lab Results - Metals

Compost Metals Results

Metal	Test Result	EPA Limit
Arsenic	< 1.0	41
Cadmium	< 1.0	39
Chromium	12	1200
Copper	63	1500
Lead	100	300
Mercury	< 1.0	17
Molybdenum	1.0	75
Nickel	11	420
Selenium	1.0	36
Zinc	120	2800

Note: All results are dry weight in milligrams per kilogram.

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Compost Lab Results – Stability and Maturity

- Respirometry test - pass
- Germination test - pass

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Screening and End Use

- Air dry and screen
  - Coarse screen for stabilization/reclamation use
  - Fine screen for landscaping/garden use
- "Overs" – recycle or dispose

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Summary of Pilot Test Results

Testing	Result
Time & Temp Results	Pass
Pathogens	Pass
Metals	Pass

- Approx. 140 cy finished compost
- Class A product approved for unlimited distribution
- Top-notch control & management by City WWTF staff

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Final Distribution of Pilot Study Compost

- Received approval from ADEC for unlimited distribution to public
- Generated informational handouts for public
- Interested parties contacted first, then provided to general public at no cost

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Pilot Test Lessons Learned

- Requires a lot of wood
- Need to control odors during mixing
- Startup time longer than anticipated
- Be prepared to ADD moisture
- Need to be able to adjust air flow to control temp

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Research on Unanswered Questions

Study Question	Answer
Will it work in Kodiak?	Yes
How much wood chips are required?	Estimate 4,000 cy/yr for full scale. Kodiak could supply up to 50% if they purchase a tub grinder
How long will it take?	11 weeks plus curing
Can moisture and odors be controlled?	Yes
What are man-power requirements?	Estimate 1 FTE for full scale
What would it cost at full scale?	Estimate \$3 to \$4 million for enclosed facility, \$79/wet ton O&M
What to do with compost?	Phase in supply, look for high volume lower quality uses to sustain while growing markets for high quality
Where to get wood chips?	Unresolved. City operation can only supply 25%. Evaluate cardboard, shredded tires. Kodiak Wood Fuels?

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Overall Assessment of Composting for Biosolids Management

- Feasible to produce if reliable wood source is secured
- Difficult to market entire volume at once
- Possible one-time high volume use: LF closure
- High capital cost for building \$3 - \$4 million
- O&M cost is comparable to landfill disposal
- Appears to have community support

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Questions?

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Alternatives for Biosolids Processing at the Kodiak WWTP

Composting Pilot Study

Doug Berschauer, P.E. – Senior Technologist
Cory Hinds, P.E. – Solid Waste Practice Lead

August 26, 2008

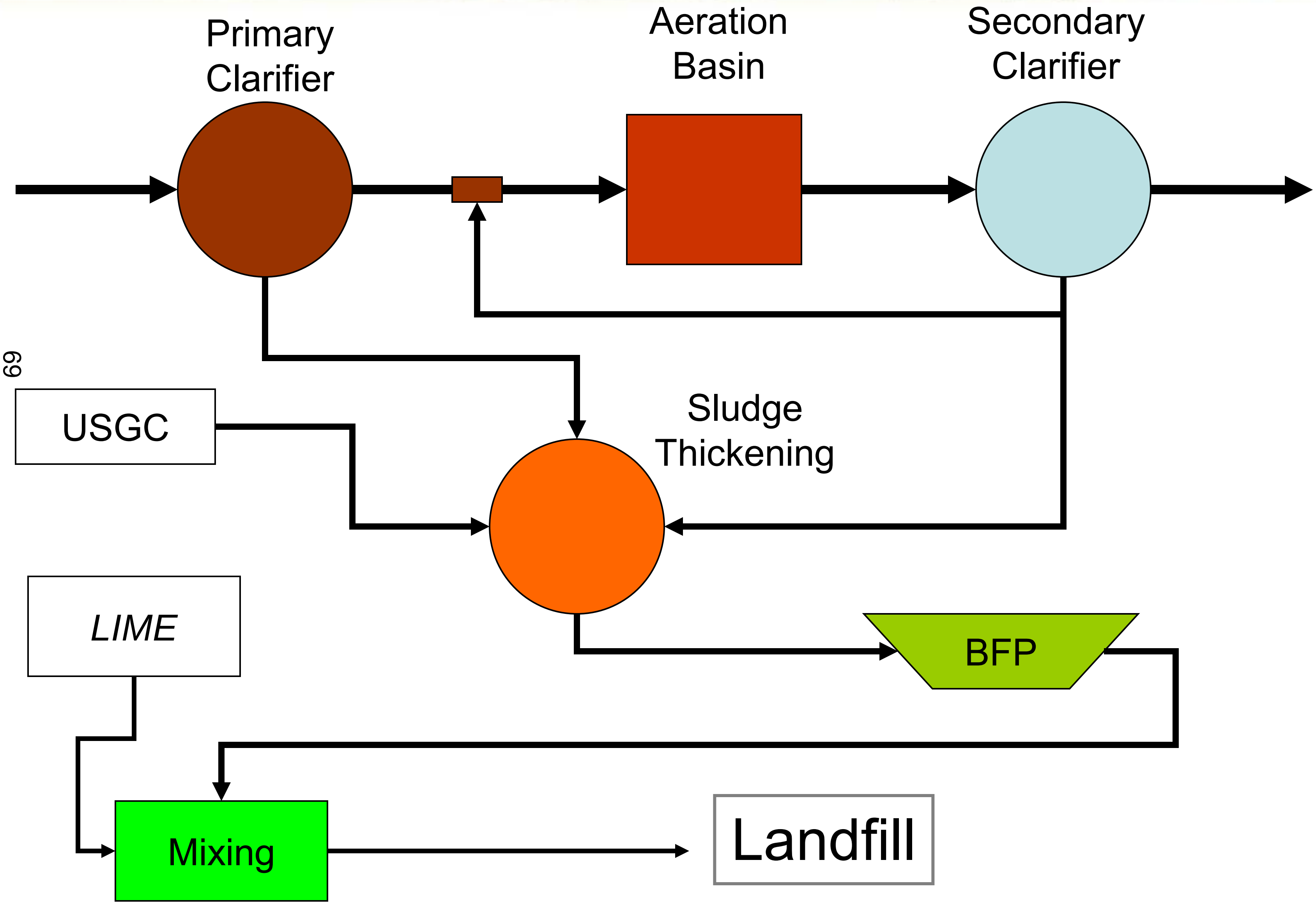
Today's Presentation

- Introductions
- Background
- Current Solids Processing
- Future alternatives
- Results and recommendations
- Composting Pilot Study
- Questions & Answers

Background

- Co-disposal of sludge with solid waste at the landfill is problematic from KIB's perspective
  - Problems receiving, storing, and placing sludge
  - Landfill nearing capacity
  - Ongoing compliance issues at landfill (leaching to surface water)
- Expensive for the City ($75/ton)
- Timeline from KIB for eliminating sludge

Current Solids Processing



Future Alternatives

- Alternatives to reduce or enhance biosolids
- Cannibal
  - Significant reduces biosolids production
  - Removes inert material
  - “In line digestion”
- Dryer/Incineration
  - Dry biosolids
  - Incinerate dried biosolids
  - Recapture heat for drying
- Composting

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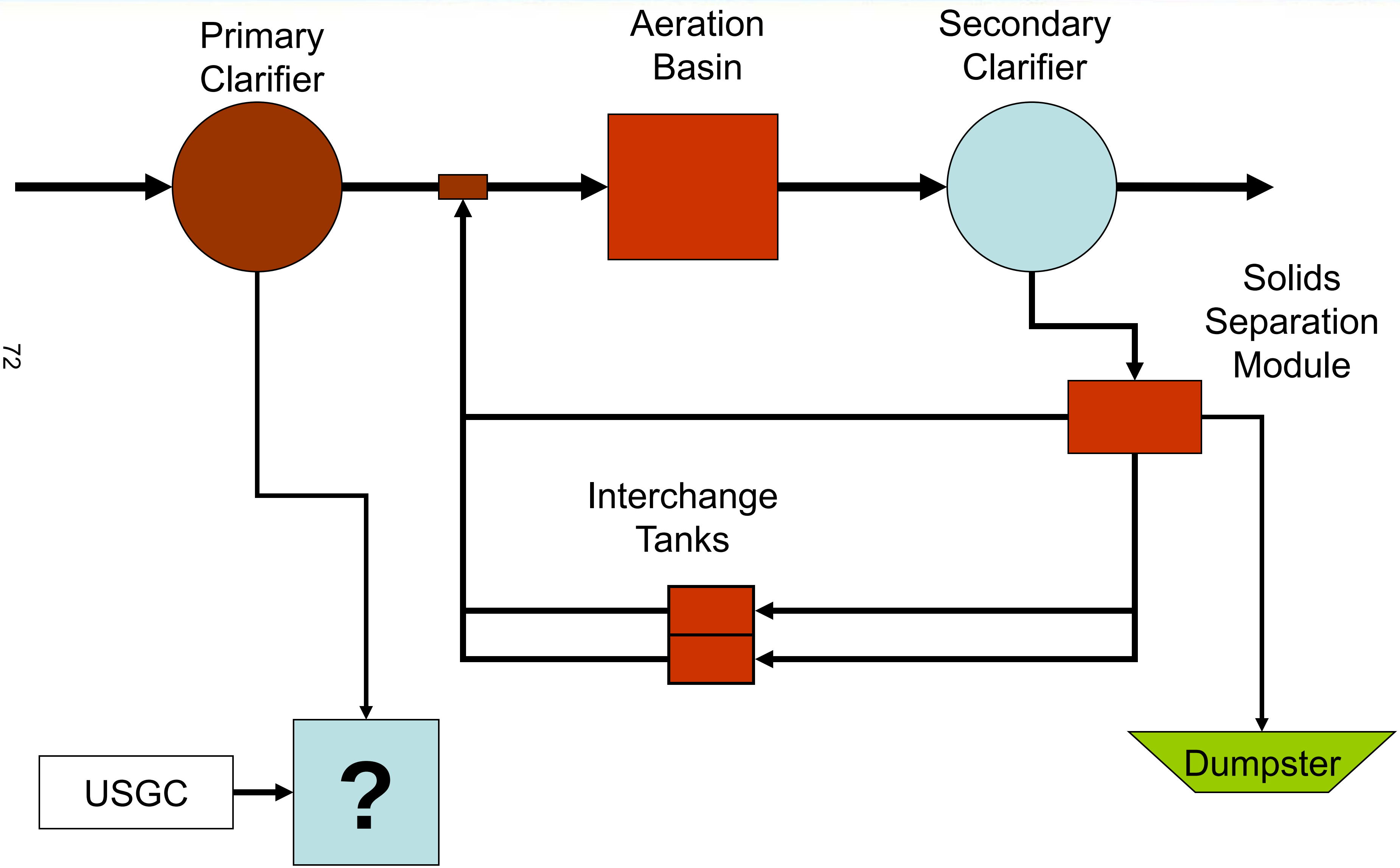
Cannibal

Cannibal Process



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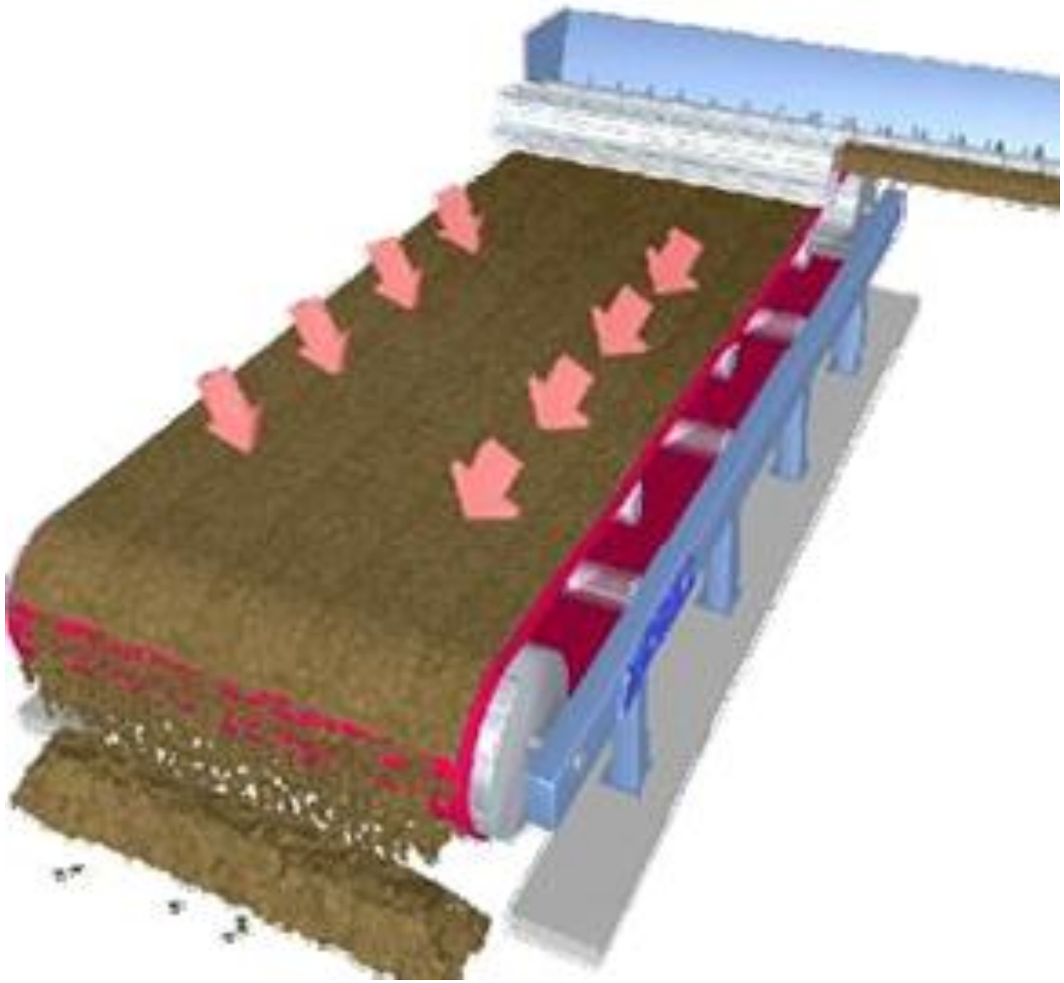
Dryer/Incineration

Belt Dryers
(Kruger Biocon at Shakopee, MN)

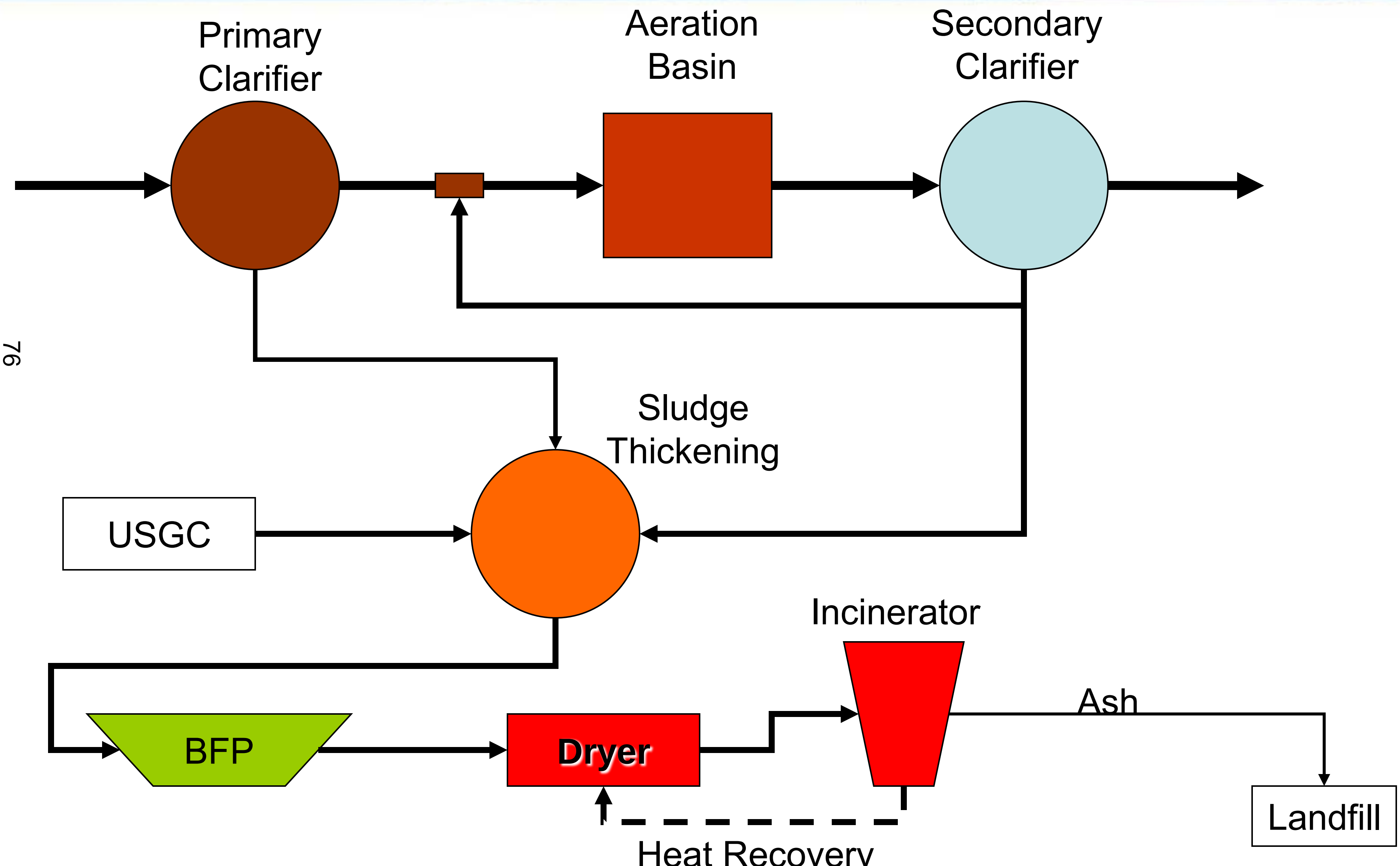
Biocon Dryer Enclosure

Biocon Dried Product

Belt Dryer



Dryer/Incineration Process



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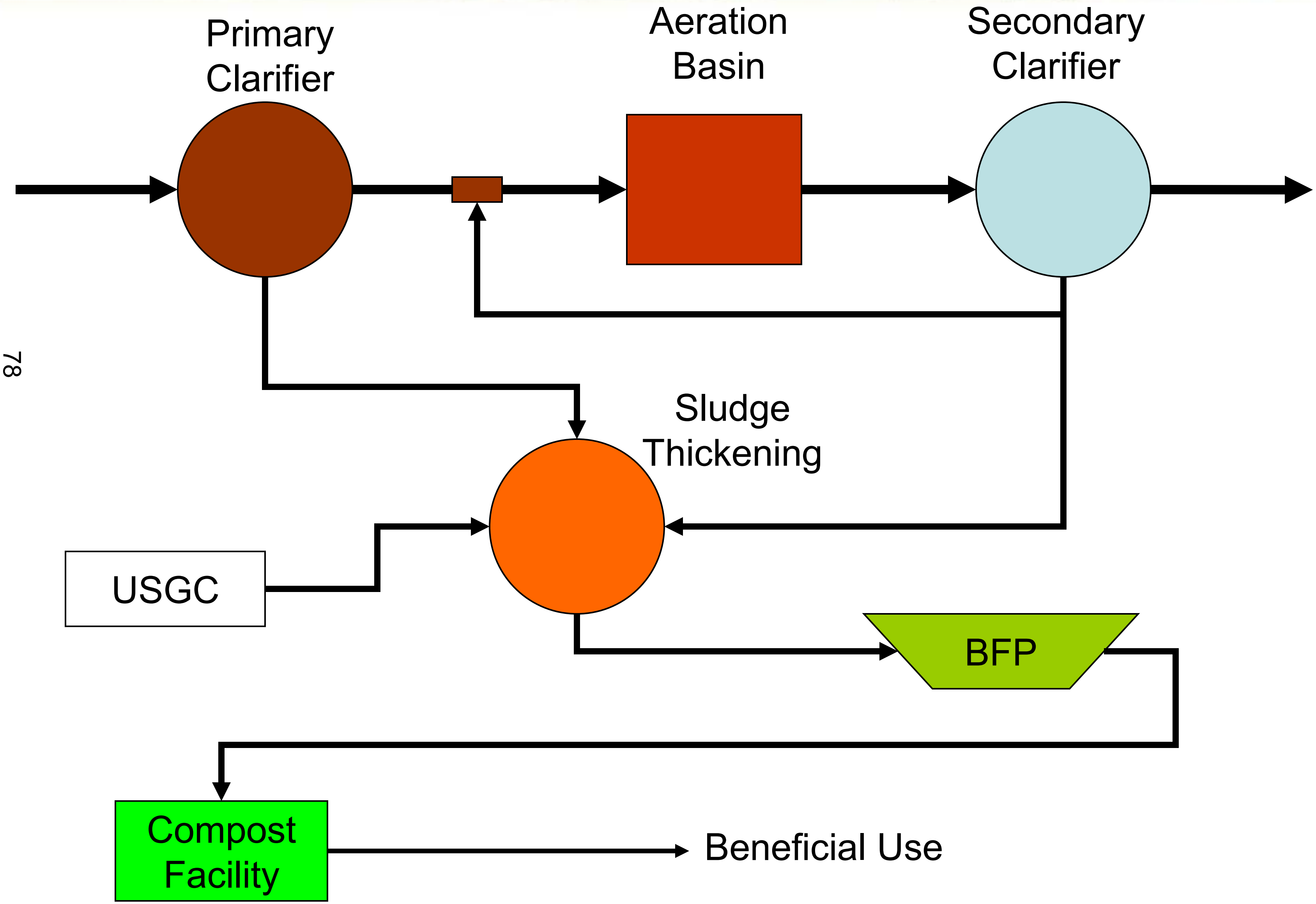
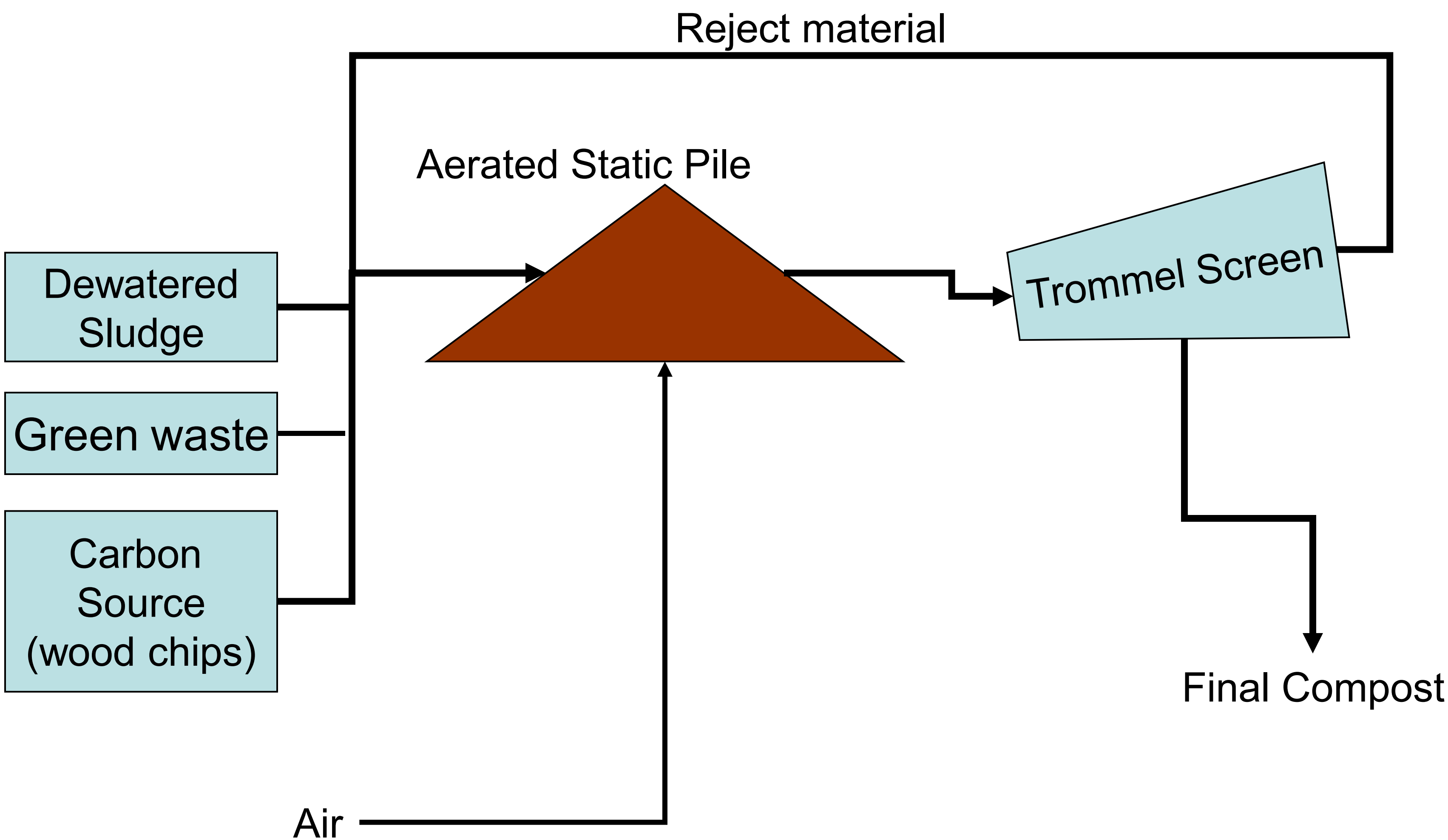
Composting

Solids Handling prior to Composting



Composting Process



Composting

Composting - blowers

Composting – No Odors!

Results and Recommendations

	Equipment Only Cost	Installed Cost	Annual O&M	25-Year Present Worth
Cannibal Process	$1,090,000	$16,800,600	$10,000	$17,050,600
Drying & Incineration	$3,190,000	$29,714,800	$36,000	$30,614,800
Composting	$1,100,000	$10,412,900	$100,000	$12,912,900

Results and Recommendations

- Canibal is not recommended for Kodiak
  - Temperature is primary factor
- Dryer/Incineration is most expensive
  - Capital costs are highest of three alternatives
  - High O&M Costs
- Composting has lowest Capital and operating cost
- Questions about Composting
  - Is there sufficient green waste on Kodiak to avoid importing material? According to mass balance and waste estimates (Bell & Assoc. 2007), yes.
  - Will there be sufficient demand for final product?

Composting Pilot Study

- Demonstrate commitment from City and the quality of compost
- Fine tune the amendment requirements
- Generate community interest and evaluate market for product
- Cost of Pilot $XXXXXX

Questions and Answers

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Alternatives for Biosolids Processing at the Kodiak WWTP

Doug Berschauer, P.E. – Senior Technologist
Floyd Damron, P.E. – Project Manager

June 27, 2008

Today's Presentation

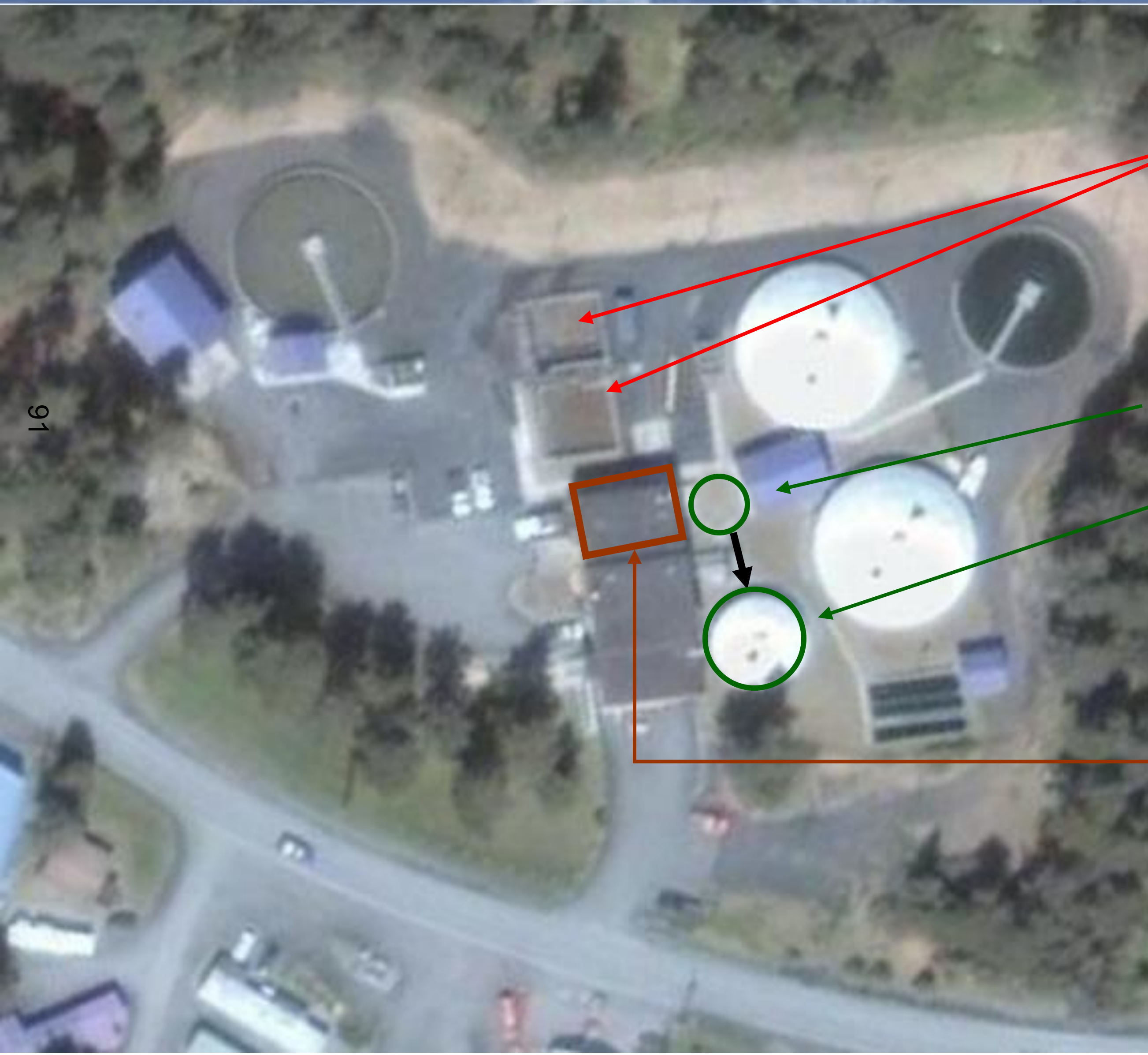
- Review of existing treatment process
- Present 3 alternatives for consideration
  - Composting
  - Cannibal
  - Dryer/Incineration
- For each alternative
  - Process diagram
  - Review site location
  - Pros
  - Cons
- Relative costs between alternatives
- Path Forward

Existing Process and Constraints

- Monthly Flow: 1.74 to 1.94 MGD (2001 – 2007)
- Influent BOD: 108 – 131 mg/l
- Influent TSS: 133 – 165 mg/l
- Biosolids production: 1,700 lbs/day (dry solids)
- Belt Filter Press usage: 2 days per week
- Future projections
  - Flow 2.2 MGD
  - Biosolids production: 2,000 lbs/day (dry solids)
- Landfill has indicated that City must cease hauling sludge
- Need to determine path forward and implement strategy to meet deadline

Existing WWTP

Existing WWTP – Recommended Improvements

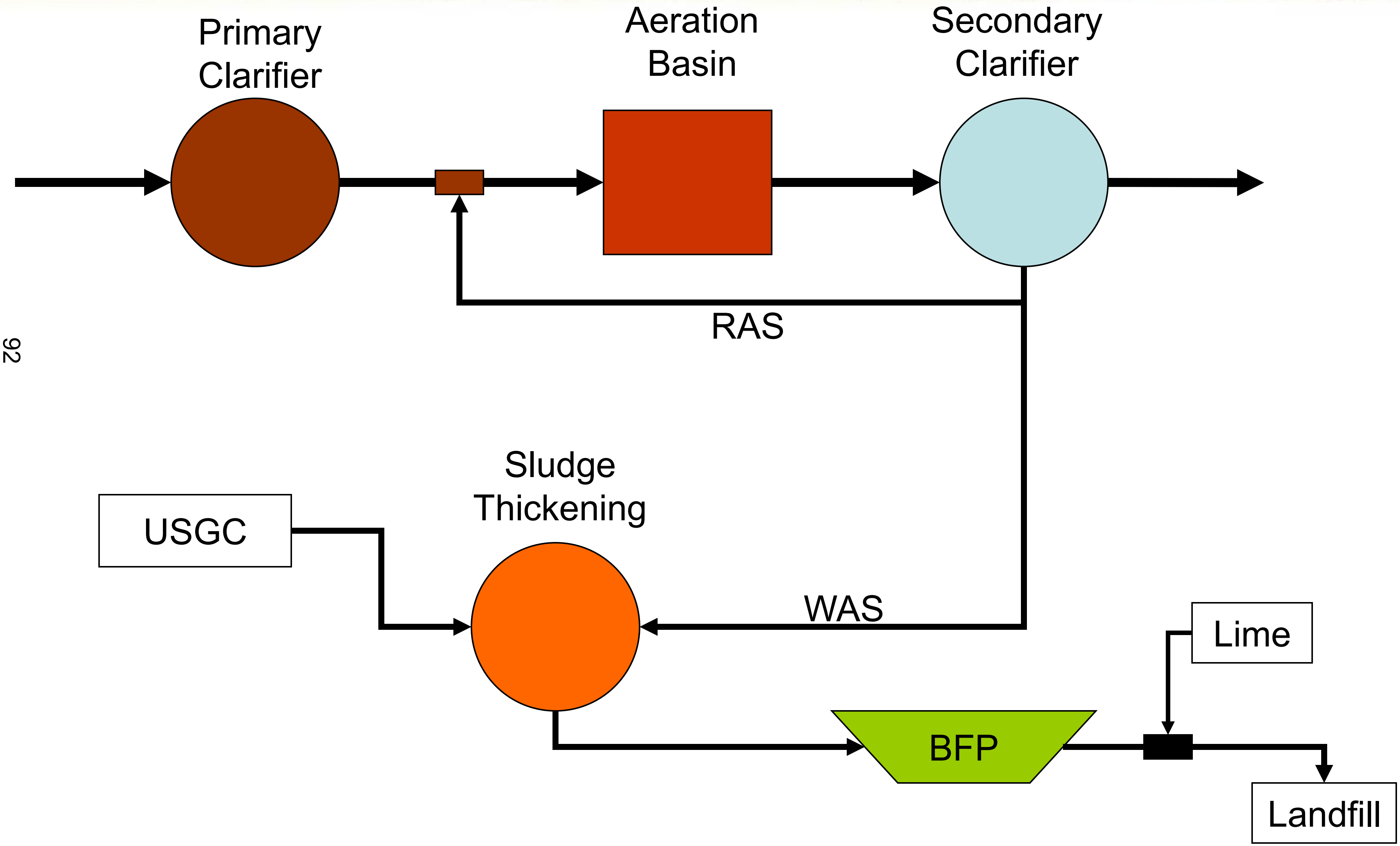


Control DO
Increase MLSS

Use Blending Tank prior to
Thickening Tank

Vendor
Inspect BFP

Existing Process



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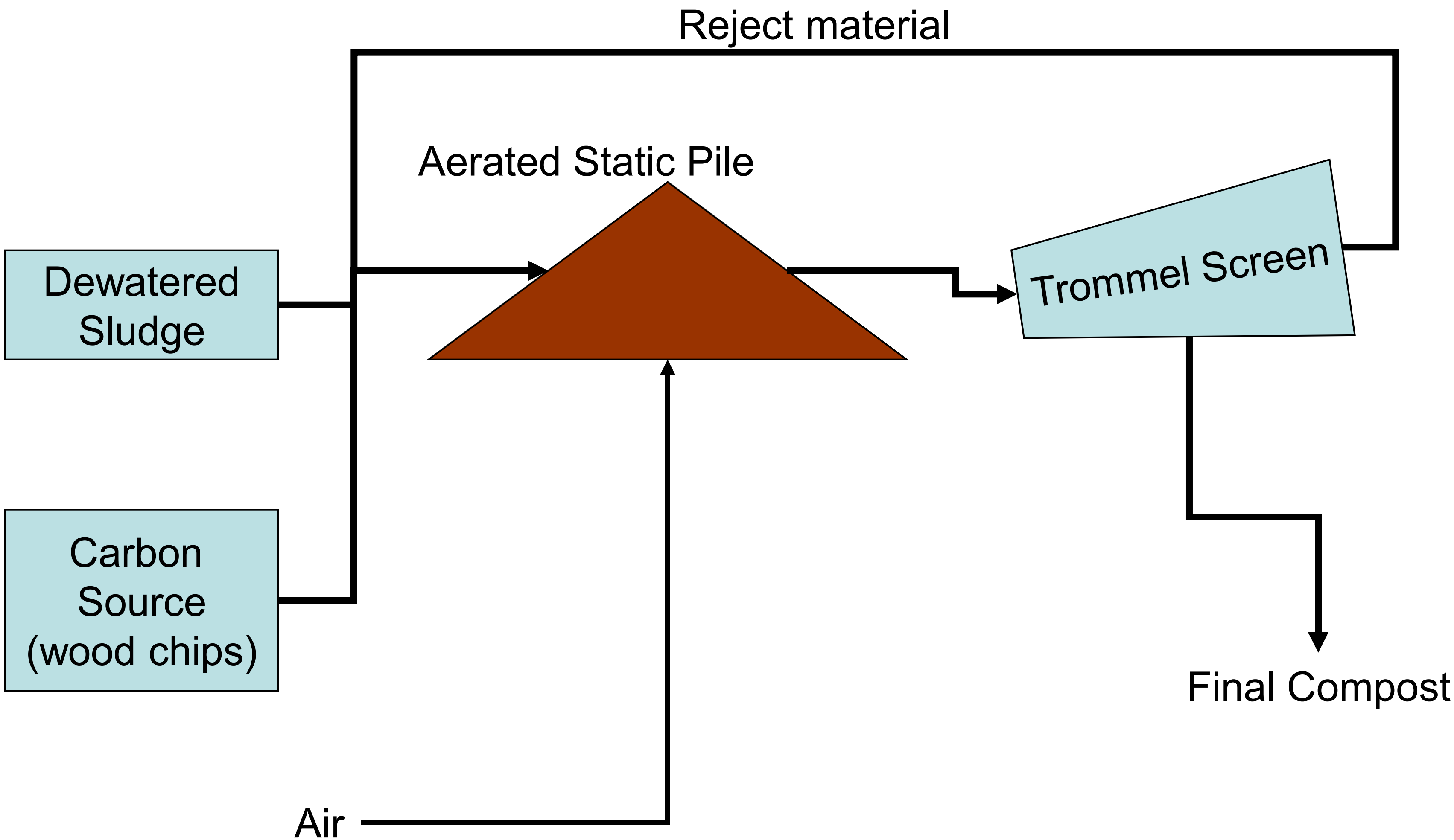
Composting

Composting



Reject material
Aerated Static Pile
Dewatered Sludge
Trommel Screen
Carbon Source (wood chips)
Final Compost
Air

Composting

Composting – scalable process

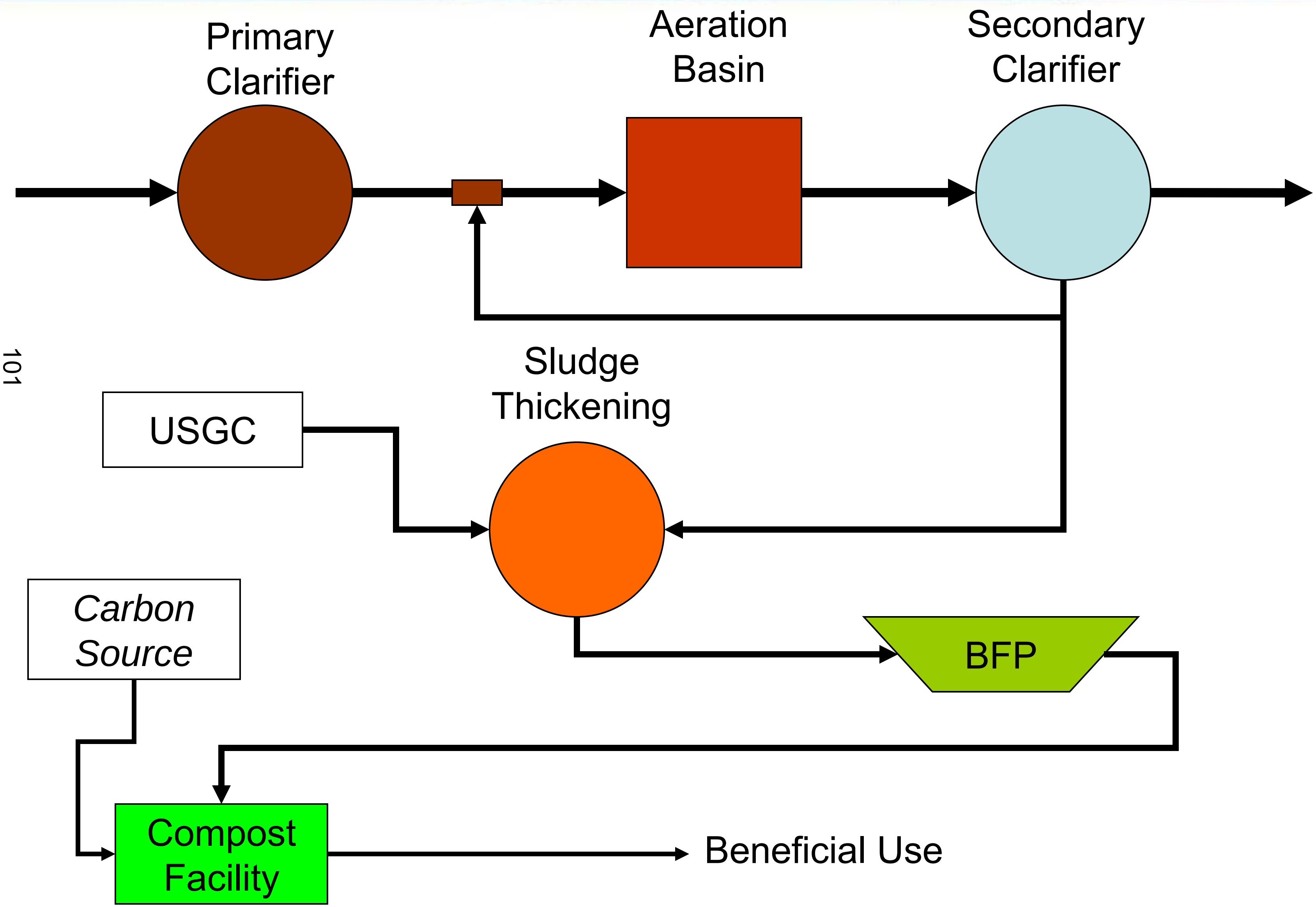
Composting - Seattle University

Composting – aeration piping

Composting - blowers

Composting – No Odors!

Composting Process



Composting

Composting Pros

- Natural process
- Proven process
  - Fairbanks is excellent example of successful program
  - Works well in cold climates
- Simple and easy to maintain
- Creates beneficial product
  - Soil amendment
  - Landscaping
- Potential private partnership with Threshold Recycling

Composting Cons

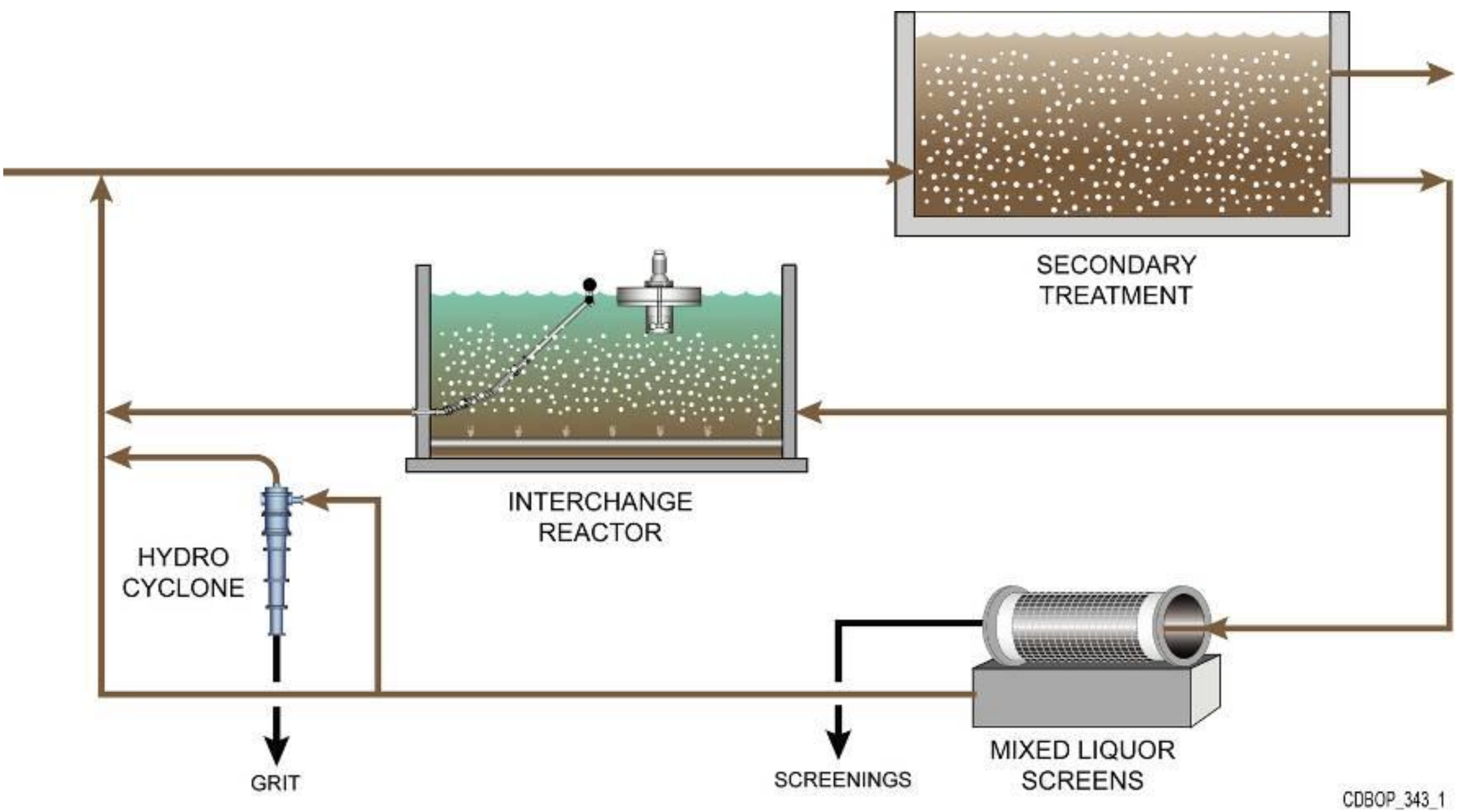
- Need roof for process and storage area – adds costs
  - It rains in Kodiak!
- Offsite location required –
  - Hauling costs
  - Land acquisition costs
- Carbon source not well defined
  - On island source?
  - Cost of off island source?
- Need for beneficial product in Kodiak?

Cannibal

Cannibal Process

- Innovative sludge reduction technology
- Siemens Water Technologies (formerly US Filter)
- Combination of physical and biological treatment steps
- WAS production is greatly reduced,
- Physical separation of inert matter using ultra-fine screening
- Sidestream biological contact tank (the interchange reactor)
  - Aerobic to a facultative dominant bacterial population.
- Mixed liquor from the bioreactor is recycled back to the main treatment process

Cannibal Process

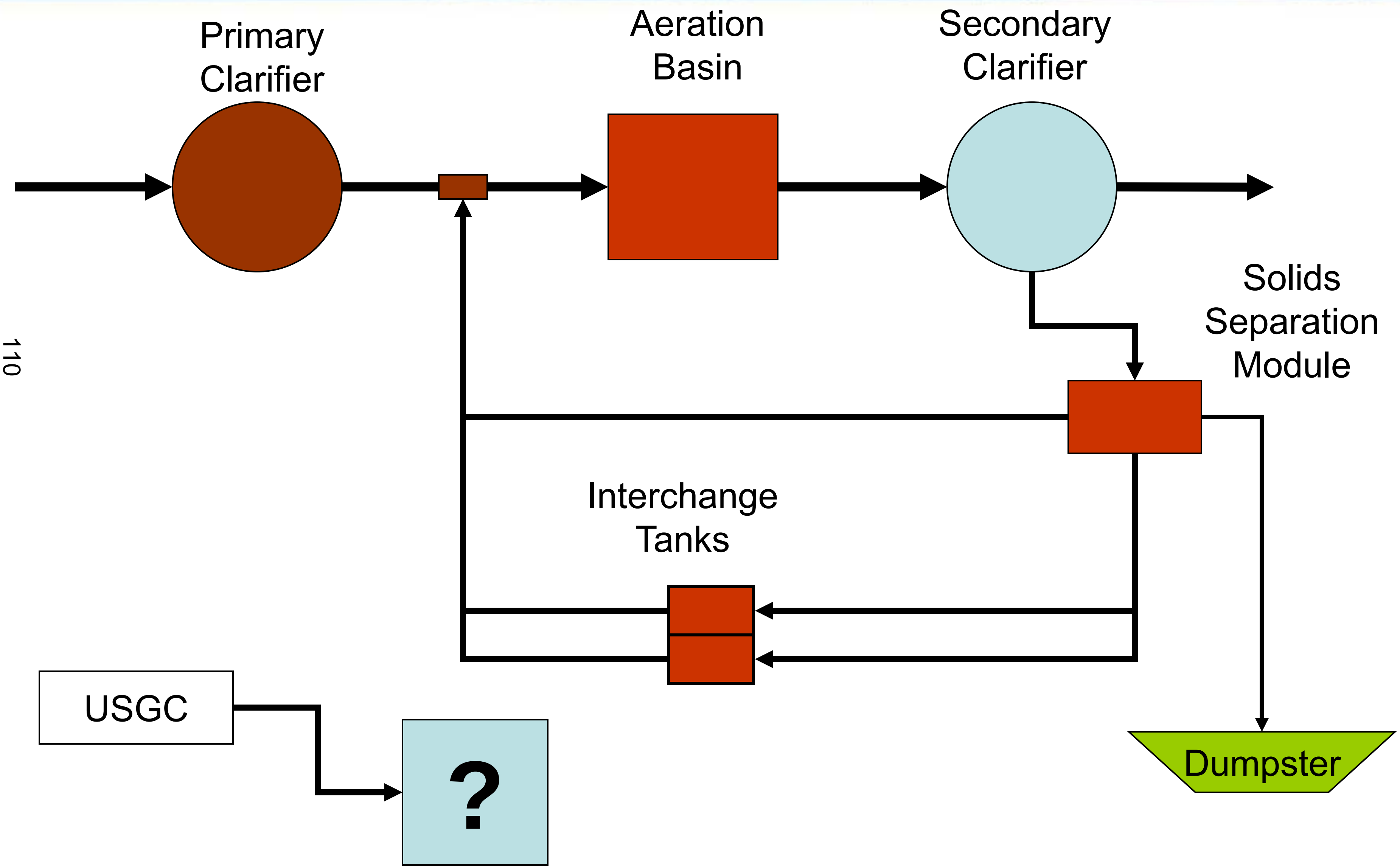


Interchange Reactor Steps

- Decant Step – top 3 feet decanted back to aeration basins
- Filling Step – screened mixed liquor is sent to refill the interchange reactor
- Aeration Step – aerated at specific intervals
- Endogenous respiration /storage step – quiescent period
  - Endogenous respiration
  - Net biological destruction of about half of the solids loading

Cannibal™ Installation at an Alabama WWTP

Cannibal Process



Cannibal

Cannibal Pros

- Significant solids production reduction
  - Sludge removed once/twice per year
- O&M cost savings
  - removes need for solids treatment and processing on regular basis
- Capital cost savings over other solids treatment process
- Could install small compost unit for small amount of solids

Cannibal Cons

- Proprietary process
- Increased inert loads to landfill
- Not a long track record
- More complex process to operate
- USCG Sludge – need to address

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Dryer/Incineration

Belt Dryers
(Kruger Biocon at Shakopee, MN)

Biocon Dryer Enclosure

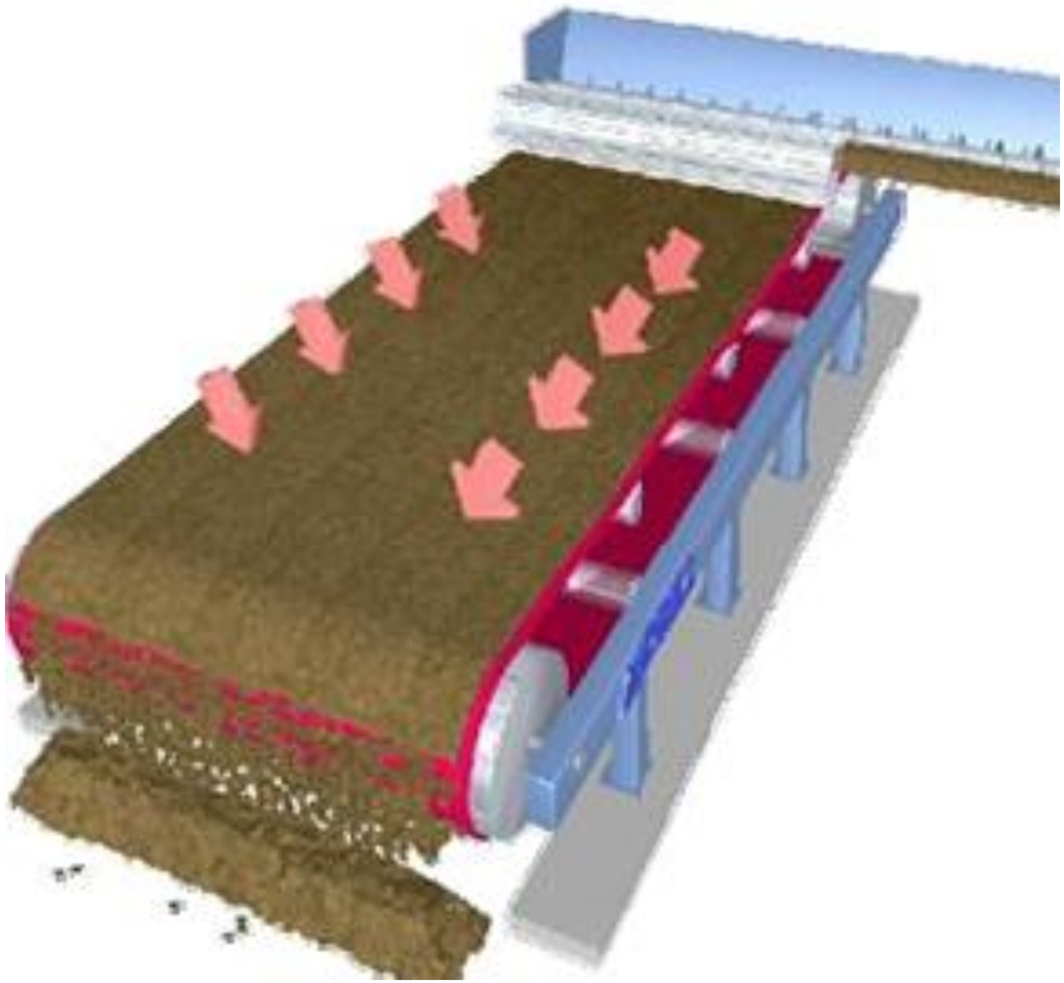
Biocon Dried Product

Belt Dryers
(Andritz BDS in Europe)

Dijon, France

Wohlen, Switzerland

Belt Dryer



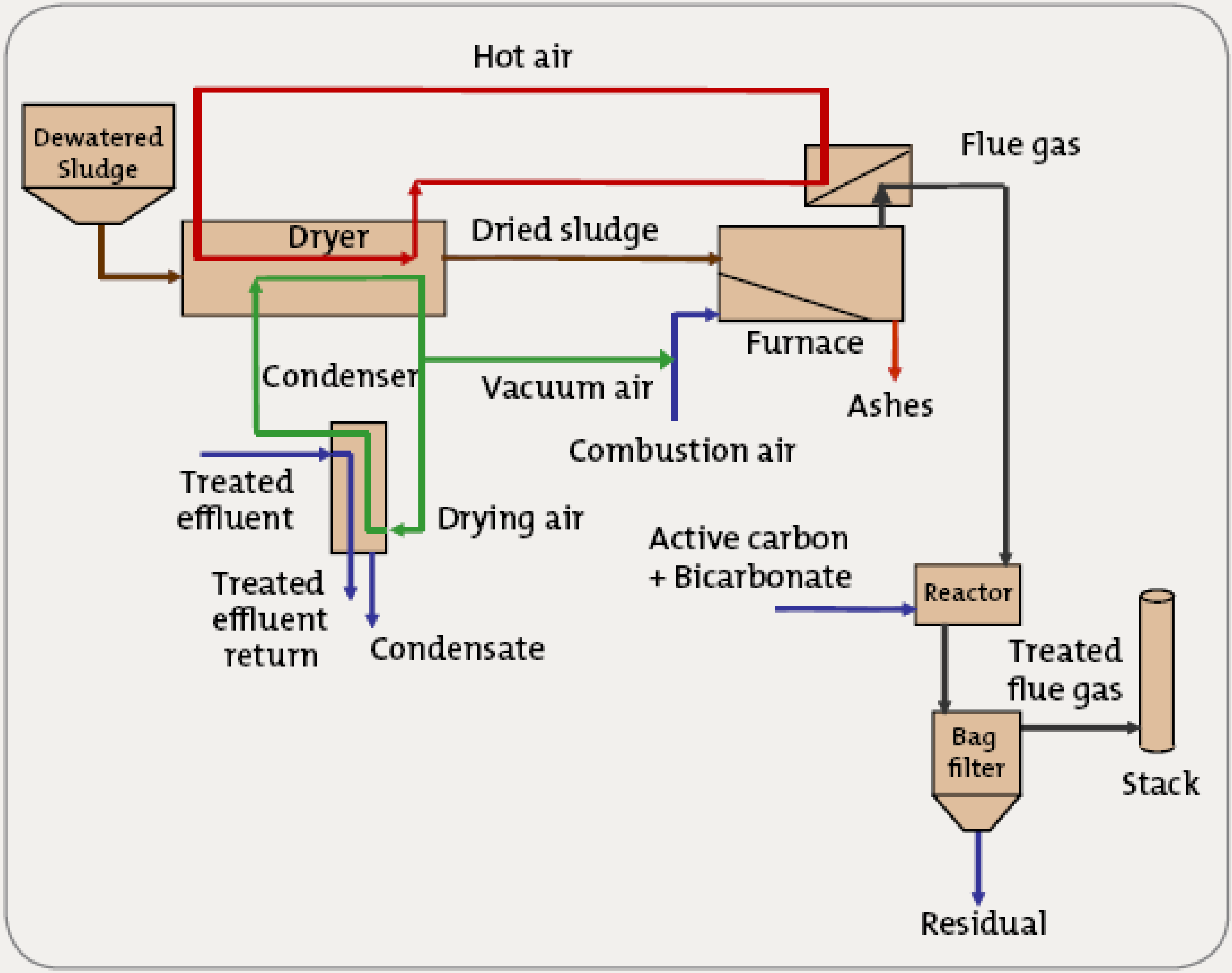
Dryer/Incineration Facts

Feed Sludge	10-15% dry solids
Solids Reduction	85-95%
Residual	Inert Ash
Pathogen Removal/Inactivation	Complete Removal
Odor Issues	None
Metal fate	Insoluble Forms
Organic contaminants	Complete Removal
Organic Carbon	Ash with less than 3% TOC
Incinerator Gas	Heat extracted for use in dryer or plant Treated to remove nearly all combustion byproducts

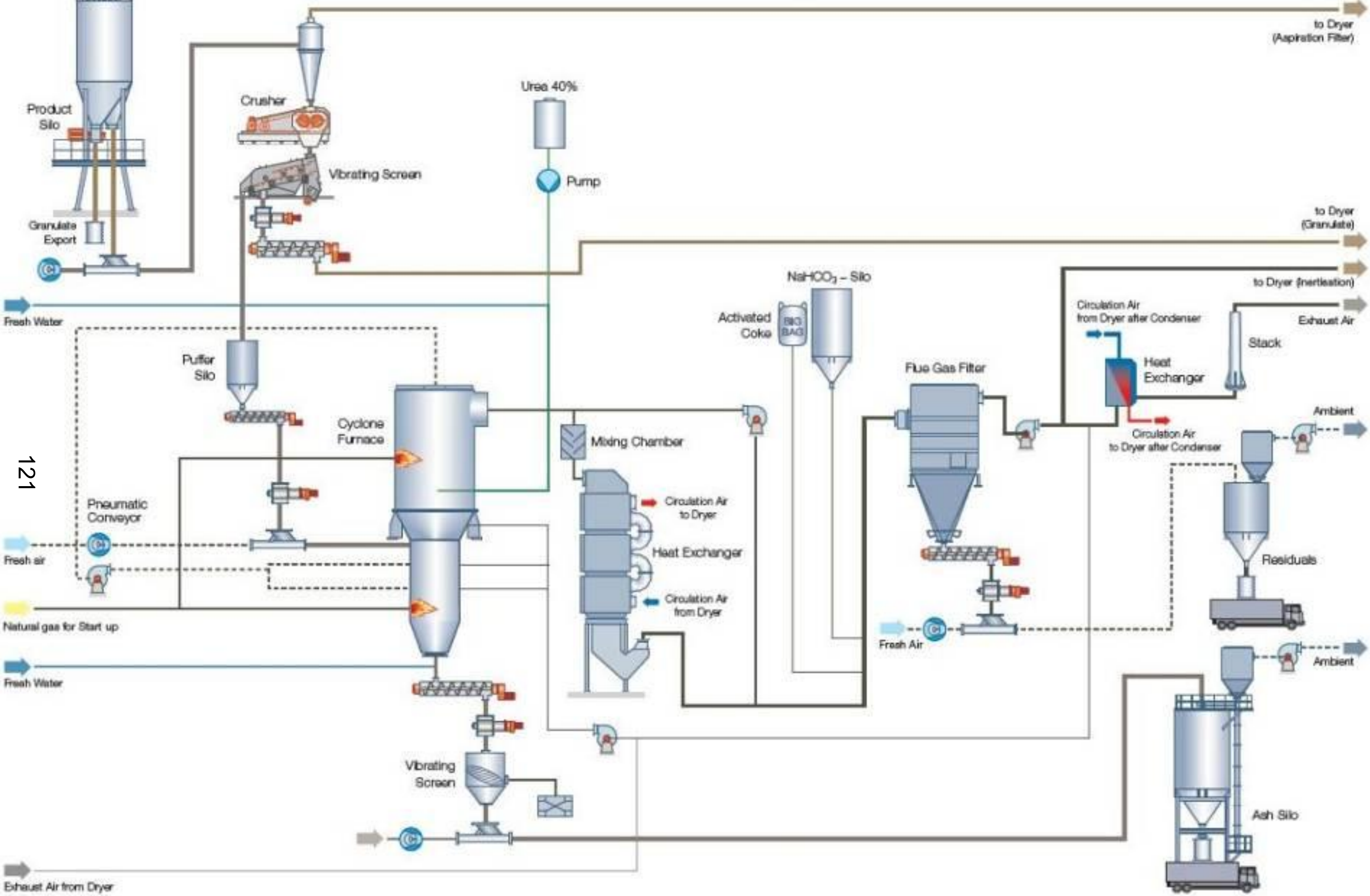
Dryer/Incineration Facts

Operation	Continuous or periodic Simple and automated from startup to shutdown
Startup	4-5 hours with cold dryer and incinerator
Shutdown	Fully automated based on time of day, volume of sludge processed, or run time

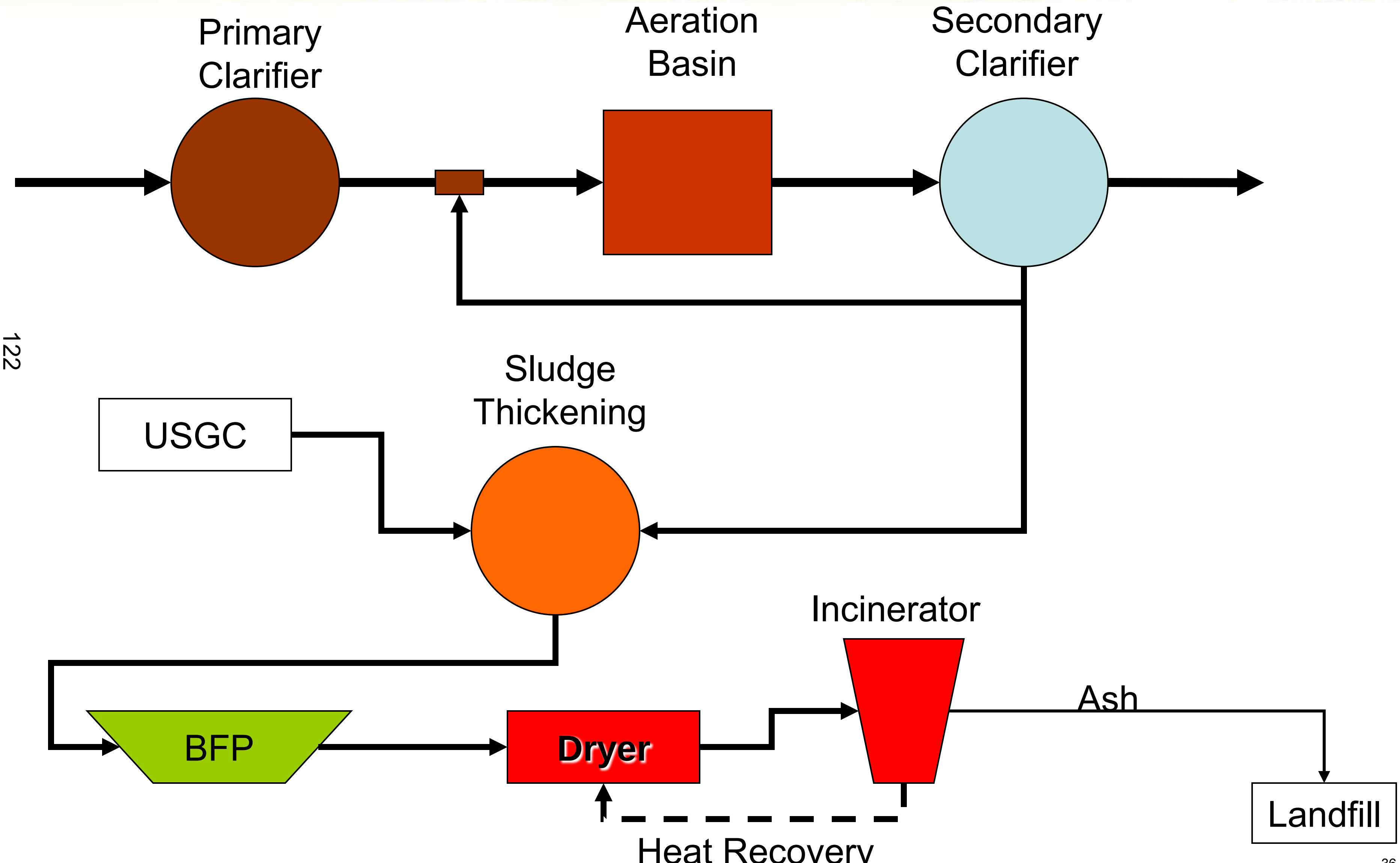
BioCon Energy Recovery System (BERS)



Flowsheet EcoDry



Dryer/Incineration Process



Dryer/Incineration

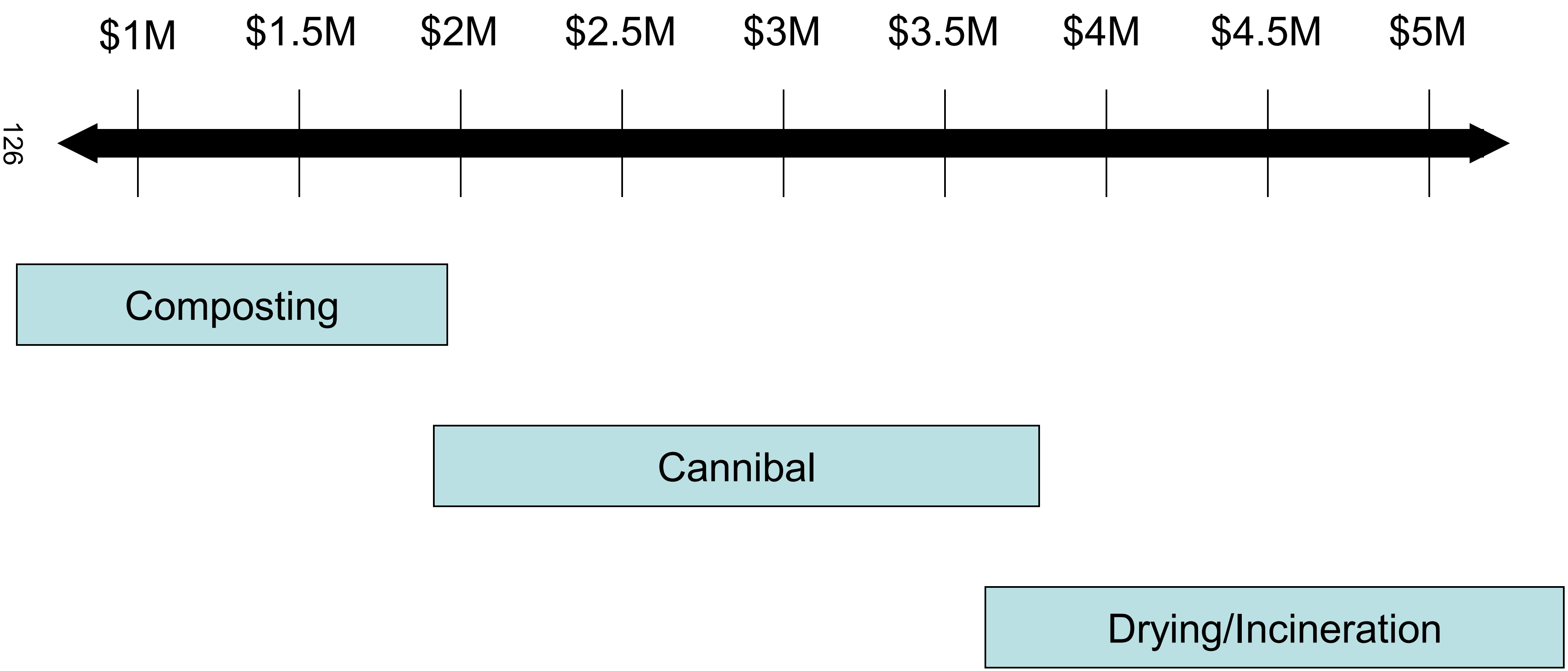
Drying/Incineration Pros

- With sufficient dewatering incineration can be self sustaining after initial start-up
- Incineration of biosolids is exothermic – heat recovery possible
- Dryers available to use recovered heat
- Overall volume reduced to 5 to 15 percent of original sludge volume
- Ash can be landfilled or used as mineral supplement in building industry
- Pathogens eliminated

Drying/Incineration Cons

- Potential air permitting issues
- Public perception
  - Stack is visible
- High Capital Cost
- High O&M Cost
  - Incoming moisture content can have significant impact on system
    - Higher moisture content can require additional fuel
  - Volatile content can also impact O&M Cost
    - Less volatile product has less fuel value and could mean additional fuel required
- High level of maintenance

Relative Capital Costs



Observations

- **The Cannibal™ Sludge Reduction Process** appears highly sustainable because it has a low energy consumption and minimizes the mass of biosolids to manage
- **Drying and incineration of biosolids is expensive**, but can be justified for medium-sized WWTPs that limited disposal options. O&M costs can be reduced by recovering the heat from incineration and applying to drying process.
- **Composting of biosolids** should be seriously considered as means of treatment and development of a beneficial product.

Questions

- Do you have any questions about how the various alternatives would be implemented?
- Are there any options we should not develop further specifically for Kodiak?

CH2MHILL

Next step is full evaluation of final alternatives.

Doug Berschauer, P.E.
Senior Technologist
June 27, 2008

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City of Kodiak Biosolids Management Alternatives

PREPARED FOR:	Mark Kozak, City of Kodiak Howard Weston, City of Kodiak
PREPARED BY:	CH2M HILL
DATE:	March 6, 2009
PROJECT NUMBER:	370587.01.SH

This memo summarizes three alternatives evaluated for Biosolids Management options for the City of Kodiak, and provides a final recommendation for a technology to be pursued. Detailed analyses of each alternative are presented in individual technical memoranda, attached as appendices to this summary memorandum.

Background

The City of Kodiak (City) Wastewater Treatment Facility (WWTF) is a secondary treatment plant with an average annual design capacity of 3.7 million gallons per day (MGD). Treatment consists of screening, primary clarification, activated sludge with fine-bubble diffusion, and secondary clarification. The solids handling system collects raw sludge from the primary and secondary clarifiers, blends and thickens the solids in a circular gravity thickener, and dewaters the resulting sludge in a belt filter press (BFP). Lime is added to the sludge for pathogen reduction, vector stabilization, and better landfilling properties. The stabilized sludge is then hauled to the Kodiak Island Borough (KIB) Landfill.

The KIB Landfill is reaching capacity and the WWTF's stabilized sludge contributes nearly 15% of the total volume of waste accepted at the landfill. As the landfill approaches capacity, biosolids production at the WWTF is increasing, compounding disposal issues and prompting KIB to increase the sludge disposal fees. In August of 2007, KIB and the City reached a memorandum of understanding, stating the City will pursue alternative options of sludge disposal. The KIB Landfill has indicated that they will not accept biosolids in their current form and quantity starting in 2010.

Technologies Evaluated

Three unique biosolids management technologies were investigated: the patented Cannibal Process; Drying followed by Incineration; and Composting. Each alternative was evaluated based on reduction of solids produced, equipment footprint, capital cost, and operation and maintenance (O&M) costs.

1. CANNIBAL

The Cannibal system is a modification of the activated sludge treatment plant at Kodiak. The process starts with removing most of the inert wastes from the wastewater stream using an ultra-fine rotary drum screen. Once it is screened, the wastewater stream flows into modified activated sludge basins. The Cannibal Process takes the solids that would normally be wasted from the activated sludge process and moves them to another basin, called the interchange bioreactor, to condition them for destruction and biodegradation. After conditioning in the interchange bioreactor, these solids are returned to the activated sludge basins where the biodegradation process is completed. In this manner the volume of biosolids is reduced as the biosolids are moved between the activated sludge basins and the interchange bioreactor in a cycle of conditioning and biodegradation.

Biosolids Reduction

The process still requires regular wasting of the biological matter, though in a reduced amount. The biosolids produced in a Cannibal system at Kodiak would be reduced by approximately 42% over current waste solids production rates. As with current procedures, the solids produced would require stabilization prior to disposal.

Equipment Layout

In order to implement the Cannibal Process at the WWTF, the primary clarifier would be converted to an interchange bioreactor and an additional basin of the same size would be constructed to increase the volume of the activated sludge basins. Additionally, facilities for the drum screening and solids disposal would be constructed.

Capital and O&M Costs

Installed capital costs, which include process modifications as well as the Cannibal bioreactor and screening equipment, along with engineering, construction, and permitting fees are approximately $ 1,090,000. This does not include the cost of constructing an additional bioreactor basin that is recommended for optimal operations. The Cannibal Process would reduce the amount of biosolids produced, dewatered and disposed of by approximately 40%. There will be a $14,000 increase in electrical operating costs associated with this option due to solids transfer pumping and additional aeration. The ultra-fine screen and grit removal system would create an inert trash and grit stream in addition to the existing influent screening, and the costs of screening and grit disposal at the landfill would offset the savings in biosolids disposal. The screening and grit material may be more easily worked into the landfill operating procedure. The City may be able to negotiate with the KIB Landfill for two disposal rates: one for the dewatered and stabilized biosolids, and one for the screenings and grit. Overall, though, the amount of material to be hauled to and disposed of at the landfill will be an increase over the current waste stream. Overall O&M costs are estimated to be reduced by $17,000 over existing O&M costs.

2. DRYING WITH INCINERATION

The drying and incineration process takes dewatered biosolids and dries them with hot air. The dried solids are then incinerated, generating heat to continue the drying process. Supplementary fuel (diesel, propane, or heating oil) is required for startup periods when the dryer and incinerator are warming up. The incineration process generates extra heat which can be used for building heat or other beneficial use.

Biosolids Reduction

Drying and incineration reduces the volume of biosolids by 90 - 95%. The end product is primarily inert ash, which can be used as fill or as an aggregate base for concrete or other building materials.

Equipment Layout

The existing lime-stabilization equipment will not be needed and can be removed; however, the new drying equipment will likely be larger and will require a new building next to the Dewater Building. The drying equipment consists of a single dryer unit, into which is fed dewatered biosolids from a storage silo (to allow the dryer to operate in larger, less frequent, energy-efficient batches.) The dried solids are then conveyed to a single incinerator and ash is collected in a hopper. Flue gases from the incinerator are scrubbed and released into the atmosphere.

Capital and O&M Costs

Drying and incineration has the highest capital cost of the three alternatives, with an installed cost of $3,190,000. O&M costs are substantially less than existing operations, with an estimated $136,000 in savings annually, due to the 95% reduction of sludge and its hauling costs and disposal fees. As with all equipment, the dryer and incinerator require regular preventative maintenance. The complex nature of the equipment may increase the amount of time operators spend maintaining solids handling and drying equipment.

3. BIOSOLIDS COMPOSTING

Composting converts biosolids into a marketable end product that is easy to handle, store, and use. The end product is a humus-like material that can be applied as a soil conditioner and low-strength fertilizer to gardens, food and feed crops, and rangelands. Aerated static pile composting, the best composting method for Kodiak, utilizes piles of composting material placed over a bed of pipes that allows air to move through the compost material. Air is provided by blowers which shorten the length of time of active composting. As the biosolids are composting, the internal temperature of the pile increases, which provides pathogen inactivation.

Biosolids Reduction

Composting does not reduce the quantity of biosolids that need to be disposed of by the WWTP; it converts them into a more agreeable product that could have beneficial use on Kodiak Island. Additionally, composting requires a bulking agent, which can frequently be found in cardboard, yard waste, and lumber or wood products which are traditionally sent to the landfill, so these products could be eliminated from the waste stream.

Equipment Layout

A composting facility for the City will require approximately 2 acres of land for active composting and curing areas, raw material and finished product storage areas. The facility should include a stormwater and leachate collection and treatment system, for stormwater runoff, and a biofilter for odor control. There should also be a reliable water supply for maintaining the proper moisture content in the compost mix, and for general facility maintenance and fire protection.

The City WWTP does not have enough space for a composting facility, so it would need to be located remotely. One advantageous location would be at the KIB Landfill through a partnering arrangement, lease agreement, or other arrangement. The WWTP biosolids are already being transported to the Landfill, so transporting biosolids would not involve a change in current practice. If there is not sufficient demand by Kodiak Island residents for compost, the finished compost could be mixed with the crushed rock currently used at the landfill for daily cover and would be a beneficial product for use as a final cover. Diverting cardboard to composting would save on the shipping costs currently spent to recycle it.

Capital and O&M Costs

A composting facility is relatively simple, but does have more labor requirements than the other alternative considered. The installed cost including equipment for a composting facility is approximately $1,500,000. Composting O&M costs include the savings of lime addition to the sludge and landfill tipping fees, and would be a reduction of approximately $65,000 per year from current O&M costs.

Recommended Alternative

Each of the alternatives evaluated have unique advantages and disadvantages. The Cannibal process can significantly reduce biosolids production, but will increase screenings and grit that must be hauled to the landfill. Drying and incineration provide the greatest solids reduction, but at a much higher cost than the other alternatives. Composting is a simple natural process that converts the biosolids to a beneficial product, but requires a larger site than currently available. The advantages and disadvantages of each alternative are summarized in Table 1.

TABLE 1
Summary of Advantages and Disadvantages of Biosolids Alternatives

Technology	Advantage	Disadvantage
Cannibal Process	• Process integrated with existing treatment system • 42% less biosolids production • Eliminates primary clarifier and sludge • May increase wastewater nutrient removal	• Does not substantially reduce biosolids production • Increase in volume of inert solids (screenings and grit) • Requires additional plant treatment volume (an additional basin is required) • Little experience in cold climates • Coast Guard sludge will still require processing
Drying & Incineration	• 95% biosolids reduction • Final product is an inert ash with beneficial uses (mineral aggregate in building industry) • Energy recover is possible • Pathogens eliminated	• High capital costs • Public perception of incinerators is generally negative • Air pollution control required • Higher maintenance due to more complex equipment
Composting	• Converts biosolids into a beneficial product (landscaping product or landfill cover) • Can help divert yard and construction waste from landfill disposal • Seen as a "green" alternative	• May need to import amendment • Market for compost in Kodiak not known • More labor intensive process • Requires a larger footprint than other systems

A summary of capital and O&M costs are presented in Table 2. O&M costs are compared to the existing biosolids handling practice. All alternatives offer a savings in O&M costs.

TABLE 2
Capital and O&M Cost Comparisons of Biosolids Alternatives

	Equipment Only Cost	Installed Cost	Annual O&M *	25-Year Present Worth
Cannibal Process	$1,090,000	$16,800,600	$229,100	$22,528,100
Drying & Incineration	$3,190,000	$29,714,800	$110,000	$32,464,800
Composting	$1,500,000	$10,412,900	$181,000	$14,937,900

*Annual O&M:	Existing System	Cannibal	Incineration	Composting
Landfill Tipping Fees ($75/wet ton)	$140,000	$147,000	$7,000	$0
Lime Addition	$25,000	$14,500	$0	$0
Polymer Addition	$5,000	$2,900	$5,000	$5,000
Sludge Hauling	$14,000	$14,700	$0	$14,000
Belt Filter Press Labor	$62,000	$36,000	$62,000	$62,000
Additional Power & Labor to run system	----	$14,000	$36,000	$100,000
Total O&M Costs	$246,000	$229,100	$110,000	$181,000

Considering both the capital and O&M costs, along with biosolids reduction capability, composting is the recommended alternative for the City's biosolids management. It eliminates the disposal of sludge in the landfill, and creates a beneficial product. For the composting alternative to be successful the feasibility of acquiring a suitable facility site needs to be studied, and the availability of suitable composting amendments needs to be investigated further. A recommended course of action is to run a pilot composting study, using the amendments on hand to help determine the quality of finished compost that the WWTP's biosolids can produce. A pilot study can give hands-on experience in producing compost, and the finished product can help determine the marketability of compost on Kodiak.

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Biosolids Composting

PREPARED FOR:	Mark Kozak, City of Kodiak Howard Weston, City of Kodiak
PREPARED BY:	CH2M HILL
DATE:	August 21, 2008
PROJECT NUMBER:	370587.01.SH

Intro paragraph

Biosolids Composting Process

Composting is a method for treating wastewater treatment plant (WWTP) biosolids to create a marketable end product that is easy to handle, store, and use. The end product is a humus-like material that can be applied as a soil conditioner and low-strength fertilizer to gardens, food and feed crops, and rangelands. The composting process works well in cold climates, and there are a number of successful biosolids composting facilities in climates colder than Kodiak. Biosolids compost is safe to use when it meets the Environmental Protection Agency's (EPA) Class A pathogen-reduction standards, and generally has a high degree of acceptability by the public. On Kodiak Island there is a likely market for compost, due to its rocky nature and the high cost of transporting topsoil from other areas.

There are three common methods of composting wastewater biosolids: in-vessel; aerated static pile; and windrow. Each method involves mixing dewatered biosolids with a bulking agent that provides carbon for the composting process and increases the porosity of the composting materials. The resulting mixture is placed in a vessel or a pile, where microbial activity causes the temperature of the mixture to rise during the "active composting" period. Elevated temperatures in the compost pile reduce bacterial and viral pathogens. The length of time of the active composting period depends on the quality of finished product desired, and is discussed later in this Technical Memorandum. After the active composting period, as the thermophilic composting activity slows and the compost mix is starting to cool down, the composting material is moved to a curing pile for a few weeks and then is ready for distribution.

Composting Methods

In-Vessel Composting: The in-vessel method provides the most control of the composting process, but construction and operation and maintenance (O&M) costs for this method are high due to the facilities required and their mechanical complexity. Advantages of the in-vessel method include having a relatively small footprint, better temperature control, and the ability of portions of the process to be automated.

Aerated Static Pile Composting: The aerated static pile method utilizes piles of composting material placed over a bed of pipes that allows air to move through the compost material. Air can be provided passively by natural convection through the pile (in which case it is known as simply static pile composting), or blowers can be used to provide larger amounts of air to the pile, shortening the length of time of active composting. In most cases, the advantages of using blowers to speed up the process and create better compost outweigh the costs of materials and energy. Blowers can push air into the pile (positive aeration), or pull the air through the pile (negative aeration) and send it through a simple biofilter, made of finished compost, for odor control. See Figure 1 below. Odor control is particularly important when using undigested biosolids, such as from the Kodiak WWTP.

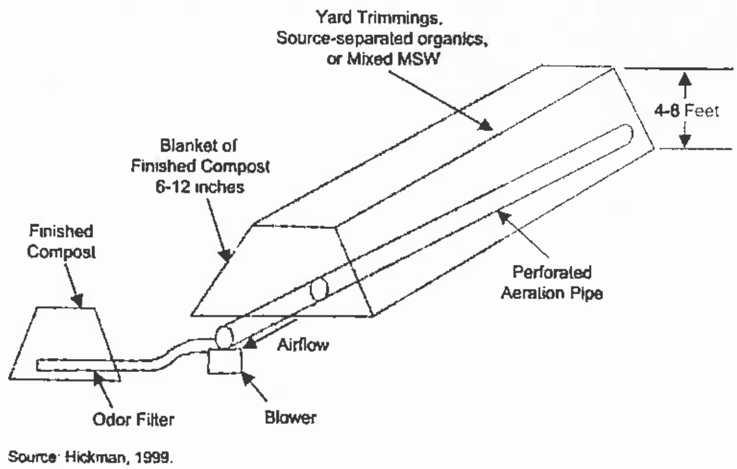

Figure 1 - Aerated Static Pile Composting Method

Windrow Composting: With the windrow method, the raw compost material is simply placed in long piles without air piping. This method requires the piles to be frequently turned to provide oxygen throughout the compost pile. It also requires a longer "active composting" period than does In-Vessel or Static Pile composting.

Kodiak's maritime climate does not warrant the need for a completely enclosed, in-vessel composting system. Capital costs of the in-vessel method can be two to three times higher than the aerated static pile, with O&M costs of in-vessel composting higher than static pile as well. The windrow method has the lowest capital cost, though it requires more land area, is more labor intensive than the aerated static pile, and odors may pose a problem. In light of these considerations, the aerated static pile is the recommended method for Kodiak's biosolids composting.

Components of Aerated Static Pile Composting

The components of an aerated static pile composting system include:

- an active composting area
- a curing area
- material storage areas

The active composting area is typically paved and contains a piping system with blowers for aeration. See Figure 2 below. For a wet or windy climate such as Kodiak's, the active composting area would need to be covered. Generally an open-sided pole barn structure is used for this purpose. The structure is usually designed and framed such that siding could be added to completely enclose it in the future if desired.

FIGURE 2 – ACTIVE COMPOSING AREA

The biosolids sludge is mixed with bulking materials and the raw compost mixture is placed in the active composting area for a period of 21 - 24 days. The piled is covered with an insulating material, such as finished compost, to maintain the temperature of the active composting pile.

The length of time of active composting depends on the duration of time that the required temperatures are maintained. Table 1 defines the time and temperature requirements for both Class A and Class B products, per the EPA's Regulation 40 CFR Part 503. The production of a Class B product, though less stringent, is not always economically justified since the product cannot be used without restrictions, and the additional expense to reach Class A requirements in composting are usually minimal since the composting process occurs naturally at thermophilic temperatures. The additional expense to consistently achieve Class A standards mostly involves more extensive temperature monitoring and additional pathogen testing.

TABLE 1 40 CFR PART 503
Time and Temperature Requirements for Biosolids Composting

Product	Regulatory Requirements
Class A	Temperature maintained at 55 °C (131 °F) or higher for at least 3 days
Class B	Temperature maintained at 40 °C (104 °F) or higher for five days during which temperature must exceed 55 °C (131 °F) for at least four hours

Source: EPA Regulation 40 CFR Part 503.

Once the required temperature and duration are reached, the compost is then moved to a curing area that may be provided with active aeration (using blowers) or passive aeration (natural convection.) Typically, the compost is kept in the curing area for a minimum of three weeks. This area should also be covered for protection against the rain and wind. See Figure 3 below.

FIGURE 3 – CURING SHEDS

Once the compost is cured, it is ready to be screened and packaged as a finished product. Screening is necessary to remove pieces of wood and other bulky materials that were not broken down in the composting process. Material that is screened out can be re-used as bulking agent in future composting. Up to 40% of the bulking agent is usually recovered in this step. For a quality compost product, the screening process should remove particles of at least 1/2-inch in size and larger; 3/8-inch particle screening is generally better for marketable compost. The finished compost's quality and characteristics are usually driven more by customer preferences than by regulations.

Equipment

Equipment that would be required at the composting facility includes:

- a tub grinder for chopping raw bulking agent, such as tree limbs and cardboard, into smaller pieces suitable for composting
- a mechanical mixer to mix the dewatered sludge with the bulking agent
- a front-end loader for moving materials and building piles
- blowers for aeration of the active compost pile
- a trommel screen for producing the finished product
- material conveyors (optional) that can help reduce the requirements for labor and rolling stock

Facility Layout

In addition to the active composting and curing areas, the general layout of the facility would include storage areas for the raw materials and the finished product, a stormwater and leachate collection and treatment system for runoff, and a biofilter for odor control. A reliable water supply is also recommended for maintaining the proper moisture content in the compost mix and for general facility maintenance, as well as fire protection. The estimated amount of land required for a composting facility for Kodiak's biosolids is two acres. Below is a typical layout of the composting facility.

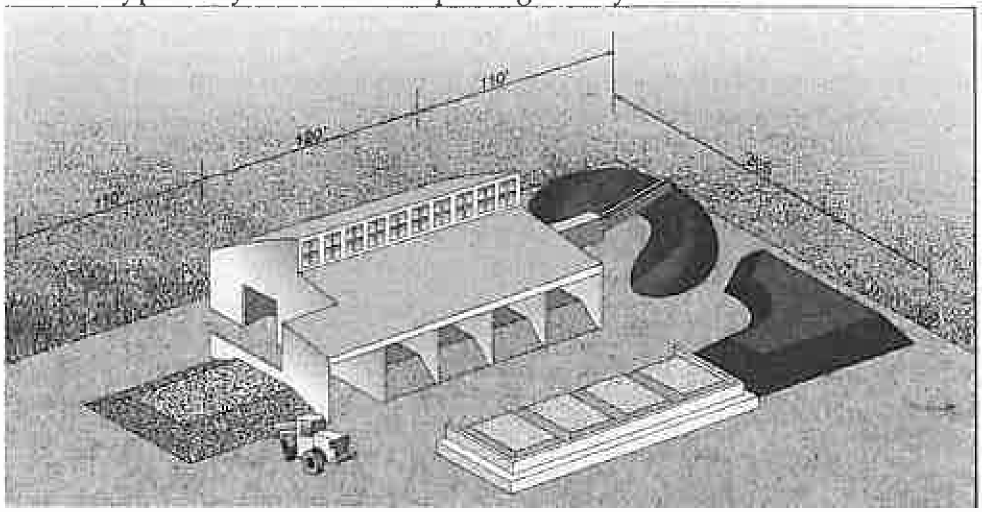

FIGURE 4 – EXAMPLE COMPOSTING FACILITY LAYOUT

Bulking Agents

An important component of the composting process is the bulking agent. Various materials can be used, such as yard waste, wood chips, cardboard, paper, and sawdust. Composting requires a source of nitrogen, which the WWTP biosolids supply, and a source of carbon, which yard waste and wood can supply. Consistently maintaining the moisture content and carbon-to-nitrogen ratio of the compost mix in the required ranges are the keys to proper composting. It is important that some of the carbon be readily available through small particles such as sawdust. Another portion of amendment needs to be bulky enough to allow for adequate aeration of the compost mix. While sawdust is an excellent carbon source, too much sawdust or other fine particles in the amendment will not provide enough porosity for the compost pile and it will become dense and anaerobic. Cardboard is a good bulking agent and can be used for up to 50% of the bulking material. The other 50% needs to be made up of chipped wood and vegetation. A wood chipper or grinder would need to be able to chop the bulking agent into ¾-inch to 4-inch size pieces.

Sources of Bulking Agents:

On-Island Sources

The Solid Waste Management Plan (Bell & Associates, Inc. June 2008) describes the waste stream to the landfill as having contained, in part, the following materials in 2007:

Cardboard................1,390 tons
Lumber & Wood..........825 tons
Yard Waste.................372 tons

The composting system requires approximately equal parts by weight of new bulking agent to biosolids. The ratio of bulking agent to biosolids in the compost mix is greater, but this rule of thumb for bulking agent requirements takes into consideration the re-use of material removed in the final screening of the finished compost. The WWTP's production of dewatered biosolids averages 2,000 tons per year and once an initial quantity of 150 – 300 tons (500 – 1000 cubic yards) of bulking agent is used to start the process, the waste stream currently going to the landfill (350 tons yard waste and 800 tons of wood) should be adequate to maintain the composting process. Cardboard can be used to supplement the wood if needed.

Establishing a steady on-island supply of wood waste is important. A program should be implemented that would encourage residents, landscapers, and builders to bring all their yard tree waste and clean scrap lumber to the composting facility. Such a program may involve setting up convenient centralized drop-off points if the composting facility is located further from town.

Another option for a source of wood product on Kodiak is a biomass farm, where fast growing species of trees and shrubs can be grown and harvested to supplement the wood and yard waste currently going to the landfill. The biomass could be harvested as needed, saving on storage space at the composting facility. It would also reduce the need to bring in product from off-island.

Off-Island Source

If not enough bulking agent is generated on Kodiak, it would need to be shipped in. Wood waste from logging on Afognak Island is available for sale through Alcan Forest Products at $40/ton. Local companies can provide a barge and tug to transport the wood to Kodiak.

Estimated costs of 500 tons of wood waste from Afognak are as follows:

TABLE 2 – COSTS OF SHIPPING WOOD WASTE TO KODIAK

Activity	Cost
Pulp wood from Afognak @ 40/ton x 500 tons	$ 20,000
Lash Marine Construction, Kodiak	$ 10,250
Barge @ $4,900/week	
Crane @ 5,350/week	
Amak Towing, Kodiak	$ 12,750
Run-time plus fuel @850/hr x 15 hours	
TOTAL Cost per 500 tons of wood waste:	**$ 43,000**

Note: Cost to truck the wood from the dock to the compost facility not included

A 500-ton shipment would provide a five to six month supply of bulking agent (provided that island residents can supply an equivalent weight of cardboard and finished lumber) and could supplement on-island tree waste for the first year while the facility became established and on-island tree waste quantities could be assessed.

Other Bulking Agents

Other types of bulking agent were investigated for their suitability and availability on Kodiak. Sawdust, as mentioned previously, is a good carbon source, but only usable if fresh and kept dry (otherwise the sawdust tends to decompose and form compost on its own). The local sawmill has a large stockpile of sawdust but it is mostly old. Any fresh sawdust produced at the mill, though, could be used in the composting. Driftwood and logs that wash up on the shore would not be good for composting because of the high salt content that would inhibit the composting process and result in a final product with an undesirably high salt content. Waste paper could also be used, but only in small amounts, as too much paper tends to form clumps in the composting process. It would generally be better to use cardboard because it is bulkier. Use of cardboard at the composting facility could save the current cost of shipping the cardboard off the island for recycling. Tires have been mentioned as a source of carbon and bulking agent when chopped into small pieces. Unfortunately, the metals contained in today's tires are not beneficial and may inhibit the composting process.

Facility Capital Costs

The cost to construct an aerated static pile composting facility has been estimated by the Environmental Protection Agency (EPA) to be $30,000 per dry ton per day processing capacity[1], an average that will vary according to location and other site conditions. For Kodiak, which produces approximately 0.96 dry tons per day of dewatered biosolids, a typical 24-day processing capacity would be estimated to cost approximately $700,000.

A composting facility in Moscow, Idaho, owned by the Latah Sanitation, Inc., composts 4,000 wet tons of biosolids per year (compared to Kodiak's 2,000 wet tons per year). The facility was constructed in 2007 for $700,000, which included site preparation costs, building, pavement, aeration system, biofilter and stormwater treatment system. Based on the cost, location, and time period the Latah Composting Facility was built, an adjustment for higher costs of construction in Kodiak and an adjustment for lower costs for a smaller facility would result in estimated capital costs in the range of $600,000 to $900,000 in 2008 dollars. Additional equipment required (truck scale, tub grinder, front end loader, truck-mounted mixer, and portable trammel screen) would add an estimated $600,000 to capital costs. Total facility capital costs are estimated to be from $1,200,000 to $1,500,000. This does not include the cost of land.

Estimated Facility Capital Costs = $1,200,000 to $1,500,000.

Facility O&M Costs

Typical O&M costs for an aerated static pile composting facility have been estimated by the EPA to be in the range of $150-$200 per dry ton per day[1], an average that varies according to geographic location, energy costs and other site conditions. This would translate to a range of $55,000-$73,000 per year for Kodiak, not accounting for local cost adjustments.

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[1] EPA 832-F-02-024, Biosolids Technology Fact Sheet, September 2002

The Latah Composting Facility collects a tipping fee of $40/wet ton of dewatered biosolids, which covers their O&M costs and provides a small profit. Their O&M costs include the expense of mixing/grinding, screening, loader costs, aeration costs, staffing, consumables, parts, and residual disposal cost. Using the Latah O&M cost of $40/wet ton for Kodiak, which produces approximately five wet tones of dewatered biosolids per day, translates to $76,000 per year. Using a more conservative O&M cost estimate of $50/wet ton would result in total O&M costs for Kodiak of $100,000 per year.

Estimated Facility O&M Costs = $100,000.

Location of Composting Facility

The WWTP does not have enough room for a composting facility, so suitable land would need to be found elsewhere. The availability and cost of two acres of land with the proper zoning would need to be investigated. The land would ideally be centrally located to facilitate drop-off of tree and yard waste and to minimize the biosolids hauling distance from the WWTF.

Locating the compost facility at the Kodiak Island Borough (KIB) Landfill, whether it was through a partnering arrangement, lease agreement, or other arrangement, would have a number of advantages. The WWTP biosolids are already being transported to the landfill, so transporting biosolids would not involve a change in current practice. If there is not sufficient demand by Kodiak Island residents for compost, the finished compost could be mixed with crushed rock currently used at the Landfill for daily cover and would be a beneficial product for use as a final cover, in which case product screening and quality control would not be as stringent. Diverting cardboard to composting would save on the shipping costs to recycle it. Current tipping fees of $75/wet ton for the WWTP biosolids can be reduced to $50/wet ton or less, as estimated above, for O&M costs.

Additional Advantages to Composting

Composting the WWTP biosolids, instead of disposing of it in the landfill, eliminates adding lime after dewatering per health department regulations. Currently, the cost to the WWTP of adding lime to the biosolids is about $25,000 per year.

Compost is a marketable product, and with an investment in packaging equipment, could be sold to offset the O&M costs. In other locations around the country, compost has been sold in bulk for prices from $3.00 to $10.00 per cubic yard. Some locations have added bagging facilities and have been able to raise the price of compost in bags to $50 - $75 per cubic yard, though net income is lower than that due to the additional handling costs. For purposes of this report, income from the sale of the finished product has not been factored in, especially since a market for compost in Kodiak has not been proven.

Conclusion

For a fairly low estimated capital cost of $1,200,000 - $1,500,000 and estimated O&M costs of $100,000 per year, the WWTP dewatered biosolids can be composted into a marketable product instead of being disposed of in the landfill. Composting Kodiak's biosolids would eliminate current landfill tipping fees that run approximately $140,000 per year, as well as $25,000 annually currently spent on lime treatment, resulting in a net savings of $65,000 in O&M costs. Two acres of land would need to be acquired, or an arrangement made with the KIB Landfill to locate the composting facility there, which could be beneficial to both City of Kodiak and KIB. A possible additional expense in the range of $43,000 per year may need to be incurred to supplement on-island wood waste supplies, though the necessity of shipping in bulking agents could be reduced with the establishment of a biomass farm.

With the availability of land in a reasonably convenient and well buffered location, and the availability of suitable amendments and bulking agents on Kodiak Island, biosolids composting could be a sustainable, long-term alternative for the City's biosolids management program.

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Sludge Drying and Incineration

PREPARED FOR: City of Kodiak

PREPARED BY: CH2M HILL

DATE: August 15, 2008

PROJECT NUMBER: 370587.01.SH

This technical memorandum summarizes sludge drying and incineration options for the City of Kodiak's wastewater treatment plant. This option utilizes the City's existing solids-handling processes through the belt filter press and would achieve elimination of current sludge disposal practices. Existing lime-stabilization equipment will not be needed and can be removed; however, the new drying equipment will likely be larger and will require a new building next to the Dewatering Building.

After dewatering, the sludge would be dried and then potentially incinerated with one of the systems being considered. There are two vendors of drying and incineration equipment: Kruger and Andritz. Kruger proposes drying and incineration for Kodak; Andritz proposes drying only but can have a furnace system added to it. This memorandum summarizes the capacity, footprint, and cost for each system.

Kruger BioConERS

The Kruger BioConERS process utilizes drying to substantially decrease the water content of the sludge prior to incineration. Energy is recovered by using the dried biosolids as fuel for the furnace, which in turns heats the air that dries the biosolids. Additional energy is recovered by a heat exchanger system which extracts heat from the water evaporated by drying. The final product of the furnace is an inert ash at > 98% solids content. Alternatively, the dryer can operate without the furnace and produce dried biosolids pellets at 92-95% solids, but in that case, supplemental fuel for the dryer would be needed.

Process

Figure 1 illustrates the Kruger BioConERS process. Dewatered sludge is stored in the sludge silo until there is enough to conduct a dryer run. Solids are pumped into an extrusion device and distributed on the belt (Figure 2). They are dried with hot air from the furnace (Figure 3 and Figure 4), which is combusting already dried biosolids. Supplemental fuel for the furnace should be on standby, but is rarely needed. Heat is recovered from the water in the dryer exhaust and used to preheat the biosolids going into the dryer, but the air from the furnace the primary source of heat to the dryer. The dryer and furnace exhausts are scrubbed to remove any pollutants and discharged to the atmosphere. The resulting ash can be placed in the landfill or used as a mineral aggregate in construction projects. If the dried pellets are not incinerated, they may be used as fertilizer or soil amendment. Figure 5 shows the dried pellets.

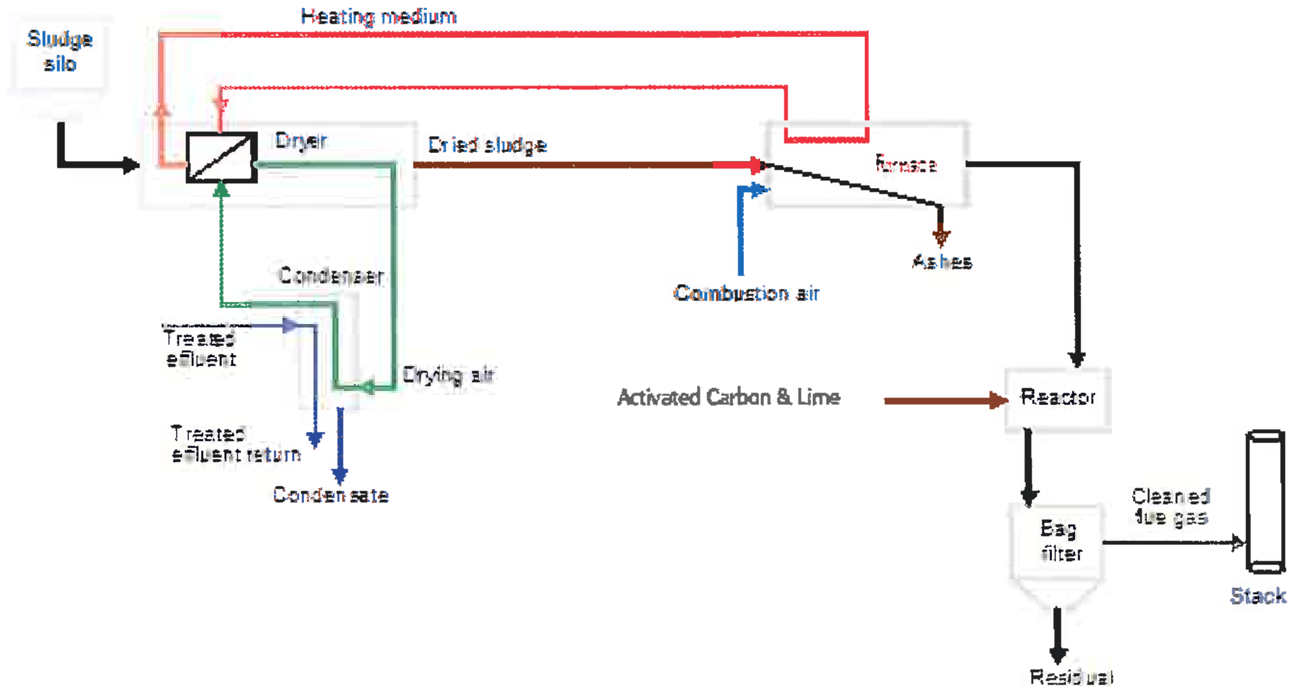

FIGURE 1
BioConERS Process

FIGURE 2
BioConERS Inside of Belt Dryer

FIGURE 3
BioConERS Incinerator Furnace

FIGURE 4
BioCon ERS Incinerator Furnace

FIGURE 5
BioConERS Driedl Biosolids (prior to incineration)

Sizing

Kruger proposes one dryer and incinerator for the City. Everything needed for operations including a dewatered sludge storage silo, Model IN750SAZN dryer with all accessories, condensers for drying air treatment, the energy recovery heat exchangers, the incinerator, and flue gas treatment equipment. Also included are dewatered sludge transfer pumps and sludge distribution systems, and all SCADA equipment to control the dryer.

Layout

Figure 6 illustrates the required footprint and possible site layout. The dryer and incinerator are located near the existing belt filter press dewatering building to minimize solids conveyance.

FIGURE 6
Drying & Incineration Footprint and Location

Capital Costs

The equipment cost for the system is broken down into $2,160,000 for the dryer and an additional $1,030,000 for the energy recovery system (furnace and related equipment). The combined cost for the dryer with the energy recovery system is $3,190,000.

O&M Costs

Kodiak's biosolids have enough energy to not require additional fuel or energy input to the drying process/energy recovery system after initial startup. There are some supplemental fuel needs for a brief time when the incinerator first starts up. Most of the operational cost for the incinerator with an energy recovery system comes from chemical use for treatment of the incinerator gases before discharge to the atmosphere.

Table 1 summarizes the estimated costs for supplemental fuel (either diesel fuel or propane) when only the dryer is used vs. when the dryer and incinerator are both used.

TABLE 1
Estimated Annual O&M Costs for Kruger Dryer and Incinerator

	Diesel	Propane
Dryer Only	$ 303,000	$ 421,000
With Energy Recovery & Incineration	$ 33,000	$ 36,000

Notes: Diesel cost estimated at $4.84/gallon, propane at $4.56/gallon.

During steady state operation, there is a significant amount of heat available from the drying and incineration process beyond the needs of the dryer. This can be used for building heat, or potentially to generate electricity for part of the plant's energy needs.

Andritz Belt Drying System

The Andritz Belt Drying System (BDS) process utilizes low-temperature drying to dry the sludge and inactivate pathogens. The dryer creates Class A dried pellets that can be recycled for beneficial reuse, somewhat similar to the Kruger BioCon dried product shown in Figure 5. Descriptions of the process, sizing, layout, and costs for this system are provided in the following sections. The final product produced by the belt drying system is typically 92% dry solids, Class A granules.

Process

Dewatered biosolids are stored in a tank and fed continuously onto the belt dryer via a distribution screw to ensure uniform height of biosolids on the belt. Figure 7 is a view inside a dryer with biosolids distributed on the belt. The dryer is operated under a slight negative pressure so all dust and odors can be treated with an optional biofilter. As they pass through the dryer, biosolids are warmed with hot air and dried. After the drying zone, the product is cooled and then discharged.

FIGURE 7
Biosolids traveling through the Andritz Belt Dryer

The drying air is heated in the furnace to the feed temperature of 120 – 150°C (approximately 250 - 300°F) before entering the belt dryer. The air flows through the biosolids and absorbs the moisture from the solids. The dryer runs at a high circulating air rate; a large part of the drying air returns to the furnace and is re-heated to the feed temperature. A portion of the dryer air is extracted by an exhaust fan and fed to a saturator/washer and on to emissions control equipment. Drying heat is generated by combustion of diesel or propane, since Andritz does not recommend a dried-pellet furnace with this system. The process can be modified to accept combustible wastes from other parts of the process or outside sources. Figure 8 illustrates the belt drying process with various heat sources.

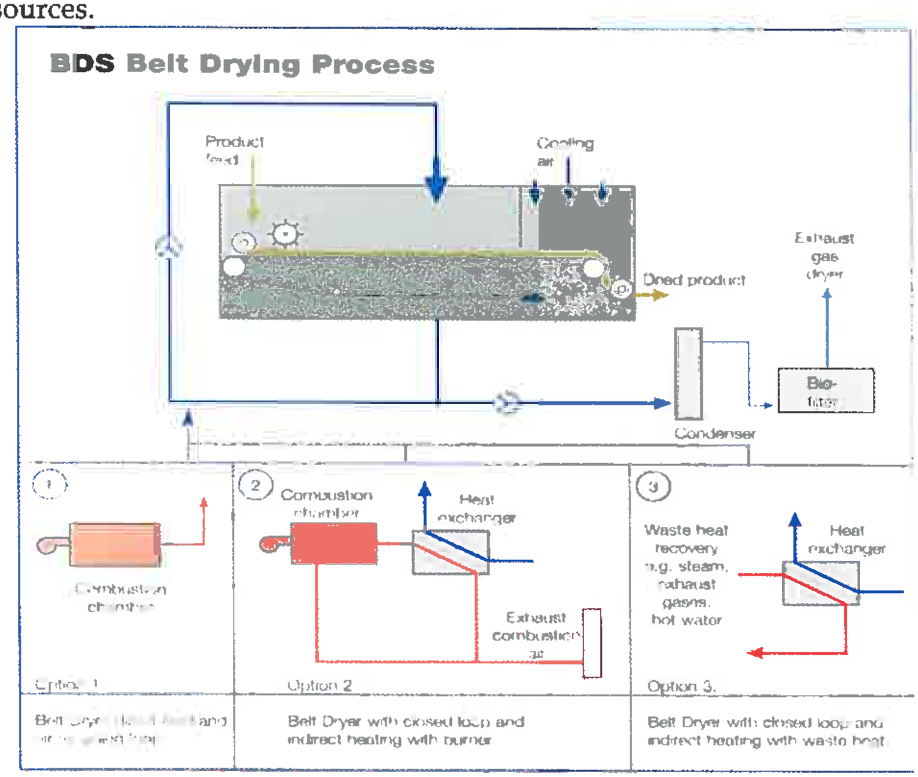

FIGURE 8
Andritz Belt Drying Process

The process is highly automated and requires little operator input after initial startup. Due to the small volume of solids produced by the WWTP, a large dewatered solids storage tank would be necessary to allow batch operation of the dryer to minimize the frequency of dryer starts and stops.

Sizing

Andritz proposes using the Andritz BDS 1.0 system. This includes everything needed for operations including a dewatered sludge storage tank, dryer, and all accessories. Also provided is a PLC interface that can be networked with the plant SCADA system to control the dryer.

Layout

The belt drying system would be located near the sludge dewatering building at the existing plant. This would minimize the need to move the dewatered sludge long distances before drying. Figure 9 illustrates a layout of a similarly sized system in Wohlen, Switzerland.

FIGURE 9
Belt dryer layout in Wohlen, Switzerland.

Capital Costs

The capital cost for a standard Andritz BDS is $2,500,000. Modification of the process to add a furnace that can burn dried pellets or alternate fuels would increase the cost by $3,000,000, resulting in a total system cost of $5,500,000 with the furnace option, which Andritz calls "Eco-Dry."

O&M Costs

TABLE 2
Estimated Annual O&M Costs for Andritz Belt Dryer System

	Diesel	Propane
Belt Dryer	$ 28,000	$ 27,000

Notes: Diesel cost estimated at $4.84/gallon, propane at $4.56/gallon.

Recommendation

Overall advantages and disadvantages of drying and incineration are summarized in Table 3. Of the two systems discussed in this memorandum, the Kruger BioCon ERS system has a lower capital and operating cost, while providing a system that reduces biosolids mass by 95% and produces a beneficial material in the dried pellets.

TABLE 3
Advantages & Disadvantages of Drying & Incineration

Advantage	Disadvantage
Maximum solids reduction compared to other alternatives considered	High Capital costs
Energy recovery possible	High O&M costs if incineration is not used
Pathogens eliminated	High maintenance requirements, ash may be hazardous due to metal leachability
Stable, odorless ash or granules	Air pollution control required
Ash can be used as mineral aggregate in building industry or landfilled	Public perception

The estimated equipment cost for the Kruger ERS (dryer and furnace) option is $3,190,000, versus an estimated equipment cost of $5,500,000 for an equivalent system by Andritz (BDS with EcoDry). For the dryer only without a furnace, the Kruger's estimated equipment cost is $2,160,000 vs. $2,500,000 for an equivalent Andritz BDS dryer.

Since the cost of supplemental diesel fuel or propane is relatively high and increasing at a rapid pace, the option of both dryer and furnace are recommended. Based on the substantial difference in estimated system costs between the Kruger BioCon-ERS ($3,190,000) and the Andritz BDS-EcoDry ($5,500,000), the Kruger BioCon-ERS dryer and furnace combination is recommended for this option.

The dryer/incinerator system has a high capital cost, but will eliminate the biosolids sludge that is currently disposed of at the landfill. This will result in a substantial annual savings in sludge hauling costs and landfill disposal fees.

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Cannibal Process

PREPARED FOR: City of Kodiak

PREPARED BY: CH2M HILL

DATE: August 15, 2008

PROJECT NUMBER: 370587.01.SH

This technical memorandum summarizes the Siemens' Cannibal alternative to reduce solids production at the City of Kodiak's (City) wastewater treatment plant. This option would modify the City's existing activated sludge process to optimize the metabolism of microbes digesting activated sludge and enhance removal of inert components from the treatment process. This memorandum details the capacity, footprint, and cost for this alternative.

Cannibal Process

The Cannibal process is based on the City's existing activated sludge process, with modifications to optimize solids removal and consumption. The Cannibal process has two components in addition to a typical activated sludge process: enhanced solids separation and the Cannibal interchange bioreactor.

Solids Separation

The Cannibal process adds ultra-fine rotary drum screens and hydrocyclones for the removal of trash, grit, and inert solids from the return activated sludge. These components typically make up 20-25% of normal mixed liquor suspended solids. After removal, these components are separated from biological solids and compressed to 20-30% of the initial volume prior to disposal.

Cannibal Interchange Bioreactor

Solids that would normally be wasted from a conventional plant are instead sent to the side-stream interchange bioreactor where the unique conditioning environment of the Cannibal Process is created. Minimal aeration is required in the interchange tanks, and the oxidation reduction potential (ORP) is carefully monitored so that air is only supplied for short periods of time when the ORP becomes too low. In the low ORP environment, aerobic bacteria are conditioned for destruction and biodegradation, making their byproducts available for facultative bacteria that thrive in this environment. A portion of this side-stream tank is interchanged back into the main treatment process where biodegradation is completed and the facultative bacteria are outcompeted by the new, fast growing aerobic bacteria. Solids are conditioned and destroyed as they cycle between the aerobic and anoxic environments, significantly reducing the effective biological solids yield.

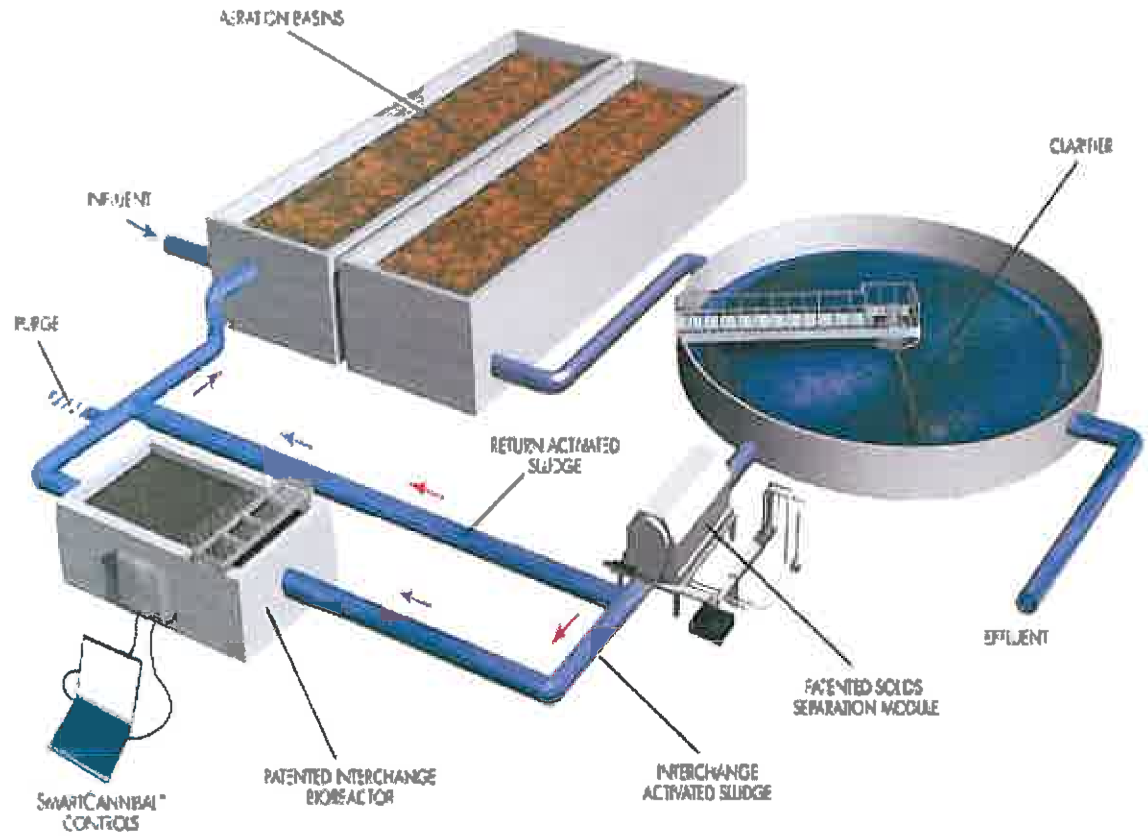

FIGURE 1
Cannibal Process Flow Schematic

The Cannibal process reduces the amount of biological solids wasting. Nevertheless, biological solids must be purged at a rate equivalent to the reduced yield of the system. A typical activated sludge plant has a yield of 0.6 pounds of sludge per pound of influent BOD. Experience at other Cannibal plants has shown yield levels as low as 0.1 to 0.2 pounds of sludge per pound of influent BOD, but due to unknown local conditions that may impact performance and elevate the yield, Siemens will set a guaranteed yield level at 0.3. At the design flow rate, the amount of biological sludge is estimated to be 203 dry tons per year. The biosolids purged must be treated as conventional waste activated sludge. This sludge, though less than the current 350 dry tons/year, will still need to be disposed of. The solids removed during ultra-fine screening and de-gritting will need to be disposed of as well. The estimated quantity of screening waste produced by the ultra-fine screens is 165 dry tons/year. The total quantity of material to be disposed of is therefore estimated to be 368 dry tons/year at the WWTP design flow rate, which is more than the City currently disposes of each year. This increase in disposed material is likely to be problematic with current landfill procedures.

Sizing

The Cannibal process requires a reduced organic loading rate in the aeration basin of 25 lbs/1000ft^3, resulting in the need for 0.8 million gallons of additional aeration basin volume.

This allows the plant to operate above a 10-day solids retention time (SRT), which is necessary for the Cannibal process to work properly. The existing primary clarifier tank can be retrofitted with diffusers to provide a portion of this volume. Additionally, the head of the main activated sludge process will need to be controlled to anoxic, anaerobic or aerated-anoxic conditions. The tanks would need to be reconfigured so there is a minimum of three tanks in series, with independent aeration control for each tank. The presence of multiple anoxic contact zones in series at the head of the plant and a significant turndown capability to deliver oxygen in the aeration basins are crucial for the Cannibal process to properly work. Table 2 summarizes the main components of the Cannibal process.

TABLE 2: CANNIBAL PROCESS SUMMARY

Component	Quantity	Size
Solids Separation Module		
Rotary Drum Screens	1	205 – 2056 gpm
Screw Press	1	5 hp
Grit Cyclone Feed Pump	1	5 hp
Grit Cyclone	4	
Grit Hoppers	1	600 gallons
Filter Bag	2	
Cannibal Interchange Bioreactor		
Interchange Bioreactor	2	0.25 MG
Floating Mixer (per basin)	1	25 hp
Decanter (per basin)	1	
Coarse Bubble Diffusers (per basin including clarifier retrofit)	140	2041 SCFM
ORP, pH, Level, TSS sensors (per basin)	1	

Layout

Figure 2 illustrates a possible site layout, with the primary clarifier converted to an interchange bioreactor and one new tank, as well as building space for the solids separation process.

FIGURE 2
Preliminary Site Layout for Cannibal Process

Capital Costs

The budget price for the Cannibal process, equipment, and services is $1,090,000. This does not include construction of additional basin volume and its associated piping and control requirements.

O&M Costs

The O&M costs for the Cannibal system are primarily electric costs for screening, pumping, and blowers. The total electrical consumption of the Cannibal process is 110 MW-hr/year, or approximately $14,300. Disposal costs for screenings, grit and biosolids would be additional, and would be slightly more than the current solids disposal costs.

Recommendation

Advantages and disadvantages of the Cannibal system are summarized in Table 2.

TABLE 2
Advantages & Disadvantages of the Cannibal process

Advantage	Disadvantage
Integrated process, which may increase nutrient removal	Only 42% reduction in biosolids that need to be disposed of
Solids processing occurs less frequently than existing operation	Increase in total volume of waste to dispose
Can decommission primary clarifier and convert it to an aeration basin; no more primary sludge to handle or primary clarifier to maintain	Requires additional treatment volume to be installed at the WWTP
	Not as efficient in cold climates as in lower latitudes

The main concern with the Cannibal process is that it is expected to produce only 42% less biomass than is produced currently. This is not an appreciable reduction in biosolids yield from current experience, and the biosolids purged from the process are not typically stabilized. The Cannibal process also produces an increased amount of fine screenings and grit, which sets the total estimated mass of solids to dispose of (biosolids plus screenings) in the range of 105% of current solids production. Additionally, the Cannibal process is predicted to be less efficient in cold climates as it is in warmer climates.

For these reasons, it does not appear that the Cannibal Process is a feasible option for the Kodiak WWTP's biosolids management plan.

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Study of Alternatives for Improving Sludge Disposal at the Kodiak Landfill

PREPARED FOR: Mark Kozak, City of Kodiak
Howard Weston, P.E., City of Kodiak

PREPARED BY: Cory Hinds and Floyd Damron, P.E., CH2M HILL

DATE: April 19, 2007

PROJECT NUMBER: 356615

Introduction

The City of Kodiak (City), the Kodiak Island Borough (KIB), and CH2M HILL met in Kodiak on February 15, 2007 to discuss options to improve the disposal of sludge at the landfill. Minutes from this meeting are included in Attachment 1. The purpose of this technical memorandum is to present the results of research and feasibility work conducted by CH2M HILL, and preliminary testing conducted by the City on the following topics related to improvement of sludge disposal operations at the landfill.

Topic 1. Will ADEC approve a tarp type cover as meeting the daily cover requirement for the City's sludge? Will ADEC approve the temporary stockpile plan?

Regulatory basis. Per state and federal regulations for sludge disposal, there are two options for meeting the pathogen and vector reduction requirements:

- **Option 1:** Stabilize with lime to pH 12 for at least 30 minutes and cover daily with soil or other material

  or

- **Option 2:** Meet Class A or Class B pathogen reduction requirements. (The City uses Class B alternative 2, Process to Significantly Reduce Pathogens #5, lime stabilization by raising pH above 12 for 2 hrs.)

  and

  Meet the vector attraction reduction requirements 40 CFR 503.33 (b)(1) - (10). Requirement (b) (6) is to raise the pH of the sludge to 12 for 2 hrs, and then keep the pH at 11.5 or higher for an additional 22 hours.

The City's currently lime stabilization sludge treatment meets the criteria for Option 2 above. **As long as the City continues to treat the sludge to these standards, cover of the treated sludge stockpile at the landfill is not required by regulations.** This is confirmed with a recent letter from Karin Hendrickson of ADEC to Tracy Mitchell of KIB, which is included for reference in Attachment 2.

However, the City anticipates that the landfill operators will continue to move stockpiled sludge from the temporary sludge stockpile as space in the landfill becomes available. Placement of temporary tarp covering of sludge stockpiles will reduce the potential for rainwater/snowmelt intrusion into the sludge and facilitate additional co-disposal with municipal solid waste (MSW) because of better sludge handling characteristics.

CH2M HILL recommends that the City focus on options to improve handling of the sludge so that the maximum volume of sludge can be co-disposed at the landfill while minimizing use of any temporary sludge stockpile. Sludge placed in the temporary stockpile will have to be double-handled, and the more the sludge is handled, the more difficult it is to handle and place.

If the stockpiles are used, care must be taken to avoid ponding of surface water in accordance with ADEC regulations (see ADEC letter in Attachment 2). As long as low areas that can catch rainwater are minimized, we do not anticipate this to be a problem.

Topic 2. How should the tarp type cover be designed for easy use by the City's sludge truck driver and landfill staff?

Use of temporary tarping is not a regulatory requirement as long as the City continues to treat the sludge to the standards described earlier. Use of tarping may help keep the sludge dry and maintain handling characteristics to facilitate placement of additional sludge volume in the landfill. Use of the temporary tarp will be an additional burden to the City, and the City needs to decide if such use makes sense.

CH2M HILL recommends that stockpiling of sludge be minimized, and any stockpile be covered with a temporary tarp to keep rain and snow off the sludge. We further recommend that the City provide close coordination with the landfill operators and provide assistance with removal of any temporary tarping when an opportunity arises to place additional sludge from the stockpile.

If the City decides to implement the temporary tarping of the sludge stockpile, the following pre-design comments are offered:

- Keep the width of the stockpiles narrow so the tarp can be more easily moved and secured by operators. It is anticipated that there will be times when the City truck driver will have to manage the removal and re-securing of the temporary tarping without support from landfill staff.
- Construct the stockpiles so that rain water runs off the tarp and does not pond. Ponding of water on the landfill surface is not allowed (see ADEC letter in Attachment 2).
- Tarps will need to be securely anchored so they do not blow away. Use of sand bags has worked well in other applications.
- Options for tarp type cover include 6-mil and 12-mil reinforced polyethylene. Polar Supply in Anchorage gave us a price for the 6-mil product (Raven Dura Skrim) of $332 for a 40-foot by 100-foot roll, or $0.08/ft^2 FOB Kodiak. The price for the 12-mil product

was $2,050 for a 53-foot by 250-foot roll, or $0.15/ft² FOB Kodiak. The total cost of the tarping will depend on the required stockpile volume and the stockpile geometry.

Topic 3. What is the recommended geometry and number of stockpiles that should be considered for the top of the landfill?

Assumptions

- Assume a worst-case scenario that half of the total volume of treated sludge can not be co-disposed and must be stockpiled. This would be 1,300 cubic yards per year (half of the total of 2,600 cubic yards generated in 2006).
- Assume two years worth of sludge would be stockpiled. Two years is the estimated length of time that the landfill top deck is available for stockpiling. See Topic 5 for additional discussion on this timing.
- The preferable area for sludge stockpiling on the landfill top deck is 200 feet by 200 feet at the north end.
- The average depth of sludge when dumped from the tote is approximately 4 feet.

TABLE 1
Options for Geometry of the Storage Cells

Alternative	Number of Cells	Width of Cells (ft)	Length of Cells (ft)	Depth of Sludge (ft)
A	3	15	600	4
B	3	20	300	4
C	2	30	300	4
D	1	135	135	4

The geometry in Alternatives A or B is recommended if temporary tarping is implemented, to keep the width of the storage cells to a minimum. Alternative A, with a cell width of 15 feet, would be sized for dumping sludge in a single row, similar to current practice at the existing sludge stockpile at the landfill. The effective width of the sludge as dumped from the tote would be approximately 10 feet, which would leave room around the edges for anchoring a tarp. The 20 foot width in Alternative B represents a width of two sludge totes dumped side-by-side in the containment cell. In alternatives B and C, it may be possible for operators to walk on top of the bales to move the tarp; however, tarping the wider piles will be more problematic. If no tarping is implemented, then the one stockpile Alternative D is recommended. However, maintenance of the required drainage would be more complicated with Alternative D.

Topic 4. What type of geotextile can be used and how should it be placed to increase the sludge usage in the active part of the landfill operation?

As described in the meeting minutes, treated sludge is currently placed between stacked bales in each lift (see sketch in Attachment 1). Typically, sludge is placed between bale layers 1 and 2 and layer 2 and 3. It is probable that additional sludge could be placed between bale layers 3 and 4 if a geotextile was placed on top of bale layer 4 to keep the sludge from "pumping" up into the driving surface.

High strength geotextile is recommended for such an application to provide "bridging" strength and assist separation of sludge from daily cover. Polar Supply in Anchorage carries a product called Protex 2006, which satisfies these requirements. Protex 2006 comes in rolls 17.5 feet wide and 258 feet long and each roll weighs approximately 250 pounds. Use of heavy equipment on the bales during placement may cause sludge to pump up to the surface, somewhat defeating the purpose of the geotextile placement. Alternately, the rolls could be dropped adjacent to the work area, rolled out, cut, and positioned by hand. Experimentation would be required to determine the best method for installation. An overlap of approximately 3 feet is recommended when placing the geotextile side by side. Cost of one roll is $465 FOB Kodiak. A rough estimate for usage is 30 rolls per year, or an annual material cost of approximately $14,000. This assumes use of one geotextile in each lift and overlap of 3 feet.

Note: if "dry" sludge with good handling characteristics can be consistently produced by Kodiak's wastewater treatment facility (WWTF), then geotextile may not be needed.

Topic 5. What are the timing issues related to placement of sludge?

Sludge can be placed in a temporary stockpile on the landfill top deck until the east side of the landfill (i.e., the Burn Area) is filled. After the Burn Area is filled, the next lift will need to be placed on the landfill's top deck, and the sludge stockpile will need to be moved. The length of time required until waste will need to be placed on the landfill top deck was evaluated by estimating the remaining volume to be filled in the Burn Area and dividing by the estimated annual incoming waste volume. The volume calculation was done using InRoads, and checked manually using the end area method. A summary of the calculation is shown below in Table 2. Backup for this estimate is included in Attachment 3.

TABLE 2
Available Duration for Temporary Sludge Stockpile on the Landfill Top Deck

Kodiak Landfill	Estimated value
Remaining volume in Burn Area[1]	50,795 cubic yards
Annual incoming waste volume[2]	23,456 cubic yards per year
Duration from 12/6/06	2.2 years
Duration from 3/6/07	1.9 years

[1] Volume is estimated as the difference between the landfill surface in December 2006 (Kodiak Land Survey topographic survey dated 12/6/2006), to fill elevation 230, the approximate average elevation of the landfill top deck.

[2] Includes municipal solid waste, sludge, and daily cover.

Topic 6. Research sludge enhancement additives to increase its "handleability" for *co-disposal* at the landfill (so more of it can go into the active landfill and less into storage).

Literature searches indicate that sludge additives used to enhance physical handling characteristics include polyacrylamide flocculants, water absorbing polymers, iron, and alkaline materials such as cement and lime kiln dusts, fly ash, and scrubber ash. According to sludge handling specialists contacted by CH2M HILL, the best, easiest, and most inexpensive way to improve handling characteristics is to add more lime after the sludge comes off the belt filter press. The lime must be well mixed with the sludge. The required volume addition may be substantial, but the lime is not an expensive additive.

Following discussions with CH2M HILL, Hap Heiberg conducted testing on (1) modifying the speed of belt filter press dewatering on sludge solids content, and (2) the effects of lime addition on sludge solids content. Initial results of the testing are as follows:

- Filter press speed modification. The speed of the belt filter press was slowed in an effort to improve sludge dewatering. This meant an operational change of running the press three days per week instead of two. According to Alan Torres, this operational change produced a significant increase in the "handleability" of the sludge brought to the landfill. Hap Heiberg indicated that slowing the belt filter press speed and increasing the number of press days helps when the sludge is not pressing well, but is not a significant factor when the sludge is dewatering and pressing well.
- Increased lime addition. The testing of lime addition is not yet complete. Initial indications are that increased lime addition of 50 to 75 percent will be successful in increasing the percent solids and the handling characteristics of the sludge. The optimal volume of lime increase has not yet been determined. Lime addition trials should be conducted at lower belt rate on the belt filter press.
- The quality of the sludge can vary considerably over time. This is due to the wastewater characteristics, operation of the WWTF, sludge age, belt filter press operation, and other factors. A given belt filter press and lime addition program may produce good results one week, and less impressive results the following week.

Topic 7. Research requirements for use of treated sludge as landfill cover.

Per ADEC, sewage sludge can be used as landfill cover if it meets the federal requirements listed in 40 CFR 503 for pathogen, vector, and odor control. The City of Kodiak already treats the sludge to EPA Class B standards by mixing with lime and elevating the pH for a specified duration. After the lime treatment, odors are not a concern. Therefore, **if sludge handling characteristics were improved**, the treated sludge from the City's WWTF could be used as landfill cover and not need to be stored at the landfill and handled multiple times. Composting is an alternative that can improve handling characteristics of treated sludge.

City of Fairbanks Composting Experience

Fairbanks composts wood chips and sewage sludge. Like the City, Fairbanks produces secondary sludge. Wood chips are obtained from the North Star Borough's sawmill. Partially decomposed wood chips screened from older compost piles are added to fresh wood chips. Fairbanks uses 2.5 parts wood chips to 1 part sludge. Fairbanks dewaters their sludge and they treat the sludge using lime. Treated sludge is sent to the composting operation at approximately 20 percent solids. Heavy equipment is used to mix the piles, and then the piles are covered with 2 feet of composted materials to control odors and insulate the pile. The mixture is composted for 2 to 6 months, then screened to remove oversize wood chips. The finished compost has unrestricted use and is sold to the public at the cost of loading ($15 per pickup bed, $5 per yard dropped into dump trucks). It is given to the public for free if they load it themselves.

In addition, Fairbanks operators report that lime-treated sludge does not mix easily with soil. This experience suggests that Kodiak would be better served with composting than trying to mix treated sludge directly with soil.

City of Ketchikan Composting Experience

The City of Ketchikan currently composts primary treated sewage sludge and woodchips, and mixes the resulting compost with soil for use as cover at their inert waste landfill. The operation is a big success for the City of Ketchikan. The following are details on the Ketchikan operation:

- The ratio of wood chips to treated sludge is 2 parts chips to 1 part sludge. The volume of incoming lime-stabilized primary sludge from the City of Ketchikan WWTF is approximately **4 cubic yards per week**.
- Incoming wood waste is chipped in a TORO 2000 tub grinder. Acceptable wood waste includes pallets, branches, and non-treated lumber. A magnet mounted on the grinder is used to capture metal, so non-treated lumber with nails can be processed.
- Wood chips are laid out in windrows on top of the landfill. A relatively flat surface is required. Sludge is dumped from a tote, and then mixed with a compost mixer which is mounted on a front-end loader. The temperature in the windrows climbs to 140 degrees Fahrenheit within 3 days.
- The windrows are periodically turned to enhance decomposition. Temperature is measured with long probes and records of temperature are kept. The compost is cured in 2.5 months, and with this additional treatment, it becomes an EPA Class A product with unrestricted use. The product could be used in a vegetable garden.
- The composting operation is permitted as a blending facility, not a treatment facility. As such, the monitoring requirements are reduced. The operation is conducted on top of the landfill, eliminating the requirements of a liner.
- The cured compost is mixed with soil (1 part compost to 1 part soil) and used as cover at the landfill. Some of the product may be stored for use as the upper growth layer for the final cover system on the landfill.

Kodiak produces significantly more sludge than Ketchikan (approximately 50 cubic yards of treated sludge per week in Kodiak compared to 4 cubic yards per week in Ketchikan). Therefore, such an operation at Kodiak would likely be limited by the availability of wood waste that can be chipped. Furthermore, the Ketchikan sludge is primary sludge, which dewaters to a much higher solids content than Kodiak's sludge. KIB's landfill does not keep records of incoming wood waste. The landfill manager Alan Torres believes that the necessary volume of wood waste may be available in the summer, but not likely in the winter. Capture of the wood waste stream would require free disposal as an incentive, and a place to store and process the wood.

Requirements for the City WWTF for a wood waste/treated sludge composting operation:

- Continue to treat the sludge via lime stabilization by raising the pH above 12 for 2 hours, and keeping it above pH 11.5 for an additional 22 hours.
- Monitor and document treatment of the sludge, for each batch.
- Submit proof of Class B treatment to the landfill manager with each incoming load of sludge[1].

Requirements for the KIB Landfill for a wood waste/treated sludge composting operation:

- Submit an ADEC permit application and comply with permit requirements for a *blending* facility.
- Supply labor to handle the incoming wood waste, run the grinder, mix the sludge and chips, monitor and document the compost temperature, and mix the compost with soil as needed to improve handling characteristics for cover.

Shared responsibilities for a wood waste/treated sludge composting operation would include:

- Purchase of the tub grinder to produce wood chips from wood waste (estimated cost $150,000)
- Purchase of the compost mixer to mount on front-end loader (estimated cost $65,000)

Conclusions

The following are conclusions of CH2M HILL's research and the City's preliminary testing:

- Additional treated sewage sludge can be co-disposed with municipal solid waste and the landfill if the sludge handling characteristics are improved to make it easier for landfill operators to place. Indications from the landfill are that the addition of lime has improved sludge consistency and made it drier and easier for co-disposal.
- Initial testing indicates that addition of lime can increase the percent solids and improve sludge handling characteristics
- Slowing of the City's belt filter press belt speed can increase the percent solids and improve sludge handling characteristics
- Sludge characteristics are variable from week to week and adding lime and slowing the belt filter press speed does not guarantee better sludge at all times.

[1] Note that the City does not have capacity to hold each batch of sludge for 24 hours for the final pH test. As an alternative, the City collects a composite sample from each sludge batch and tests it after 24 hours. This means that the 24 hour pH test results would not be available with each batch of sludge sent to the landfill for composting. The results would be available the following day. Such details would be finalized in a monitoring plan if composting is implemented.

- Stockpiling of treated sludge is acceptable to ADEC as long as the City continues to treat the sludge to Class B standards via the addition of lime, and no ponding of surface water occurs. Tarp cover is not required by regulation.
- If temporary sludge stockpiles are implemented, and if the City decides to implement temporary tarping, then narrow stockpiles are recommended. If temporary tarping is not implemented, then a wider stockpile can be created. The KIB would prefer that the stockpiles be placed at the north end of the landfill top deck.
- Any temporary sludge stockpiles placed on the landfill top deck will need to be moved in approximately 2 years.
- High-strength geotextile such as Propex 2006 can be used to provide stabilization of daily cover and separation of sludge from daily cover. This should increase the volume of sludge that can be co-disposed with municipal solid waste. Experimentation would be required to determine the best method for placement. Material costs are not significant.
- Composted wood chips and treated sludge can be mixed with imported rock for use as landfill cover if material handleability is acceptable. Capital expenditures would be required for a grinder and compost mixer. Pilot testing would be required.

Recommendations

The following are recommendations for improving sludge handling and disposal:

- The City should operate the belt filter press at a slow speed. This may mean dewatering sludge 2 or 3 days per week. Specific procedures should be developed for WWTF staff, and additional training or incentives should be given for producing higher solids content sludge.
- The City should work with belt filter press manufacturer (Andritz) representatives to discuss specific operational methods or additives that can improve sludge dewatering and sludge handleability characteristics.
- The City should continue to increase lime addition to the dewatered sludge. The optimal lime addition will be determined via ongoing testing by Hap Heiberg. Specific procedures should be developed for WWTF staff.
- Delivery of the treated sludge should be coordinated with KIB landfill staff.
- The City should ensure that record keeping for sludge treatment is in compliance with the requirements of 40 CFR 503.17. This includes signing a certification statement, documenting the method of treatment, and retaining the information for five years. Documentation of Class B sludge treatment standards eliminates the requirement for daily cover of the sludge.
- Given the improved characteristics of the sludge, the KIB should strive to increase the co-disposal of treated sewage sludge with municipal solid waste to minimize sludge stockpiling. Specifically, the KIB should increase the co-disposal of sludge by increasing the thickness of sludge placed between each lift and adding placement of sludge between the third and fourth bales in each lift. Use of high strength geotextile should be

considered on top of the fourth lift to prevent impacts to operations. The City should purchase 4 rolls of Propex 2006 high strength geotextile and coordinate delivery to the landfill to help increase the rate of sludge co-disposal as a pilot study.

- If stockpiling a portion of the annual sludge volume is required, then landfill staff should construct narrow stockpiles on the landfill top deck; tarping should be used to keep the sludge dewatered; and the City should purchase 1 roll of 12-mil reinforced polyethylene tarping and coordinate delivery to the landfill with sufficient sand bags to anchor the tarp. Any added costs to uncover and resecure the tarping on sludge stockpiles need to be addressed.
- If stockpiling is required, landfill staff should coordinate with the City when opportunities for co-disposal of stockpiled sludge arise.
- The City and KIB should jointly consider the option of composting wood waste and treated sludge to reduce waste volume and generate useable landfill cover. Of particular importance are the handling characteristics of the composted material or mixed rock and compost as cover during wet conditions. A pilot study should be conducted before investing in required composting equipment. If the composted material is acceptable for landfill cover use, both the City and KIB may realize considerable savings.
- The City should continue testing of the sludge for heavy metals per 40 CFR 503.16.
- To satisfy the Class B requirements for testing treated sludge without having to store the sludge, we recommend that the City re-test, at 22 hours, the same sample that was collected earlier and tested after 2 hours. To confirm that storage of the entire batch of treated sludge is not required, we recommend that the City hold one batch of sludge for 22 hours and compared the testing results of the entire batch of sludge vs. the smaller sample. The results of this testing should be kept on file.
- The City should proceed with their planned long-term study of viable sludge disposal alternatives.

Attachment 1
Sludge Meeting Summary

Sludge Disposal at Kodiak Island Borough Landfill

ATTENDEES: Howard Weston, City
Mark Kozak, City
Hap Heiberg, City
Rick Gifford, KIB
Bud Cassidy, KIB
Tracy Mitchell, KIB
Alan Torres, KIB
Floyd Damron, CH2M HILL
Cory Hinds, CH2M HILL

COPIES: Project file

FROM: CH2M HILL

DATE OF MEETING: February 15, 2007

DATE OF SUBMITTAL: February 28, 2007

The City of Kodiak (City) retained CH2M HILL to travel to Kodiak to meet with City and Kodiak Island Borough (KIB) contacts to discuss short-term and long-term options for sludge disposal at the Kodiak Landfill. Prior to the meeting, Floyd and Cory met with Howard, Mark, and Hap at Public Works; toured the City WWTP's treatment process and sludge dewatering, screenings collection, and lime addition equipment; witnessed sludge transport and dumping at KIB's landfill; and discussed placement of the treated sludge at the landfill with the landfill manager, Alan Torres.

The meeting was held at the KIB conference room. A summary of discussion and action items is as follows:

1. The purpose of the meeting was to understand issues and opportunities for the City and KIB related to sludge disposal, and try to develop a solution for continued sludge disposal at the landfill (3-5 yrs) until the City completes a sludge alternative study and decides if construction is feasible for an alternative to the current sludge disposal practices.

2. The main issue of concern for the City is to secure a continued option for sludge disposal for at least 3 to 5 years and not be denied landfill entry by KIB.

3. The main issue for the KIB is how and where to continue placement of the sludge in the landfill as space becomes more limited. Other issues include ADEC regulations for sludge storage and daily cover.

4. The sludge is dewatered and limed at the WWTP, and transported to the landfill in totes on a truck. The consistency of the sludge varies from day to day, but generally resembles soil in appearance, but with a gelatinous texture. The sludge is then dumped on the ground at the landfill as directed by the landfill manager. The landfill staff then picks up the sludge with a loader and places it between bales of municipal solid waste (MSW) as described below. The drier the sludge the easier it

is to handle and place in the landfill. The sludge is more difficult to handle each time it is moved and the longer it is uncovered and exposed to rainfall.

5. Alan described current methods and limitations of sludge placement. Current procedure is to stack bales of MSW 4-high to yield one 10 to 12 foot lift, then place daily cover material over the top layer of bales. Sludge is placed in a relatively thin 6" to 12" layer between bale layers 1 and 2, and layers 2 and 3. No sludge is placed between layers 3 and 4 because it tends to come up between the bales and make operations difficult. This limits the volume and timing that sludge can be placed in the landfilled waste. Incoming sludge that can not be placed between the layers of bales is stockpiled. Alan estimates that on average, the KIB has capacity to place only 50% of the sludge between the MSW bales, while the other 50% needs to be stockpiled. This means that the landfill can not handle the full volume of sludge received. Stockpiling of sludge creates a space problem and the possibility of having to handle the sludge multiple times before placement. Various other sludge placement methods have been tried at the landfill. These ideas were discussed, but each had problems related to operations. Alan reports that he has contacted other communities that handle sludge and no other viable placement methods were identified. The current sludge placement method appears to be the best option.

6. Two potential solutions were discussed:

    a. Placement of additional sludge between bale layers 3 and 4, and use of geotextile over the 4th bale in each lift to keep sludge from rising up and becoming an operational problem.

    b. Stockpiling of the sludge on the top deck of the landfill until another final disposal solution is available. Landfill staff would place a ring of bales around the perimeter of a stockpile location, the sludge would be placed, then the sludge would be covered. Dimensions of the stockpile, type of cover, and operational procedures were not detailed in the meeting.

7. KIB is excavating rock for the lateral expansion, so availability of daily cover is not a problem. The City has various projects with "waste" material that might be suitable for landfill daily cover, but additional cover is not needed at the present time. The following clarification was provided by KIB following the meeting: "It has been staff's experience that any cover material, other than rock, is not suitable or desirable for landfill cover."

8. KIB has just issued an RFP for a comprehensive solid waste study. Sludge disposal will be included in the study.

9. Sludge production schedule and delivery schedule were discussed. The City offered to vary sludge days and delivery, but Alan and Hap both agreed the landfill and WWTP staff were cooperating well already on this issue and no changes were necessary at this time.

10. Long-term plans were discussed, including the potential that the KIB may decide to ship solid waste off island. The Borough will be closer to making a decision once the

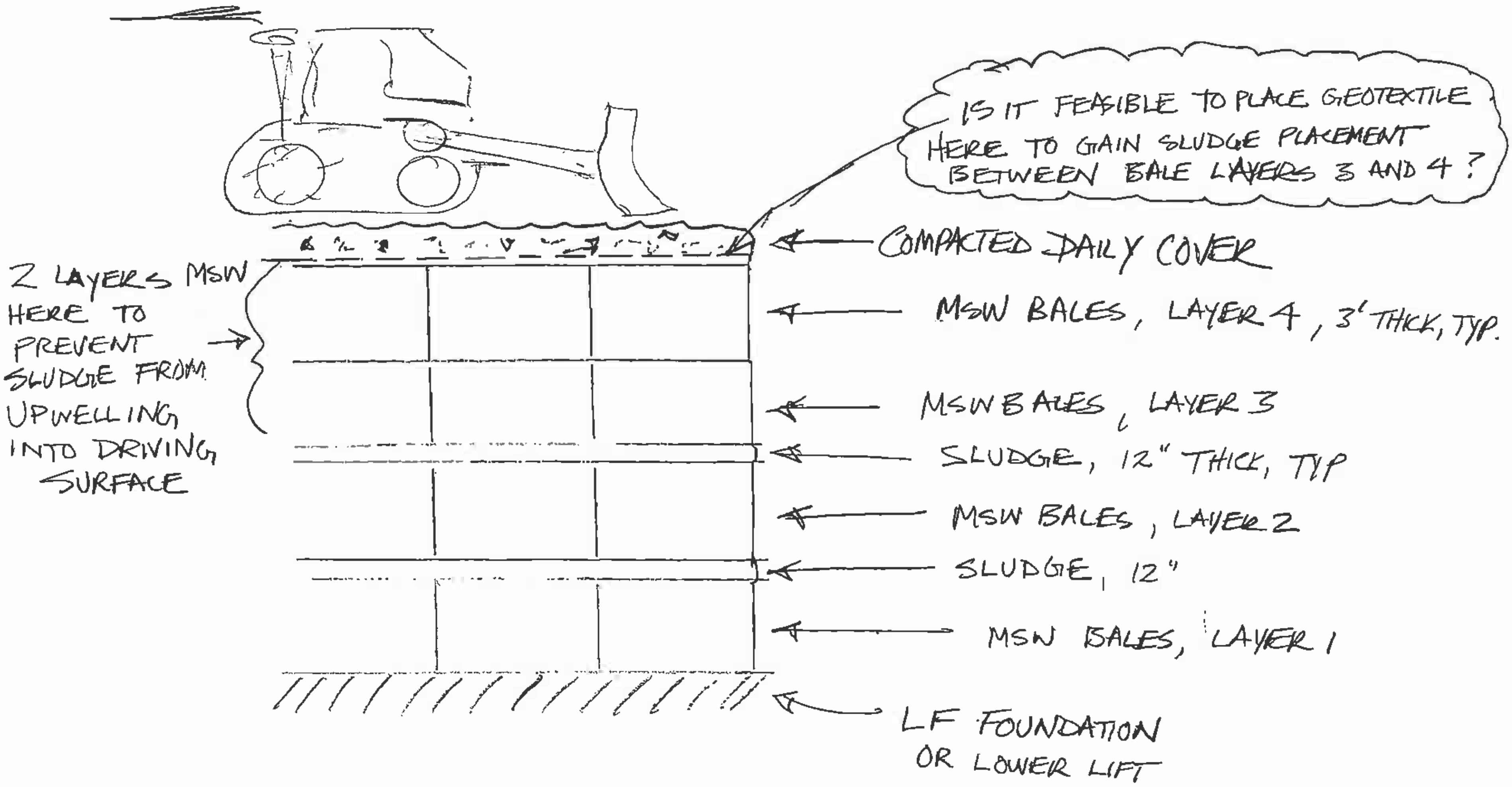
results of the comprehensive solid waste study are available. This may be in about 1 year.

11. The City and KIB agreed to work together to find a solution that works for both.
12. KIB agreed that the City can expect to continue to haul its sewage sludge for at least the next few years while alternatives are studied and the best solution implemented. This is assuming compliance with ADEC Solid Waste is achievable.

The following are action items for the meeting:

#	**Action Item**	**Responsible Person**	**Due**
1	Work with WWTP staff to produce drier sludge	City of Kodiak/Hap	Ongoing
2	Determine ADEC requirements for temporary cover for sludge stockpile	KIB/Tracy	Complete
3	Evaluate feasibility and cost for use of geotextile and placement of sludge at three levels within bale lifts	CH2M HILL/Cory	ASAP
4	Implement the proposed plan for placement of the current stockpiled sludge in the Burn Area	KIB/Alan	Ongoing
5	Evaluate timing, geometry, and operational procedures for temporary sludge stockpile on the landfill top deck	CH2M HILL/Cory	ASAP
6	Evaluate any additives that can be added to the sludge to improve handling	CH2M HILL/Cory	ASAP

It was agreed that information gathered on these action items would be shared with all parties on an ongoing basis and as needed.



EXISTING SLUDGE DISPOSAL OPERATION

2/20/07
CLH

Attachment 2
ADEC Letter

STATE OF ALASKA

SARAH PALIN, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL HEALTH
SOLID WASTE PROGRAM

555 Cordova Street
Anchorage, Alaska 99501
PHONE: (907) 269-7626
FAX: (907) 269-7600
http://www.dec.state.ak.us/

February 27, 2007

Ms. Tracy Mitchell
Environmental Specialist
Kodiak Island Borough
710 Mill Bay Road
Kodiak, AK 99615

Certified Mail
 # 7001 2510 0002 7773 2905
Return Receipt Requested

Subject: Approval of Sludge Storage Proposal

Dear. Ms. Mitchell,

We received your request to store sewage sludge at the Kodiak Island Borough Landfill on February 16, 2007; additional information was submitted on February 20, 2007. The small working space at the current landfill cell is making it difficult to place large amounts of sludge in with bales for co-disposal.

The Borough proposes to construct a holding area for sewage sludge on top of the intermediate cover on the existing landfill cell. This holding area would be constructed of bales, and would provide a place to store sewage sludge until it is possible to dispose of sludge with municipal waste.

The Department of Environmental Conservation approves your sewage sludge storage proposal, with the following stipulations;

- The storage area must be constructed to prevent surface water accumulation or ponding in or near the storage area. Any ponded water must be removed in accordance with Title 18, Chapter 60, Section 225 of the Alaska Administrative Code (18 AAC 60.225).
- The sewage sludge must meet the free liquid requirements of 18 AAC 60.365 prior to being disposed of, or stored at, the landfill.
- The sewage sludge within the storage area may not be stored in this manner indefinitely. Once the new landfill cell is built, all sewage sludge will be co-disposed with municipal solid waste in the cell.
- The sewage sludge must meet the vector attraction and pathogen reduction requirements of 18 AAC 60.365. If the sludge is not treated in accordance with Title 40, Section 503.32 and Section 503.33 of the Code of Federal Regulations

(40 CFR 503.32 and 33) prior to storage/disposal, the sludge must be covered when not in use.

- You must ensure that odors do not create a nuisance, in accordance with 18 AAC 60.233.

If you have questions or need further assistance, please contact me at (907) 269-7626, or by e-mail at *Karin_Hendrickson@dec.state.ak.us*.

Sincerely,

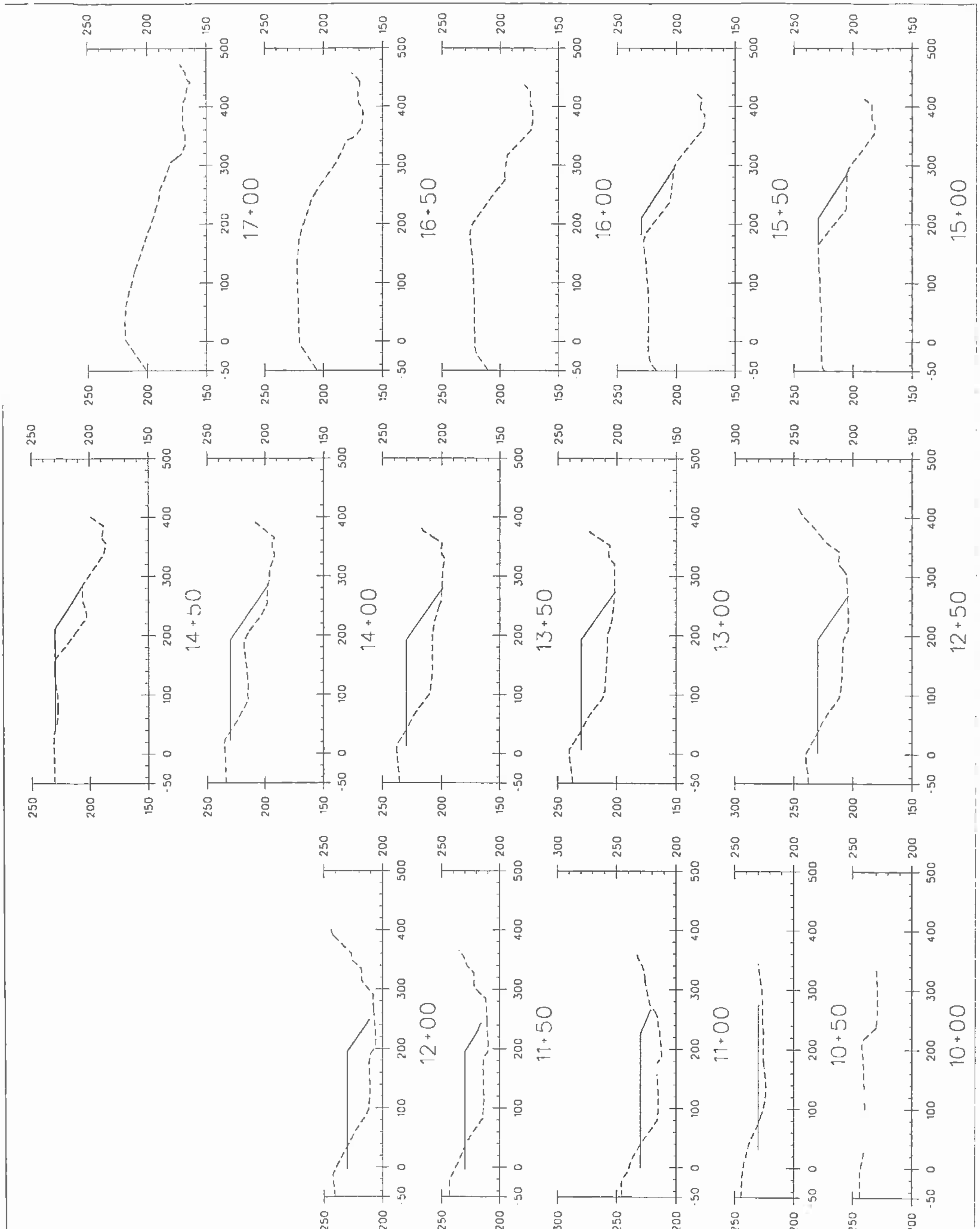
Karin Hendrickson
Environmental Program Specialist

Attachment 3
Backup for Remaining Life Estimate

Estimate for Annual Incoming Waste Volume

	MSW	Sludge	Cover	Total	Comments
weight (lb)	22,537,492	4,289,960			From Alan Torres, KIB, avg 02-06 for MSW, 2006 number for sludge
density (lb/cy)	1,240	1,571			From Alan Torres, KIB, 2006
volume (cy)	18,175	2,731	2,550	**23,456**	Total annual volume for remaining life estimate.

From Alan (KIB LF)			From Hap (City of Kodiak WWTP)					
Year	MSW	Sludge	Sludge (lb)	Screengings (lb)	Total (lb)	Vol. Sludge (cy)	Sludge Density (lb/cy)	
2002	23,274,490	3,750,027	3,599,000	161,000	3,760,000	2,300	1,565	
2002-2003	-1.91	-1.39			-0.89%			
2003	22,829,947	3,697,902	3,552,000	174,500	3,726,500	2,250	1,579	
2003-2004	-0.03	5.9			2.88%			
2004	22,823,098	3,916,078	3,676,500	157,500	3,834,000	2,350	1,564	
2004-2005	-1.78	4.83			4.36%			
2005	22,416,847	4,105,225	3,837,500	163,500	4,001,000	2,450	1,566	
2005-2006	-4.79	4.5			6.99%			
2006	21,343,080	4,289,960	4,110,000	170,500	4,280,500	2,600	1,581	
							1,571	average density
Average 02-06	22,537,492	3,951,839						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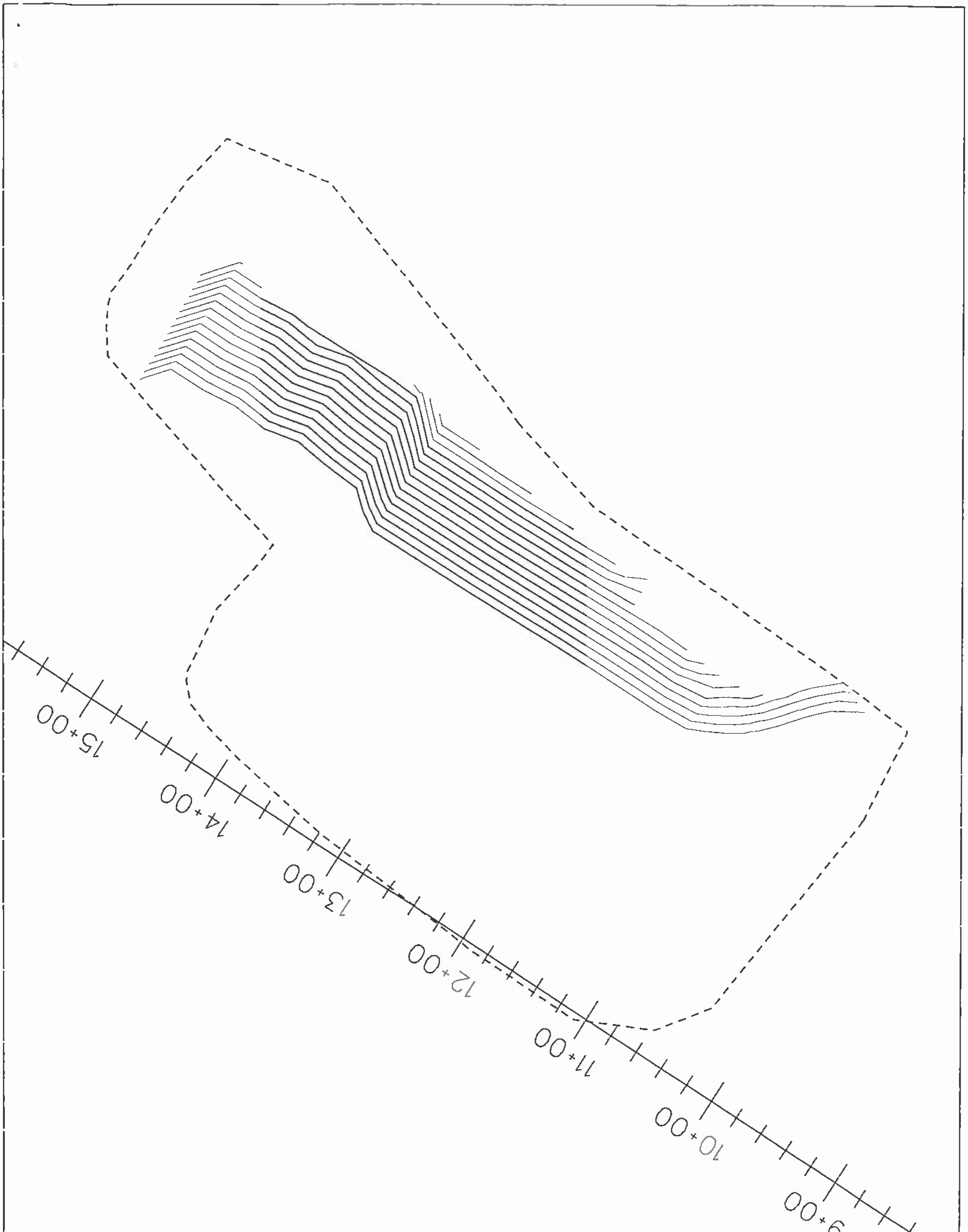
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