Section 6
Fertilizer, Biosolids, and Reclaimed Water Management

Pierce County Public Works and Utilities – Sewer Utility
Unified Sewer Plan Update

Section 6 – Fertilizer, Biosolids, and Reclaimed Water Management

Section 6 documents the transition of the Chambers Creek Regional Wastewater Treatment Plant (WWTP) from a Class B biosolids based treatment facility with offsite disposal through land application to that of a Class A treatment facility producing an Exceptional Quality (EQ) Class A dry pelletized fertilizer. This chapter also reviews Reclaimed Water, its uses within the WWTP, Chambers Creek Properties, and possible offsite delivery.

6.1 Past Biosolids Management

Biosolids are the stabilized solids from the wastewater treatment process suitable for land application as defined in WAC173-308 and 40 CFR Part 503. Biosolids are managed to meet air quality standards and the Federal Clean Water Act (40 CFR Part 503), the Washington Water Pollution Control Act (WAC173-340), the Model Toxics Control Act (MTCA), and the Biosolids Management and associated regulations contained in WAC173-204.

Prior to the fertilizer manufacturing facility going on line in June of 2006, biosolids from the primary and secondary treatment processes at the Chambers Creek Regional WWTP were processed to a Class B specification, the material was thickened, digested, and dewatered to a semi-solid form. This material was then hauled by semi-truck and land applied as a soil conditioner to permitted properties located in Lewis County.

Pierce County Wastewater Utility's biosolids management program was based upon land application for beneficial reuse utilizing the following five management components:

- Produce biosolids having the fewest constraints on how they can be safely used,
- Process biosolids to produce Class A biosolids for use as a soil amendment,
- Incorporate policies from the Unified Sewer Plan and the Pierce County Comprehensive Plan in the Biosolids Management Program for the Chambers Creek Regional WWTP,
- Continue testing biosolids-based soil conditioners to determine appropriate application rates, and
- Use biosolids to help reclaim the gravel mine on the Chambers Creek Properties.

The Utility has met and exceeded the management components listed above by incorporating the policies from the 2001 Unified Sewer Plan for biosolids with the production of an Exceptional Quality Class A biosolids based fertilizer product that has no constraints on usage by the public, establishment of appropriate application rates for the product, and use of the product in the ongoing reclamation of the Chambers Creek Properties.

Even though Pierce County has moved to Class A type biosolids production, the Utility has also retained the ability to continue limited land application in the event that an interruption in pellet production occurs.

6.2 Overview of the Fertilizer Manufacturing Program

With the conversion of the Chambers Creek Regional Wastewater Treatment Plant from production of Class B biosolids to Class A Exceptional Quality fertilizer production, the Sewer Utility has met the goal set out in section 5.2.3 Biosolids Management of the 2001 Unified Sewer Plan to "*Process biosolids to produce Class A biosolids for use as a soil amendment.*"

6.2.1 Class A Biosolids

Class A biosolids are treated by a process to further reduce pathogens such as composting, pasteurization, drying or heat treatment, advanced alkaline treatment, or by testing and meeting the pathogen density limits in Part 503. Class A pathogen reduction reduces the level of pathogenic organisms in the biosolids to a level that does not pose a risk of infectious disease transmission through casual contact or ingestion.

EQ – Exceptional Quality Class A biosolids which also meet Part 503 VAR options 1-8 and meet the metals limits (Part 503 Table 3) are designated as “Exceptional Quality (EQ).” These products are exempted from the Part 503 General Requirements, Management Practices and Site Restrictions, and may be generally marketed and distributed. SoundGRO™ is a Class A - EQ product as classified by the United States Environmental Protection Agency (EPA) Part 503.

6.2.2 Fertilizer Manufacturing

The Fertilizer Manufacturing Facility (FMF) at the Chambers Creek Regional WWTP utilizes a direct drying and pelletization process. The process is discussed in 7 phases: Dewatering, Mixing, Drying, Air and Solids Separation, Pellet Sorting, Pellet Cooling and Storage, and Air Treatment and Recirculation.

6.2.3 Fertilizer Manufacturing Process and Equipment

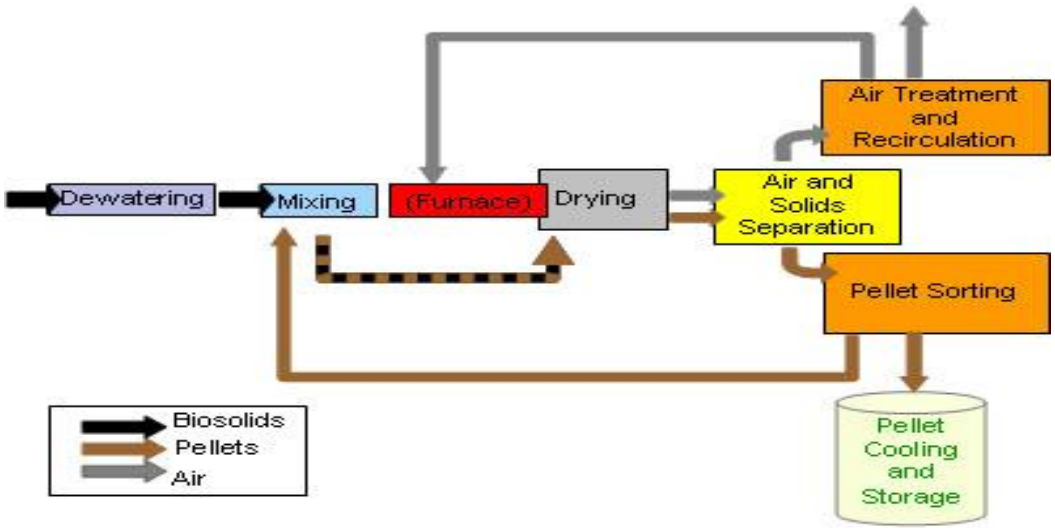

Figure 6.2-1 Fertilizer Manufacturing Process Schematic and Overview

Dewatering - After being anaerobically digested, the biosolids are conveyed to one of two centrifuges for dewatering. The centrifuges operate at 3200 RPM and use a liquid polymer to separate the solids and the liquids. Upon emerging from the centrifuge, the biosolids are 20% dry solid (DS) and ready for the heat drying and pelletization process.

Mixing - The biosolids continue to the mixer where they are mixed with recycled pellets to form consistency of 70% DS.

Drying - The mixture is then sent to the drying drum. The drying drum consists of three concentric cylinders through which the pellets pass through consecutively. Heated, re-circulated air is blown into the drying drum from a furnace that burns natural and methane gas, (methane gas being generated on-site in the digestion process). The inlet temperature of the drying drum is 850°-950° F and the outlet temperature is 210° F. After the pellets emerge from the drying process they are 93% DS, near perfectly dry.

Air and Solids Separation - The pellets and the heated air pass through a pre-separator. The pre-separator has a baffle that slows the velocity of the air, causing the heaviest solids to drop out. The air and the lighter solids then pass through a polycyclone, consisting of tunnels which use centrifugal motion to allow the rest of the solids to drop out. The pellets are then sorted and the air is transferred to air treatment and recirculation stage.

Pellet Sorting - The solids from the pre-separator and the polycyclone are then sent to a vibrating screen. The vibrating screen consists of three tiers of screens that sort the solids, now pellets, into four sizes: product-sized pellets (0.5-2.5 mm), oversize pellets (2.5-10 mm), fines (<0.5 mm), and trash (>10mm). The oversized pellets are then crushed and combined with the fines before being sent to the recycle bin. The product-sized pellets are sent to the pellet cooler.

Pellet Cooling and Storage - Pellets that are the proper size are cooled to 90° F in the pellet cooler and sent to one of three storage silos using a pneumatic conveyor. Trucks can be loaded directly from the silos and weighed. The silos each have 10,000 cubic feet of storage capacity and together can hold 2 weeks of manufactured pellets at current production rates.

Air Treatment and Recirculation - The air is sent back to the furnace and re-circulated through the system. Air that needs to be treated is scrubbed with water and chemicals to eliminate odors and then released to the atmosphere. Volatile Organic Compounds (VOCs) are a main source of air pollution. The Regenerative Thermal Oxidizer (RTO) efficiently destroys 95% of the VOCs prior to discharge of the treated air to the atmosphere.

6.3 Final Product – SoundGRO®

The final product is SoundGRO® an Exceptional Quality Class A dry pelletized fertilizer product for use in commercial, industrial, and residential landscapes and gardens. It is produced from the solid residual by-products of the wastewater treatment process and meets or exceeds both United States Environmental Protection Agency (EPA) standards for biosolids safety for materials classified as Exceptional Quality, and the Washington State Department of Ecology regulations for Class A biosolids. Projections for 2010-2016 are for an annual production of 2,300 tons.

This end product is marketed as a commercial fertilizer and is trademarked, registered, and licensed in the states of Washington, Idaho, Montana, California, and Oregon for use as a commercial fertilizer. Because it is a licensed commercial fertilizer, SoundGRO® can be marketed directly to the public with no limitations on its use, unlike the limitations placed on land applied Class B biosolids.

Pierce County works closely with the Washington State University Cooperative Extension to test, validate, and make recommendations pertaining to the available nitrogen uptake of the product to plant materials. The first goal of the program determined the available nitrogen using the field nitrogen fertilizer equivalency technique. That information was then compared to other biosolids based fertilizers and soil amendment products. The second goal determined the optimum timing of applications of SoundGRO® to maintain a high quality turf/lawn and shrub materials.

6.3.1 Nutrient Testing and Quality

Pierce County has its biosolids analyzed by an outside commercial testing laboratory monthly to ensure that it is continually meeting standards for quality and safety. One of the benefits of a 100% naturally organic nitrogen fertilizer is that it contains micronutrients that are beneficial and essential to plant growth. SoundGRO® is guaranteed to have the following nutrients in the corresponding concentrations:

Table 6.3-1 Nutrient Quantity

Nutrient	Quantity
Total Nitrogen	6.4%
water insoluble nitrogen	5.9%
water soluble nitrogen	.5%
Available Phosphate (P_2O5)	7.0%
Calcium (Ca)	3.0%
Magnesium (Mg)	0.90%
Iron (Fe)	0.55%
Molybdenum (Mo)	0.0010%
Zinc (Zn)	0.05%

6.3.2 Heavy Metals Analysis

Concerns associated with the use of a biosolids based fertilizer product are connected to the possibility of heavy metals content in the product. The United States EPA adopted the 40 CFR Part 503 guidelines which outline standards for safe heavy metal concentrations in biosolids based fertilizers. Per independent analysis, heavy metal concentrations in SoundGRO® are consistently below these adopted standards.

Table 6.3-2 Heavy Metals Concentrations and EPA Standards

Heavy Metal	SoundGRO™ Heavy Metal Concentration Averages (ppm)[1]	EPA Standards for Class A 'Exceptional Quality' Biosolids (ppm)
Arsenic	3.1	41.0
Cadmium	5.1	39.0
Mercury	1.0	17.0
Molybdenum	21.1	75.0
Nickel	3.0	420.0
Lead	21.2	300.0
Selenium	6.1	100.0
Zinc	1005.8	2800.0
Chromium	26.8	1200.0
Copper	543.7	1500.0

[1] ppm – parts per million

6.3.3 End User Guidelines

Based on the above nutrient loads and heavy metals analysis, the following user guidelines were adopted working with the Washington State University Cooperative Extension:

- Lawns - Apply 20 lbs of SoundGRO® per 1000 square feet 4 times per year in mid-April, mid-June, early September, and late October.
- Trees - Apply 5 lbs of SoundGRO® for every inch of the tree's diameter measured 4 feet from the ground. Apply under drip line or outer circumference of the tree.
- Shrubs - Spread 4 lbs of SoundGRO® per 100 square feet on shrub beds.
- Vegetable Gardens - Mix 3 lbs of SoundGRO® per 100 square feet into bedding soil in spring. Repeat when plants emerge.
- Annuals - Mix 3 lbs of SoundGRO® per 100 square feet into flower bed soils in spring. Repeat when buds are forming.
- Perennials - Mix 2 lbs of SoundGRO® per 100 square feet into the flower bed soils in spring. Repeat application when buds are forming.

These recommendations along with the nutrient and heavy metals analysis are printed on every bag of SoundGRO®.

6.4 Marketing and Distribution

SoundGRO® Mission Statement:
Produce a high quality fertilizer at a reasonable price, making it accessible to commercial and residential customers while continuing to maintain the County and environmental standards.

6.4.1 Situation Analysis

SoundGRO® has completed its first four years of production and sales. In that time the product has enjoyed favorable reviews from residential and commercial customers. Early free product giveaway promotions and tradeshow appearances increased product awareness and educated the public on the benefits and use of SoundGRO®.

Often SoundGRO® is compared with other products available in Pierce County, "*Tagro"* manufactured by the City of Tacoma and "*Bonney Good Sumner Grow"* by the City of Sumner. Special care is taken at every opportunity to show that the three products are wholly different in their manufacture, use, packaging, and storage qualities. Continued action and education is needed and is vital for a successful transition between non-paying and paying customers. The Utility will continue to identify and capture the residential customer base and expand the commercial user base.

6.4.2 SoundGRO® Market

The primary market has been in residential, large turf (golf course, playfields) and farmland. With continuing marketing and education, additional users are being identified. SoundGRO® has "green" qualities that most consumers are quick to understand and identify with. Using SoundGRO® closes the loop on recycling, preserves natural resources, eliminates the need for chemical based fertilizers, and is environmentally friendly.

6.4.3 Placement and Distribution

SoundGRO® is not made in sufficient quantities to be marketed in large big box chain stores, so the marketing strategy has been to find local distributors and nearby customers large enough to take bulk quantities of 10-40 tons or more per purchase. Residential customers are able to purchase SoundGRO® in 50 pound bags directly from the Chambers Creek Wastewater Treatment Plant during plant operating hours,

or from any of the network of distributors throughout Pierce County.

Additional work is currently underway to increase the level of distribution throughout Washington, Oregon, Idaho, Montana, and California in bulk sales for specialized “mix-in” soil amendments. This success will serve to increase the visibility of the product with both the residential and commercial end user.

6.5 Economic and Ecologic Benefits to the Utility, Utility Staff, and the Community

With the automated fertilizer manufacturing facility now on-line, there is less contact with waste materials that come into the Chambers Creek Regional Wastewater Treatment Plant. This automated manufacturing process has:

- Eliminated semi-truck transport traffic on-site, greatly reducing both vehicle and worker interaction while increasing plant safety.
- Eliminated the use of fossil fuels in diesel semi-truck transportation of biosolids.
- Eliminated 52,000 road miles per year of semi-truck transportation of biosolids.
- Eliminated off site biosolids dispersal – protecting and preserving open space.
- Streamlined waste solids processing.
- Allowed training and the use of “best available technologies” in the wastewater industry.

6.6 Back-up Distribution and Land Application Alternatives

Previous to the initiation of Class A EQ fertilizer production, Pierce County sent all biosolids, then Class B quality, to land application sites in Lewis County, Washington. Pierce County retains the option to continue land application of biosolids in the event of Class A manufacturing process interruptions such as mechanical, electrical, or other failures within the fertilizer manufacturing process.

6.7 Demand Management

Demand management is a program of activities that result in a cost-effective reduction in the amount of and/or strength of generated wastewater with the goal of delaying and/or reducing the need for additional wastewater treatment and transmission capacity. The following demand management activities are approved components of the selected centralized treatment alternative and remain part of the Utilities wastewater strategy:

- Retention of plumbing code requirements for low-flow fixtures,
- Support cost-effective incentive programs for low-flow plumbing fixture and appliance replacement in service areas,
- Participate in public information and education programs in service areas,
- Continue an aggressive infiltration and inflow (I/I) program to locate and correct I/I sources,
- Examine long-term cost-effectiveness of basing residential rates on the volume of wastewater discharged,
- Continue to monitor wastewater and ensure removal of harmful substances from process water before discharge into public sewers (pretreatment),
- Counsel commercial and industrial businesses on how to keep substances harmful to the treatment process out of their wastewater, and
- Continue to charge non-residential dischargers for extra waste loads.

6.8 Reclamation and Reuse – Reclaimed Water

In Washington State water reclamation and reuse regulations consider reclaimed water a resource. Current program authorities are based upon RCW 90.46 which requires a permit to be issued to use reclaimed water and for that use to be based upon the standards and guidance in the *1997 Water Reclamation Standards (Standards).*

Reclaimed water can be described as water pulled from a wastewater treatment plant or off-site satellite

Membrane Bioreactor (MBR) facility that has undergone additional treatment to remove solids and is reused for some beneficial purpose rather than being discharged to a receiving body of water.

Reclaimed Water Quality Standards establishes five classes of reclaimed water expressed as a combination of minimum treatment requirements and a limited set of numeric reclaimed water quality criteria. Class A reclaimed water is required for applications where there is a relatively high risk of human exposure to potential pathogens in the reclaimed water such as parks and golf courses. For uses where the potential for human exposure is lower, Class B and Class C are acceptable.

The Reclaimed Water Quality Standards include two "+" categories of reclaimed water for use in aquifer recharge, Class A+ and Class B+. RCW 90.46.080 requires water used for aquifer recharge through surface percolation conform to the state drinking water criteria which limits nitrate + nitrate (NO_3 + NO_2) to 10 mg/l.

RCW 90.46.042 requires that use of reclaimed water for direct recharge conform to standards and guidance (Section 3 of the 1997 *Standards*) which limits total nitrogen to less than 10 mg/l for recharge of potable aquifers. These categories of reclaimed water will minimize concerns over nitrate contamination of groundwater beneath sites where reclaimed water is applied.

Tacoma Public Utilities conducted a Water Reuse Feasibility Study as an investigation of wastewater reuse opportunities at wastewater treatment plants within or adjacent to their service area. The report identified two potential reuse markets for reclaimed wastewater from the Chambers Cree Regional WWTP: industrial and irrigation.

Potential application sites within two miles of the WWTP included 505 acres of parks, cemeteries, and golf courses. (This did not include on-site uses identified in the Chambers Creek Properties Master Site Plan.) Two pipeline projects were described to transfer wastewater to the closest sites.

In 1997, Tacoma Public Utilities released the Stone Consolidated Mill Conservation and Water Reuse Assessment (Abitibi Consolidated Paper Mill, now closed). The assessment concluded that while treated wastewater was a viable source of industrial process water, the cost of providing the reclaimed water was not cost-effective for the mill. However, the report stated that the unit cost of reclamation facilities and operations would be less costly for Tacoma Water to pay for than the cost of the next new water supply.

In 1998, the legislature passed ESHB 2514, establishing funds and criteria for watershed assessments and plans. The Tacoma-Pierce County Health Department was awarded grant funds to conduct an assessment of the Chambers Creek - Clover Creek WRIA. The technical assessment was to produce information crucial to reevaluating reuse opportunities within the basin.

Minimum requirements of the assessment were to include:

- an estimate of the surface and ground water present in the watershed,
- an estimate of the water represented by claims in the water rights claims registry,
- water use permits,
- certificated rights,
- existing minimum instream flow rules,
- federally reserved rights, and any other rights to water,
- an estimate of the surface and ground water actually being used in the management area,
- an estimate of the water needed in the future for use in the management area,
- identification of the location of areas where aquifers are known to recharge surface water bodies and areas known to provide for the recharge of aquifers from the surface, and,
- an estimate of the surface and ground water available for further appropriation taking into account minimum instream flows necessary for fish.

Since these investigations were conducted, the Chambers Creek Properties Master Site Plan has been adopted, with an additional update approved in 2007. This plan identifies wastewater reclamation, water

ponds, and on-site irrigation as components of the Master Site Plan for the 930 acres of the Chambers Creek Properties and a method under which mine reclamation could be augmented.

RCW 90.48.112 has required consideration of opportunities for the use of reclaimed water in engineering reports, plans and specifications for the construction of new sewer service systems, sewage treatment or disposal plants or systems, or for improvements or extensions to existing sewer service systems or sewage treatment or disposal plants. Engineering reports occur after general sewer plans identify the service areas and major system improvements necessary to provide service.

The following water reclamation and reuse components are elements of the Unified Sewer Plan:

- Continue to work towards water reclamation and reuse opportunities in the Chambers Creek Properties Master Site Plan,
- Develop a Water Reuse Plan for off-site reuse associated with any new wastewater treatment plant constructed as part of Unified Sewer Plan implementation, and
- Cooperate with water purveyors neighboring Pierce County owned wastewater treatment plants.

The objective is to reduce demand for potable water by using reclaimed water where feasible. The Utility is investigating the construction of a Reclaimed Water System to be located at the Chambers Creek Regional Wastewater Treatment Plant to provide reclaimed water for the Chambers Creek Regional Wastewater Treatment Plant and the Chambers Creek Properties.

Based upon policies in the 2007 Chambers Creek Properties Master Plan, the Chambers Creek Regional Wastewater Treatment Plant will produce only Class A reclaimed water for re-use on the properties or in sales to the community.

Additional investigation for the possible location of other facilities, including mini-satellite MBR facilities to provide reclaimed water for wetland enhancement, increased stream flows, and aquifer recharge separate from the Chambers Creek facility is also being considered, the latter requiring a policy change from centralized to partially decentralized treatment.

The total amount of reclaimed water for irrigation and water features and wetland and stream enhancement has not been determined.

In light of these factors, the Pierce County Sewer Utility integrates reclamation and reuse into the sewer service general plan as policy, as follows:

- Continue to work towards water reclamation and reuse opportunities in the Chambers Creek Properties Master Site Plan.
- Cooperate with water purveyors neighboring Pierce County-owned wastewater treatment plants.
- Investigate the economic feasibility of off-site reuse of reclaimed water from the Chambers Creek Regional WWTP and the opportunities for use of reclaimed wastewater per the Chambers Creek Properties Master Site Plan.

6.9 Air Quality

Air quality elements include improvements to both the Chambers Creek Regional Wastewater Treatment Plant and collection system components. Air quality must meet the federal Clean Air Act, 40 CFR Part 60, and WAC Chapter 173-400 - General Regulation for Air Pollution Sources. Air quality is, and will continue to be, addressed as part of construction and operation of wastewater treatment and collection facilities.