APPENDIX E

REVIEW OF SLUDGE MANAGEMENT OPTIONS

MEMORANDUM

TO: Bruce Buel, General Manager November 30, 2007

FROM: Malcolm McEwen
Eileen Shields

SUBJECT: Review of Solids Management Options

DRAFT

Introduction

The District faces several challenges related to wastewater management at Southland Wastewater Treatment Facility (WWTF), including short-term and long-term solids management. Sludge handling at Black Lake and Southland WWTFs has been a concern, and will likely continue to be a concern through the foreseeable future. Ongoing planning efforts (such as the Sewer Master Plan, Southland WWTF Master Plan, Supplemental Water Alternatives Evaluation, and ongoing Southland WWTF Groundwater Evaluation) will assist the District in developing a strategy for addressing these challenges.

In order to provide support during project development, Boyle was hired to prepare a review of regulatory issues, "classifications" of sludge, conceptual processing options, and typical capital and operations/management costs. These issues are summarized below and more fully reviewed in the remainder of this memorandum.

Regulatory Issues

Current regulations concerning solids from wastewater treatment plants are layered and complex. Not surprisingly, the differences in regulations begin with the names used to describe the material in question:

Biosolids or Sewage Sludge?

Federal regulations concerning sewage sludge became effective on March 22, 1993 (The Standards for the Use or Disposal of Sewage Sludge, 40 CFR Part 503). However, since that time the USEPA is apparently discontinuing the use of the term "sewage sludge" in favor of the term "biosolids."

The California Integrated Waste Management Board uses both terms, and describes the difference: "Biosolids are the end product after treating sewage sludge with anaerobic digestion in combination with heat." (www.ciwmb.ca.gov/Organics/Biosolids/)

San Luis Obispo County defines "treated sewage sludge/biosolids" according to the source of the material and its ability to meet various requirements of 40 CFR Part 503.

Federal Regulations

The following summary is taken from a staff report prepared for the California Integrated Waste Management Board:

The US Environmental Protection Agency (USEPA) is responsible for the development and implementation of federal rules and regulations regarding biosolids processing, use, and disposal. The primary federal regulation for biosolids management is 40 Code of Federal Regulations (CFR) 503 (Part 503). In California, the 503 rule is enforced through National Pollutant Discharge Elimination System (NPDES) permits. Promulgated in 1993, the regulations under Part 503 apply to land application, surface disposal, and incineration of biosolids.

Numerous federal regulations in addition to Part 503 also apply to biosolids management.

Federal Classifications

According to the USEPA's *A Plain English Guide to the EPA Part 503 Biosolids Rule* there are 4 categories of biosolids:

1. Exceptional Quality Biosolids: Although not explicitly defined in the Part 503 rule, the Plain English Guide uses the term Exceptional Quality (EQ) to characterize biosolids that meet low-pollutant and Class A pathogen reduction (virtual absence of pathogens) limits and that have a reduced level of degradable compounds that attract vectors.

   EQ biosolids are considered a product that is virtually unregulated for use, whether used in bulk, or sold or given away in bags or other containers.

2. Pollutant Concentration Biosolids: Although not explicitly defined in the Part 503 rule, the Plain English Guide uses the term Pollutant Concentration (PC) to refer to biosolids that meet the same low-pollutant concentration limits as EQ biosolids, but only meet Class B pathogen reduction and/or are subjected to site management practices rather than treatment options to reduce vector attraction properties.

   If pathogens (Salmonella sp. bacteria, enteric viruses, and viable helminth ova) are below detectable levels, the biosolids meet the Class A designation. Biosolids are designated Class B if pathogens are detectable but have been reduced to levels that do not pose a threat to public health and the environment as long as actions are taken to prevent exposure to the biosolids after their use or disposal. When Class B biosolids are land applied, certain restrictions must be met at the application site; other requirements have to be met when Class B biosolids are surface disposed. The land application restrictions allow natural processes to further reduce pathogens in the biosolids before the public has access to the site.

   – A Plain English Guide to the EPA Part 503 Biosolids Rule

   Unlike EQ biosolids, PC biosolids may only be applied in bulk and are subject to general requirements and management practices; however, tracking of pollutant loadings to the land is not required.

   Cumulative levels of pollutants added to land by EQ or PC biosolids do not have to be tracked because the risk assessment has shown that the life of a site would be at least 100 to 300 years under the conservative parameters assumed.

3. Cumulative Pollutant Loading Rate (CPLR) [Biosolids]: CPLR biosolids typically exceed at least one of the pollutant concentration limits for EQ and PC biosolids but meet the ceiling concentration limits. Such biosolids must be applied to land in bulk form. The cumulative levels of biosolids pollutants applied to each site must be tracked and cannot exceed the CPLR.

4. Annual Pollutant Loading Rate (APLR) [Biosolids]: APLR biosolids are biosolids that are sold or given away in a bag or other container for application to the land that exceed the pollutant limits for EQ biosolids but meet the ceiling concentration limits (see below). These biosolids must meet APLR requirements and must be accompanied by specific biosolids application rate information on a label or handout that includes instructions on the material's proper use.

The pollutant limits noted above are summarized below:

USEPA Pollutant Limits for Biosolids

Reference	Table 1 §503.13	Table 2 §503.13	Table 3 §503.13	Table 4 §503.13
Pollutant	**Ceiling Concentration Limits for All Biosolids Applied to Land (milligrams kilogram) [a]**	**Pollutant Concentration Limits for EQ and PC Biosolids (milligrams per per kilogram) [a]**	**Cumulative Pollutant Loading Rate Limits for CPLR Biosolids (kilograms per hectare)**	**Annual Pollutant Loading Rate Limits for APLR Biosolids (kilograms per hectare per 365-day period)**
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Chromium	3,000	1,200	3,000	150
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum [b]	75	-	-	-
Nickel	420	420	420	21
Selenium	100	36	100	5.0
Zinc	7,500	2,800	2,800	140
Applies to:	All biosolids that are land applied	Bulk biosolids and bagged biosolids[c]	Bulk biosolids	Bagged biosolids[c]

Notes:
a Dry-weight basis
b As a result of the February 25, 1994, Amendment to the rule, the limits for molybdenum were deleted from the Part 503 rule pending EPA reconsideration.
c Bagged biosolids are sold or given away in a bag or other container.

Note that recent analytical results for Southland and Blacklake sludge show metals concentrations well below these limits:

Pollutant Levels in District Biosolids Sampled on 8/16/2007

Pollutant	Controlling Pollutant Concentration Limits for Biosolids (mg/kg)	Southland WWTF Sludge (maximum of 3 samples) (mg/kg)	Blacklake WWTF Sludge (maximum of 2 samples) (mg/kg)
Arsenic	41	< 0.25	< 0.25
Cadmium	39	< 0.50	< 0.50
Chromium	1,200	0.54	0.90
Copper	1,500	127	34.2
Lead	300	< 0.25	< 0.25
Mercury	17	< 0.20	< 0.20
Molybdenum	75	0.98	1.41
Nickel	420	< 0.50	0.59
Selenium	36	< 0.50	< 0.50
Zinc	2,800	22.1	34.6

Federal Regulation of Composted Biosolids

The Code of Federal Regulations, Title 40, Part 503 (40 CFR 503) defines time and temperature requirements for Class A and Class B products, as shown below. Composted biosolids that meet both Class A requirements and the maximum pollutant levels of Part 503 are considered "exceptional quality" (EQ) and can be sold in bags or bulk and used without additional regulatory restrictions. Class B composted biosolids can be used on agricultural land where there is no public contact provided additional site restrictions are met.

40 CFR 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 5 days during which temperatures exceed 55 °C for at least 4 hours

Source: 40 CFR Part 503, via US EPA. Biosolids Technology Fact Sheet, Use of Composting for Biosolids Management. September 2002.

California State Regulations

Numerous California agencies have the ability to regulate biosolids management practices, as summarized below:

Agency	Authority
California Department of Health Services (DHS)	The DHS administers the California Hazardous Waste Control Law (HWCL) and has responsibility for determining whether biosolids are a hazardous or nonhazardous material.
State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs)	Through its nine RWQCBs, the SWRCB allows for individual waste discharge requirements (WDRs), or general waste discharge requirements (GWDRs) to regulate the discharge of biosolids to land. In order to streamline the permitting process, the SWRCB authorized the RWQCBs to prescribe GWDRs for Class B and Class A biosolids.
California Integrated Waste Management Board (CIWMB)	In 1995, the CIWMB established composting regulations that are applicable to biosolids composting. The regulations were amended by the CIWMB in November 2002 and last revised effective April 2003.
California Air Resources Board (CARB)	The CARB conducted a review of the PM-10 (10 microns in diameter) standard as a requirement of the Children's Environmental Protection Act (Senate Bill 25, 1999, Chapter 731). The anticipated tightening of air particulate standards will increase regulatory control of agriculture, particularly the application of biosolids products, such as compost at agricultural sites.

Source: California Integrated Waste Management Board Meeting, Agenda Item 4, 4/13/2004.

California State Classifications

According to the California Integrated Waste Management Board, there are essentially three categories of biosolids: Class B biosolids, Class A biosolids, and Exceptional Quality (EQ) biosolids.

- Class B biosolids may have low levels of pathogens which rapidly die-off when applied to soils, essentially becoming pathogen-free within a short period following application when the "Part 503" Rule requirements are followed.
- Class A biosolids are essentially free of pathogens prior to land application. The metal contents requirements under the Part 503 Rule are the same for Class A and Class B biosolids.
- Exceptional Quality biosolids have lower metals concentration requirements than either Class A or Class B biosolids and have the same pathogen levels as Class A biosolids.

County Regulations

Land application of "biosolids," (also referred to as "treated sewage sludge") is regulated under Chapter 8.13 of the Health and Safety Code. Key provisions of that regulation include:

- Defines biosolids and exceptional quality biosolids.
- Remains in effect until 2/28/2010 or until a permanent ordinance is adopted, which ever occurs first.
- Requires notification of the Public Health Department, Environmental Health Services Division 30 days prior to the land application of biosolids exceeding or equaling 5 cubic yards,
- Places a moratorium on land application of biosolids other than exceptional quality biosolids.
- Places a cap of 1,500 cubic yards on the cumulative total of exceptional quality biosolids that can be land applied within SLO County in any 12-month period,
- Allows unused capacity (of the 1,500 cubic yards noted above) to be carried over for a 12-month period.
- "Biosolids" as used in this ordinance also excludes biosolids that have been composted with other organic products such as green waste and sold in bulk form.

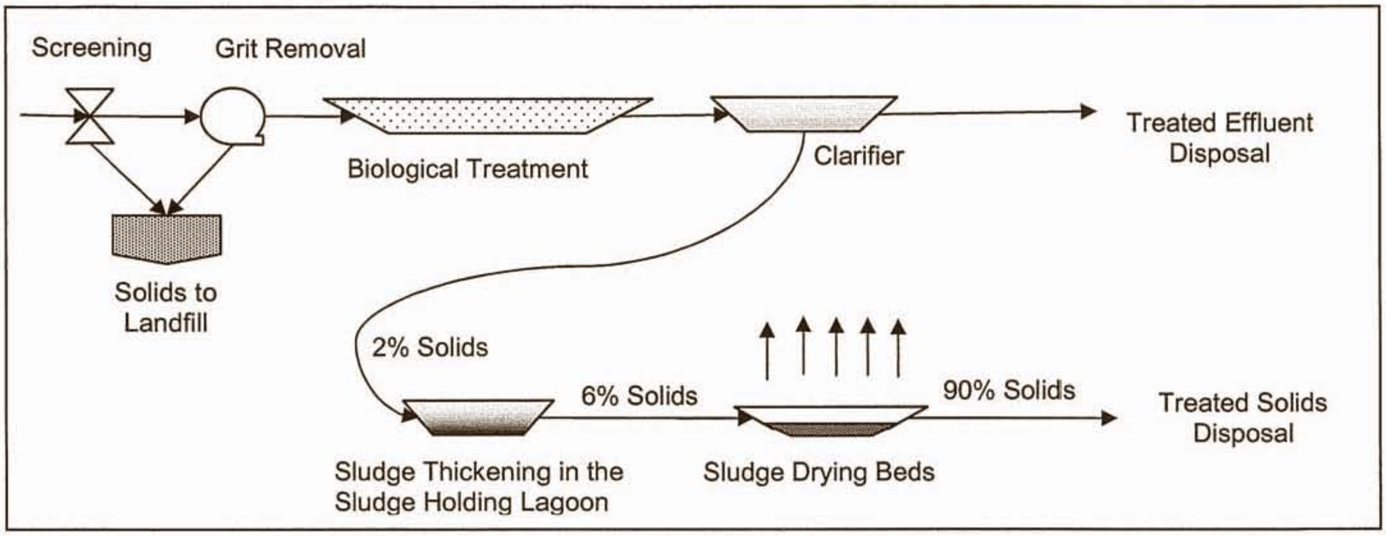
Current NCSD Solids Management Approach

Influent solids entering the Southland WWTF pass through grinders at the plant headworks before being pumped to the aeration ponds. The aeration ponds provide a zone for solids settling and aerobic treatment for the wastewater. Two types of solids are contained within the ponds: inorganic solids and end products of aerobic degradation of organic waste. Anaerobic zones exist near the bottom of the ponds, allowing some solids digestion to take place. Solids that build up in the aeration ponds are periodically moved to onsite drying beds.

Influent solids in Blacklake WWTF receive similar treatment: grinding then settling in the aeration ponds. When solids are removed from the Blacklake aeration ponds they are transported to the Southland WWTF for drying.

Solids are not removed from the Southland site on a regular schedule because their rate of accumulation is small in comparison to the volume available for storage and digestion. The present plan for disposal involves on-site drying then either land application or hauling to a landfill. The solids currently drying on-site contain a significant quantity of grit and other fixed solids, as well as sand and gravel which were incorporated into the material during its removal from the settling ponds. These materials make the sludge unacceptable by the nearest composting facility (Engel & Gray in Santa Maria). Planned headworks improvements (screening and grit-removal) will reduce the amount of these unacceptable materials in the sludge generated at Southland WWTF in the future.

Expected Solids Loading



Future Solids Generation and Treatment Flow Chart for Southland WWTF

For planning purposes, we are assuming the Southland WWTP will be upgraded to use a Biolac® treatment process, and that plant upgrades will include screening and grit removal. Influent solids that pass screening and grit removal will enter the aerated Biolac® treatment pond. During treatment additional solids will be created. (These solids are the residual cellular material of the micro-organisms that provide "treatment" of the wastewater.) Within the Biolac® treatment pond the movement of the diffusers and fine aeration will keep solids in suspension. These suspended solids will pass into clarifiers where settling occurs. From the clarifiers, waste sludge will be pumped into sludge holding lagoons for further settling and storage. Recent analyses (8/16/2007 samples) show a solids content of approximately 2% in the material pumped to the sludge holding lagoons. Further settling occurs in the sludge holding lagoons, increasing the solids content further.

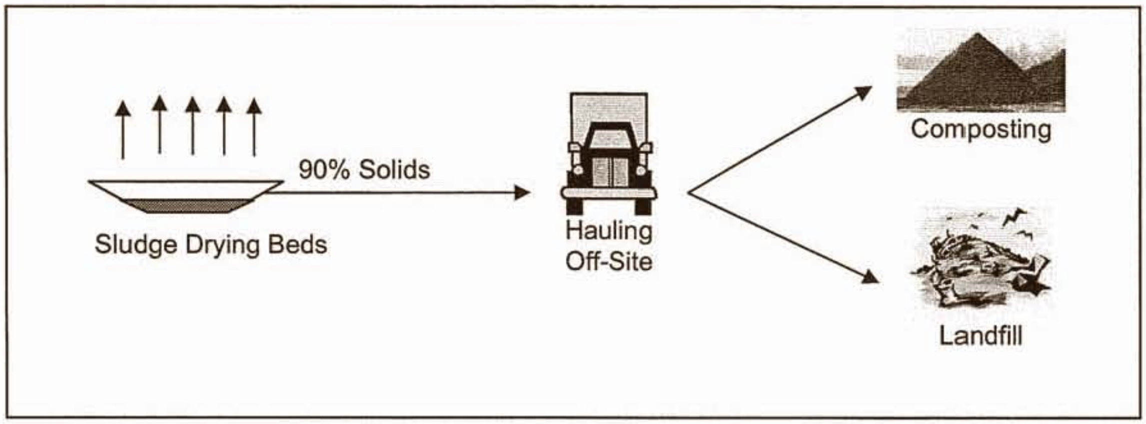
At the buildout flow rate (Average Annual Flow = 1.67 mgd in the year 2030), assuming settling to 6% solids, storage capacity in the Southland WWTF sludge holding lagoons is approximately 1 year. From here, there are several different processing options for the biosolids, as discussed below.

When operated at the full design capacity of 1.67 MGD the Southland WWTF is estimated to produce 3,600 lb/day of solids. Assuming the Blacklake plant produces a similar volume of solids per gallon of wastewater, its average flow of 0.15 MGD would contribute an additional 360 lb/day of solids, bringing the total solids load for the district to approximately 4,000 lb/day. Because no upgrades of the system are anticipated, we assume that accumulated solids from the Blacklake treatment facility will continue to be transported to the Southland site for drying and/or additional treatment.

Conceptual Processing and Disposal Options

Three options for additional processing and disposal or reuse of District biosolids are described below.

Hauling Dried Sludge to Receiving Facility or Landfill



Solids can be hauled to sludge receiving facilities for composting, land application, incineration, or other methods of disposal. Numerous wastewater agencies in SLO County utilize this option, including the South San Luis Obispo WWTP, Pismo Beach, Morro Bay, California Men's Colony, Cambria CSD, San Simeon CSD, and Cypress Ridge. The solids can be taken "wet" from the sludge holding lagoons (at approximately 6% solids). To reduce volume and weight (ultimately, disposal cost), additional processing may include using drying beds, or mechanical dewatering (for example with a belt press or centrifuge) before hauling for disposal or reuse.

Commercially operated composting facilities in Santa Barbara County (Engle and Gray in Santa Maria) and Kern County (San Joaquin Composting) accept sludge from municipal wastewater treatment facilities.

The District can dispose of their sludge by having it hauled to a receiving facility for composting, landfill, or some other disposal option, as shown below.

Several landfills in San Luis Obispo County are willing to accept sludge, at 50% solids or drier, either as inputs to a composting operation, or as waste for landfill.

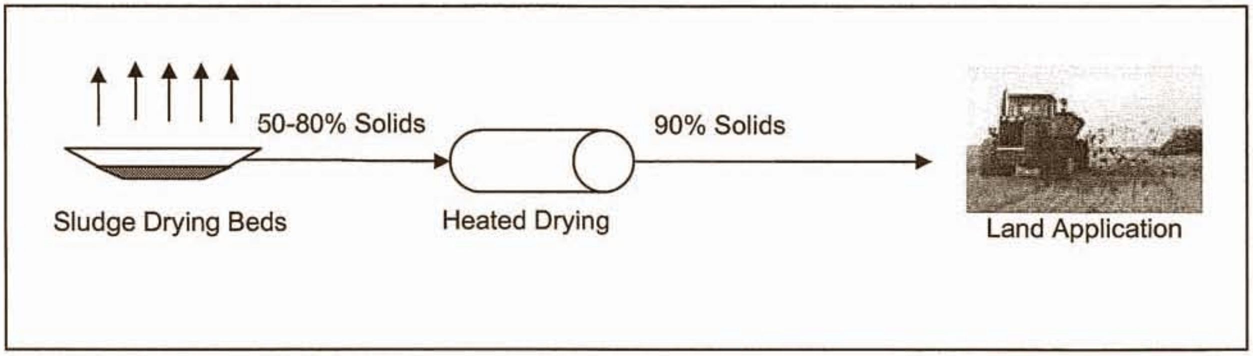
Advantages to hauling include:

- Minimal labor requirements;
- Minimal processing requirements;
- Lowest construction cost option (at the present time);
- Minimal permitting requirements;

Disadvantages include:

- Reliance on receiving facilities;
- The potential for tipping and transportation costs to increase; and
- Loss of a potential resource.

Land Application of Biosolids by District



Biosolids can be applied to land. These applied biosolids replenish organic material and supply nutrients. There are several methods for application and the method selected is dependent on the type of land use and the consistency of the biosolids. Liquid biosolids (containing between 3 and 6 percent solids) can be applied to land surfaces or injected into soil. Dewatered biosolids of up to 30 percent solids have a consistency of damp soil and can be easily applied with conventional agricultural equipment.

Federal regulations establish criteria for biosolids quality and restrictions on land application use. Biosolids must be processed before land application to help minimize odors, reduce vector attraction, and reduce or eliminate pathogens. State and local regulations establish further requirements.

To meet these regulations to minimize odors, reduce vector attraction, and reduce or eliminate pathogens, the District could use a heated drying process following the sludge drying beds, as shown above.

Note that an interim San Luis Obispo County ordinance greatly restricts land application as a viable option. Approved in March 2004, Ordinance 3023 creates a moratorium on the land application of biosolids, other than those classified as exceptional quality (EQ). Composted biosolids are excluded from the County ordinance. The ordinance was initially approved with a 24-month time period, then was amended in February 2006 to extend until February 28, 2010 or until a permanent ordinance is adopted. It places a cap of 1,500 cubic yards on the permissible volume of exceptional quality (EQ) biosolids land applied in the County in any calendar year.

Assuming the District's biosolids were dried to 90% solids, resulting in a bulk density of 1100 pounds per cubic yard, existing Blacklake and Southland WWTF flows would produce approximately 800 cubic yards per year. At Southland plant's upgraded capacity (1.67 MGD) approximately 1,300 cubic yards of biosolids would be produced. Therefore, at these rates the District would now be applying over one-half of the annual biosolids land application allocation for the entire county, and would eventually consume over 80% of the County-wide allocation.

Land application rates are also limited by the ability of the crop to uptake nutrients contained in the biosolids – the "agronomic rate". The agronomic rate is determined by soil conditions, nutrient content of the biosolids (nitrogen typically being the limiting nutrient), crop requirements, and other factors. Typical nitrogen concentrations in municipal wastewater biosolids are 4% (*Use of Reclaimed Water and Sludge in Food Crop Production*, National Academy Press, 1996.) Agronomic loading rates for crops are typically between 150 and 250 lb/acre per year. Assuming 4% total nitrogen in the biosolids, and an agronomic rate limited by 200 lb/acre of nitrogen, approximately 290 acres would be needed for land application of biosolids generated by the Blacklake and upgraded Southland wastewater plants when operated at design capacity. The required area could be larger or smaller depending on the agronomic rate that is determined for the specific soils, crops, management practices, and conditions at the time of application.

Note that public perception may present a significant obstacle to land application. SLO County enacted regulation of land application of biosolids in part due to negative public perception of land application of biosolids. These regulations were intended to "regulate" land application, but have effectively stopped land application of biosolids within the County (pers. comm. with Curt Batson, Director of Environmental Health Department, SLO County).

EQ (exceptional quality) biosolids must be free of pathogens, non-attractive to vectors (rodents and insects), and cannot exceed specified concentrations of various metals. Recent laboratory results tend to indicate that Southland WWTF solids meet the metals requirements. However, requirement to reduce pathogens and vector attraction will require either the use of digestion or composting.

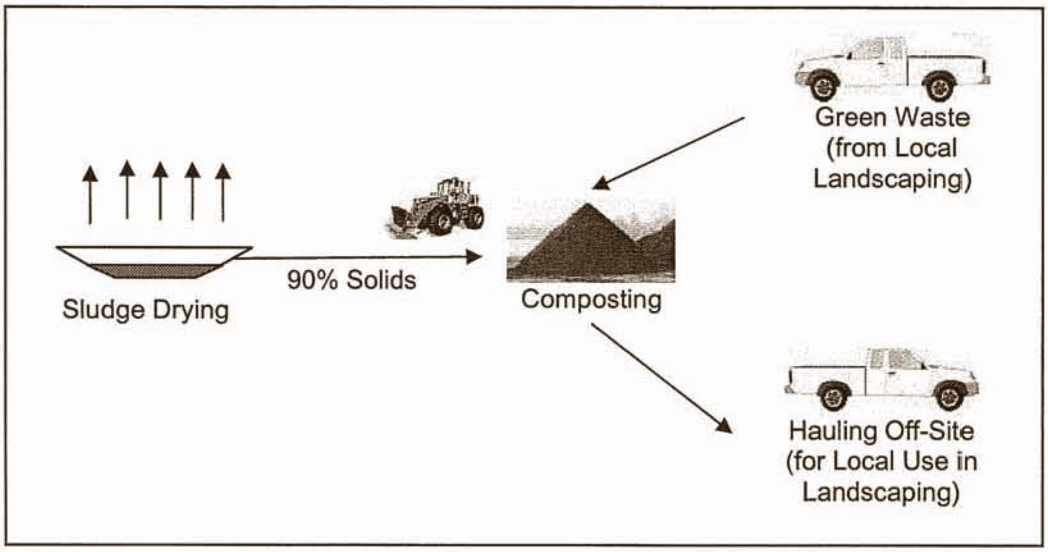
Land application has some advantages in comparison to other disposal options:

- Does not require bulking agents;
- Does not require hauling long distances.

However, land application has several significant disadvantages:

- Significant treatment, monitoring, and reporting requirements;
- Negative public perception; and
- Land application by other facilities may exhaust the allowable County-wide application rate.

Composting Biosolids with Green Waste



Biosolids are composted by being mixed with a bulking agent (typically wood chips, saw dust, or green waste) and placed in piles or an enclosed vessel where microbial activity breaks down the materials and raises the temperature. The increased temperature reduces or eliminates pathogens. Temperature and time requirements for pathogen reduction are dictated by federal, state, and local regulations and vary for the desired end-use of the product. The resulting compost is a humus-like material that can be used as a soil amendment to provide important nutrients and improve soil texture.

To produce composted biosolids the District could dedicate one of the sludge drying beds for this purpose, using locally produced green waste as the bulking agent, as shown below.

There are three common methods for composting municipal wastewater sludge.

- Aerated static piles are long piles of dewatered sludge mechanically mixed with a bulking agent spread over a bed of perforated pipes through which air is transferred. This method has an extensive operating history and is adaptable to changes in biosolids and bulking agent characteristics, but has wide ranging capital costs and requires a moderate amount of labor.

- Windrows are long piles of dewatered sludge mixed with a bulking agent. Because windrows are without supplied air, the piles are mechanically turned periodically to induce air transfer and supply oxygen. Windrows are a proven technology on the small scale and are also adaptable to changes in biosolids and bulking agent characteristic. Capital costs are relatively low, but operations are labor intensive.

- In-vessel composting is done by placing a mixture of dewatered sludge and bulking agent into a silo, vessel, tunnel, or channel. Mixing devices, such as augers or rams, are used to aerate and move the product through to the point of discharge. In-vessel technology has a short operating history, is sensitive to changes in biosolids and bulking agent characteristics, and has high capital costs compared to other methods. In-vessel composting is not labor intensive, but relies highly on mechanical equipment. Main advantages include small land area requirements and increased control of air pollution (odors, dust, particulates, etc) from the compost.

Green waste may be readily available in Nipomo. At the present time annual green waste chipping events are sponsored by the Fire Safe Council with the assistance of the California Department of Forestry and the Air Pollution Control District. Residents are encouraged to pile their clean yard waste materials near the curb for this free on-the-spot chipping service. It may be possible to collect green waste material through this program for composting with biosolids.

Challenges involved with starting a composting program may include:

- Capital cost for equipment and on-site improvements,
- Acquiring an adequate volume of green waste or other bulking agent,
- Labor requirement to maintain the composting,
- The potential for odors at the composting site,
- Meeting regulations for composted biosolids,
- Determining a market for the end product, and
- The risk that future regulations will tighten for composted biosolids.

However, biosolids composting has several desirable aspects, such as:

- Establishing a local beneficial use,
- Creating a resource out of a product previously viewed as waste,
- Less reliance on decreasing landfill space for solids disposal,
- Added flexibility for solids processing, and
- Reduction of transport and disposal fees.

Currently, Morro Bay/Cayucos Wastewater Treatment Plant is the only facility in San Luis Obispo County that composts biosolids from their treatment facility. Since 2002, staff there have been developing the beneficial reuse program and are currently composting approximately 50 percent of the treatment plant's digested biosolids onsite with windrows using EPA 40 CFR 503 guidelines. The facility produces exceptional quality (EQ) biosolids compost using green waste from local arborists and the City of Morro Bay. At this quality, the product is essentially free from restrictions, save record-keeping and laboratory proof of EQ standards. The compost is given away to the public and private landscapers for use.

Typical Capital and O&M Costs

Typical costs for capital improvements and operation and maintenance are projected below. These projections are based on plant flows at buildout. Projected costs are given in present value.

Hauling to Sludge Receiving Facilities/Landfills

The relative cost of wet and dried hauling options are compared below. As is evident, drier sludge costs less to remove.

Table 1 Biosolids Hauling Cost Opinion - Comparison of Varying Solids Content

Option	Units	Wet from Sludge Holding Lagoons	Dry from Sludge Drying Beds
Solids Content	% by weight	6%	90%
Solids Loading Rate	lb/day	3,980	3,980
Sludge Loading (includes water)	tons/year	12,100	700
Truck Capacity	tons	25	25
Truck Loads per year	loads per year	484	28
Trucking Fee to SJ Composting	$/truck load	$680	$483
Tipping fee	$/ton	$26	$26
SJ Composting tipping fee	$/truck load	$650	$650
Total cost per truck	$/truck load	$1,330	$1,133
Cost per year (1)	$/year	$640,000	$32,000
Total cost per ton of sludge (1)	$/ton	$53.00	$45.00
Total cost per ton of solids (1)	$/ton	$890.00	$44.00

(1) Rounded to 2 digits.

Upgrading the existing sludge-drying beds initially and building additional sludge-drying beds in the future is recommended in the Southland Wastewater Treatment Facility Master Plan:

> *Although the District has used the existing drying beds successfully for many years, we recommend upgrading them. The beds are not lined, and any infiltration through the bottom of the beds could contribute to groundwater degradation. In addition, the beds will be used more regularly in the future and should be lined with concrete to allow vehicles and equipment to work in the ponds without getting stuck. Therefore, initially (during construction of the Phase I Biolac improvements – in the next 2 years) we recommend lining the ponds with concrete and installing a decanting pump station for dewatering the beds and conveying supernatant back to the plant's headworks for treatment. ...*

In the next phase of construction, it is recommended that the District construct two (2) new sludge drying beds by 2015 (simultaneously with Phase II upgrade of the Biolac system to meet 2030 demands) similar in size to the existing beds.

Typical present value (2007) costs that can be expected for hauling dried biosolids from the Southland WWTF are summarized below.

Typical Costs for Hauling Offsite	Capital Cost	O&M Cost	Annual Cost [2]
Construct drying beds [1]	$1,540,000		$135,000
Hauling and Tipping Fees;		$32,000	32,000
Contingency		20,000	20,000
Total	$1,540,000	$52,000	$187,000

1. Cost projection for two additional solids drying beds in Southland WWTF Master Plan, 2007.
2. Amortized at 6% over 20 years.

Composting by the District

Capital costs for composting are wide ranging, as there are different technologies. In-vessel composting has the highest capital costs. Aerated piles require the installation of piping to provide air circulation under and into the pile. Windrows offer the lowest capital costs and equipment requirements.

The City of Morro Bay operates their composting pilot project with little to no additional capital costs. Their existing concrete-lined drying beds and a front-end loader are used for composting windrows and green waste is collected from local arborists and the City. The composting operation is run from May through December and ongoing costs include the part-time labor of one employee (approximately ¾-time) and laboratory analyses. Some money is saved by diverting 50 percent of the biosolids that would otherwise be hauled to San Joaquin Composting. The cost to implement a full-scale composting operation onsite as part of the planned Morro Bay treatment plant upgrade was recently estimated to range from $800,000 to $2,400,000. A wide range of costs resulted because a number of different treatment options were examined.

Typical costs that can be expected for windrow composting at the Southland WWTF are summarized below.

Typical Costs for Composting Biosolids	Capital Cost	O&M Cost	Annual Cost [2]
Construct a paved/concrete-lined surface[1]	$1,540,000		$135,000
Front-end loader to move, turn piles [3]	100,000		10,000
One employee, 3/4-time [5]		$38,000	$38,000
Laboratory analyses [4]		20,000	20,000
Fuel, repairs, and contingency		20,000	20,000
Total	$1,640,000	$78,000	$223,000

(1) Cost projection for two additional solids drying beds in Southland WWTF Master Plan, 2007.
(2) Amortized at 6% over 20 years. (3) Based on $95,000 bid for standard bucket loader, City of Santa Maria, May 2005. (4) 6 analyses per year. (5) Based on 2007-08 proposed District budget, average total cost $48,371 per employee.

For comparison purposes, as part of the August 2007 "Viable Project Alternatives Fine Screening Analysis" for the Los Osos Wastewater Project the capital and annual O&M costs for a composting facility for a wastewater treatment plant designed to treat a wet-weather flow of 1.4 MGD were estimated to be $1 million and $180,000/year, respectively.

Land Application

Land application of biosolids (without composting) requires production of Class A exceptional quality (EQ) biosolids. This requirement could be met by using a heat dryer which raises the biosolids temperature to 80 deg C and reduces the moisture content to 10% or less. Hauling costs would be significantly less than for hauling to a disposal/composting facility, assuming the land application site is relatively close to the biosolids treatment site.

Typical costs that can be expected for heat drying and land application are summarized below. These costs do not include the cost of land purchase.

Typical Costs for Land Application	Capital Cost	O&M Cost	Annual Cost [2]
Construction [1]	$3,600,000		$315,000
O&M [1]		$130,000	$130,000
Hauling [3];		20,000	20,000
Contingency		21,000	21,000
Total	$3,600,000	$171,000	$486,000

1. Scaled up from "Viable Project Alternatives Fine Screening Analysis" estimate for Los Osos WWTP operating at 1.4 MGD.
2. Amortized at 6% over 20 years.
3. Assumes no cost for tipping.

November 30, 2007

Summary

At design capacity the Blacklake WWTP and the upgraded Southland WWTF are expected to produce approximately 4,000 lb/day of solids. A number of different disposal options were considered. Three disposal options appear suitable for the District's needs at this time: (1) hauling to an offsite facility for composting or other disposal method, (2) onsite composting with locally collected green waste, and (3) land application of heat-dried biosolids.

Hauling to an offsite facility involves little additional effort, but may become more expensive as fuel prices rise and regulations change. No capital investments are needed at the present time, but an additional sludge drying bed will need to be constructed as plant flows and associated solids loads increase.

Composting on-site requires some additional capital investment, a dedicated operator, a readily available supply of greenwaste, and a market for the compost.

Land application will require capital investment in a facility to reduce vector attraction, and eliminate pathogens. A recently enacted County ordinance places significant restrictions on the land application option. At projected flow and solids production rates for the year 2030, 290 acres of land may need to be available for land application.

Typical capital and O&M costs for these three options are shown below.

Typical Costs for Biosolids Disposal	Capital Cost	O&M Cost	Annual Cost (2)
Hauling Offsite	$1,540,000(1)	$50,000	$190,000
Onsite Composting	$1,640,000	$80,000	$220,000
Heat-Drying and Land Application	$3,600,000	$170,000	$500,000

(1) Capital improvements for offsite hauling will not be needed until solids loading rates exceed current capacity.
(2) Amortized at 6% over 20 years

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