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Biosolids Management Plan for the Metropolitan Wastewater Management Commission

Eugene/Springfield

CVO\043410042

CONTENTS

1 **Introduction** **1-1**

2 **Site Description** **2-1**
2.1 Liquids Flowstream 2-1
2.2 Solids Flowstream 2-1
2.2.1 Primary Treatment 2-3
2.2.2 Secondary Treatment 2-4
2.2.3 Solids Thickening 2-4
2.2.4 Digestion 2-4
2.2.5 Facultative Storage Lagoons 2-4
2.3 Septage Receiving Facilities 2-5
2.4 Pretreatment Program 2-5

3 **Solids Treatment Processes** **3-1**
3.1 Pathogen Reduction 3-1
3.2 Vector Attraction Reduction 3-1
3.3 Additional Reduction 3-2
3.3.1 FSLs and ADBs 3-2
3.3.2 Composting 3-2

4 **Contingency Options** **4-1**
4.1 Process Failure 4-1
4.1.1 Breakdown of Liquid Biosolids Application Equipment 4-1
4.1.2 Unexpectedly Narrow Window of Application 4-1
4.1.3 Digester Upset or Breakdown 4-1
4.1.4 Liquid Biosolids Spill at the WWTP 4-1
4.2 Spill During Transport 4-2
4.2.1 Over-the-Road Spill Response Procedures 4-2
4.2.2 Cleanup Procedures 4-2

5 **Biosolids Characteristics** **5-1**
5.1 Sampling and Monitoring Program 5-1
5.2 Biosolids Chemical and Nutrient Characteristics 5-1
5.3 Pathogen and Vector Attraction Reduction Characteristics 5-2

6 **Reporting** **6-1**
6.1 Recordkeeping and Monthly Reporting 6-1
6.2 Annual Report to DEQ 6-1

7 **Biosolids Removal ,Processing and Application** **7-1**
7.1 Storage at Application Site 7-1
7.1.1 General Site Design 7-3
7.1.2 Liquid Biosolids 7-3
7.1.3 Cake Biosolids 7-3

7.2 Dedicated Site Selection 7-3
7.2.1 Criteria for Dedicated Site Selection 7-3
7.3 Notification of Property Oweners and Community 7-5
7.4 Application Rates 7-5
7.5 Monitoring and Recordkeeping 7-6
7.6 Selection of New Cooperating Sites 7-9

Section **Page**

8 **Biocycle** **8-1**

Appendixes

A Recent Monitoring Results
B NPDES Permit
C List of Approved Biosolids Land Application Sites
D Agronomic Application Rate Calculations
E Compost Information Handout

Tables

2-1 Summary of BMF Facilities Components 2-4
5-1 Trace Element Concentrations for MWMC Dewatered Biosolids Based on Average 2000 Concentrations 5-2
5-2 MWMC Biosolids Nutrient Concentrations 5-2
6-1 Monitoring and Record Keeping Requirements from MWMC's NPDES Permit for Biosolids 6-1
7-1 Equipment listing 7-2
7-2 Site Selection Criteria for Dedicated Biosolids Application Site 7-4
7-3 Available Nitrogen Assumptions for Dedicate Site Loading Rate Calculations 7-6
7-4 Annual Site Loading Capacities for Poplar Tree and Grass Crops at the Dedicated Site 7-7
7-5 Monitoring Summary for Dedicated Biosolids Site 7-8
7-6 Site Selection Criteria for New Cooperative Sites 7-10
7-7 Available Nitrogen Assumptions for New and Existing Cooperative Sites Loading Rate Calculations 7-11
7-8 Monitoring Summary for Cooperative Sites 7-12

Figures

2-1 Biosolids Process Flow Diagram
7-1 MWMC Biosolids Reuse Site Layout 7-13
7-2 MWMC Biosolids Management Facility Site Layout

SECTION 1

Introduction

This biosolids management plan describes the intended use and operation of the Metropolitan Wastewater Management Commission's (MWMC) solids processing and biosolids recycling program.

The MWMC's Eugene/Springfield Water Pollution Control Facility (E/S WPCF) currently produces 4800 dry tons of biosolids annually. These solids are processed at the Biosolids Management Facility (BMF), located 5.5 miles north of the WPCF. For the majority of biosolids produced, MWMC will continue to rely on volunteer and cooperating agricultural producers to utilize biosolids nutrient and soil building qualities for crop growth.

In July 2000, the MWMC purchased 597-acres of land adjacent to the existing Biosolids Management Facility. The MWMC intends to develop an environmentally safe and economically viable agricultural operation that will beneficially recycle a significant portion (20-50 percent) of the current annual biosolids production.

A small scale (5-10 percent of annual production) aerated-static pile composting program is operated utilizing a controlled mix of wood chips and biosolids that is recycled back to the urban area as a finished compost product.

The land application program, compost program, and the planned poplar project provide beneficial reuse of biosolids through soil improvement and crop fertilizer value.

This plan describes the quantity, quality, and origin of biosolids and biosolids derived products generated at the BMF. Pretreatment and treatment processes are outlined for perspective, as well as site selection criteria and land application and reuse practices.

Specific objectives of this plan are:

- Provide DEQ and EPA with all required information on the origin and reuse of wastewater residuals (sludge and biosolids)
- Provide land application site and crop management information for "Class B" biosolids.
- Outline methods of distribution and management controls for "Class A" biosolids.
- Describe contingency options in the event of a facility breakdown, upset, or accidental spill, either at the WPCF, BMF or in transport to a land application site.
- Define land application site section criteria and public notification procedures.

SECTION 2

Site Description

The following sections describe the MWMC facilities as they relate to biosolids production and handling.

2.1 Liquids Flowstream

The Cities of Eugene-Springfield own and operate a municipal sewage collection system and a 49-MGD (dry weather flow) activated sludge water pollution control facility (WPCF). The average wet weather design flow for the plant is 70-MGD, and the peak design flow is 175 MGD. The MWMC WPCF contains headworks, primary treatment, secondary treatment and sludge processing components.

The headworks consist of automated screw pumps, bar screens, four aerated grit removal chambers, and four pre-aeration basins for odor control. They are followed by four circular 1.5 MG primary clarifiers. Secondary sewage treatment facilities consist of eight 2.2 MG activated sludge aeration basins equipped with both coarse and fine air bubble diffusers. The aeration basins are normally operated in the plug flow mode. The secondary sewage treatment system is also able to operate under complete mix, step feed, or contact stabilization methods. Eight circular 1.4 -MG clarifiers complete the secondary process. The final process adds chlorine for disinfection and sulfur dioxide to remove residual chlorine. Treated effluent is discharged to the Willamette River at River Mile 178. Sludges collected from the primary and secondary treatment processes are transferred to anaerobic digesters for stabilization.

Approximately 87% of the materials delivered to the WPCF for processing are from domestic sources, approximately 13% are from industrial/commercial sources and less than 1% is from septage and other sources.

2.2 Solids Flowstream

The solids processing and biosolids reuse system for Eugene-Springfield consists of anaerobic digestion facilities at the Water Pollution Control Facility (WPCF), and facultative storage lagoons (FSLs), belt filter presses, and air drying beds (ADBs) located remotely at the BMF. Anaerobically digested biosolids is pumped from sludge holding tanks at the WPCF through a 5.5-mile pipeline to the FSLs at the BMF. Approximately 53 million gallons of 2 percent (approx.) digested biosolids, or approx. 4,800 dry tons, is produced annually at the Eugene-Springfield WPCF.

Supernatant from the sludge storage lagoon is returned to the WPCF treatment process.

Beginning in the spring, biosolids are removed from the FSLs with a dredge and pumped through filters and belt presses and transported by truck to the ADBs. Biosolids remain in the ADBs from 6 to 10 weeks (depending on weather conditions and crop land availablity) where it is turned and windrowed periodically using a Brown Bear windrow machine. If the weather has been conducive to drying, near the end of July, the resulting dewatered biosolids are removed from the beds, transported by truck to farms where a cooperative land application agreement has been reached, and spread on the farm land using end pushout (“manure”) spreaders. A second drying cycle is begun in July or August with land application occurring in September.

With development of the dedicated biosolids site, liquid biosolids prior to the belt presses can be diverted directly to the dedicated land application system. If monitoring determines that the belt press filtrate meets Class B biosolids pathogen reduction and vector attraction criteria, it may also be applied to the land application system.

In addition to being transported off-site to cooperating agricultural fields, dried biosolids harvested from the drying beds may also be applied to certain buffer areas on the dedicated site. A schematic of this operation is shown in Figure 2-1 (Biosolids Process Flow Diagram).

In addition to the land application program, a small-scale aerated static pile composting operation is conducted at the BMF. This operation utilizes dried biosolids from the ADBs to construct aerated static piles each year. The piles are created by mixing wood chips with the dried biosolids, in approximately a 2-to-1 volume ratio, and building an 8-foot-high trapezoidal pile over perforated plastic aeration piping that runs the length of the pile. A centrifugal blower, connected to the aeration piping, draws or pushes air through the pile at timed intervals to maintain a specific temperature range within the core of the composting pile (50° to 60°C). After the composting activity within the pile has reached maturity, the piles are broken down and screened to recover wood chips that have not degraded. The resulting screened compost is hauled off-site where it is utilized for soil conditioning, landscaping, ornamental gardens, and vegetable gardens. An information packet is provided to each end-user outlining directions for use, suggested application rates, and quality analysis. An example of this is located in Appendix E.

The key sizing and performance criteria for the existing biosolids management system are listed in Table 2-1.

TABLE 2-1
Summary of BMF Facilities Components

Facultative Storage Lagoons (FSLs)	
No. of FSLs	4
Lagoon Surface Area	25 acres (272,250 sq. ft each)
Hydraulic Capacity	25 million gallons (each)
Loading rate	
Design	25 lb VSS/1,000 sq. ft/day
Current	19.2 lb VSS/1,000 sq. ft/day
Future (2020)	29.0 lb VSS/1,000 sq. ft/day
VSS Destruction	40 percent (design), 34 percent (actual)
Dredge Pumping	2,000 gpm at 54 psig
Supernatant Pumping	800 gpm at 23 ft TDH
Air Drying Beds	
Number	13
Drying Bed Surface Area	24 acres
Sidewall Depth	14 inches (typ. depth: 12 in.)
Drying Cycles	
Number	2 per year (Apr - Aug, Aug - Oct)
Fill Time	6 to 12 weeks
Drying Time	0 to 12 weeks
Capacity per Drying Cycle	7,000,000 dry lbs of solids (based on 16 percent solids from belt presses)
Storage	
Liquid Storage Tanks	
Number	3
Capacity	1- 50,000 gal
	2- 370,000 gal
Cake Storage Hoppers	
Number	2
Capacity	90 yd^3 each
Mixing Pumps	
Number	4
Type	Induced-Screw Impeller
Capacity	900 gpm at 75 ft TDH
Belt Filter Press	
Number	3
Size	2-meter
Design Capacity	2440 dry lbs/hour (each)

2.2.1 Primary Treatment

Four circular primary clarifiers remove approximately 35 percent of the solids in the wastewater stream. Each clarifier has a dry weather design hydraulic capacity of 12.5 MGD and a wet weather design hydraulic capacity of 17.8 MGD. Primary sludge is gravity thickened to 4 to 6 percent solids in the clarifiers. The thickened sludge is collected into a hopper by rake arms where it is transferred by air operated diaphragm pumps to the primary digesters.

2.2.2 Secondary Treatment

Aeration and clarification are the two components of secondary treatment. The mixture of activated sludge and wastewater leaves the aeration tank and flows into the secondary settling tanks. The activated sludge is settled at the bottom of the tank and concentrated to approximately 1 to 1.5 percent solids in the secondary clarifiers. The excess activated sludge is then pumped to a gravity belt thickening process prior to anaerobic digestion for further biological treatment.

2.2.3 Solids Thickening

Primary sludge is thickened by gravity in the primary clarifiers to approximately four to six percent solids. The thickened sludge is collected by rake arms into a hopper where it is transferred by air operated diaphragm pumps to anaerobic digesters.

From the aeration basins, wastewater flows into eight secondary clarifiers. Each clarifier has a dry weather hydraulic design of 6.9 MGD and a wet weather hydraulic design of 9.5 MGD. Secondary sludge (waste activated sludge) can be thickened in two different modes of operation.

During the cooler winter months, the activated sludge can flow by gravity from the return activated sludge tower to the plant head works. At the head works, the waste activated sludge is combined with the plant influent and continues on to the primary treatment process, where it is co-thickened with the raw primary sludge.

Waste-activated sludge is transferred to one of the two gravity drainage belts. The waste activated sludge is conditioned with polymer and applied to the filter belts at approximately 0.8 percent solids, and thickened to 4 percent dry solids. After gravity belt-thickening, the activated sludge is pumped to the anaerobic digestion process.

2.2.4 Digestion

Sludge from the primary and secondary processes is thickened and then pumped to the digestion process (three 1.14MG digesters). Approximately 5 – 9 million gallons of septage is received from regional haulers throughout the area annually and is either treated through the plant process or pumped directly to the digestion process. The combined sludges are inoculated with bacteria and heated to approximately 36°C. Bacteria in the digestion process reduce the organics into water, carbon dioxide and methane gas. This process takes place over 15 to 35 days, depending on the amount of sludge that is pumped to the digesters. The methane gas is used to produce heat and electrical energy that is used in the operation of the Regional Treatment Facility.

2.2.5 Facultative Storage Lagoons

Digested biosolids from the holding tanks are pumped through a 5.5-mile force main into one of four 6.25-acre FSLs located at the BMF. The FSLs are designed to maintain an aerobic layer free of scum or membrane-type film build-up. The aerobic layer is maintained by controlling annual organic lagoon loading at or below a critical area loading rate, and by the use of surface mixers to agitate and mix the aerobic surface layer.

The aerobic surface layer of the FSLs is usually between 1 and 3 feet in depth above the settled solids and supports a very dense population of algae. Dissolved oxygen is supplied to this layer by algae photosynthesis, by direct surface transfer from the atmosphere, and by the surface mixers. Oxygen is utilized by the bacteria in the aerobic degradation of colloidal and soluble organic matter, while the digested solids settle to the bottom of the lagoons and continue their anaerobic decomposition. The hydraulic capacity of each FSL is approximately 25-million gallons.

Supernatant flows via 10-inch-diameter pipe to a point where it is discharged to a sanitary sewer manhole and conveyed to the E/S WPCF.

2.2.6 Belt Filter Presses

Biosolids are pumped from the FSLs at approximately 3-5 percent solids, and is directed to one of two 370,000-gallon tanks for mixing prior to thickening. Biosolids pumped from the mix tanks pass through a screening process to remove materials in excess of 5mm. From the screens, the biosolids are injected with a concentrated polymer solution and flow onto one of three 2-meter belt filter presses. Dewatered solids are removed from the presses at approximately 16-18 percent solids. Dewatered solids are transported to the Air Drying Beds for further processing or transported directly to the land application sites for application.

Filtrate and washwater from the presses can be pumped directly to the FSLs or pumped into the supernatant return line, which flows to the WPCF for further treatment. Future application may include irrigation of filtrate and washwater to the dedicate land application site and poplar plantation.

2.3 Septage Receiving Facilities

In addition to wastewater received at the WPCF, approximately 5 - 9 million gallons of septage and a small volume of holding tank wastewater, chemical toilet wastes and grease trap wastes are received annually from regional haulers throughout the area. The septage received at the regional plant is treated through the WPCF or alternately, pumped directly to the anaerobic digestion process discussed in Section 2.2.4.

2.4 Pretreatment / Industrial Source Control

The regions industrial wastewater pretreatment program protects the environment and the area's wastewater collection, treatment facilities and biosolids quality by regulating potentially contaminated wastewater discharges from commercial and industrial activities.

The cities of Eugene and Springfield operate independent industrial source control programs under a model ordinance developed by the MWMC and adopted by the cities of Eugene and Springfield. The MWMC ordinance directed both cities to established local limits to maintain biosolids quality at or below 50-percent of the "clean sludge" criteria identified in 40CFR Part 503.13 (See Appendix A for recent monitoring results).

Springfield administers the program within Springfield's urban growth boundary, and Eugene administers the program in the Eugene area.

Regulatory activities include developing pollutant limits for industrial discharges, responding to permit violations, and conducting industrial site inspections.

Regulatory Authority

Code of Federal Regulations, Title 40, Part 403

Springfield Code, sections 4-7-1 to 4-7-8

Eugene Code, sections 6.501 t0 6.596

Specific restricted substance limitations for industrial and commercial users are listed in the City of Eugene Administrative Rule R-6.463-B and the City of Springfield Administrative Rule R-4-7-1 B.

SECTION 3

Solids Treatment Processes

3.1 Pathogen Reduction

The 40 CFR Part 503 and Oregon Chapter 340, Division 50 pathogen reduction alternatives ensure that pathogen levels in biosolids are reduced to levels considered safe for biosolids to be land applied or surface disposed. The allowable alternatives include a combination of technological and biological controls to reduce pathogens. Subpart D of Part 503 includes criteria to classify biosolids as Class A or Class B with respect to pathogens. These classifications are based on the level of pathogens present in biosolids that are used or disposed (EPA, 1994).

Class A processes reduce pathogens to below detectable levels allowing product distribution with fewer regulatory constraints. Class B processes reduce pathogens to levels that are unlikely to pose a threat to public health when site and management restrictions are maintained.

In order to meet Class B biosolids pathogen requirements, one of the following three alternatives can be used:

- Alternative 1: Monitor indicator organisms. A test of fecal coliform density is required as an indicator for all pathogens. The geometric mean of seven samples shall be less than 2 million MPN (Mean Probable Number) per gram per total solids.
- Alternative 2: Treat biosolids in a process to significantly reduce pathogens (PSRP). PSRPs include aerobic digestion, air drying, anaerobic digestion, composting, lime stabilization.
- Alternative 3: Treat biosolids in a process equivalent to a Process to Significantly Reduce Pathogens (PSRP).

Pathogen reduction is achieved during anaerobic digestion (Alternative 2) for all MWMC biosolids that are to be land applied. This is a PSRP as defined in 40 CFR Part 503.32(b)(3). Solids are retained in the digesters for at least 15 days at a minimum temperature of 35ºC. This time and temperature criteria achieves Class B status for liquid biosolids that may be land applied. The liquid biosolids are then further processed in the FSLs. Biosolids from the FSLs that are not land applied as Class A or Class B liquids are further processed by belt press dewatering and then air-drying to approximately 50 percent solids (see Section 3.3 Additional Reduction).

It is desirable to also land-apply the filtrate from the belt presses. The filtrate is expected to meet pathogen reduction and vector attraction criteria for Class B biosolids. However, the actual characteristics of the belt press filtrate will be tested after the belt presses are brought on line to confirm that it meets the requirements for Class B biosolids land application.

3.2 Vector Attraction Reduction

Pathogens in biosolids pose a risk when they are brought into contact with humans or other susceptible hosts (plants or animals). Vectors—which include flies, mosquitoes, fleas, rodents, and birds—can transmit pathogens to humans and other hosts either through physical contact or by playing a specific role in the life cycle of pathogens. Reducing the attractiveness of biosolids to vectors reduces the potential for transmitting diseases from pathogens in biosolids.

There are 12 options in Part 503 rule to demonstrate reduced vector attraction reduction for biosolids. The first of the twelve options is to meet 38 percent reduction in volatile solids content. The following formula (EPA publication number 831B-93-002a) is used to calculate the Percent Volatile Reduction: **(In-Out) * 100 /(In-(In x Out)) = percent Volatile Solids Reduction.**

MWMC biosolids have consistently met vector attraction reduction requirements by achieving greater than 38 percent volatile solids reduction. Digestion reduces volatile solids by at least 38 percent producing a stable product that does not attract vectors or generate offensive odors. This practice for vector attraction meets requirements of Part 503.33(b)(1).

3.3 Additional Reduction

3.3.1 FSLs and ADBs

Additional pathogen and vector attraction reduction is achieved from treatment in FSLs for all biosolids that are land applied. Biosolids that are not immediately land applied are belt press dewatered and then transported to the ADBs for further pathogen reduction. Testing is conducted on biosolids processed in the ADBs, and this monitoring data indicates that biosolids harvested from the ADBs consistently meet Class A pathogen reduction criteria as defined in 40 CFR 503.32(a)(6). Testing, sampling, monitoring, and documentation of results for microbial organisms is ongoing to insure continued attainment of Class A pathogen requirements for dewatered and dried biosolids (see Table 5-3 and Appendix A).

3.3.2 Composting

A portion (about 5%) of annual biosolids production receive additional vector and pathogen reduction through the aerated static pile composting process. Temperatures in the compost system are maintained at 55°C (131°F) or higher for three consecutive days. This qualifies as a Process to Further Reduce Pathogens (PFRP) as defined by 503.32(a)(7) and generates a Class A biosolids product. Microbial monitoring is conducted as required to demonstrate that in addition to process controls in the compost system, the density of fecal coliforms or Salmonella in the compost meets the requirements of Part 503 rules.

Dried or dewatered biosolids are mixed at controlled rates with a carbon source, usually wood chips obtained from city tree pruning activities. Mixing of the biosolids and wood chips is accomplished with specialized batch mixing equipment or with the Brown Bear auger/mixer. With the Brown Bear, a series of passes incorporate the biosolids and wood chips. This mixture is stacked in a large windrow approximately 8-10 feet high, 15-20 feet wide and 200 feet long. The windrows are constructed over a 12-inch bed of insulating wood chips to form an air plenum using perforated plastic piping connected to air blowers.

The blowers are set up on automatic timers to control the flow of air and temperature of the compost piles. An insulating blanket of 8– 10 inches of wood chips or finished compost is used to cover the pile.

After a period of 30-60 days of active composting, the biosolids compost is stockpiled for additional curing. The compost pile is monitored for temperature during this period. When the temperature of the curing pile has dropped below 45 degrees C, it is determined to be sufficiently stable for marketing. After screening and pathogen, nutrient and pollutant analysis, the compost is ready for marketing. To date, marketing of the finished compost has been limited to commercial landscape users, local utilities, and the City Parks Department.

An information packet is provided to each end-user outlining directions for use, suggested application rates, quality analysis and product origin (see Appendix E).

SECTION 4

Contingency Options

Contingency options are outlined in the context of a biosolids management plan in the event of a process failure or spill during transport of biosolids to neighboring sites. A process failure includes potential breakdown of biosolids application equipment, an unexpectedly narrow window of application, a digester upset, a digester breakdown, belt filter press breakdown, or a liquid biosolids spill at the WWTP or in transport to the BMF. The following contingency options will be observed in case of a process failure or a spill during transport.

4.1 Process Failure

4.1.1 Breakdown of Belt Filter Presses

The facultative storage lagoons (FSLs) will be maintained with some excess capacity. This allows biosolids to be stored longer than planned in the FSLs without adverse consequences. The FSLs can store up to 80-million gallons of liquid biosolids. In the event of difficulties with the belt press system, the ADBs can be utilized to air dry liquid biosolids or a liquid hauling program can be initiated.

4.1.2 Unexpectedly Narrow Window of Application

In the event that the acceptable window of application in the poplar tree plantation or agricultural fields is much less than expected, additional land can be found for biosolids recycling in neighboring areas utilizing the site selection criteria outlined in Table 7.6. In addition, liquid biosolids can be stored in the FSLs until the following growing season.

4.1.3 Digester Upset or Breakdown

In the event of an upset or breakdown of the anaerobic digesters, biosolids can be transported directly to the FSLs. The WPCF utilize three 1.1MG digesters for sludge stabilization and pathogen destruction. In the event of a single digester upset, the effected digested will be taken out of service until the situation has been corrected, or the digester has been cleaned and the solids disposed of appropriately. With one digester out of service, soilds detention time averages about 18-days. In the unlikely event of two digesters out of service, detention time would be reduced to about 9-days, which is under the time requirement to meet PSRP criteria. In this event, the off-line aerations basins could be put into service as aerobic digesters. Supplemental stabilization and pathogen reduction occurs in the FSLs and ADBs, resulting in an additional 30 percent reduction in volatile solids. Pathogens and volatile solids are monitored and measured in the biosolids prior to land application to insure that the regulatory criteria has been met.

4.1.4 Liquid Biosolids Spill at the WWTP

If a drain is nearby, liquid biosolids will be washed to the nearest drain and returned to the headworks. If determined to be advantageous, a sump may be dug at the spill location for enhanced collection of the spill, and collected liquids can then be pumped to the headworks. If no drain is nearby, adsorbent materials will be added, and biosolids will be added to drying beds. DEQ will be contacted directly or via the Oregon Emergency Response (OER) system phone number.

In areas where conditions are suitable, lime may be used on the remaining solids to reduce potential pathogen impacts on surrounding areas. In areas where sensitivity to lime may be an issue, such as near sensitive waterways and dry windy locations where lime may be spread by vehicles or wind, use of lime may not be appropriate.

4.1.5 Force Main

Biosolids from the WPCF is pumped approximately 5.5-miles via an 8-inch forcemain to the BMF. In the event of a forcemain failure or extended repair, biosolids can be temporarily routed to an existing 2-acre storage lagoon located at the WPCF. This lagoon has an 8-MG storage capacity.

4.2 Spill During Transport

Biosolids are transported off site by truck. In the event a spill occurs, the measures outlined below will be taken and DEQ will be contacted directly or via the OER phone number.

4.2.1 Over-the-Road Spill Response Procedures

Spill response procedures include the following:

- The truck should be parked on the side of the road. Traffic cones, reflectors and/or flares should be used to divert traffic around the spill. The driver will remain with the truck and spilled materials, unless it is necessary to leave temporarily to contact emergency services.
- Drivers shall notify their supervisor as soon as possible by radio or by phone. The highway patrol should also be notified if the spill has occurred on a public right of way.
- Authorities should be notified that non-hazardous and non-toxic biosolids are being hauled.
- The driver will cooperate with authorities, assist with traffic control and clean-up.
- The driver will not leave the scene of any spill even a small one, until it is cleaned up. Small spills may be cleaned up before they are reported.
- Contract haulers will be required to submit spill response plans for approval .
- In the event of a spill, DEQ will be contacted directly or via the OER phone number.

4.2.2 Cleanup Procedures

Cleanup procedures include the following:

- Spilled biosolids should be loaded back into the vehicle if it is operable. If the vehicle is disabled, the spill must be loaded into an alternate vehicle.
- Spilled biosolids must be prevented from migrating off the incident site, into storm drains, or into surface waters. This is especially important if an incident occurs in rain conditions. Biosolids spills may be diked or controlled with sand, sand bags, straw, absorbents, or other blocking materials.
- A small spill may be loaded into the receiving vehicle by a two-person crew with shovels. A large spill must be loaded into the vehicle by an appropriate rubber tired loader. The scene coordinator must decide upon the most efficient loading option, based on equipment availability and spill size.
- After the spill has been loaded, the incident site must be cleaned. Spills may need to be cleaned by sweeping the site of the remaining debris. Tools or trucks should not be washed off at the spill location but returned to the BMF or WPCF for cleaning

- In areas where conditions are suitable, lime may be used on the remaining solids to reduce potential pathogen impacts on surrounding areas. In areas where sensitivity to lime may be an issue, such as near sensitive waterways and dry windy locations where lime may be spread by vehicles or wind, use of lime may not be appropriate.

Cleaned-up spills should be either taken to the original destination or returned to the BMF.

SECTION 5

Biosolids Characteristics

5.1 Sampling and Monitoring Program

Biosolids quality will be monitored for the following characteristics:

- Total solids
- Volatile solids
- Nitrogen (NH_3-N, NO_3-N, and TKN)
- Phosphorus
- Potassium
- pH
- Metals (As, Cd, Cu, Hg, Mo, Ni, Pb, Se, and Zn)

Biosolids sampling will be conducted monthly during periods of liquid biosolids reuse (minimum of six times per year for all dried or dewatered biosolids) to monitor total solids; volatile solids; nitrogen for NH_3-N, NO_3-N, and TKN; phosphorus; potassium; and pH. Except for pH, which will be expressed in standard units, these characteristics will be expressed in percent dry weight. A composite sample, representative of the product to be land applied, will be collected from the facultative storage lagoons, mix tanks, or the air drying beds.

Sampling will also be conducted six times per year to monitor metals content for As, Cd, Cu, Hg, Mo, Ni, Pb, Se, and Zn (total in mg/kg). A composite sample, representative of the product to be land applied, will be collected from the facultative storage lagoons, mix tanks, or the air drying beds.

Monthly monitoring of the percent volatile solids reduction will be accomplished when biosolids are land applied. The following formula (EPA 831B-93-002a) is used to calculate the percent volatile reduction: **(In-Out) * 100 /(In-(In x Out)) = Percent Volatile Reduction.**

The dates, volumes, and locations of biosolids applications will be recorded in an application log that is maintained on file and can be reviewed by the Oregon Department of Environmental Quality.

5.2 Biosolids Chemical and Nutrient Characteristics

The trace element characteristics of MWMC biosolids are presented in Table 5-1. The values presented represent the average concentrations for 2000. The low levels of trace elements allows MWMC biosolids to meet the EPA "clean biosolids" criteria defined in 40 CFR Part 503.13.

TABLE 5-1
Trace Element Concentrations for MWMC Dewatered Biosolids Based on Average 2000 Concentrations (mg/kg)

	MWMC Biosolids	EPA — "Clean Biosolids" Table 3	EPA— Maximum Allowed Concentration Table 1
Arsenic	2	41	75
Cadmium	7	39	85
Copper	655	1,500	4,300
Lead	135	300	840
Mercury	4	17	57
Molybdenum	5	---*	75
Nickel	37	420	420
Selenium	6	100	100
Zinc	1,250	2,800	7,500

* As a result of the February 25, 1994, amendment to the rule, the limits for molybdenum were deleted from PC and CPLR of Part 503 rule pending EPA reconsideration.

Expected nutrient content of MWMC biosolids are summarized in Table 5-2. While these characteristics remain reasonably constant, frequent monitoring will continue to determine nutrient content for land application loading calculations. Copies of recent biosolids analyses are included in Appendix A.

TABLE 5-2
MWMC Biosolids Nutrient Concentrations

	Content (percent dry weight)
Total Kjeldahl Nitrogen	4.00
Ammonia Nitrogen	0.80
Nitrate + Nitrite Nitrogen	0.05
Phosphorus	4.75
Potassium	0.46

Results are an average of all dewatered biosolids applied in 2000.

5.3 Pathogen and Vector Attraction Reduction Characteristics

The MWMC WPCF will continue to produce biosolids that at a minimum meet Class B requirements and the criteria for vector attraction reduction as described in Section 3, Solids Treatment Processes, of this plan. Several years of pathogenic organism analysis of the final biosolids product that is land applied indicates that MWMC biosolids typically meets Class A pathogen reduction criteria as established in 503.32 (a)(6). Results from ADB monitoring for pathogenic organisms is detailed in table 5.3

TABLE 5-3
MWMC Land Applied Biosolids Pathogen Concentrations, 2000

	July	September
Salmonella sp.	<2.2MPN /4grams	<2.2 MPN / 4 grams
Enteric virus	<1 PFU / 4 grams	<1 PFU /4 grams
Helminth Ova	<1 / 4 grams	<1 / 4 grams

SECTION 6

Reporting

6.1 Recordkeeping and Monthly Reporting

Table 6-1 summarizes the monitoring and record keeping requirements from the existing E/S WPCF NPDES permit for the biosolids program. According to the NPDES permit, monitoring results will be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the department by the 15th day of the following month. These monitoring reports will identify the name, certificate classification, and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports will also identify each system classification as found on page 1 of the NPDES permit (appendix b) table 6-1.

Monitoring and Recordkeeping Requirements from MWMC's NPDES Permit for Biosolids (Permit 55999)

Item or Parameter	Frequency	Type of Sample
Biosolids analysis including total solids (% dry wt.); volatile solids (% dry wt.); biosolids nitrogen for NH_3-N, NO_3-N, and TKN (% dry wt.); phosphorus (% dry wt.); potassium (% dry wt.); pH (standard units) Biosolids metals content for As, Cd, Cr, Cu, Hg, Ni, Pb, Se, and Zn, measured as total in mg/kg	Quarterly	Composite sample to be representative of the product to be land applied from the facultative storage lagoon and/or drying beds[1]
Total Organic pollutants	Annually	Composite sample to be representative of the product to be land applied from the facultative sludge lagoons and/or drying beds[1, 2]
Record of % volatile solids reduction accomplished through stabilization	Monthly for Anaerobic Digesters	Calculation[3]
Record of locations where biosolids are applied on land (site location map to be maintained at treatment facility for review upon request by DEQ)	Each occurrence	Date, quantity, and locations where biosolids is applied recorded on a site location map.

Notes from MWMC NPDES Permit #55999:

[1] See NOTE 4 in NPDES Permit #55999 p.8 in Appendix B

[2] See NOTE 7 in NPDES Permit #55999 p.8 in Appendix B

[3] Calculation of the % volatile solids reduction for the anaerobic digesters is to be based on comparison of a representative grab sample of total and volatile solids entering the digestion process and a representative composite sample of sludge solids exiting the sludge holding tanks.

6.2 Annual Report to DEQ

An annual Biosolids Application Monitoring Report will be prepared and submitted to DEQ and EPA no later than February 19 of the following year. The report will describe solids handling activities for the previous year and include the required information outlined in OAR 340-50-035 (6)(a)-(e). The report will detail the results of the biosolids sampling and biosolids land application season of the prior year. The annual report will consist of tabular data summaries and graphical representations of analysis and measurement results for various monitored parameters.

Recommendations to revise the monitoring plan, which may include an increase or a reduction in monitoring frequency and monitoring constituents, will be addressed in the report.

From a performance-based perspective, the annual report is the mechanism for changing site operations. The biosolids management plan will be evaluated, and operational changes for the upcoming year will be proposed and explained. For example, the loading rates may change in response to results from performance-based monitoring, or process variation could be proposed based on changing conditions or market demands. The proposed analyte list and sampling frequencies could increase or decrease depending on sampling results. Proposed changes will be provided in tabular format.

SECTION 7

Biosolids Removal and Processing

Biosolids are removed from the WPCF by utilizing two centrifugal pumps to transport the anaerobically digested biosolids 5.5-miles through an 8-inch forcemain to one of four FSLs at the BMF.

Biosolids are typically stored in the FSLs during the wet months from October through March. Historically, one FSL is harvested annually. Occasionally portions of two FSLs may be harvested to allow for increased operational flexibility and additional storage capacity.

Beginning in April, biosolids are harvested from one of four FSLs with a floating dredge and pumped to one of two 370,000 gal mixing tanks prior to dewatering with the BFPs. Dewatered biosolids are transported to the ADBs for further drying and processing prior to land application. Alternately, biosolids can be pumped from the FSLs and directed to the ADBs, bypassing the mechanical dewatering process, for air drying.

Daily mixing of the biosolids in the ADBs with a specialized tractor with an auger/mixer attachment maximizes surface exposure, increases the evaporation rate, aerates the biosolids and increases exposure to ultra-violet light, all of which contributes to pathogen destruction. Although all of the mechanisms for pathogenic reduction are not known at this time, mechanisms that might be expected to destroy pathogens of concern in air drying of biosolids are: desiccation (the actual drying out of the biosolids), chemical effects, and thermal effects.

Pathogen destruction using storage and air-drying utilizes ambient conditions which vary from day-to-day and season-to-season. Because of this, the MWMC process does not currently meet the DEQs or the EPAs criteria for a PFRP or a certified "Class A" process. Therefore, each batch of dried biosolids from the ADB is monitored for pathogenic organisms prior to land application. However, due to the lengthily time period that currently exists to obtain results (approximately six weeks), MWMC manages the land application program under the Class B management requirements. Based on several years of pathogen testing, MWMC's air-dried biosolids consistently meet the EPA's "Class A" requirements for pathogens of concern (See Table 5.3 or Appendix B for pathogen analysis results).

All drying of biosolids is accomplished through evaporation. After the biosolids are placed in the ADBs, the auger/mixer is used to windrow the biosolids. The windrows allow any rainfall to be routed away from the biosolids, collected and recycled to the FSLs for processing.

Biosolids are dewatered to 15-20 percent solids and then air dried to approximately 40-60 percent solids. Front-end loaders are used to remove the biosolids from the ADBs which are placed into large end-dump trailers for transportation to Department approved agricultural fields. Transportation is typically accomplished utilizing MWMC owned and operated vehicles. Occasionally MWMC will hire contract haulers to assist with transportation needs. In the field, biosolids are loaded into 8-yard push-out style manure spreaders and applied at controlled rates in accordance with crop nutrient needs and Department requirements.

Biosolids dewatered or dried in the ADBs can also be utilized in a Department approved composting program. Dewatered or dried biosolids is composted utilizing the aerated static pile process or aerated windrow process. Biosolids are mixed at controlled rates with a carbon source (typically a 2:1 mix of wood chips to biosolids). Mixing of the biosolids and carbon source is accomplished utilizing the auger/mixer tractor or a specialized mixing device. The mixture is then stacked in large piles approximately 8 feet high, 20 feet wide and 150 feet long for the windrows. The larger piles may be up to 8 feet high, 80 feet wide and 100 feet long. The piles are constructed over a 12-inch bed of insulating wood chips and perforated plastic pipes. The perforated pipes are connected to blowers that are controlled by automatic timers which control the air flow and temperature of the compost pile. An insulating blanket of 8 to 10 inches of finished compost or wood chips is used to cover the pile.

Temperature is monitored daily using 36-inch temperature probes and digital meters during the active composting phase of the operation. Temperature monitoring points are located approximately 12-inches above the toe of the pile and 12-iches deep, per Department recommendations. Temperature is maintained at 55 degrees Centigrade for a minimum of three consecutive days throughout the pile to meet "Class A" pathogen reduction requirements.

TABLE 7.1
Equipment listing

Equipment Description	Number Available
Diesel tractor/truck	3
35-yard end dump trailer	3
35-yard push out trailer	1
18-yard dump truck	1
5,500 gallon tanker	3
100-hp farm tractor	2
8-yard push out spreader	3
3.5-yard front end loader	2
2-yard front end loader	1
Auger/mixer tractor	1
Auger/mixer attachment	1
All terrain vehicle	2
Service/fuel truck	1
Shredder	1
Water tank/high pressure pump	1

7.1 Storage

Storage capacities of the FSLs and other storage facilities are given in Table 2-1.

7.1.1 General Dedicated Site Design

The proposed dedicated reuse site is shown in Figure 7-1. The site will be divided into seven management units (MUs) within which management will be kept uniform to the extent possible. Each management unit will be planted in either hybrid poplar or grass hay. As described below, appropriate buffers will be maintained between application areas and adjacent properties, roads, or water bodies.

7.1.2 Liquid Biosolids

Liquid Class A or Class B biosolids at approximately 2 to 5 percent solids will be pumped via an enclosed pipe system from the FSLs to the temporary holding tank by the FSL dredge. Residence times in the temporary holding tank will remain relatively short (on the order of minutes to days) due to the limited capacity of the tank (approximately 50,000 gallons).

Filtrate from the belt press units may also be pumped from the units to the temporary holding tank for subsequent land application. Filtrate and standard liquid class B biosolids at approximately 2 to 5 percent solids flow streams will be kept separate to insure appropriate agronomic application rate accounting.

With a dedicated reuse pump station, the low solids biosolids or filtrate is pumped through a main trunk supply pipeline to one or more pipeline laterals which in turn delivers the flow to one of the seven management units on the site. Within the management units, hard-hose reel application equipment is used to apply the liquid to the land surface. The hard-hose reel units may be connected to any of a series of risers from the pipeline laterals.

Main trunk pipelines and the laterals within the management units planted with trees (see Figure 7-1) will be buried PVC pipe. In the areas planted with grass, above-ground, aluminum pipe will be used for the management unit laterals.

7.1.3 Cake Biosolids

Class A and/or Class B cake biosolids (approximately 50 percent solids) from the drying beds will be transported to the crop site and buffer areas (see Figure 7-1) and land applied in the appropriate areas with tractor-drawn spreaders similar to those used in general agricultural applications.

7.2 Dedicated Site Selection

The criteria and management issues considered during site selection for a dedicated biosolids land application site are described below. The proposed site has been evaluated for compliance with applicable regulations, primarily OAR 340-50-30, for land application of biosolids for agricultural use. A detailed description of the site evaluation can be found in the reconnaissance study (CH2M HILL, 1999) and site feasibility report (CH2M HILL, 2000).

7.2.1 Criteria for Site Selection

Site criteria for land applying biosolids include physical geographical features (geological formation, floodplain proximity, groundwater and surface water proximity, topography, and soils), and method of application. The criteria used for selection of this site mirror the Oregon DEQ recommendations as described in OAR 340-50 and are summarized in Table 7-2. In addition to these general site selection criteria, the proximity to the current BMF weighed into the selection of the proposed dedicated site.

TABLE 7-2
Site Selection Criteria for Dedicated Biosolids Application Site

Parameter	Criteria
Geology	Must have a stable formation.
Floodplain	Site should not be subject to flooding or excessive runoff from adjacent land
	In case of periodic flooding, application will not be conducted until flooding has receded
Groundwater	At time of application, the minimum depth to permanent groundwater will be 4 feet
	Minimum depth to temporary groundwater will be 1 foot.
Topography	Slopes less than 12 percent
	Liquid biosolids will be applied with appropriate management to eliminate surface runoff
Soils	Minimum rooting depth of 24 inches.
	No rapid leaching.
	Avoid saline or alkali soil.
Method of application and proximity to sensitive areas	Buffer strips will be maintained to protect water bodies and other sensitive areas. Size depends on method of application and proximity to sensitive areas as described below:
	• Near ditch, pond, channel, or waterway
	– 200-foot buffer strip for liquid biosolids
	– 50-foot buffer strip for dried biosolids
	• Near domestic wells—200-foot buffer strip for all biosolids
	• Adjacent to property boundaries or public roads
	– 100-foot buffer for liquid biosolids
	– 25-foot buffer for dried biosolids

7.2.1.1 Landscape Position and Geology

The proposed site is located along the watershed divide of two area streams. Therefore, little runoff is expected from off-site, and any flooding should be limited to small areas immediately adjacent to the intermittent drainage ways on the site. In addition, land application periods will be restricted to the summer dry season, when major rainfall events are generally infrequent and of short duration. Application will not be conducted on any flooded lands.

The site is located on a stable alluvial plain with 0 to 3 percent slopes, so landslides or other slope instability are not an issue and runoff from the site can be easily prevented with proper management of liquid application rates.

7.2.1.2 Soils and Groundwater

A detailed soils evaluation was conducted for the site (CH2M HILL, 2000) which concludes that roots extend to at least 24 inches. Some roots were found to penetrate at a depth of 40 inches. The silty clay loam soils which cover the site should prevent rapid leaching of applied liquids. The soil chemical properties were found to be suitable for agricultural crops with no salinity or alkalinity limitations.

Ground water levels on the site vary from approximately 6 to 25 feet below the ground surface during the dry season (approximately May through September). The ground water level rises considerably during the wet season with depths to the water table in the range of 1 to 12 feet over most of the area by early spring. Application of biosolids will be limited to the period of May through September to insure that the minimum depth to groundwater (4 feet below ground surface at time of application) is maintained.

Buffer strips will be maintained along the intermittent drainage ways on the site to further guard against contamination of surface water and shallow groundwater in those areas. The buffer along these drainage ways will be 200 feet for application of liquid biosolids, and 25 feet for the dried biosolids (dried biosolids will be applied within the 200-foot liquid buffer up to 25 feet from the drainage way). Liquid biosolids will not be applied within 200 feet of the production wells adjacent to the site.

7.3 Notification of Property Owners and Community

Neighboring land owners and residents of all Department approved land application sites will be directly contacted by city staff when feasible or provided with notification by mail prior to beginning initial land application activities.

The dedicated site has been purchased and retained by MWMC for the purpose of operation of a farm for biosolids land application. A community education and involvement process has been initiated to obtain input from the surrounding community on issues of concern and to help address these issues in overall design and operation plans. The community involvement program has included a series of public meetings and individual contacts with neighboring landowners and community members. This process of community involvement will be continued during design, construction, and operation phases of the project.

7.4 Application Rates

Application rates are based on agronomic loading rates for the crop nitrogen requirements. The fraction of the nitrogen available for plant uptake for the different material types applied to the dedicated site are summarized in Table 7-3. The fraction of available nitrogen available for plant uptake for all other Department approved cooperative application sites are summarized in Table 7-7. These fractions are applied to regular analyses of the biosolids nitrogen content to determine the amount of plant available nitrogen (PAN) in the source material. The PAN in the applied material is used in combination with the amount of material applied to determine the site nitrogen loading in pounds of nitrogen per acre (lb.-N/acre).

Soil testing for carryover nitrate N (NO_3-N) will be conducted at cooperative application sites that exceed two (2) out of three (3) successive years of application at agronomic rates.

For the dedicated site, the cumulative nitrogen loading will be monitored for each management unit within the site. Site loading will be discontinued for the year when the cumulative loading rate reaches the management unit capacity for the year. Annual loading capacity for the grass and poplar tree crops are summarized in Table 7-3. Agronomic rate calculations are found in Appendix D.

TABLE 7-3
Available Nitrogen Assumptions for Loading Rate Calculations on **Dedicated Site***

Nitrogen Source	Percent of Nitrogen Available for Plant Uptake
Class A Cake Biosolids	
Organic Nitrogen	20 percent
Ammonia Nitrogen	85 percent
Nitrate and Nitrite Nitrogen	100 percent
Class B Liquid Biosolids and Filtrate	
Organic Nitrogen	20 percent
Ammonia Nitrogen	50 percent
Nitrate and Nitrite Nitrogen	100 percent

*Per discussion with DEQ.

While total annual nitrogen capacity for mature poplars under ideal conditions in the Willamette Valley are estimated to be 260 lb.-N/acre, the potential water uptake of the poplar trees will not be supplied by the anticipated biosolids loading scenario for the site. In addition, low permeability layers in the site soils may prevent the poplar trees from reaching their full growth potential. Considering the soil and water availability factors, the trees and grass may not meet the full uptake capacity that would be expected under ideal conditions. Therefore, an annual uptake potential of 220 lbs./acre is used for initial site capacity determination. The nitrogen capacity for trees will be phased in as the trees mature according to the schedule in Table 7-3. Similarly, because of water supply limitations, a nitrogen uptake potential for grass of 120 lb.-N/acre/year is assumed rather than the 150 lb.-N/acre/year that would be expected if the grass had a full water supply.

TABLE 7-4
Annual Site Nitrogen Loading Capacities for Poplar Tree and Grass Crops at the Dedicated Site (lb/ac/year)*

	1 Year-old	2 Year-old	3 Year-old	Beyond 3 Year-old
Poplar Trees	150	180	200	220
Grass	120	120	120	120

*Per discussion with DEQ.

As described in Section 7.5 below, soils at the site will be monitored to determine if excess leaching of nitrogen is occurring. If the monitoring at the site suggests that the site is being over or under-loaded, these initial estimates for crop capacity will be reevaluated and recommendations of adjustments to loading rates will be made to DEQ.

7.5 Monitoring and Recordkeeping

Appropriate monitoring will be conducted to insure that application is limited to agronomic rates and that the application system performance conforms to expectations. Table 7-5 summarizes the biosolids quality and system monitoring for the dedicated site.

TABLE 7-5
Monitoring Summary for Dedicated Biosolids Site

Item or Parameter	Minimum Frequency	Type of sample
Biosolids and Water Application Rates for Dedicated Site		
Liquid Biosolids Quantity applied (gallons/acre)	Daily	Flowmeter
Record of locations where biosolids are applied on each field site (site location maps to be maintained at treatment facility for review upon request by DEQ)	Each occurrence	Date, volume, and locations where biosolids were applied recorded on site location map
Supplemental irrigation water applied	Each occurrence	Date, volume, and locations where irrigation water is applied recorded on site location map
Biosolids Quality		
Biosolids analysis including total solids (% dry wt.), volatile solids (% dry wt.), biosolids nitrogen for NH_3-N;NO_3-N; and TKN (% of dry wt.), potassium (% of dry wt.), pH (standard units)	Monthly during reuse (minimum of 6/year)	Composite sample to be representative of the product to be land applied from the facultative sludge lagoon, belt press filtrate drain and/or drying beds
Biosolids metals content for As, Cd, Cu, Hg, Mo, Ni, Pb, Se, and Zn, measured as total in mg/kg	6/year	Composite sample to be representative of the product to be land applied from the facultative sludge lagoon, belt press filtrate drain and/or drying beds
Record of % volatile solids reduction accomplished through stabilization	Monthly when land applying biosolids (minimum of 6/year)	Calculation
Pathogen reduction to meet Class A criteria	6/year	Composite to be representative
System Performance and Environmental Compliance		
Groundwater levels (to insure minimum depth to groundwater criteria are met)	Annually, prior to seasonal application	Monitoring well level indicator in installed or existing monitoring wells
Residual soil nitrogen	Annual	Composite soil samples
Tree and grass health	At least monthly during application	Visual observation
Application equipment	Regularly at time of application	Field check during setting of reels
Flow meter calibration	Annually	Verification

Records of amounts and quality of applied biosolids will be maintained for each management unit on the dedicated site. In some instances, application may be made on only a portion of a management unit. In these events, the records will be maintained for the particular reel coverage area that has received biosolids until application to the remaining portion of the management unit is completed. This process will help to maintain a uniformity of application within management units to simplify monitoring interpretation and other site management activities such as harvesting.

At the beginning of each application season, a tentative biosolids application schedule will be developed based on expected biosolids quality and site nutrient loading capacity. This schedule may, however, be adjusted during the season according to the actual quality as determined through regular monitoring. Records of applications volumes and quality will be used to calculate the total nitrogen loading for the management units. The cumulative loading for the year will be tracked, and used to adjust application scheduling for management units and to determine when cumulative loadings begin to approach the site nitrogen loading capacity.

The application schedule and records will be available for inspection.

7.6 Selection of New Cooperating Sites

As described earlier, the planned dedicated site will not meet the total biosolids recycling needs of MWMC, and cooperation with area growers will continue. As new cooperative sites are considered, similar criteria and management issues will be used in the selection process.

For non-dedicated, cooperative arrangements, where application of biosolids will be intermittent, the site selection criteria as summarized in Table 7-2 will be used with a few exceptions as summarized in Table 7-6. For these intermittent sites, property boundary buffers of 50 feet for liquids and 10 feet for solids application will be maintained, and slopes greater than 12% may be used for solids application.

Land application rates on cooperative sites will be determined based on the agronomic rate for the crop grown at the site using the assumptions for available nitrogen given in Table 7-5. The low available fraction (15%) of organic nitrogen reflects the more stable organic material resulting from the degree of anaerobic treatment in the FSLs. Also note that these organic nitrogen mineralization rates are slightly different from those used for the dedicated site, reflecting an extra margin of safety for the dedicated site, which will receive more regular biosolids application. Records of amounts and quality of applied biosolids will be maintained for each cooperative application site.

In all cases when new biosolids application sites are considered, appropriate notification procedures will be followed, and requests for site approval will be submitted to DEQ. Door-to-door personal contacts will be made with neighboring property owners where feasible, and letters will be sent to non-resident neighboring landowners or landowners who could not be personally contacted.

TABLE 7-6
Site Selection Criteria for Cooperative (non-dedicated, intermittent) Biosolids Application Sites

Parameter	Criteria
Geology	Must have a stable formation.
Floodplain	Site should not be subject to flooding or excessive runoff from adjacent land
	In case of periodic flooding, application will not be conducted until flooding has receded
Groundwater	At time of application, the minimum depth to permanent groundwater will be 4 feet
	Minimum depth to temporary groundwater will be 1 foot.
Topography	Slopes less than 12 percent for liquid biosolids, Slopes less than 20 percent for Cake biosolids
	Liquid biosolids will be applied with appropriate management to eliminate surface runoff
Soils	Minimum rooting depth of 24 inches.
	No rapid leaching.
	Avoid saline or alkali soil.
Method of application and proximity to sensitive areas	Buffer strips will be maintained to protect water bodies and other sensitive areas. Size depends on method of application and proximity to sensitive areas as described below:
	• Near ditch, pond, channel, or waterway
	– 50-foot buffer strip for all biosolids
	• Near domestic wells—200-foot buffer strip for all biosolids
	• Adjacent to property boundaries or public roads
	– 50-foot buffer for liquid biosolids
	– 10-foot buffer for dried biosolids
Geographic location	Within reasonable transport distance, primarily in Lane, Benton and Linn counties.

TABLE 7-7
Available Nitrogen Assumptions for Loading Rate Calculations on **New and Existing Cooperative Sites***

Nitrogen Source	Percent of Nitrogen Available for Plant Uptake
Organic Nitrogen	15 percent
Ammonia Nitrogen	85 percent when incorporated within 24 hours
	50 percent when surface applied
Nitrate and Nitrite Nitrogen	100 percent

*Ammonia volatilization and organic nitrogen mineralization rates used represent anaerobically digested, lagoon stabilized , and air dried biosolids.

TABLE 7.8
Monitoring Summary for Cooperative Biosolids Application Sites

Item or Parameter	Minimum Frequency	Type of sample
Biosolids Quality		
Biosolids analysis including total solids (% dry wt.), volatile solids (% dry wt.), biosolids nitrogen for NH_3-N;NO_3-N; and TKN (% of dry wt.), potassium (% of dry wt.), pH (standard units)	6/year	Composite sample to be representative of the product to be land applied from the Facultative Storage Lagoon, Air Drying Beds or Belt Filter Press
Biosolids metals content for As, Cd, Cu, Hg, Mo, Ni, Pb, Se, and Zn, measured as total in mg/kg	6/year	Composite sample to be representative of the product to be land applied from the Facultative Storage Lagoon, Air Drying Beds or Belt Filter Press
Record of % volatile solids reduction accomplished through stabilization	Monthly when land applying (Minimum of 6/year)	Calculation
Pathogen reduction to meet Class A criteria	6/year	Composite to be representative
System Performance and Environmental Compliance		
Groundwater levels (to insure minimum depth to groundwater criteria are met)	prior to application	Monitoring existing domestic wells if available
Residual soil nitrogen	When applying to two out of three successive years	Composite soil samples
Application equipment	Regularly at time of application	Field check during set up of field
Biosolids applied	Each occurrence	Map indicating date, area, and volume of biosolids applied each day