MWMC Eugene-Springfield WPCF Facility Plan—Projected Flowstreams for Solids Processes and Capacity Analysis of Biosolids Treatment Processes and Facilities

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Executive Summary

This technical memorandum has been prepared as part of the 2003 Metropolitan Wastewater Commission (MWMC) Eugene-Springfield Water Pollution Control Facility (E-S WPCF) Facility Plan Update (Project Number P80010). The analysis detailed in this memorandum includes projected biosolids flowstreams through the year 2025 at the E-S WPCF and the Biosolids Management Facility (BMF), as well as a capacity analysis of solids treatment processes and major conveyance systems at and between the E-S WPCF and BMF. Existing facility capacities and, where appropriate, future potential capacities have also been developed for the Biocycle Farm (BF), Seasonal Industrial Waste Facility (SIWF), and Cooperative Farms.

Solids projections have been developed at 5-year increments from 2005 to 2025 for solids flowstreams and for liquid flowstreams associated with solids treatment processes. Figure A-1 in Attachment A illustrates the general solids flow schematic at the E-S WPCF and BMF. Figure A-2 illustrates the conveyance system between the E-S WPCF, BMF, BF, and the SIWF. Table 1 summarizes 2003 production and 2025 projections for critical solids flowstreams. Table B-1 in Attachment B details the solids and solids-related flowstreams illustrated in Figure A-1 at the E-S WPCF. Solids projections over this planning period have taken into account the addition of future secondary clarification, aeration basins, and effluent filtration. Similarly, operational changes such as the pumping of thin primary sludge have been accounted for, as well as how the BMF and BF will be operated in the future.

TABLE 1
Summary of Biosolids Projections
MWMC Facility Plan, Eugene-Springfield

Flow Stream	Average Annual Biosolids (in dry tons per year unless noted otherwise)	
	2003[1]	**2025**
Primary Sludge	3,670	7,600
Waste Activated Sludge	3,730	7,900
Digested Biosolids (biosolids to Biosolids Management Facility [BMF])	3,900	8,600
Applied to Belt Filter Press (BFP)	6,300	5,000
Applied to Biocycle Farm (BF)	N/A[5]	2,950[6]
Mechanically Dewatered Biosolids (BFP)	6,200[2]	4,900[3]
Filtrate recycle from Mechanical BFP Dewatering	Data Not Available	242,000 gpd[4]
Available effluent for reuse	3.5 MGD	13-14 MGD
Facultative Sludge Lagoon (FSL) supernatant	248,000 gpd	302,000

(1) Data through October 2003.
(2) From daily recorded BMF data during BFP seasonal operation period of March – September. Data available was through September 17, 2003.
(3) Based on all BFPs online 85% of time and operating at current operational averages of 12.2 hours/day, 5 days/week, 7 months/year (March-September) and solids production at hydraulic maximum, which is the limiting factor.
(4) Based on all BFPs online, 98 percent solids capture, and current operational averages shown in Note 3.
(5) BF Phase 1 of 2 to be online in Spring 2004.
(6) Based on 2025 non-irrigated capacity of crops at the BF. BF capacities are shown in Table 3.

Table 2 summarizes the capacity of the main solids treatment processes at the E-S WPCF and BMF, as well as the conveyance systems between the two facilities. The capacities listed in Table 2 represent the limiting capacity of the process. Table 2 also indicates the amount of capacity available for installed (all units online) and firm (largest unit offline) conditions.

TABLE 2
Summary of E-S WPCF and BMF Solids Processing Capacity Assessment
MWMC Facility Plan, Eugene-Springfield

	Assessment						Available Capacity			
				Capacity			Compared to Installed		Compared to Firm	
Unit Process	Limiting Flow Condition	Limiting Factor	Design Criteria	Installed[1]	Firm[2]	Current Loading (2002)	Quantity	% of Total Capacity	Quantity	% of Total Capacity
WAS Thickening	WWMW	Solids Loading	2010 lbs/hr[9]	96,500 ppd	48,250 ppd	38,900 ppd	57,600 ppd	60%	9,340 ppd	19%
Anaerobic Digestion	AA[8]	Hydraulic Loading	20-day SRT	3.48 MG	2.32 MG	131,200 gpd	856,000 gal	25%	-304,000 gal	0%
Facultative Sludge Lagoons[3]	AA	Solids Loading	6-foot Solids Depth	41 MG	31 MG	30 MG[4]	11 MG	26%	1 MG	2%
Biosolids Dewatering (BFP)[5]	AA	Hydraulic Loading	140 gpm[10]	307,440 gpd	205,000 gpd	305,200 gpd	2,240 gpd	1%[6]	-100,200 gpd	0%[6]
Biosolids Dewatering (Drying Beds)[5]	AA	Hydraulic Loading	6” Solids Depth, Avg.	3,100 Dry Tons	2,700 Dry Tons	4,800 Dry Tons[7]	-1,700 Dry Tons	0%[6]	-2,100 Dry Tons	0%[6]
Biosolids Forcemain	AA	Pump	430 gpm	860 gpm	430 gpm	104 gpm	756 gpm	88%	326 gpm	76%
Reclaimed Water Main	AA	Pipe	2,800 gpm	2,800 gpm	N/A	400 gpm	2,400 gpm	86%	N/A	N/A
Supernatant Line	AA	Hydraulic Loading	800 gpm	800 gpm	0	158 gpm	642 gpm	80%	0	0%

TABLE 2
Summary of E-S WPCF and BMF Solids Processing Capacity Assessment
MWMC Facility Plan, Eugene-Springfield

Unit Process	Assessment					Current Loading (2002)	Available Capacity			
	Limiting Flow Condition	Limiting Factor	Design Criteria	Capacity			Compared to Installed		Compared to Firm	
				Installed[1]	Firm[2]		Quantity	% of Total Capacity	Quantity	% of Total Capacity

(1) All units online.
(2) Largest unit offline.
(3) Current loading represents average biosolids volume in the four lagoons in 2002 based on average biosolids depth of 9 feet
(4) Based on influent biosolids to FSL at 2 percent dissolved solids (DS) and effluent biosolids from FSL at 3 percent DS, 70 percent volatile suspended solids (VSS) in FSL influent biosolids, and 25 percent VSS reduction in FSL.
(5) Capacities based on using drying bed space for either mechanical dewatering or air-drying dewatering. Total capacities are not cumulative.
(6) Biocycle Farm Phase 1 to become operational in Spring 2004 and will reduce load required by BFPs and/or Air-Drying Beds.
(7) Represents 2002 digested biosolids solids production; however, air-drying beds has not been used in the last several years.
(8) AA and WWMM flow conditions were evaluated, AA was limiting based on associated 20-day solids retention time (SRT).
(9) Hours of operation equal to 24 hours/day, 7 days/week.
(10) Hours of operation equal to 12.2 hours/day, 5 days/week, 7 months/year.

Table 3 summarizes the biosolids quantities, in dry tons per year, of MWMC's current (2003) biosolids reuse program. Table 3 also shows the maximum receiving potential of the reuse sites based on current site conditions. BF capacity is based on liquid biosolids applied to 425 acres and dewatered biosolids applied to 132 acres. SIWF capacity is based on liquid biosolids being applied to approximately 200 acres.

TABLE 3
Summary of Current Biosolids Reuse in Dry Tons per Year
MWMC Facility Plan, Eugene-Springfield

Reuse Facility	2003 Annual Production	2003 Land Application	Existing Maximum Capacity	Near-Term (Spr 2004) Application	Maximum Future Potential[1]	
					2010	2025
Biocycle Farm[2]	6200	0	0	2,200[5]	3,500	3,500
Cooperative Farms		5,900	32,000	4,600[6]	42,000	42,000
Composting[4]		300	300	300	10% Annual Production	10% Annual Production
SIW[3]		0	0	0	1,200	1,200

(1) Assumes irrigated crops.
(2) Includes both liquid and dewatered biosolids application.
(3) Assumes irrigated poplars growing.
(4) Approximately 5 percent of annual BMF production.
(5) Non-irrigated, immature poplars.
(6) Total dewatered cake production minus composting.

Introduction

This technical memorandum has been prepared as part of the 2003 Metropolitan Wastewater Management Commission (MWMC) Eugene-Springfield Water Pollution Control Facility (E-S WPCF) Master Plan Update (MWMC Project No. 80010) and includes an analysis of biosolids flow projections (Task 9.1) and process/facility capacity (Task 9.2). Current and future biosolids (liquids and dewatered) and liquid stream (FSL supernatant, belt filter press filtrate, and gravity belt filtrate) production at the E-S WPCF and Biosolids Management Facility (BMF), as well as storage, processing, and conveyance between all related facilities (for example, Biocycle Farm [BF] and Seasonal Industrial Waste Facility (SIWF)) has been quantified. A capacity assessment of unit processes and conveyance systems associated with biosolids treatment and handling at the E-S WPCF, BMF, BF, and SIW, as well as overall facility capacity, has been developed.

Solids Process Flow and Mass Projections

Flowstreams associated with solids treatment processes at the E-S WPCF and BMF were evaluated. The flowstreams that were analyzed include waste activated sludge (WAS), thickened waste activated sludge (TWAS), primary sludge (PS), thickened primary sludge (TPS), digester feed sludge (DFS), digested sludge (DS), belt thickener recycle (TF), gravity thickener recycle (GTF), liquid biosolids to the belt filter presses (BFPs), liquid biosolids to the BF, dewatered biosolids (DSC), BFP recycle, and supernatant.

Flows were projected from 2005 to 2025 at 5-year increments for dry weather average (DWA), dry weather maximum month (DWMM), wet weather average (WWA), wet weather maximum month (WWMM), and wet weather maximum week (WWMW) flow conditions. Future influent plant flows for the five flow conditions were taken from the projections developed in Technical Memorandum No. 3, Flow and Load Projections. The upper limit values presented in the October 7, 2003 memorandum for maximum month flows were used for this evaluation. Development of projected biosolids flowstreams was accomplished through the use of CH2M HILL's steady-state, mass balance model Pro2D. Design criteria used in the model were based on CH2M HILL and industry standards. Key operational assumptions developed in Tasks 2, 3, and 4 of this Master Plan Update were used in the model. The operational assumptions, on an incremental year basis, included:

2005:

- South aeration basin train in step-feed operation
- Eight secondary clarifiers
- No effluent filters
- No pumping of thin primary sludge

2010:

- South aeration basin train in step-feed operation
- Ninth secondary clarifier added
- Installation of effluent filters capable of treating 30 mgd

- Thin pumping of primary sludge (1 percent dry solids) during wet weather conditions only
- Installation of gravity thickener for primary sludge achieving thickened primary sludge performance of 5 percent dry solids

2015:

- Same as 2010, except
- Both north and south aeration basin trains in step-feed operation

2020:

- Same as 2015, except
- Tenth secondary clarifier added

2025:

- Same as 2020

General:

- During dry weather model runs, one secondary clarifier would be offline
- During wet weather model runs, all secondary clarifiers would be online

Table B-1, in Attachment B, presents the projected biosolids flow streams in volumetric flow (mgd), daily mass (ppd), and concentration (mg/L). As can be seen in Table B-1, quantities associated with processes at the BMF are not shown. Future operational alternatives, to be developed in Task 9.3, will affect how flow is controlled from the FSLs to either dewatering (BFPs), the BF, or SIWF. Upon development of recommended operating alternatives, Table B-1 will be completed.

Biosolids and Effluent Capacity Analysis

Capacities for solids treatment processes and facilities have been evaluated at the E-S WPCF, BMF, BF, SIWF, and Cooperative Farms. Similarly, the major conveyance systems between the WPCF and the BMF have been evaluated. Capacities of solids treatment processes are based on solid and hydraulic loading design criteria. For land application sites (BF, SIWF, and Cooperative Farms), capacities have been established based on application of liquid biosolids and dewatered biosolids of irrigated and non-irrigated land. Conveyance capacities have been established based on pipe operating pressures and available pumping capacity.

Detailed capacity data for the processes and facilities discussed below is included in Attachment C, Capacity Tables. Table C-1 provides summarized capacity data and limiting factors for processes and associated equipment (for example, pumps) related to thickening, digestion, dewatering and biosolids storage. Table C-2 provides detailed data for the information presented in Table C-1, as well as the conveyance systems capacities.

E-S WPCF

The major solids processes at the E-S WPCF consist of WAS thickening and anaerobic digestion. These processes are discussed below.

Waste Activated Sludge Thickening

Two 3-meter gravity belt thickeners (GBTs), manufactured by Ashbrook, are located in the thickening building. The GBTs thicken was from the secondary clarifiers from approximately 0.5 percent to 4 percent dry solids prior to WAS entering the digesters. Polymer is added to the WAS prior to entering the GBTs to help form a floc that can support itself during the drainage procedure without breaking apart and losing solids to the filtrate. Current operational procedures have one unit on standby and one online. The units operate 16 to 24 hours/day, 7 days/week, except for periods of time when WAS may be co-thickened in the primary clarifiers. The thickening capacities with one unit offline and the other operating 24 hours/day are:

Solids loading of 2,010 dry lbs/hour ..... 48,240 lbs/day

Hydraulic loading of 720 gal/minute..... 1.04 MG/day

Anaerobic Digestion

The plant contains three concrete anaerobic digesters, operated as high-rate, complete mix systems. The digesters are 85 feet in diameter, have a 27.5-foot sidewall depth, fixed covers, and active digester volumes of 85 percent (970,000 gallons). Two smaller holding tanks, each with a volume of 360,000 gallons, receive digested biosolids prior to being pumped to the BMF.

Digesters are designed on the basis of hydraulic detention time, and organic loading expressed as pounds of volatile solids per unit volume per day. For high-rate, complete-mix digesters, typical design criteria are a detention time of between 15 and 20 days and a loading of between 0.1- to 0.15-pound of volatile solids per cubic foot per day, both based on active volume. Capacities of the digesters are:

Solids loading of 0.15 lbs VSS/ft^3-day:..... 58,300 lbs VSS/day

Detention time of 15 days (maximum month): .....193,800 gal/day

Detention time of 20 days (average day):.....145,400 gal/day

Biosolids Management Facility (BMF)

The major solids processes at the BMF are the FSLs, biosolids dewatering, and solids storage.

Facultative Sludge Lagoons (FSLs)

Four 6.25-acre FSLs are located adjacent to the dewatering building at the BMF. The normal operating depth of the lagoons is 13.5 feet, at which there is approximately 1.5 feet of freeboard. Under current operation the solids blanket in the lagoon is approximately 9 to 10 feet deep with a resultant water cap of 3.5 to 4.5 feet. Typical design standards for a lagoon of this depth would have a solids blanket 5 to 6 feet deep. This suggests that the FSL

should be harvested. The lagoons receive digested biosolids from the E-S WPCF year-round, but solids within the FSLs are only removed March through September. Solids are removed from one lagoon at a time. Prior to harvesting a lagoon, the lagoon is taken offline to allow the solids to settle. On average, one lagoon is offline for 6 months annually. Solids residence time is approximately 3 years. Supernatant is returned daily back to the E-S WPCF.

FSLs are designed on the basis of organic loading, expressed as pounds of volatile solids per 1,000 ft^2 of surface area per day, and on maintaining a solids blanket depth of a specific range. Capacities of the FSLs with one unit offline 6 months per year are:

Solids loading of 25 lbs VSS/1000 ft^2-day.....23,400 lbs VS/day
(2002 loading was 16,600 lbs VSS/day)

At solids depth of 6 feet.....41 million gallons of biosolids storage

Biosolids Dewatering

Three 2-meter BFPs, manufactured by Andritz, are located in the dewatering building at the BMF. Based on plant data, the belt presses concentrate digested biosolids (3 percent dry solids, average) held in the FSLs to approximately 17 percent dry solids. The system is designed to operate continuously with minimal operator attention. However, the BFPs are currently operated 13 hours/day Monday through Thursday and 9 hours/day on Friday, or an average of 12.2 hours/day, 5 days/week. The dewatering facility currently operates March through September. Bypass of the belt filter presses is available for liquid disposal of the biosolids to either the air drying beds or, beginning in the Spring of 2004, to the BF. This allows operating flexibility for different biosolids disposal methods and sites. The dewatering capacities with all BFPs operating 85 percent of the time, 12.2 hours/day, 5 days/week, 7 months/season, are:

Solids loading of 2,440 dry lbs/hour: .....76,000 lbs/day

Hydraulic loading of 140 gal/minute:.....242,000 gal/day

Solids Storage

Short-term and seasonal long-term storage exists at the BMF. Short-term storage is available through two 90 yd^3 elevated hoppers. The hoppers receive dewatered biosolids directly from the BFPs and have a total storage volume of 180 yd^3. At the daily solids processing capacity of the BFPs, 98 percent solids capture, 17 percent dry solids, and a cake density of 58 lbs/f^3 (1,600 lbs/yd^3), approximately 321 yd^3 of biosolids are produced. This allows for slightly more than 1 day of storage.

Long-term seasonal storage is available through thirteen drying beds with an average surface area of 1.85 acres per bed. At an average drying depth of 0.48-foot, the drying beds have a storage volume of 19,300 yd^3. Currently, however, the drying beds are being used to windrow dewatered biosolids to 40 to 50 percent dry solids prior to land applying to cooperative farms. As such, the storage volume is most likely higher for their current use because of the increased heights of the windrows. The air drying beds must store dewatered biosolids for approximately 3 months (March-May) prior to land application. Cooperative farms begin receiving biosolids in June and end in August and September.

Conveyance

The primary conveyance systems are those between the WPCF and the BMF and include the FSL supernatant line, the biosolids forcemain, and the reclaimed water main.

Supernatant

The supernatant line is a 10-inch-diameter line, approximately 1 mile long, that flows by gravity or can be pumped to a manhole (Prairie and Enid Road intersection), where it is discharged into a 27-inch sewer line that flows to the E-S WPCF. The line conveys supernatant from the FSLs at the BMF to the WPCF. One pump is available to pump the supernatant to the WPCF. The capacities of the line and the supernatant pump are listed below:

Line capacity at design velocity of 3.2 ft/sec and 10 psi.....800 gal/minute

Pump capacity at total dynamic head (TDH) of 24 feet.....800 gal/minute

Biosolids Forcemain

The biosolids forcemain is 8 –inches in diameter and approximately 4.5 miles long. The line conveys digested biosolids from the solids holding tanks at the WPCF to the FSLs at the BMF. Two pumps are available to pump the digested biosolids from the WPCF to the BMF. Under typical operation, only one pump is used at a time. The capacities of the line and the digested biosolids pumps (both online) are listed below:

Line capacity at max design velocity of 6.8 ft/sec and 200 psi .....1,200 gal/minute

Pump capacity at TDH of 110 feet.....860 gal/minute

Reclaimed Water Main

The reclaimed water main provides irrigation water to the BF and general plant water required at the BMF from the W2 water system at the WPCF. The majority of the line consists of the existing 12-inch SIWF line. Sections of the existing line have been replaced with new 16-inch pipe. A new 16-inch pipe has been constructed from the WPCF W2 pump station to the existing SIWF line along Northwest Expressway. One of three vertical turbine pumps at the W2 pump station has been isolated to pump water to the BMF and BF. The maximum pressure allowed in the SIWF pipeline is 100 psi. The capacity of the line and the W2 pump is listed below:

Line capacity at design pressure of 100 psi in 12-inch SIWF line .....2,800 gal/minute

Pump capacity at pressure of 75 psi .....≥2,800 gal/minute

Biocycle Farm (BF)

The Biocycle Farm is a 596-acre parcel adjacent to the BMF. The BF will be developed to land apply liquid biosolids, effluent, and limited dewatered biosolids.

Two crops were considered for land application: poplar trees, and grass hay. The poplar trees will be harvested on a 10-year cycle. The site will be initially developed with grass and poplars will be phased in over the next 6 years, as indicated in Table 3. The poplars will be

developed in six management units (MUs). A list of MUs and acreages are summarized in Table 3.

As per regulatory standards, buffer zones will be required. These buffer acreages are listed in Table 3. Buffer zones vary with the product that is applied (that is, cake product or liquid product). Dewatered cake biosolids require buffers of 200 feet away from any well on the uphill slope and 100 feet on the lower side of the well with a slope of 3 percent, 50-foot setback from any distinguishable water way, and 25 feet from neighboring property or road-side fence. Liquid biosolids application generally requires buffers of 200-foot setback from any well, stream, pond or distinguishable water way and 100 feet from housing or roadside fence.

TABLE 3
Biocycle Farm Management Unit Acreage and Planting Plan
MWMC Facility Plan, Eugene-Springfield

Management Units	Type	Acres	Planting Date	Replanting Date
MU 1 & 2	Non Buffer	165	2004	2014
MU 3 & 4	Non Buffer	130	2006	2016
MU 5 & 6	Non Buffer	130	2008	2018
All MUs	Buffer	84		
NE Corner	Buffer-like application(1)	48		
TOTAL BUFFER AREAS		132		
TOTAL NON BUFFER AREAS		425		

(1) Although the NE corner of the BF is not a buffer area, if used in the future it would only receive dewatered biosolids because of access difficulties.

The BF biosolids capacity will vary over the years as the mix of grass and young and mature poplars evolves. Table 4 summarizes the BF capacity for irrigated and non-irrigated scenarios. Table C-3 in Attachment C provides a more detailed summary of loading rates and capacities at the BF through 2025. It is assumed that the BF capacity is based on non-irrigated conditions. The buffer zones will receive dewatered biosolids and the rest of the site will receive liquid biosolids. Dewatered biosolids loading capacity will vary between 400 and 740 dry tons per year. The liquid biosolids capacity ranges from approximately 2,000 to 2,870 dry tons per year on irrigated poplars and grass, and 1,700 to 2,500 dry tons per year on non-irrigated poplars and grass. The quality of irrigation water is assumed to be that of well water. Future application of reclaimed water and effluent may have higher nitrogen content, which will reduce the total amount of biosolids that can be applied.

TABLE 4
Summary of Biocycle Farm Capacity in Dry Tons of Biosolids Per Year
MWMC Facility Plan, Eugene-Springfield

	Liquid Biosolids on Non-Buffer Areas (425 acres)		Dewatered Biosolids on Buffer Areas (132 acres)		Total	
Year	Irrigated Capacity	Non-Irrigated Capacity	Irrigated Capacity	Non-Irrigated Capacity	Irrigated Capacity	Non-Irrigated Capacity
2005	1880	1609	824	612	**2704**	**2221**
2010	2561	2228	905	675	**3466**	**2903**
2015	2165	1868	824	612	**2989**	**2480**
2020	2561	2228	905	675	**3466**	**2903**
2025	2451	2128	824	612	**3275**	**2740**

Irrigation water is assumed to be the quality of well water

Seasonal Industrial Waste Facility (SIWF)

The SIWF is a 196-acre parcel located approximately 1 mile from the BMF. It is currently developed with three 60-acre circles and one 16-acre circle of grass. The irrigation system consists of Pierce center pivots. If used in the biosolids application program by MWMC, the 196 acres at SIWF could receive liquid biosolids from the BMF and effluent from the E-S WPCF. The land could be left in grass and the existing conveyance system would have to be retrofitted to receive liquid biosolids, or the land could be planted in poplars and a new irrigation and biosolids spreading system would have to be installed.

Table 5 summarizes the SIWF capacity for irrigated and non-irrigated poplar and grass crops. Table C-4 in Attachment C provides a more detailed summary of loading rates and capacities at the SIWF through 2025.

A 57-million-gallon storage lagoon is also located at the SIWF site. Previously used to store cannery waste, this lagoon will be evaluated for effluent equalization/storage, BFP filtrate storage, and FSL supernatant equalization/storage/treatment. The lagoon may also be used in the near-term for storing the contents of individual FSL cells at the BMF during the re-lining effort of the FSLs.

TABLE 5
Summary of SIWF Capacity in Dry Tons of Biosolids Per Year
MWMC Facility Plan, Eugene-Springfield

	Liquid Biosolids on Poplars (196 acres)		Liquid Biosolids on Grass (196 acres)	
Year	Irrigated Capacity	Non-Irrigated Capacity	Irrigated Capacity	Non-Irrigated Capacity
2005	783	666	783	666
2010	1214	1057	783	666
2015	1214	1057	783	666

TABLE 5
Summary of SIWF Capacity in Dry Tons of Biosolids Per Year
MWMC Facility Plan, Eugene-Springfield

	Liquid Biosolids on Poplars (196 acres)		Liquid Biosolids on Grass (196 acres)	
Year	Irrigated Capacity	Non-Irrigated Capacity	Irrigated Capacity	Non-Irrigated Capacity
2020	1214	1057	783	666
2025	1214	1057	783	666

Irrigation water is assumed to be the quality of well water

Cooperative Farms

Approximately 7,500 acres of farmland in the vicinity of the BF are permitted to apply dried biosolids. These farms generally grow annual ryegrass, ryegrass seed, wheat, fescue, pasture, and hay. For calculation purposes, it was assumed that the loading rates for dried biosolids for all of these crops were the same as grass; that is, 5.63 dry tons/acre-year for irrigated land and 4.16 dry tons/acre-year for non-irrigated land. This would give MWMC the capacity to apply approximately 31,200 to 42,200 dry tons per year of biosolids if all farms were used in the land application program.

Table 6 summarizes the combined total capacity of all cooperative farms for irrigated and non-irrigated conditions. Table C-5 in Attachment C provides a more detailed summary of loading rates and capacities at the cooperative farms through 2025.

If the land is used as pasture, it should be noted that after application of bulk Class B biosolids, grazing animals should not be allowed on pasture or forage, nor should livestock feed be harvested for 30 days. This 30-day waiting period can be restrictive if harvesting several crops of hay per year is desired. This time period of 30 days is intended to ensure pathogens die off, and can be waived with Class A biosolids.

TABLE 6
Summary of Cooperative Farm Capacities
MWMC Facility Plan, Eugene-Springfield

	Dewatered Biosolids Capacity (dry tons per year)	
Year	Irrigated Capacity	Non-Irrigated Capacity
2005	42,191	31,166
2010	42,191	31,166
2015	42,191	31,166
2020	42,191	31,166
2025	42,191	31,166

Irrigation water is assumed to be the quality of well water.

Effluent Land Application Capacity

There are four potential sources of water for the crops:

- Liquid biosolids
- A mixture of washwater and filtrate water from the belt press (estimated 600 ppm of nitrogen)
- "Clean" well water (limited supply)
- E-S WPCF effluent (Level II, III, and IV)

Each of these water sources varies in nitrogen content. The biosolids capacity evaluations for the BF, SIWF, and the Cooperative Farms are based on non-irrigated crops or "clean" well water irrigation. Any additional nitrogen loading from the water source would result in reducing the liquid or dewatered biosolids loading because the goal of the irrigation operations is to prevent percolation of water and nitrogen below the root zone during the irrigation season. Deep percolation of some fraction of the wastewater mixed with rainwater will occur in the dormant season, but proper nitrogen management will minimize the amount of residual nitrogen remaining in the soil as the wet season begins.

When the crop water requirements are not being fully met, the crop is not expected to grow as much as a crop receiving full irrigation. It was assumed that the partially irrigated crop would not take up the maximum crop nutrient requirement. Poplars will receive up to 220 lb/acre of nitrogen (instead of the recommended 260 lb/acre) and grass will receive 120 lb/acre of available nitrogen (instead of the recommended 150 lb/acre) if not irrigated.

Some of the crop water requirement will also be met through biosolids application. However, less than 2 inches of total depth of liquid biosolids will be applied. Additional water can be provided through application of clean well water when available. Well water contains only traces of nitrogen and is not considered a source of nitrogen for the crops.

The design hydraulic loading rate is based on the irrigation agronomic rate. The gross irrigation requirement is the total crop water demand adjusted for effective precipitation and irrigation efficiency. The design net irrigation requirement of the reuse site is 14 to 22 inches depending on the crop, age, and monitored consumption and losses. Both poplar trees and grass are grown in the region without irrigation. Deficit irrigation will be practiced at the site, which will encourage deep rooting and use of groundwater and will minimize leaching of water and the nutrients that might move with the water.

Filtrate Water

The application of filtrate is equivalent to the application of a liquid fertilizer. The concentration in nitrogen is high enough that it would have to replace any liquid biosolids application. Filtrate could, however, be supplemented with irrigation of well water or Level IV effluent.

Level IV Effluent

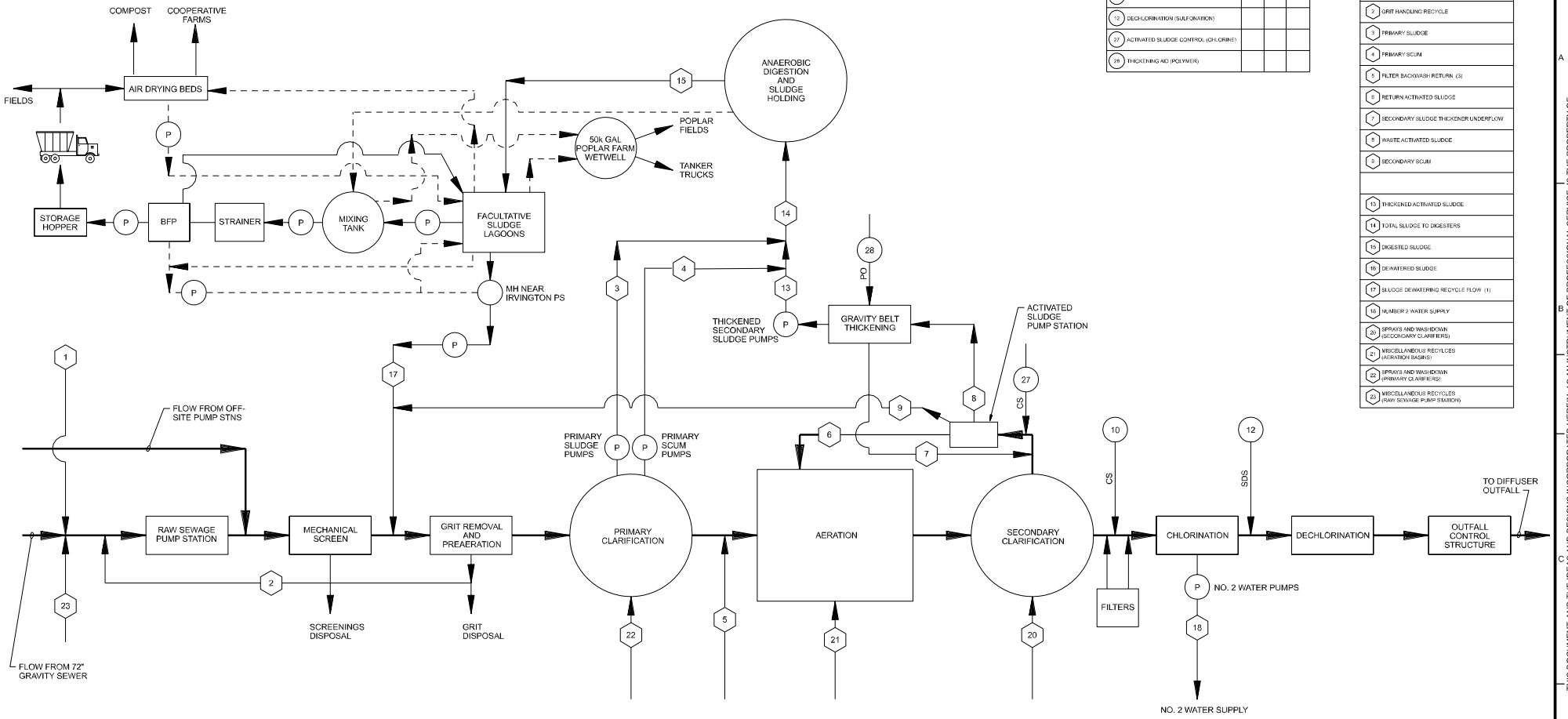
Liquid biosolids can be supplemented with Level IV effluent. The biosolids loadings presented in Table C-6, however, will need to be adjusted down to account for the

supplemental nitrogen provided by the effluent. Further discussion on effluent loadings will be provided in a future document addressing various scenarios of land application at the BF and SIWF.

Conclusions

The capacities presented in this document, along with projected biosolids flow and loads, suggest that MWMC possesses enough land, through direct ownership or cooperative land application farms, to dispose of liquid and dewatered biosolids, as well as effluent, through 2025. Current operating conditions of the FSLs suggest that they should be harvested such that solids depth in the lagoons is between 5 and 6 feet. Further tasks included in the overall Facilities Plan Update will evaluate application and operational scenarios to optimize the disposal of effluent, and liquid and dewatered biosolids, as well as the processing of BFP recycle.

Attachment A
FIGURES



CHEMICAL FEED POINT LOCATIONS	CHEMICAL SOLUTION MGD		
	MIN	AVG	MAX
10 CHLORINATION			
12 DECHLORINATION (SULFONATION)			
27 ACTIVATED SLUDGE CONTROL (CHLORINE)			
28 THICKENING AID (POLYMER)			

STREAM IDENTIFICATION
1 PLANT WASTEWATERS
2 GRIT HANDLING RECYCLE
3 PRIMARY SLUDGE
4 PRIMARY SCUM
5 FILTER BACKWASH RETURN (3)
6 RETURN ACTIVATED SLUDGE
7 SECONDARY SLUDGE THICKENER UNDERFLOW
8 WASTE ACTIVATED SLUDGE
9 SECONDARY SCUM
13 THICKENED ACTIVATED SLUDGE
14 TOTAL SLUDGE TO DIGESTERS
15 DIGESTED SLUDGE
16 DEWATERED SLUDGE
17 SLUDGE DEWATERING RECYCLE FLOW (1)
18 NUMBER 2 WATER SUPPLY
20 SPRAYS AND WASHDOWN (SECONDARY CLARIFIERS)
21 MISCELLANEOUS RECYCLES (AERATION BASINS)
22 SPRAYS AND WASHDOWN (PRIMARY CLARIFIERS)
23 MISCELLANEOUS RECYCLES (RAW SEWAGE PUMP STATION)

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	C ALLEN
DR	J BAUM
CHK	
APVD	

NO.	DATE	REVISION	BY	APVD

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL

FIGURE A-1

GENERAL SOLIDS/LIQUID BALANCE

SHEET	
DWG	G-9
DATE	
PROJ	

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FILENAME: FILE-NAME PLOT DATE: 22-DEC-2003 PLOT TIME: 17:41:20

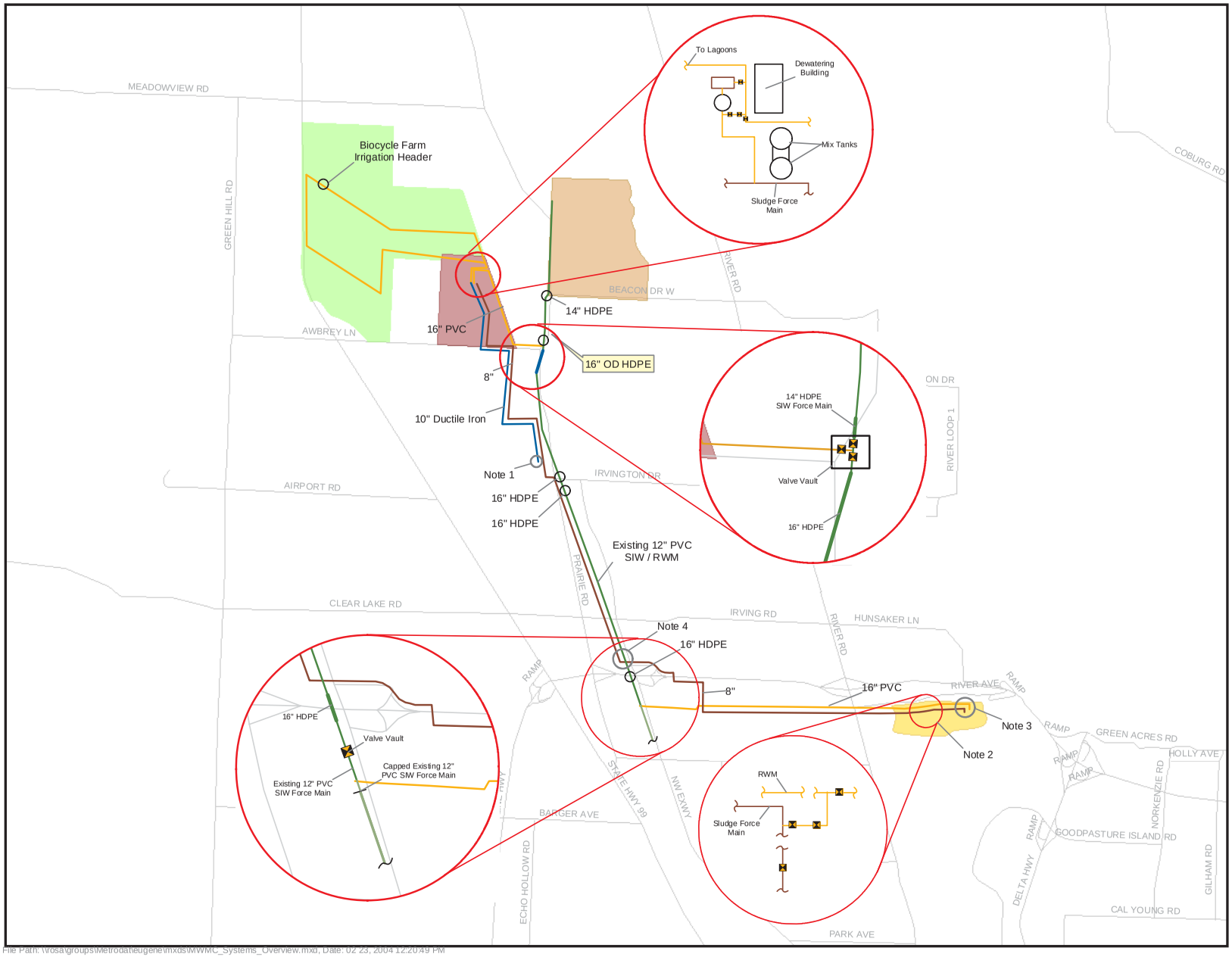

Figure A-2

MWMC Conveyance System Between Facilities

Legend

- Valve
- Roads
- Existing PVC Seasonal Industrial Waste (SIW)
- Reclaimed Water Main (RWM)
- Supernatant
- Sludge Force Main
- Biosolids Management Facility
- E/S WPCF
- Biocycle Farm
- Seasonal Industrial Waste Facility

Notes:

1. 10" Supernatant force main connects to existing 27" sewer.
2. Sludge force main connects to digested sludge storage tanks.
3. RWM connected to E/S WPCF W2 pump station.
4. SIW/Biosolid forcemain intertie for loop cleaning. Additional interites at BMF and E/S WPCF.

N
W E
S

0 2,500 5,000 Feet

CH2MHILL

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Attachment B

SOLIDS PROJECTIONS

TABLE B-1

Solids Flow Balance

MWMC Facility Plan, Eugene-Springfield

2005	Flow (mgd)					TSS (lb/d)					TSS (mg/L)				
Flow Stream Identification	**AA[5]**	**DWA**	**DWMM**	**WWA**	**WWMM**	**AA[5]**	**DWA**	**DWMM**	**WWA**	**WWMM**	**AA[5]**	**DWA**	**DWMM**	**WWA**	**WWMM**
Waste Activated Sludge	-	0.309	0.383	0.838	0.787	-	26,300	32,000	30,000	34,200	-	8,000	10,000	4,300	5,200
Thickened Waste Activated Sludge	-	0.075	0.091	0.085	0.097	-	25,000	30,400	28,500	32,500	-	40,000	40,000	40,000	40,000
Belt Thickener Recycle	-	0.323	0.184	0.796	0.696	-	1,314	600	1,500	1,700	-	500	400	240	300
Primary Sludge	-	0.077	0.103	0.097	0.122	-	29,000	38,800	36,500	45,705	-	45,000	45,000	45,000	45,000
Digester Feed Sludge	-	0.152	0.194	0.183	0.219	-	54,000	69,200	65,000	78,200	-	42,500	42,700	42,700	42,800
Digested Sludge	-	0.152	0.194	0.183	0.219	-	32,100	41,600	36,400	44,200	-	25,300	25,600	23,900	24,200
Mechanical Dewatering Feed[2]	0.261	-	-	-	-	65,400	-	-	-	-	30,000	-	-	-	-
Dewatered Sludge Cake	0.045	-	-	-	-	64,000	-	-	-	-	170,000	-	-	-	-
Biocycle Farm Feed Sludge[3]	0.049	-	-	-	-	12,200	-	-	-	-	30,000	-	-	-	-
Mechanical Dewatering Filtrate	0.242	-	-	-	-	1,300	-	-	-	-	700	-	-	-	-
Lagoon Supernatant[4]	0.302	-	-	-	-	760	-	-	-	-	300	-	-	-	-
2010	**Flow (mgd)**					**TSS (lb/d)**					**TSS (mg/L)**				
Flow Stream Identification	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**
Waste Activated Sludge	-	0.389	0.382	0.871	0.836	-	28,100	35,000	43,600	52,400	-	8,300	11,000	6,000	7,500
Thickened Waste Activated Sludge	-	0.080	0.100	0.124	0.149	-	26,650	33,300	41,400	49,800	-	40,000	40,000	40,000	40,000
Primary Sludge	-	0.084	0.114	0.436	0.561	-	31,500	42,700	36,400	46,800	-	45,000	45,000	10,000	10,000
Thickened Primary Sludge	-	-	-	0.064	0.083	-	-	-	26,900	34,500	-	-	-	50,000	50,000
Digester Feed Sludge	-	0.164	0.213	0.188	0.232	-	58,100	76,000	68,300	84,300	-	42,600	42,700	43,400	43,600
Digested Sludge	-	0.164	0.213	0.188	0.232	-	34,300	45,500	41,800	52,700	-	25,100	25,500	26,600	27,200
Belt Thickener Recycle	-	0.317	0.288	0.753	0.693	-	1,400	1,750	2,180	1,930	-	532	730	350	450
Gravity Thickener Recycle	-	-	-	0.372	0.478	-	-	-	4,740	6,100	-	-	-	1,530	1,530
Mechanical Dewatering Feed[2]	0.261	-	-	-	-	65,400	-	-	-	-	30,000	-	-	-	-
Dewatered Sludge Cake	0.045	-	-	-	-	64,000	-	-	-	-	170,000	-	-	-	-
Biocycle Farm Feed Sludge[3]	0.049	-	-	-	-	12,200	-	-	-	-	30,000	-	-	-	-
Mechanical Dewatering Filtrate	0.242	-	-	-	-	1,300	-	-	-	-	650	-	-	-	-
Lagoon Supernatant[4]	0.302	-	-	-	-	760	-	-	-	-	300	-	-	-	-
2015	**Flow (mgd)**					**TSS (lb/d)**					**TSS (mg/L)**				
Flow Stream Identification	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**
Waste Activated Sludge	-	0.789	0.770	1.751	1.675	-	30,200	37,800	45,400	55,100	-	4,600	5,900	3,100	3,940
Thickened Waste Activated Sludge	-	0.086	0.107	0.129	0.157	-	28,700	35,900	43,100	52,320	-	40,000	40,000	40,000	40,000
Primary Sludge	-	0.090	0.123	0.470	0.605	-	33,800	46,000	39,200	50,500	-	45,000	45,000	10,000	10,000
Thickened Primary Sludge	-	-	-	0.069	0.089	-	-	-	28,900	37,250	-	-	-	50,000	50,000
Digester Feed Sludge	-	0.176	0.230	0.198	0.246	-	62,500	81,900	72,000	89,600	-	42,600	42,700	43,400	43,600
Digested Sludge	-	0.176	0.230	0.198	0.246	-	37,000	49,100	44,800	56,700	-	25,100	25,500	26,600	27,200
Belt Thickener Recycle	-	0.709	0.669	1.628	1.523	-	1,511	1,900	2,300	2,750	-	260	3,400	167	216
Gravity Thickener Recycle	-	-	-	0.400	0.516	-	-	-	5,100	6,570	-	-	-	1,530	1,530
Mechanical Dewatering Feed[2]	0.261	-	-	-	-	65,400	-	-	-	-	30,000	-	-	-	-
Dewatered Sludge Cake	0.045	-	-	-	-	64,000	-	-	-	-	170,000	-	-	-	-
Biocycle Farm Feed Sludge[3]	0.049	-	-	-	-	12,200	-	-	-	-	30,000	-	-	-	-
Mechanical Dewatering Filtrate	0.242	-	-	-	-	1,300	-	-	-	-	650	-	-	-	-
Lagoon Supernatant[4]	0.302	-	-	-	-	760	-	-	-	-	300	-	-	-	-

TABLE B-1

Solids Flow Balance

MWMC Facility Plan, Eugene-Springfield

2020	Flow (mgd)					TSS (lb/d)					TSS (mg/L)				
Flow Stream Identification	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**
Waste Activated Sludge	-	0.788	0.770	1.750	1.676	-	32,300	40,600	48,700	59,300	-	4,900	6,300	3,340	4,240
Thickened Waste Activated Sludge	-	0.092	0.115	0.139	0.169	-	30,700	38,500	46,300	56,300	-	40,000	40,000	40,000	40,000
Primary Sludge	-	0.096	0.131	0.502	0.649	-	36,200	49,400	41,900	54,100	-	45,000	45,000	10,000	10,000
Thickened Primary Sludge	-	-	-	0.074	0.096	-	-	-	30,900	39,900	-	-	-	50,000	50,000
Digester Feed Sludge	-	0.188	0.247	0.213	0.264	-	66,900	87,900	77,200	96,300	-	42,600	42,700	43,500	43,600
Digested Sludge	-	0.188	0.247	0.213	0.264	-	39,700	53,000	48,100	61,100	-	25,300	25,700	27,100	27,700
Belt Thickener Recycle	-	0.702	0.661	1.618	1.514	-	1,613	2,000	2,500	3,000	-	275	370	180	235
Gravity Thickener Recycle	-	-	-	0.187	0.553	-	-	-	700	7,050	-	-	-	447	1,530
Mechanical Dewatering Feed[2]	0.261	-	-	-	-	65,400	-	-	-	-	30,000	-	-	-	-
Dewatered Sludge Cake	0.045	-	-	-	-	64,000	-	-	-	-	170,000	-	-	-	-
Biocycle Farm Feed Sludge[3]	0.049	-	-	-	-	12,200	-	-	-	-	30,000	-	-	-	-
Mechanical Dewatering Filtrate	0.242	-	-	-	-	1,300	-	-	-	-	650	-	-	-	-
Lagoon Supernatant[4]	0.302	-	-	-	-	760	-	-	-	-	300	-	-	-	-
2025	**Flow (mgd)**					**TSS (lb/d)**					**TSS (mg/L)**				
Flow Stream Identification	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**	**AA[5]**	**DWA**	**DWMM**	**WWA[1]**	**WWMM[1]**
Waste Activated Sludge	-	0.787	0.770	1.750	1.677	-	34,300	43,300	52,100	63,600	-	5,230	6,740	3,600	4,550
Thickened Waste Activated Sludge	-	0.098	0.123	0.148	0.181	-	32,600	41,100	49,500	60,400	-	40,000	40,000	40,000	40,000
Primary Sludge	-	0.103	0.140	0.535	0.692	-	38,600	52,650	44,680	57,800	-	45,000	45,000	45,000	45,000
Thickened Primary Sludge	-	-	-	0.079	0.102	-	-	-	33,000	42,600	-	-	-	50,000	50,000
Digester Feed Sludge	-	0.201	0.263	0.227	0.283	-	71,200	93,800	82,500	103,100	-	42,600	42,700	43,500	43,600
Digested Sludge	-	0.201	0.263	0.227	0.283	-	42,400	56,700	51,500	65,600	-	25,360	25,800	27,200	27,750
Belt Thickener Recycle	-	0.695	0.653	1.608	1.502	-	1,720	2,200	2,600	3,200	-	300	400	200	254
Gravity Thickener Recycle	-	-	-	0.456	0.590	-	-	-	5,820	7,500	-	-	-	1,530	1,530
Mechanical Dewatering Feed[2]	0.261	-	-	-	-	65,400	-	-	-	-	30,000	-	-	-	-
Dewatered Sludge Cake	0.045	-	-	-	-	64,000	-	-	-	-	170,000	-	-	-	-
Biocycle Farm Feed Sludge[3]	0.049	-	-	-	-	12,200	-	-	-	-	30,000	-	-	-	-
Mechanical Dewatering Filtrate	0.242	-	-	-	-	1,300	-	-	-	-	650	-	-	-	-
Lagoon Supernatant[4]	0.302	-	-	-	-	760	-	-	-	-	300	-	-	-	-

Notes:

(1) Pumping thin primary sludge from the primary clarifiers at the E/S WPCF. Approximately 1% dry solids.

(2) Operation: 12.2 hrs/day, 5 days/week, 7 months/year (Mar-Sept)

(3) Annualized values. Actual application to BF is seasonal (May-Aug or Sept). Based on non-irrigated capacity.

(4) Assumes 12 hrs/day operation

(5) Solids process flow stream located at the BMF were calculated based on Annual Average conditions due to seasonal operation and storage in the FSLs. Solids processes at the E-S WPCF were not evaluated at Annual Average flow conditions.

Attachment C

CAPACITY TABLES

TABLE C-1
Solids Processing Capacities at E/S WPCF and BMF
MWMC Facility Plan, Eugene-Springfield

Unit Process	Criteria	Number of Units	Limiting Factor at Current Operation	Total Process Capacity Installed (All Units Online)	Total Process Capacity Firm (One Unit Offline)
WAS THICKENING					
Gravity Belt Thickeners	2010 dry lbs solids/hr SLR	2	Solids Loading	96480 ppd	48240 ppd
	720 gpm HLR			2073600 gpd	1036800 gpd
GBT Feed (WAS) Pumps	800 gpm	2	N/A	1600 gpm	800 gpm
Thickened Sludge (TWAS) Pumps	120 gpm	2	N/A	240 gpm	120 gpm
SOLIDS DIGESTION					
Anaerobic Digestion	0.15 lbs VSS/cf/day	3	Hydraulic Loading @ Average Day	58295 lb VSS/day	38864 lb VSS/day
	15 day SRT @ Maximum Month			193800 gpd	129200 gpd
	20 day SRT @ Average Day			145350 gpd	96900 gpd
Digested Sludge Pumps	430 gpm	2	N/A	860 gpm	430 gpm
BIOSOLIDS DEWATERING					
BFP Feed Tanks	360,000 gallons, each	2	N/A	720000 gal	360000 gal
Belt Filter Presses	2440 dry lbs solids/hr SLR	3	Hydraulic Loading	89304 ppd	59536 ppd
	140 gpm HLR			307440 gpd	204960 gpd
BFP Feed Pumps	200 gpm	3	N/A	600 gpm	400 gpm
Sludge Strainers	200 gpm	3	N/A	600 gpm	400 gpm
Filtrate Pumps	575 gpm	3	N/A	1725 gpm	1150 gpm
Cake Conveyance	30 Wet tons/hr	1	N/A	30 wet tons/hr	0 wet tons/hr
BIOSOLIDS STORAGE					
Facultative Sludge Lagoons	25 lbs VSS/1000 sf-day	4	Solids Storage	41 MG	31 MG
	6 ft sludge depth				
Short-Term (Cake Hopper)	180 CY of Storage	2	N/A	180 CY	90 CY
Long-Term Seasonal (Drying Beds)	1485 CY of Storage	13	N/A	19305 CY	17820 CY

BFP = Belt Filter Press
SRT = Solids Retention Time
SLR = Solids Loading Rate
HRT = Hydraulic Retention Time
PPD = Pounds Per Day
VSS = Volatile Suspended Solids
GBT = Gravity Belt Thickener

TABLE C-1
Solids Processing Capacities at E/S WPCF and BMF
MWMC Facility Plan, Eugene-Springfield

Unit Process	Criteria	Number of Units	Limiting Factor at Current Operation	Total Process Capacity Installed (All Units Online)	Total Process Capacity Firm (One Unit Offline)
WAS THICKENING					
Gravity Belt Thickeners	2010 dry lbs solids/hr SLR	2	Solids Loading	96480 ppd	48240 ppd
	720 gpm HLR			2073600 gpd	1036800 gpd
GBT Feed (WAS) Pumps	800 gpm	2	N/A	1600 gpm	800 gpm
Thickened Sludge (TWAS) Pumps	120 gpm	2	N/A	240 gpm	120 gpm
SOLIDS DIGESTION					
Anaerobic Digestion	0.15 lbs VSS/cf/day	3	Hydraulic Loading @ Average Day	58295 lb VSS/day	38864 lb VSS/day
	15 day SRT @ Maximum Month			193800 gpd	129200 gpd
	20 day SRT @ Average Day			145350 gpd	96900 gpd
Digested Sludge Pumps	430 gpm	2	N/A	860 gpm	430 gpm
BIOSOLIDS DEWATERING					
BFP Feed Tanks	360,000 gallons, each	2	N/A	720000 gal	360000 gal
Belt Filter Presses	2440 dry lbs solids/hr SLR	3	Hydraulic Loading	89304 ppd	59536 ppd
	140 gpm HLR			307440 gpd	204960 gpd
BFP Feed Pumps	200 gpm	3	N/A	600 gpm	400 gpm
Sludge Strainers	200 gpm	3	N/A	600 gpm	400 gpm
Filtrate Pumps	575 gpm	3	N/A	1725 gpm	1150 gpm
Cake Conveyance	30 Wet tons/hr	1	N/A	30 wet tons/hr	0 wet tons/hr
BIOSOLIDS STORAGE					
Facultative Sludge Lagoons	25 lbs VSS/1000 sf-day	4	Solids Storage	41 MG	31 MG
	6 ft sludge depth				
Short-Term (Cake Hopper)	180 CY of Storage	2	N/A	180 CY	90 CY
Long-Term Seasonal (Drying Beds)	1485 CY of Storage	13	N/A	19305 CY	17820 CY

BFP = Belt Filter Press
SRT = Solids Retention Time
SLR = Solids Loading Rate
HRT = Hydraulic Retention Time
PPD = Pounds Per Day
VSS = Volatile Suspended Solids
GBT = Gravity Belt Thickener

TABLE C-2
Solids Unit Process Capacity
MWMC Facility Plan, Eugene-Springfield

Updated: 4/1/2005

Component/Process	Location	Existing Sizing		Design Criteria		Capacity Installed	Capacity Firm
WAS THICKENING							
WAS Pumps:	WPCF	Number of Units	2	Capacity, each:		1600 gpm	800 gpm
		Type	Screw Centrifugal	Hydraulic, gpm	800		
		Drive	AFD				
		Motor HP, each	15				
Gravity Belt Thickening:	WPCF	Number of Units	2	Capacity, each:			
		Width, each, meters	3	Solids, dry lbs/hr	2010	96480 ppd	48240 ppd
		Cake, min, % dry solids	5	Hydraulic, gpm	720	2073600 gpd	1036800 gpd
		Solids Capture, min, %	95				
		Operation, hrs/day					
		2 Units	24				
Thickened Sludge Pumps:	WPCF	Number of Units	2	Capacity, each:		240 gpm	120 gpm
		Type	Progressing Cavity	Hydraulic, gpm	120		
		Drive	AFD				
		Motor HP, each	20				
SOLIDS DIGESTION							
Anaerobic Digestion:	WPCF	Primary Digesters		SLR (lb VSS/cf/day):			
		Number of Units	3	DWMM	0.15	58295 lb VSS/day	38864 lb VSS/day
		Type	Fixed Cover	SRT (days):			
		Diameter, ft	85	Averge Day	20	145350 gpd	96900 gpd
		SWD, ft	27.6	Maximum Month	15	193800 gpd	129200 gpd
		Active Volume, gal	969,000				
Sludge Holding Tanks:	WPCF	Number of Units	2				
		Type	Fixed Cover				
		Diameter, ft	60				
		Active Volume, gal	-				
		Gas Holder Volume, gal	-				
		Slugde Storage Vol, gal	360,000				
Digested Sludge Pumps:	WPCF	Number of Units	2	Capacity, each:		860 gpm	430 gpm
		Type	Centrifugal	Hydraulic, gpm	430		
		Drive	AFD				
		Motor HP, each	75				
SLUDGE DEWATERING							
BFP Feed Tank Mixing Pump	BMF	Number of Units	2	Capacity, each		3600 gpm	1800 gpm
		Type	Screw-Centrifugal	Hydraulic, gpm	1800		
		Motor HP, each	25				
BFP Feed Tank	BMF	Number of Units	2	Capacity, each		720000 gal	360000 gal
		Type	Reinf. Concrete, OpenTop	Volume, gal	360,000		
		SWD, ft	26				
		Diameter, ft	48				
Belt Filter Presses:	BMF	Number of Units	3	Capacity, each			
		Width, each, meters	2	Solids, dry lbs/hr	2440	89304 ppd	59536 ppd
		Cake, min, % dry solids	17	Hydraulic, gpm	140	307440 gpd	204960 gpd
		Solids Capture, min, %	98				
		Operation, hrs/day	12.2				
		Operation, days/wk	5				
		Operation, months/year	7				
Belt Filter Press Feed Pumps:	BMF	Number of Units	3	Capacity, each:		600 gpm	400 gpm
		Type	Progressing Cavity	Hydraulic, gpm	200		
		Drive	AFD				
		Motor HP, each	15				
Sludge Strainers:	BMF	Number of Units	3	Capacity, each:		600 gpm	400 gpm
(BFP Feed)		Type	Parkson Strainpress	Hydraulic, gpm	200		
Filtrate Pumps:	BMF	Number of Units	3	Capacity, each:		1725 gpm	1150 gpm
		Type	Submersible	Hydraulic, gpm	575		
		Drive	AFD				
		Motor HP, each	15				
Cake Conveyance	BMF	Number of Units	1	Capacity, each:		30 wet tons/hr	0 wet tons/hr
		Type	Screw Auger	Wet tons/hr	30		
		Drive	Single Speed				
SOLIDS STORAGE							
Facultative Sludge Lagoons	BMF	Number of Units	4	Capacity, each:			
		Area each, acres	6.25	Lb VSS/1000 SF/Da	25	27225 lb VSS/day	20419 lb VSS/day
		Depth, ft	13.5	Sludge Depth, ft	6	41 MG	31 MG
		Bottom Width, ft	300.5	Water Depth, ft	7.5	53 MG	40 MG
		Bottom Lengh, ft	715.5				
		Side Slope, ft/ft	2.5				
Short-Term Storage:	BMF	Number of Units	2	Capacity, each:			
(Cake Hopper)		Type	Elevated Steel Hopper	Weight, tons	81.5	163 tons	82 tons
				Volume, CY	90	180 CY	90 CY
Long-Term Storage:	BMF	Number of Units	13			Storage Volume =	19300 CY
(Air Drying Beds)		Area, each, acres	1.85			Solids Applied (dry wt) =	3130 dry tons
		Equivalent Average Depth, ft	0.48			Solids Applied (wet wt) =	17400 wet tons
		Bulk Density of Biosolids, lb/c	67				
CONVEYANCE BETWEEN FACILITIES							
Biosolids Forcemain	WPCF -> BMF	Length		Capacity		1203 gpm	-
		Material	Ductile Iron	Design Velocity, fps	6.8		
		Size, in	8.5	(maximum)			
		Number of Pumps	2	Capacity		860 gpm	430 gpm
		TDH, psi	110	Hydraulic, gpm	430		
		Motor HP, each	75				
Reclaimed Water Main	WPCF -> BMF & BF	Length (12"/16")		Capacity		2800 gpm	-
		Material	PVC	Design Velocity, fps	0.0		
		Size, in	12, 16, & 24				
		Number of Pumps	1	Capacity			
		TDH, psi	65	Hydraulic, gpm	2340	2340 gpm	0 gpm
		Motor HP, each	150	(at 75% speed)			
Supernatant	BMF -> WPCF	Length		Capacity		783 gpm	
		Material	PVC	Design Velocity, fps	3.2		
		Size, in	10				
		Number of Pumps	1	Capacity		875 gpm	0 gpm
		TDH, ft	24	Hydraulic, gpm	875		
		Motor HP, each	10				

TABLE C-4
Liquid and Dewatered Biosolids Capacity at SIWF
MWMC Facility Plan, Eugene-Springfield

	Year	Non Buffer Areas					Biosolids Capacity (Tons)							
		Poplars				or Grass	Liquid Biosolids on Poplars		Dewatered Biosolids on Poplars		Liquid Biosolids on Grass		Dewatered Biosolids on Grass	
		Year 1	Year 2	Year 3	Year 4		Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity
Loadings (tons/acre)	Liquid Biosolids Irrigated Loading	4.00	5.10	5.64	6.19	4.00								
	Liquid Biosolids Non Irrigated Loading	3.40	4.40	4.90	5.39	3.40								
	Dewatered Biosolids Irrigated Loading	5.63	7.32	8.17	9.02	5.63								
	Dewatered Biosolids Non Irrigated Loading	4.16	5.47	6.13	6.79	4.16								
Available Land (Acres)	2001													
	2002													
	2003													
	2004						0	0	0	0	0	0	0	0
	2005	**196**				**196**	**783**	**666**	**1103**	**814**	**783**	**666**	**1103**	**814**
	2006		196			196	999	862	1435	1072	783	666	1103	814
	2007			196		196	1106	960	1601	1201	783	666	1103	814
	2008				196	196	1214	1057	1767	1330	783	666	1103	814
	2009				196	196	1214	1057	1767	1330	783	666	1103	814
	2010				**196**	**196**	**1214**	**1057**	**1767**	**1330**	**783**	**666**	**1103**	**814**
	2011				196	196	1214	1057	1767	1330	783	666	1103	814
	2012				196	196	1214	1057	1767	1330	783	666	1103	814
	2013				196	196	1214	1057	1767	1330	783	666	1103	814
	2014				196	196	1214	1057	1767	1330	783	666	1103	814
	2015				**196**	**196**	**1214**	**1057**	**1767**	**1330**	**783**	**666**	**1103**	**814**
	2016				196	196	1214	1057	1767	1330	783	666	1103	814
	2017				196	196	1214	1057	1767	1330	783	666	1103	814
	2018				196	196	1214	1057	1767	1330	783	666	1103	814
	2019				196	196	1214	1057	1767	1330	783	666	1103	814
	2020				**196**	**196**	**1214**	**1057**	**1767**	**1330**	**783**	**666**	**1103**	**814**
	2021				196	196	1214	1057	1767	1330	783	666	1103	814
	2022				196	196	1214	1057	1767	1330	783	666	1103	814
	2023				196	196	1214	1057	1767	1330	783	666	1103	814
	2024				196	196	1214	1057	1767	1330	783	666	1103	814
	2025				196	**196**	**1214**	**1057**	**1767**	**1330**	**783**	**666**	**1103**	**814**

TABLE C-5

Dewatered Biosolids Capacity with Outside Farms

MWMC Facility Plan, Eugene-Springfield

Year	Grass (Acres)	Dewatered Biosolids Capacity (Tons)	
		Irrigated Capacity	Non Irrigated Capacity
Loading Rate (tons/acre)		5.63	4.16
2001	7500	42,191	31,166
2002	7500	42,191	31,166
2003	7500	42,191	31,166
2004	7500	42,191	31,166
2005	**7500**	**42,191**	**31,166**
2006	7500	42,191	31,166
2007	7500	42,191	31,166
2008	7500	42,191	31,166
2009	7500	42,191	31,166
2010	**7500**	**42,191**	**31,166**
2011	7500	42,191	31,166
2012	7500	42,191	31,166
2013	7500	42,191	31,166
2014	7500	42,191	31,166
2015	**7500**	**42,191**	**31,166**
2016	7500	42,191	31,166
2017	7500	42,191	31,166
2018	7500	42,191	31,166
2019	7500	42,191	31,166
2020	**7500**	**42,191**	**31,166**
2021	7500	42,191	31,166
2022	7500	42,191	31,166
2023	7500	42,191	31,166
2024	7500	42,191	31,166
2025	**7500**	**42,191**	**31,166**

TABLE C-6
MWMC Land Application Liquid and Dewatered Biosolids Capacity Summary
MWMC Facility Plan, Eugene-Springfield

	Biocycle Farm (596 acres)						**SIW (196 acres)**				**Other Farms (7500 acres)**	
	Liquid Biosolids on Non Buffer Areas (425 Acres)		Dewatered Biosolids on Buffer Areas (132 acres)		Total		Liquid Biosolids on Poplars (196 acres)		Liquid Biosolids on Grass (196 acres)		Dewatered Biosolids Capacity	
Year	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity	Irrigated Capacity	Non Irrigated Capacity
2005	1880	1609	824	612	**2704**	**2220**	783	666	783	666	42,191	31,166
2010	2561	2228	905	675	**3466**	**2903**	1214	1057	783	666	42,191	31,166
2015	2632	2293	905	675	**3538**	**2968**	1214	1057	783	666	42,191	31,166
2020	2255	1950	905	675	**3161**	**2625**	1214	1057	783	666	42,191	31,166
2025	2612	2274	905	675	**3518**	**2949**	1214	1057	783	666	42,191	31,166

Notes:
All capacities are expressed in dry tons of biosolids.