

2005
CITY OF SALEM, OREGON
BIOSOLIDS MANAGEMENT PROGRAM - BACKGROUND INFORMATION

Name and address of person(s) performing final re-use for Willow Lake Water Pollution Control Facility

Willow Lake Water Pollution Control Facility
5915 Windsor Island Road North
Salem OR 97303

Phone: 503 588 6380
Contact: Francis Kessler, Wastewater Services Manager
Mark Johnston, Residuals Manager

Local Liquid Augment Transport and Application Contract
Pacific Powervac LLC **Phone:** 503 261 9800
14041-B NE Sandy Blvd. **Contact:** Robert Anderson
Portland OR 97230

Local Liquid Augment Transport and Application Contract
Cowlitz Clean Sweep **Phone:** 360 423 6316
55 International Way **Contact:** Ken Partridge
Longview WA 98632

Local Cake Application Contract
Residuals Inc. **Phone:** 503 508 7266
618 Valleywood Drive SE **Contact:** Brian Johnston
Salem OR 97306

Madison Ranch Transport Contract
Groat Brothers Inc. **Phone:** 360 887 4600
1531 Guild Road **Contact:** Dennis Groat
Woodland WA 98674

Madison Ranch Application Contract
K & S Madison, Inc. **Phone:** 541 376 8107

WILLOW LAKE WASTEWATER TREATMENT PLANT

| | |
|--|--|
| Location | Salem, Oregon |
| Startup date | 1964 |
| Source category | Major domestic |
| Treatment system | Class IV |
| Service population | 212,000 |
| Maximum organic load: population equivalent (PE) | 850,000 |
| Number of employees | 53 |
| Discharge point | Willamette River at river mile 78.4 (Outfall 001A & 001B) |

PLANT FLOW PARAMETERS AND PERMIT LIMITATIONS

| | | | |
|---|-------------|-------------------------------|-------------|
| NPDES Permit Number 101145 Renewal Date 11-24-04 Expiration Date: 10-31-09 | | | |
| Summer (normal canning season) June 1 - October 31 | | Winter November 1 - May 31 | |
| Average dry weather flow | 35 mgd | Average wet weather flow | 62 mgd |
| CBOD | 32 mg/L | CBOD | 25 mg/L |
| TSS | 37 mg/L | TSS | 30 mg/L |
| E. Coli | 126/100 mls | E. Coli | 126/100 mls |
| pH | 6.0 - 9.0 | pH | 6.0 - 9.0 |

COLLECTION SYSTEM

| | |
|-----------------------------|-----------|
| Collection system | Class IV |
| Sanitary sewer mains length | 695 miles |
| Permanent SS pump stations | 34 |

PRETREATMENT PROGRAM

| | |
|--|----|
| City of Salem Revised Sewer Ordinances, Chapter 74 addresses Sanitary Pretreatment | |
| Pretreatment permitted industries | 32 |
| Categorical users | 9 |
| Permitted septic haulers | 1 |

2005: ANNUAL BIOSOLIDS REPORT

Introduction

The City of Salem Oregon, is located in the Willamette Valley, an area of rich agricultural production. The local climate is characterized by cool, moist winters and warm, dry summers, with an average annual precipitation of 40 to 45 inches. Snowfall and extended periods of freezing weather are infrequent.

The rich soils and mild climate of the Salem area are ideal for farming. Soils are dominated by silty-clay deposits of Willamette River bottom sediments. Eastward, the soils are predominantly clay, while to the northeast, loamy soils predominate. Soil conditions and agricultural practices allow local biosolids application during fair weather from early spring through October and at our Easter Oregon application site throughout the winter months.

The City of Salem owns and operates a municipal sewage collection and wastewater treatment facility under National Pollutant Discharge Elimination System (NPDES) Permit Number 101145. The Willow Lake Water Pollution Control Facility (WLWPCF) provides secondary treatment for a population center of approximately 212,000, which includes Salem, Keizer, Turner, and unincorporated parts of Marion County.

The Biogro Program

The City of Salem's biosolids distribution program (Biogro), is charged with the task of biosolids management. The Biogro Program is dedicated to the beneficial reuse Salem's recycled biosolids as a valuable commodity providing nutrients and soil enhancement properties to Oregon's farmers and ranchers while complying with federal, state, and local biosolids regulations and management practices.



Figure 1: Tanker with Biogro Emblem

The Biogro Program has managed the biosolids beneficial reuse program for over 35 years, applying Class B biosolids on private agricultural lands since 1968.

Currently, the program manages municipal staff and equipment, oversees reporting and documentation requirements and oversees numerous transport and application service contracts. Other important elements of the program include digester operation, managing liquid and dewatered biosolids production, and application site management.

2005 Wastewater Processing

The treatment facility is sited on 40 acres between the City of Keizer's urban growth boundary and the Willamette River. WLWPCF is designed for an average dry weather flow and peak wet weather flow of 35 and 105 million gallons per day (mgd). Treatment processes include mechanical screening, secondary treatment, sludge thickening, anaerobic digestion, cogeneration, solids dewatering, chlorine disinfection and dechlorination. Treated effluent from



Figure 2: WLWPCF

the treatment plant is discharged to the Willamette River (78.4 River Mile), in Marion County, Oregon.

The facility receives flow from residential, commercial, light industrial, and institutional dischargers, as well as seasonal loadings from local canneries. In 2005 approximately **129,930** gallons of septage was received at a city operated septage receiving facility and conveyed to the plant for treatment. Presently, the City manages an EPA approved pretreatment program which oversees **32** permitted dischargers, including **9** categorical industries.

The facility can operate in a variety of secondary modes, including; trickling filter, conventional air activated sludge, high purity oxygen activated sludge, trickling filter/air activated sludge, and

trickling filter/high purity oxygen activated sludge in parallel. The flexibility of the secondary process allows the WLWPCF to handle wide variations in Biochemical Oxygen Demand (BOD) loading which occur between canning and non-canning seasons.

2005 Biosolids Stabilization Processes

In 2005 primary solids were thickened in one of three (3) gravity thickeners. Secondary solids were thickened on a Gravity Belt Thickener. Solids were thickened to approximately five percent prior to mesophilic primary/secondary anaerobic digestion in one of two digester facilities.

The north digester facility is composed of two (2) mechanically mixed, free cover, primary digesters which overflow to a floating dome, secondary digester. The south digester facility is composed of two (2) gas mixed, fixed cover, primary digesters which overflow to two (2) secondary digesters. All four primary digesters are externally heated with coiled heat exchangers using a modified hot water loop from a cogeneration system as a heat source. Additionally, each facility houses boilers as a redundant heat source. The digester facilities gas systems are common and provide fuel for the cogeneration system.

Design organic loading on the primary digesters is approximately 0.23 pounds of volatile solids/day/cubic feet of digester volume. In 2005 the average organic loading on the primary digesters was approximately **0.064** pounds of volatile solids/day/cubic feet of digester volume. The solids flow stream is divided between the north and south digester facilities using magnetic flow meters and automated feed valves. The south facility has a larger capacity and receives 60 percent of total plant solids production, while the north facility receives 40 percent. As a result of the 60/40 flow split and identical feed sources, the mean cell residence time (MCRT), and volatile solids loading rates are similar. There are no substantial differences in biosolids produced at either facility.

2005 Biosolids Analysis, Quantity, and Quality

In 2005 WLWPCF analyzed biosolids for metals and nutrient characteristics more frequently than the minimum requirements listed in 40 CFR 503.16, Table 1. All biosolids analyses were performed in-house.

Total and volatile solids of raw digester feed were measured daily. Primary digester feed rates and temperatures were also measured daily. Primary digester alkalinity and pH were measured three (3) times per week. Monthly averages were used to calculate total volatile solids reduction.

When the Belt Filter Press was in operation daily dewatered biosolids samples were collected every four (4) hours. During local liquid application biosolid samples were taken when filling each tanker load. Dewatered and liquid samples were composited separately and analyzed monthly for all pollutants listed in 40 CFR 503.13, Table 1, as well as Total Solids, Total Volatile Solids, pH, Total Kjeldahl Nitrogen (TKN), Nitrate Nitrogen (NO₃) and Ammonia Nitrogen (NH₃), Phosphorus (P), and Potassium (K).

In 2005 the City of Salem generated approximately **3,475.4** dry US tons of Class B biosolids. Approximately **3,448.6** dry US tons were land applied. The remaining **26.8** dry US tons were applied in January 2006. The applied biosolids in 2005 contained about **193,857** pounds of Plant Available Nitrogen (PAN), **158,683** pounds of P, and **32,556** pounds of K.

All biosolids produced met the pathogen reduction requirements in 40 CFR 503.32(b)(3), Appendix B; Processes to Significantly Reduce Pathogens (PSRP), Item 3, which states:

Anaerobic digestion - Sewage sludge is treated in the absence of air for a specific mean cell residence time (MCRT) at a specific temperature. Values for the MCRT and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.

All biosolids produced also met the vector attraction reduction (VAR) requirements in 40 CFR 503.33(b)(1) which states:

The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent (see calculation procedures in "Environmental Regulations and Technology-Control of Pathogens and Vector Attraction in Sewage Sludge," EPA-625/R-92/013, 1992, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268).

The overall MCRT averaged **45.1** days at an average temperature of **97.4** degrees Fahrenheit (**36.3** degrees Celsius), and the VAR averaged **64.0** percent.

2005 Biosolids Management Description

In 2005 the City of Salem managed **40** applications of Class B biosolids (liquid and dewatered) on **22** DEQ authorized sites consisting of sod, hay, grass seed, and pasture lands totaling about **1,819** acres. Control of application rates was the responsibility of the City of Salem. All applications were consistent with site restrictions outlined in 40 CFR 503.32 (b)(5) and application rates specified in the individual DEQ site authorization letters.

In 2005 Belt Filter Press maintenance was scheduled from June through late August to coincide with low flow levels in the Willamette River. Additionally, BFP production was halted from September 3 through September 22 for cake truck maintenance.

In 2005 approximately **51** percent of the annual biosolids volume (dry US tons) were produced during the local application season, which runs from May to October (on most application sites). During the remainder of the year, dewatered biosolids were transported to Madison Ranch, in eastern Oregon.

This year, the City of Salem relinquished application rights on Madison Ranch Fields #1 & 2 in exchange for a new reuse site also located on Madison Ranch. The additional purchase of 194 acres expanded the new application site to **720.8** acres. This site has been contracted for the next **14** years. In 2005 no new application sites were approved other than the new reuse acreage situated on Madison Ranch.



Figure 3: Madison Ranch Application Site

In 2005 the Biogro staff continued to use a Global Positioning System (GPS) to measure acreage and lay out buffer zones around wells, structures, sensitive areas and the perimeter of the property. A buffer zone of at least 50 feet was required around property perimeters and near surface water. A buffer zone of at least 200 feet was required around all residences and wells.

Well and soil samples were collected prior to any local application. Well samples were tested for NO₃. Soil samples were analyzed for background levels of pH, Cation Exchange Capacity (CEC), total NO₃, P, K and 40 CFR 503.13, Table 1 pollutants.

All analytical results were incorporated into the Biogro program database and shared with the farmer. In addition, the cumulative loading of nutrients and pollutants were recorded. To-date monitoring has not revealed any problems related to biosolids applications.

All record keeping and reporting practices including the NPDES Discharge Monitoring Report, farmer monitoring reports, and the EPA 503 Annual Compliance Report comply with 40 CFR 503.17 and 503.18.

In 2005 liquid biosolids were applied using 6000 and 5500 gallon pressurized tanker trucks at application rates pre-approved by the DEQ. Typically, an application rate of about 1 dry ton per acre provided approximately 100 pounds of Plant Available Nitrogen (PAN). Dewatered biosolids were also applied using a tractor and manure spreader. Typically, an application rate of about 3 dry tons per acre provided approximately 100 pounds of PAN. DEQ site approval letters approved PAN application rates from 75 pounds to 150 pounds per acre.



Figure 4: Liquid Application



Figure 5: Solids Handling Building