City of Everett

Basis of Planning Technical Memorandum

Strategic Planning for Biosolids Management

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Final

Project: 142050

HDR

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List of Acronyms

ATAD	autothermal thermophilic aerobic digestion
BUFs	Beneficial Use Facilities
CFR	Code of Federal Regulations
CFU	Colony-Forming Unit
CWA	Clean Water Act
EPA	US Environmental Protection Agency
EQ	Exceptional Quality
MPN	Most Probable Number
NAS	National Academies of Science
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
O&M	Operations and Maintenance
PC	pollutant concentration
PEC	Pathogen Equivalency Committee
PFRP	Processes to Further Reduce Pathogens
PFU	Plaque-Forming Unit
PSRP	Process to Significantly Reduce Pathogens
TF/SC	Trickling Filter/Solids Contact
TS	Total Solids
USEPA	US Environmental Protection Agency
VAR	Vector Attraction Reduction
VS	Volatile Solids
WERF	Water Environment Research Foundation
WPCF	Water Pollution Control Facility
WSS	Water Secondary Sludge
WWTP	Wastewater Treatment Plant

1.0 Introduction and Background

The City of Everett, Washington has contracted with HDR Engineering, Inc. to develop a strategic plan for the biosolids management program in order to identify needs, risks, and adaptations to improve the existing program. This plan will include the examination of possible interim treatment expansion at the existing facilities, along with integration with the currently planned construction of future treatment processes.

Presently the City's processing of biosolids generates an end product that is managed by recycling it as a fertilizer. Five approaches have been used to recycle biosolids:

- Land application on agricultural sites (referred to as land application);
- Forest fertilization (silvicultural application);
- Creating a Class A compost for use in landscaping;
- Using Class B biosolids for landscaping at the City's Water Pollution Control Facility (WPCF); and
- Using Class B biosolids for land reclamation projects.

A desirable approach may be to continue to diversify end use products.

This technical memorandum provides basic background information on the City of Everett's sewer utility, the facilities and processes currently used to treat wastewater at the City's Water Pollution Control Facility (WPCF), and the City's current and historic biosolids management practices. A discussion of biosolids regulations and trends will lay a foundation for development of the strategic plan.

1.1 City of Everett Wastewater Program

The City of Everett owns and operates 345 miles of sewers and 29 pump stations that convey domestic, commercial, and industrial wastewater to the Everett WPCF (City of Everett, 2008). Some sections of the City's sewer system collect both wastewater and stormwater runoff, and are referred to as combined sewers. The City operates combined sewage storage and treatment facilities to manage the excess stormwater collected in the sewer system.

1.2 Everett Water Pollution Control Facility

The Everett WPCF is located in north Everett, just east of Interstate 5 adjacent to the Snohomish River. The WPCF serves the City of Everett as well as other purveyors outside the City including: the Mukilteo Water and Wastewater District, the Alderwood Water and Wastewater District, the City of Marysville, and the Silver Lake Water and Sewer District. The City is also considering accepting and treating wastewater from the City of Snohomish.

The WPCF has a design capacity of 36.3 million gallons per day (MGD), with a 2008 average annual flow of 18.6 MGD.

1.2.1 Treatment Process

The Everett WPCF was constructed as a lagoon system in the 1960's (Carollo, 2009). The WPCF now has two parallel treatment trains: an aeration/oxidation pond system (North plant) and a trickling filter/solids contact (TF/SC) process (South plant). The TF/SC process treats the base wastewater flow, and excess quantity is routed to the lagoon process, which also provides peak flow storage (City of Everett, 2008). The Headworks serves both trains and provides screening and grit (rocks and other dense materials) removal. Both treatment trains provide secondary treatment with biological processes and disinfection of the treated wastewater. Currently, the two parallel treatment trains have the following processes downstream of the Headworks:

1. Aerated lagoon system (North plant):
    a. Two facultative (partially aerated) lagoons, each with a volume of about 33.5 million gallons.
    b. Oxidation Pond: shallow (4-6 ft deep) ponds where anaerobic and aerobic degradation of the wastewater takes place, facilitated by microorganisms.
    c. Polishing Pond: provide final clarification of the water after degradation takes place in the oxidation pond.
    d. Disinfection: sodium hypochlorite is added to the treated water.
2. The “mechanical” (South) plant:
    e. Primary Sedimentation: large tanks that allow organic solids to settle by gravity.
    f. Trickling Filters: large tanks with filter media supporting the growth of bacteria for biological (secondary) treatment.
    g. Solids Contact Basin: tanks that are aerated to improve the settling characteristics of the trickling filter outlet water.
    h. Secondary Sedimentation: large circular tanks that allow biological solids from the solids contact basin to settle by gravity.
    i. Disinfection: sodium hypochlorite is added to the treated water.

Solids accumulated in the primary sedimentation tanks, called primary sludge, are pumped to the facultative lagoons (AC-1 and AC-2). Excess solids from the secondary sedimentation tanks, called waste secondary sludge (WSS), are also pumped to these lagoons.

Everett currently removes biosolids from the lagoon system every one or two years. A contractor is hired to dredge and dewater the biosolids, which are then temporarily stored on an asphalt pad at the east side of lagoon system prior to beneficial use.

1.2.2 Treated Water Reuse and Discharge

Treated wastewater from the “mechanical” (South) plant train is discharged through a marine outfall to Port Gardner Bay. This outfall is shared with the Kimberly Clark Corporation and the City of Marysville. Another outfall to the Snohomish River serves the lagoon (North) plant train, which treats excess flows that exceed the capacity of the “mechanical” (South) plant train. A small portion of the treated water can be reused as cooling water at the Kimberly Clark mill.

1.2.3 Proposed Solids Handling Improvements

Since 2007, there has been an increase in organic loading to the Everett WPCF, which requires adding treatment capacity to remain in compliance with the City’s National Pollutant Discharge Elimination System (NPDES) permit. In April 2010, the City completed an extensive planning process for future expansion of the WPCF to accommodate expected growth through the year 2030. The 2010 Engineering Report recommended a number of upgrades to the WPCF including separate anaerobic digestion of all solids generated from the treatment process. The anaerobic digestion process is currently under design with construction anticipated by 2016. A mechanical solids dewatering process was recommended for construction in 2030.

The 2010 Engineering Report presented biosolids quantity estimates through the year 2030. Two projections are made, as it is unknown at this time whether or not the City of Snohomish will discharge wastewater to the City of Everett in the future. The estimated biosolids quantities are shown in Table 1.

Table 1: Projected Average Biosolids Quantities With and Without City of Snohomish Contribution (2010 Engineering Report).

WITHOUT SNOHOMISH	DRY TONS/YEAR
2010	5,749
2020	7,063
2030	7,884
WITH SNOHOMISH	**DRY TONS/YEAR**
2010	5,749
2020	7,665
2030	8,486

2.0 Biosolids Management Trends and Drivers

2.1 General Overview

USEPA (1999) and NEBRA (2007) provide the most wide-ranging look at trends in biosolids management in the US. Figure 1 shows the breakdown of biosolids use/disposal in the US in 2004. Land application and advanced treatment (Class A or similar processing) represent over half of the biosolids use in the US.

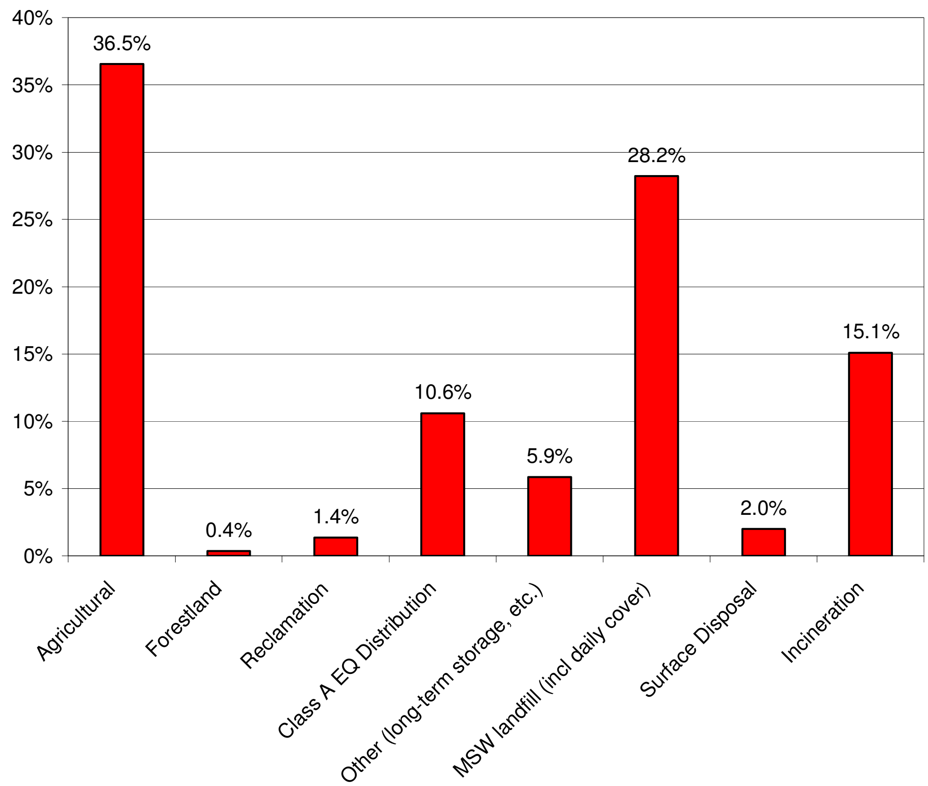

Figure 1: North East Biosolids and Residuals Association Estimate of Biosolids Use/Disposal in the US in 2004 (NEBRA, 2007; MSW = Municipal Solid Waste).

In Washington, a number of utilities produce Class A biosolids including Everett (composting). Most biosolids in Washington are land applied on agricultural land as Class B biosolids, as shown in Figure 2.

2.2 Regulatory Review

The policy of the US Environmental Protection Agency (EPA) is to promote the beneficial use of biosolids while maintaining environmental quality and protecting public health (EPA, 2003). The Clean Water Act (CWA) Amendments of 1987 required the EPA to develop new regulations pertaining to sewage sludge/biosolids. In February, 1993, EPA published 40 CFR Part 503 (i.e., Part 503). The Part 503 Rule is a complex, risk-based assessment of potential environmental effects of pollutants that may be present in biosolids (USEPA, 1995). These guidelines regulate pollutant and pathogen concentrations as well as vector attraction reduction (VAR). The guideline defines biosolids as Class A or Class B, depending on the potential level of pathogens. Class A biosolids must meet strict pathogen standards and can be used with no restrictions, while Class B biosolids must meet less stringent pathogen requirements, with application restricted to crops with limited human and animal exposure. Biosolids in both classes must meet VAR requirements.

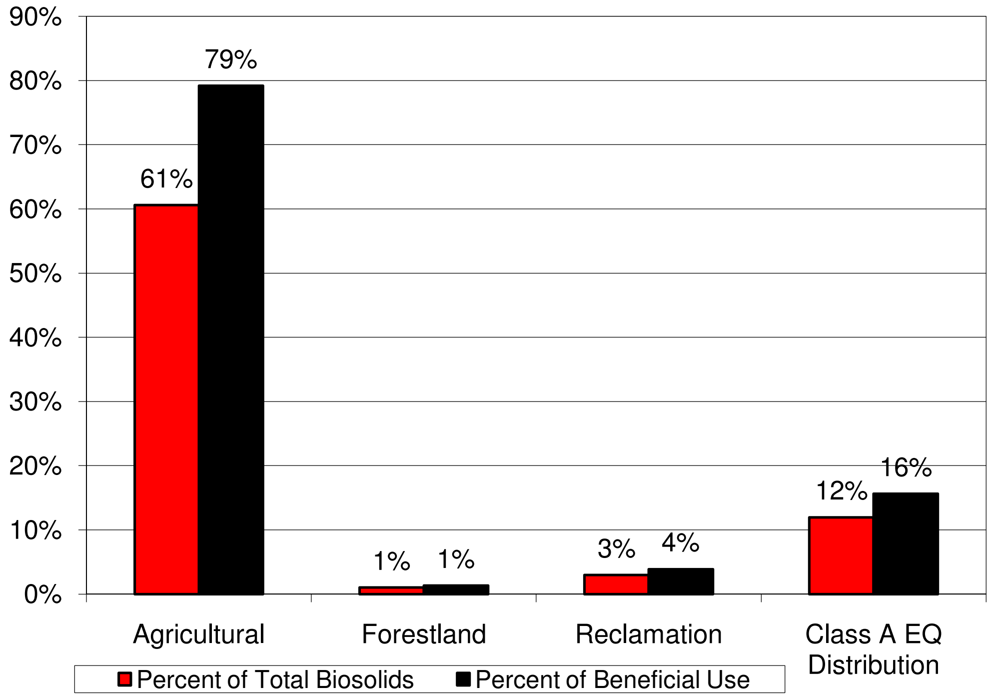

Figure 2: NEBRA Estimate of Biosolids Use/Disposal in Washington in 2004 (NEBRA, 2007).

The Part 503 Rule applies to biosolids applied to agricultural and non-agricultural land, biosolids placed in or on surface disposal sites, or biosolids that are incinerated. Biosolids that are disposed of in a landfill or used as a cover material at a landfill are subject to federal requirements in 40 CFR Part 258. The general provisions of the Part 503 Rule provide basic requirements for biosolids applied to land including pollutant limits, management practices, operational standards, monitoring, record keeping, and reporting. This technical memorandum will not discuss requirements for surface disposal, disposal in a landfill, or incineration. Washington State requires "beneficial use" of biosolids, which is typically interpreted by the Department of Ecology as recycling. The City has moved forward with design of an anaerobic digestion system and will continue to produce biosolids suitable for recycling.

2.2.1 Pollutants

Part 503 also requires that limits for certain pollutants, such as metals, not be exceeded. Two approaches to meeting the Part 503 metals limits are allowed: 1) a maximum concentration must be met, or 2) a maximum cumulative amount of metals added to the soil via biosolids must be met. Biosolids meeting the Part 503 requirements by method one are called pollutant concentration (PC) biosolids, and limits are shown in Table 2. If biosolids metals meet these concentrations, no record keeping of cumulative loading to soils is required. If PC biosolids also meet Class A pathogen reduction standards, they are considered exceptional quality (EQ), and may be distributed to the public. The City currently meets all maximum allowable concentration limits for PC biosolids. USEPA is considering lowering the limits of some of these pollutants and close scrutiny of the City's biosolids is strongly suggested so that the City will be prepared if regulatory changes occur.

Table 2: Pollutant Concentration (PC) Biosolids

POLLUTANT	ALLOWABLE CONCENTRATION (mg/kg monthly average)[1]	EVERETT 2009 AVERAGE CONCENTRATION (mg/kg)
Arsenic (As)	41	11.3
Cadmium (Cd)	39	8.3
Copper (Cu)	1,500	526
Lead (Pb)	300	116
Mercury (Hg)	17	2
Nickel (Ni)	420	47
Selenium (Se)	100	7
Zinc (Zn)	2,800	1,558

1. *Source: Table 3 of 40 CFR 503.13*

Technologies to process biosolids generally do not decrease concentrations of metals in biosolids, unless other material is mixed with biosolids such as amendment material for composting.

An effective industrial pretreatment program is the key to complying with Part 503 metals limits, as industrial inputs into the collection system are usually the primary source of metals. EPA is currently considering adding 15 additional chemicals to the list of regulated pollutants. Those include acetone, anthracene, barium, beryllium, carbon disulfide, 4-chloroaniline, diazinon, fluoranthene, manganese, methyl ethyl ketone, nitrate, nitrite, phenol, pyrene, and silver. Given that the City of Everett is planning to anaerobically digest solids, it is not expected that any proposed nitrate or nitrite limits would be a concern.

The EPA conducted an extensive sampling program of representative biosolids across the country in 2009. The City of Everett was one of the 74 municipal wastewater treatment plants surveyed in the study. The City's biosolids were sampled and analyzed for the compounds being considered for future regulation, providing a baseline for the City.

2.2.2 Pathogens

As described above, two classes of biosolids suitable for land application are defined by EPA, Class A and Class B. Class A biosolids are pathogen-free for all practical purposes and can be used without any additional public contact restrictions. Class B biosolids may have low levels of pathogens, and restrictions are imposed on public access and crop harvesting after land application, which are described in the following sections. It should be noted that the restrictions and limits for Class A and Class B biosolids provide equal public health protection.

2.2.2.1 Class B

Class B biosolids are the predominant class of biosolids produced in the US (USEPA, 1999; NEBRA, 2007). Common treatment technologies, such as aerobic and anaerobic digestion, are used at many municipal wastewater treatment plants to inactivate the vast majority of potential pathogens in sludge. However, the sludge is not considered "pathogen-free," and EPA requires that specific management practices be employed to protect the public. Class B biosolids must also meet the same vector attraction reduction requirements as Class A biosolids.

Class B biosolids must meet one of several pathogen destruction alternatives including the following:

- Alternative 1: Meet monitoring requirements for fecal coliform.
- Alternative 2: Employ a process to significantly reduce pathogens (PSRP), or
- Alternative 3: Employ a process equivalent to a PSRP.

PSRPs include the following:

- Anaerobic digestion between 15 days at 35 ^oC (95 ^oF) to 60 days at 20 ^oC (68 ^oF).
- Aerobic digestion between 40 days at 20 ^oC (68 ^oF) to 60 days at 15 ^oC (59 ^oF).
- Air drying for at least 3 months.
- Composting – temperature of the sludge must be 40 ^oC (104 ^oF) or higher for at least five days. For four hours of that period, the temperature must be 55 ^oC (131 ^oF) or higher.
- Lime stabilization – the pH of the sludge must be raised to 12 for at least two hours, and must remain above 11.5 for 24 hours.

Alternative 3 for Class B biosolids requires approval of the USEPA or state regulatory agency. The regulating authority makes the decision on whether or not a process should be considered as equivalent to a PSRP. Both equivalent processes and PSRPs must meet specified pathogen requirements as well.

Biosolids treatment must include a method for reducing the attraction of vectors. Alternatives depend on the method of treatment and include 38 percent volatile solids (VS) destruction, a specific oxygen uptake rate of less than 1.5 mg oxygen per hour per gram total solids and other methods. Anaerobic digestion typically complies with the 38 percent VS destruction criteria.

Management practices are required to limit public and animal contact after Class B biosolids are applied and to allow natural processes to further inactivate potential pathogens. The management practices for Class B biosolids are in addition to the general management requirements specified in Subpart A of the Part 503 regulations, and are summarized in Table 3.

2.2.2.2 Class A

Producing Class A biosolids may provide significant cost savings and flexibility for biosolids management depending on the treatment process and the quality of the final product. In some cases, Class A biosolids can generate revenue. However, Class A solids treatment technologies generally require increased capital and operations and maintenance (O&M) costs for processing. As discussed previously, the land application of Class B biosolids is subject to a variety of restrictions not required of Class A biosolids.

Class A pathogen reduction requirements include fecal coliforms of less than 1000 MPN/gram Total Solids (TS) or Salmonella of less than 3 MPN per 4 grams TS. The Most Probable Number (MPN) method is commonly used in microbiology. Alternatives for meeting Class A pathogen requirements are shown in Table 4. Pasteurization systems meet both Class A Alternative 1 and Alternative 5 (PFRP) of the Part 503 regulations.

Table 3: Site Restrictions for Class B Biosolids Application

LAND/CROP	REGULATION
Land with a high potential for public exposure	Public access restricted for 1 year after biosolids application
Land with a low potential for public exposure	Public access restricted for 30 days after biosolids application
Food crops, feed crops or fiber crops	Not harvested for 30 days after biosolids application
Food crops with harvested parts that touch the biosolids/soil mixture and are totally above the land surface (e.g., melons, cucumbers)	Not harvested for 14 months after biosolids application
Food crops with harvested parts below the land surface (e.g., root crops such as potatoes, carrots, radishes)	Not harvested for 20 months after biosolids application
Animal grazing on a site	Restricted for 30 days after biosolids application
Turf placed on land with high potential for public exposure or a lawn unless otherwise specified by the permitting authority	Restricted for 1 year after biosolids application

Thermal treatment means that specific time-temperature requirements must be met as specified by the Part 503 regulations. Figure 3 shows the time-temperature curve for sludge with a solids concentration less than seven percent and a contact time of at least 30 minutes (Regime D). Several regimes are specified in the regulations, but Regime D is most applicable to Everett's treatment process. Other time-temperature curves apply at different solids concentration and contact time regimes. All biosolids particles processed using this alternative must be subjected to the USEPA specified time-temperature regime, which means that batch or plug-flow processing must be employed – continuous flow processes with a detention time on or above the time-temperature curve are not acceptable.

A high pH-high temperature process is defined as the three following conditions: elevating the pH to more than 12 for at least 72 hours, maintaining the temperature of the sludge above 52°C for at least 12 hours while the pH is above 12, and air drying to over 50 percent solids after the 72-hour period of elevated pH.

Table 4: Alternatives for Meeting Part 503 Class A Requirements

ALTERNATIVE	DESCRIPTION
Alternative 1	Thermally treated (must meet specific time-temperature requirements depending on solids concentration)
Alternative 2	High pH-high temperature (lime stabilization followed by air drying)
Alternative 3[1]	"Other Processes" – sampling required
Alternative 4[1]	"Unknown Processes" – sampling required
Alternative 5	Use of a Process to Further Reduce Pathogens (PFRP)
Alternative 6	Process equivalent to PFRP (requires approval of EPA's Pathogen Equivalency Committee)

1. These alternatives are not allowed under Washington state regulations.

Figure 4 shows a breakdown of how wastewater utilities are producing Class A biosolids in the US. By far, the most common method is to employ an EPA-prescribed technology (Alternative

5, Processes to Further Reduce Pathogens, or PFRPs). Alternatives 1 and 2 are the next most common methods for meeting Class A requirements.

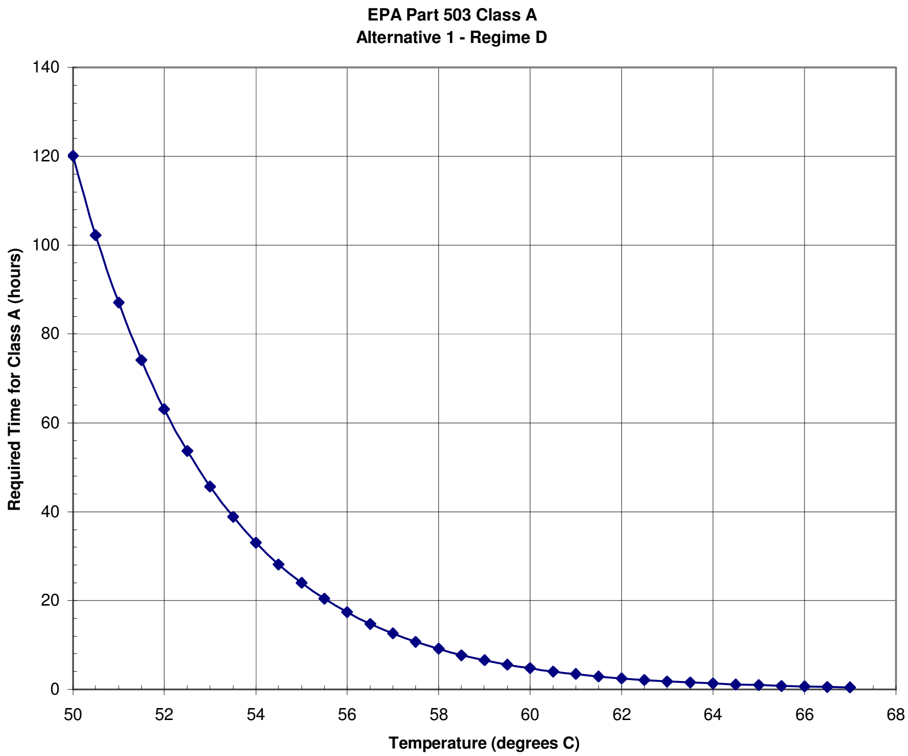

Figure 3: Class A Alternative 1, Regime D (solids concentration less than 7 percent, at least 30 minutes contact time)

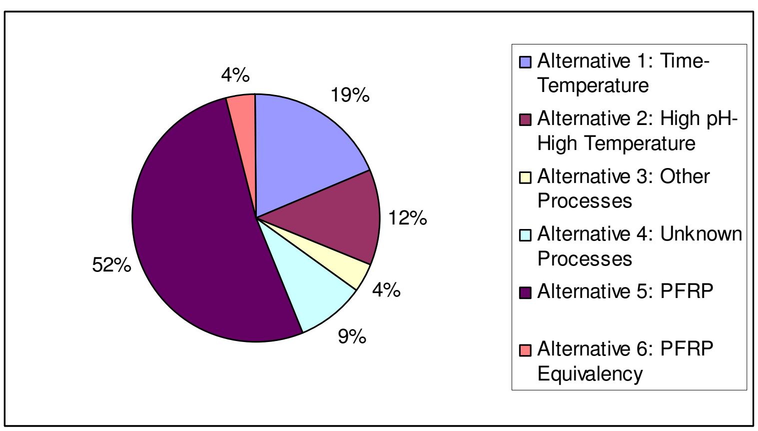

Figure 4: USEPA Estimate of the Production of Class A Biosolids in the US (USEPA, 1999)

Other processes can meet Class A criteria through Alternative 3. Biosolids must have enteric virus levels less than 1 Plaque-Forming Unit (PFU) per 4 g TS and viable helminth ova levels less than 1 per 4 g TS.

Treatment processes that do not meet the requirements of the three previously described methods ("unknown processes," Alternative 4) can be considered Class A biosolids if they meet the pathogen requirements already mentioned. Since this alternative relies on testing rather than an established process, the regulations stipulate that frequent sampling must be undertaken, but do not specify the number of samples to be taken.

Processing under Class A alternatives 3 and 4 rely on enteric virus and helminth ova testing, which can be expensive and time-consuming (4 weeks for helminth ova, and 2 weeks or longer for enteric viruses). There are also a limited number of accredited laboratories capable of performing these analyses. Washington has eliminated Alternatives 3 and 4 under state regulations.

PFRPs include composting, heat drying, heat treatment, thermophilic aerobic digestion (also known as autothermal thermophilic aerobic digestion or ATAD), beta ray irradiation, gamma ray irradiation, and pasteurization. Detailed descriptions of the requirements for these processes can be found in USEPA (2003).

New processes not specified by the USEPA can be considered equivalent to a PFRP. The permitting authority is responsible for determining if a process is equivalent, and this is generally the Pathogen Equivalency Committee (PEC) of the USEPA.

2.2.3 Vector Attraction Reduction

Vector attraction reduction (VAR) requirements minimize the likelihood of environmental transport by vectors. These requirements are the same for Class A and Class B biosolids. Alternatives depend on the method of treatment and include 38 percent volatile solids (VS) destruction, a specific oxygen uptake rate of less than 1.5 mg oxygen per hour per gram TS, and other more complex methods. In general, pathogen reduction must be achieved prior to or at the same time as vector attraction reduction for biosolids to be considered Class A. Problems with pathogen re-growth led EPA to include this provision. This means that pasteurization must be upstream of digestion to meet the regulatory requirements.

2.2.4 Management Practices

A number of management practices are required by the Part 503 regulations and apply to bulk application of both Class A and Class B biosolids.

2.2.4.1 General

General management practices required for land application include providing buffer zones around wells, surface water, and property boundaries; not causing any adverse impact to threatened or endangered species; and not applying biosolids to flooded, frozen, or snow-covered land.

2.2.4.2 Agronomic Application Rate

Biosolids must be applied at an agronomic rate, and nitrogen is most commonly used to determine the agronomic rate for biosolids application. As defined in 40 CFR 503:

"Agronomic rate is the…application rate (dry weight basis) designed:

To provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on land; and

To minimize the amount of nitrogen…that passes between the root zone of the crop or vegetation grown on the land to the groundwater.

Excess nitrogen applied to land could result in nitrate contamination of groundwater. The agronomic rate must be determined by considering total and available nitrogen in the biosolids and the expected yield of the crop or vegetation.

In some states the application rate of nitrogen "shall not exceed the agronomic rate for the particular cultivar grown," with agronomic rate defined as "a rate of biosolids or domestic septage which matches *nutrient* requirements for a specific crop on an annual basis." Rates also must be applied so that runoff, erosion, leaching, nuisance conditions, or groundwater contamination are prevented.

Changing policy in the preparation of NPDES permits has resulted in inclusion of conditions that specify agronomic rates of phosphorus. USEPA may follow what many states have adopted - a Phosphorus Index to manage phosphorus loading on land application sites. The Phosphorus Index is a risk management-based approach that takes into account transport and source factors to estimate the potential for off-site movement of phosphorus from a given site. The Natural Resources Conservation Services (NRCS) developed Phosphorus Indices for states (*NRCS Agronomy Technical Note No. 26 – Revised, October 2001*). This guidance document was developed as an assessment tool to help land managers assess the risk of offsite phosphorus migration for an individual site, but was not designed to determine compliance with water quality regulations.

The Phosphorus Index includes worksheets for agricultural land application sites to generate a site rating based on transport and source factors, and use the site rating to assign a vulnerability class (low, medium, high, very high) indicating the potential for offsite transport. This process uses the transport and source factors shown in Table 5.

Table 5. Phosphorus Index Transport and Source Factors

TRANSPORT FACTORS	SOURCE FACTORS
Soil erosion (sheet and rill, wind)	Soil test phosphorus (P) concentration
Irrigation-induced erosion	Commercial P fertilizer application rate
Runoff class	Commercial P fertilizer application method
Flooding frequency	Organic P source application rate
Distance to surface waters/buffer width	Organic P source application method
Subsurface drainage	

Additional research is being conducted regarding the use of phosphorus indices. Agronomic phosphorus loading limitations have the potential to increase land requirements two to three times beyond that required based on agronomic nitrogen loadings. In general, the agronomic phosphorus loading rates would place more severe restrictions on wastewater treatment plants (WWTPs) that employ phosphorus removal, whereby significant amounts of phosphorus leave the plant site as stored phosphorus in biosolids, or land apply biosolids in phosphorus-limited watersheds. This could impact WWTPs, since phosphorus may be a critical issue in the future for certain watersheds throughout the US and in Washington where biosolids are currently applied. Washington State does not currently require that a Phosphorus Index be used.

2.2.5 Monitoring

Microbiological monitoring for either fecal coliforms or Salmonella sp. is required for all Class A biosolids alternatives and all Class B biosolids except Class B Alternative 2. Monitoring must be at the time of biosolids use, at the time the biosolids are prepared for sale or give away in a bag or other container for land application, or at the time the biosolids or material derived from the biosolids (e.g. compost) is prepared.

Monitoring requirements vary by the size of the wastewater utility and the method of sludge processing as shown in Table 6. Since Everett only produces biosolids on a periodic basis, the City monitors biosolids by taking samples throughout the lagoons twice per year. In addition, the Waste Secondary Sludge (WSS) is sampled on a quarterly basis.

Table 6: Frequency of Monitoring Required by Part 503 Regulations

AMOUNT OF BIOSOLIDS PER 365-DAY PERIOD		MINIMUM FREQUENCY
DRY METRIC TONS	DRY ENGLISH TONS	
0-290	0-320	Once per year
290-1,500	320-1,654	Once per quarter (four times per year)
1,500-15,000	1,654-16,540	Once per 60 days (six times per year)
15,000 or greater	16,540 or greater	Once per month (12 times per year)

Reprint of Table 3-4 from USEPA, 2003

2.3 Washington State Regulations

Washington State regulates biosolids under Chapter 70.95J RCW. Chapter 70.95J recognizes biosolids as a valuable commodity, and specifies implementation of a program that maximizes beneficial use. The state requirements are found in Chapter 173-308 of the Washington Administrative Code (WAC). The state program meets federal minimum requirements and has added requirements including, but not limited to, the following:

- Biosolids must not contain a significant amount of manufactured inerts (e.g. plastics, debris). Typically, this requirement is met by screening the wastewater at the municipality's treatment plant.
- As mentioned previously, federal Class A alternatives 3 and 4 are not allowed under state regulations.
- For all practical purposes, the state rule does not allow biosolids to be disposed of (e.g. landfill) on a long-term basis.
- Biosolids generators and all entities managing biosolids must obtain a state permit and pay permit fees.
- The state rule has certain exemptions for research.

2.4 Other Regulatory Issues

The National Academies of Science (NAS) completed an assessment of the science that supports the Part 503 Rule, and concluded that there is no evidence that current biosolids management practices under existing regulations are not safe, but that more research is required to update the science behind the regulations (National Research Council, 2002). NAS concerns included the synergistic effects of chemical pollutants and pathogens, and pathogens and chemical pollutants not considered in the risk assessment of the Part 503 Rule. As a result of NAS recommendations, USEPA may begin a review of the Part 503 Rule every five years, as is done for other USEPA-promulgated rules. USEPA is currently reviewing the Part 503 regulations and is expected to issue an updated version in the near future.

2.4.1 Pathogen Re-growth and Reactivation

Recent Water Environment Research Foundation (WERF) research has shown that fecal coliform, the indicator organism commonly used for pathogens, sometimes reactivates and/or re-grows after mechanical dewatering of solids. This has occurred with a variety of anaerobic digestion processes, both Class B and Class A. Research is ongoing to further understand the mechanisms and causes of this phenomenon. Research to date has shown that high solids centrifuges have the most potential to reactivate or re-grow fecal coliform. The City's contractors typically use high-solids centrifuges to dewater biosolids removed from the lagoon.

2.4.2 Trace Organic Compounds

Pharmaceuticals, personal care products, their intermediates, and other organic compounds have been found at very low levels in the environment, including in biosolids. Risks from current biosolids management practices are not completely known, but to date no increased risk from current biosolids management practices has been demonstrated. A recent Water Environment Research Foundation report (WERF, 2010) addresses the status of the science, risks, and public perception surrounding this complex issue.

2.5 Local Drivers

Increasing urbanization and development of agricultural land are making it increasingly difficult to find and permit sites for land application of biosolids. Although land application is still a relatively economical method, the availability of suitable local agricultural land is decreasing. Also, use of biosolids products have come under increasing regulatory restrictions in recent years and what once was considered best practice may not now be allowed.

Development around the Everett WPCF is causing increased scrutiny and the potential for increased odor complaints from activities at the WPCF. However, capital improvements over the past few years have reduced odors from the facility and complaints from neighbors. There have been no odor complaints directly attributed to the WPCF in the last two years.

2.6 Public Perception

Political divisions and conflicts have emerged over the management of biosolids around the US, particularly in California, Virginia, and Pennsylvania, but most recently in Washington State. Local ordinances have been passed banning either Class B or all biosolids land application. Growing and more organized opposition to current biosolids management practices are forcing some utilities to apply biosolids in more remote areas or further process solids in order to manage biosolids in alternative ways. In contrast, the City of Everett has an excellent biosolids management program. The City of Everett has a public education program including a brochure and a website, but stakeholder involvement and a larger campaign would be beneficial.

3.0 Biosolids Management Program Review

3.1 Biosolids Management Program Overview

Historically, most of the dewatered biosolids have been hauled and applied to farmland in Snohomish and Douglas counties. The City currently maintains permits for some sites in Snohomish County and is permitted to send biosolids to private land application facilities, called Beneficial Use Facilities (BUFs), in Douglas and Yakima counties.

A small portion of Everett's biosolids are composted for use in local areas including the Snohomish County PUD Right-of-Way land reclamation project and landscaped areas at the WPCF.

Historically, the City has used biosolids to fertilize local forest land. In addition, the City has applied biosolids to a City-owned poplar farm adjacent to the WPCF.

3.2 Regulatory Compliance

The City meets the most stringent criteria for regulated pollutants (discussed in Section 2.2.1). Vector attraction reduction (discussed in Section 2.2.3) criteria is met by bench-scale testing to simulate anaerobic digestion as no anaerobic digesters are currently at the plant.

The majority of the City's biosolids meet Class B pathogen standards (discussed in Section 2.2.2.1), and the remainder meet Class A pathogen standards through composting. Class A biosolids are produced to provide additional management options to Class B reuse in agriculture and silviculture.

4.0 References

Carollo Engineers, City of Everett Engineering Report, 2010.

City of Everett, 2008 Utilities Annual Report.

CH2M Hill, City of Everett Comprehensive Sewer Plan, 2006.

USEPA (1999), *Biosolids Generation, Use, and Disposal in the United States*, Publication EPA530-R-99-009.

USEPA (2003), *Environmental Regulations and Technology, Control of Pathogens and Vector Attraction in Sewage Sludge*, Publication 625R82013.

National Research Council (2002), *Biosolids Applied to Land, Advancing Standards and Practices*.

North East Biosolids and Residuals Association (NEBRA, 2007), *A National Biosolids Regulation, Quality, End Use and Disposal Survey, Preliminary Report*.

Water Environment Research Foundation (WERF, 2010), *Trace Organic Chemicals in Biosolids-Amended Soils: State-of-the-Science Review.*