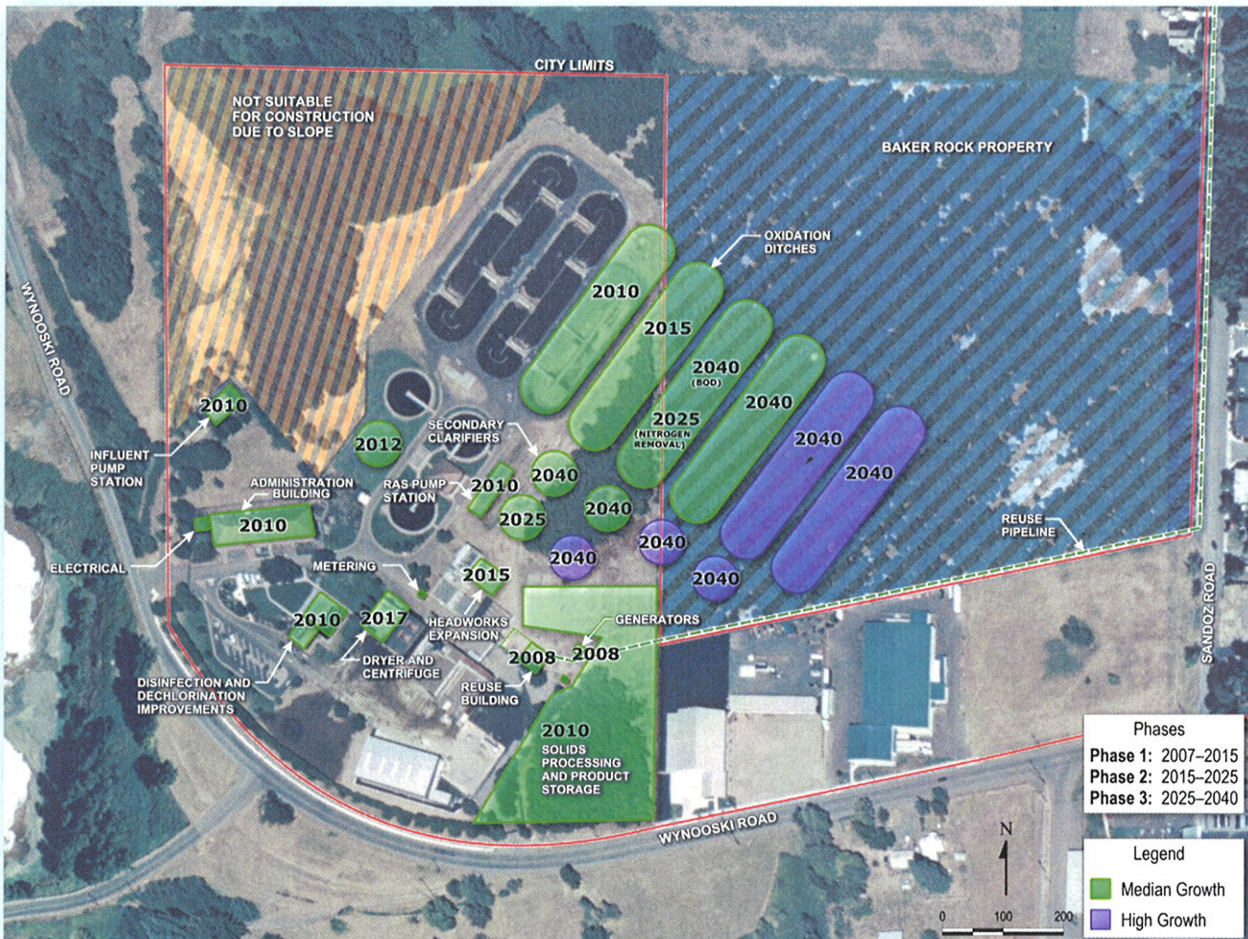
City of Newberg

Wastewater Treatment Plant
Facilities Plan Update

June 2007

Revised October 2007



City of Newberg

BROWN AND CALDWELL

Environmental Engineers & Consultants

WASTEWATER TREATMENT PLANT
FACILITIES PLAN UPDATE

Prepared for the
City of Newberg, Oregon

June 26, 2007
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Re-issue date: October 2007

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JULY 15, 1983
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LIST OF ACRONYMS

AAF	average annual flow
AD	average day
ADWF	average dry weather flow
ASP	aerated static pile
AWWF	average wet weather flow
BFP	belt filter press
BOD	biochemical oxygen demand
C	Celsius
$CBOD_5$	5-day carbonaceous biochemical oxygen demand
CIP	Capital Improvement Program
CMOM	Capacity, Management, Operations and Maintenance
DEQ	Oregon Department of Environmental Quality
DI	ductile iron
DNA	deosyribonucleic acid
EPA	Environmental Protection Agency
EQC	Oregon Environmental Quality Commission
ETL	excess thermal load
F	Fahrenheit
FTE	full-time equivelant
gcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
gsfd	gallons per square foot per day
HI	Hydraulic Institute
HOCl	hypochlorite
hp	horsepower
IPS	Influent Pump Station
I/I	infiltration/inflow
LUC	land use compatibility
MBR	membrane bioreactor
MCC	motor control center
MD	maximum day
MG	million gallons
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mgd	million gallons per day
mL	milliliters
MLSS	mixed liquor suspended solids
mm	millimeters
MMDWF	maximum month dry weather flow
MMWWF	maximum month wet weather flow
NPDES	National Pollutant Discharge Elimination System
OAR	Oregon Administrative Rules
O&M	operations and oaintenance
OHD	Oregon Health Division
pcd	pounds per capita per day
PDF	peak day flow
PHF	peak hour flow
PLC	programmable logic controller
POTWs	Publicly Owned Treatment Works
ppd	pounds per day
pph	pounds per hour
psfd	pounds per square foot per day
psi	pounds per square inch
PWF	peak week flow
RAS	return activated sludge
RRE	Repair, Renovation and Expansion
SMPU	Sewerage Master Plan Update
SRT	solids retention time
SSOs	sanitary sewer overflows
SST	sludge storage tank
TKN	total Kjeldahl nitrogen
TMDLs	total maximum daily loads
TPAD	temperature-phased anaerobic digestion
TS	total solids
TSS	total suspended solids
UGB	urban growth boundary
URA	urban reserve area
UV	ultraviolet
VLR	vertical loop reactor
WAS	waste activated sludge
WET	whole effluent toxicity
WLA	waste load allocation
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
ZID	zone of initial dilution
7Q10	annual flow for seven consecutive days that has a recurrence interval of 10 years

LIST OF ACRONYMS

AAF average annual flow
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BFP belt filter press
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CIP Capital Improvement Program
CMOM Capacity, Management, Operations and Maintenance

DEQ Oregon Department of Environmental Quality
DI ductile iron
DNA deosyribonucleic acid

EPA Environmental Protection Agency
EQC Oregon Environmental Quality Commission
ETL excess thermal load

F Fahrenheit
FTE full-time equivelant

gcd gallons per capita per day
gpd gallons per day
gpm gallons per minute
gsfd gallons per square foot per day

HI Hydraulic Institute
HOCl hypochlorite
hp horsepower

IPS Influent Pump Station
I/I infiltration/inflow

LUC land use compatibility

MBR membrane bioreactor
MCC motor control center
MD maximum day
MG million gallons
mg/kg milligrams per kilogram
mg/L milligrams per liter
mgd million gallons per day
mL milliliters
MLSS mixed liquor suspended solids
mm millimeters
MMDWF maximum month dry weather flow
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NPDES National Pollutant Discharge Elimination System

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RAS return activated sludge
RRE Repair, Renovation and Expansion

SMPU Sewerage Master Plan Update
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UGB urban growth boundary
URA urban reserve area
UV ultraviolet

VLR vertical loop reactor

WAS waste activated sludge
WET whole effluent toxicity
WLA waste load allocation
WTP Water Treatment Plant
WWTP Wastewater Treatment Plant

ZID zone of initial dilution

7Q10 annual flow for seven consecutive days that has a recurrence interval of 10 years

EXECUTIVE SUMMARY

ES.1 OVERVIEW

In 2004, the City of Newberg (City) contracted with Brown and Caldwell to develop a Facilities Plan to provide recommendations to the City's Capital Improvements Program (CIP) for the City's wastewater treatment plant (WWTP). The purpose of the Newberg WWTP Facilities Plan Update is to provide the planning for required modifications to meet projected growth within the urban growth boundary (UGB) and the urban reserve area (URA) to maintain compliance with its National Pollutant Discharge Elimination System (NPDES) permit and potential future regulations.

ES.1.1 Wastewater Service

The City owns and operates a secondary WWTP located at 2301 Wynooski Road, Newberg, Oregon. The City currently provides wastewater collection and treatment services to its residents, commercial establishments, institutional customers, and a number of industries. Sewer service is provided only to customers within the city limits, with the exception of a few residences outside of the city and SP Newsprint Company, which discharges only domestic wastewater to the municipal system.

ES.1.2 WWTP Description

The Newberg WWTP was placed into service in 1987. The facility is a Class IV oxidation-ditch type, activated sludge plant with Class A in-vessel biosolids composting. The treatment train consists of influent pumping, screening and grit removal, oxidation-ditch activated sludge, clarification, solids dewatering, composting, odor control, chlorination, dechlorination, and effluent discharge to the Willamette River. A schematic of the treatment train is shown in Figure ES-1.

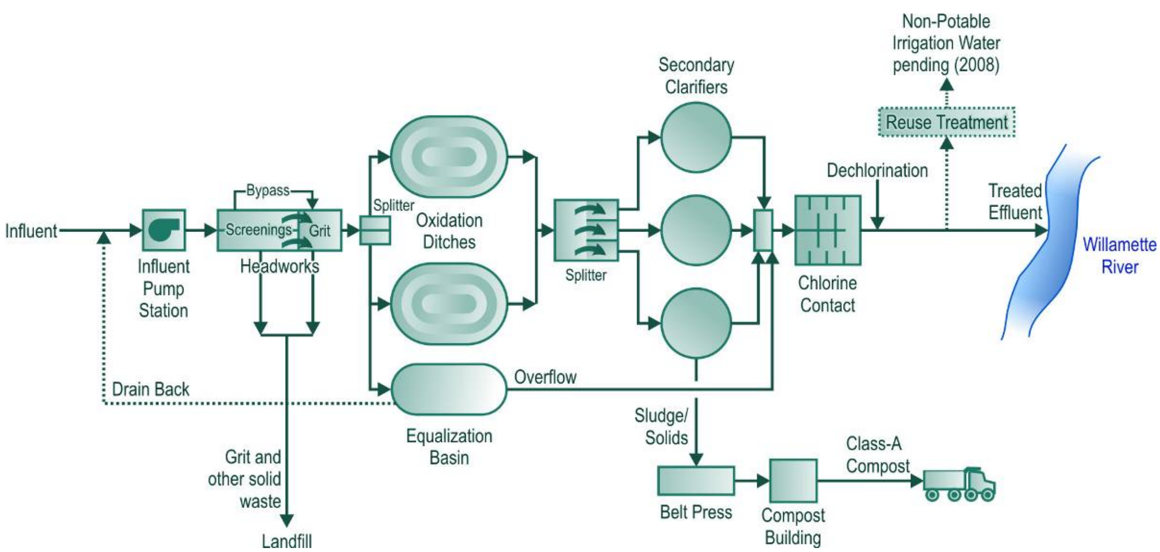


Figure ES-1. Schematic of Newberg WWTP

As shown in Figure ES-2, the two main products that result from the City's wastewater treatment process are water and compost. The WWTP discharges treated water to the Willamette River, and the City is implementing plans to irrigate golf courses with some of the treated product (reuse water) by October 2008. The City sells its NEWGROW compost product to the public throughout the year.

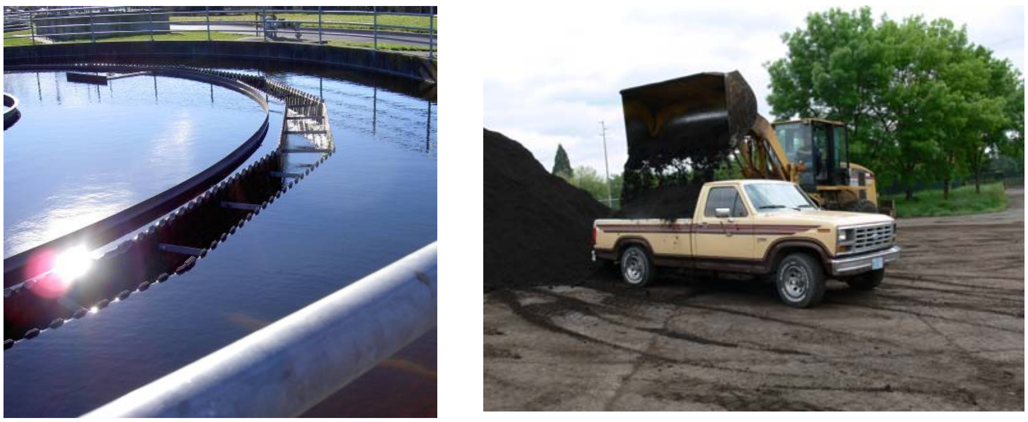


Figure ES-2. Newberg WWTP Products: Water and Compost

The last Facilities Plan was completed 22 years ago as part of the Sewerage Master Plan Update (KCM, 1985), after which the City constructed the existing WWTP on Wynooski Road with federal grants. The purpose of the Newberg WWTP Facilities Plan Update is to provide the planning for required modifications to meet projected growth within the UGB and the urban reserve area to maintain compliance with its NPDES permit and potential future regulations.

ES.1.3 Factors Affecting the WWTP

There are three major factors that impact the wastewater service and the WWTP. These are:

- Ability to treat the City's wastewater to the required quality
- Ability to convey and treat the quantity of wastewater (hydraulic capacity)
- Ability to handle solids, compost, and deliver compost product to the public

Willamette River water quality requirements dictate how well the wastewater needs to be treated. There are minimum technology standards that require secondary biological treatment and disinfection prior to surface water discharge; and receiving water quality standards that protect its beneficial uses. Changes are needed immediately to improve the reliability of the disinfection process.

The WWTP must also be able to accommodate the peak hydraulic flow. Infiltration/inflow (I/I) from rainwater direct connections (inflow) and infiltration from high groundwater is responsible for the peak hydraulic flow at the Newberg WWTP. A schematic of I/I is shown in Figure ES-3. The Newberg Collection System Master Plan being prepared in parallel with the Facilities Plan confirms the I/I contribution to the peak wastewater flows needing to be accommodated.

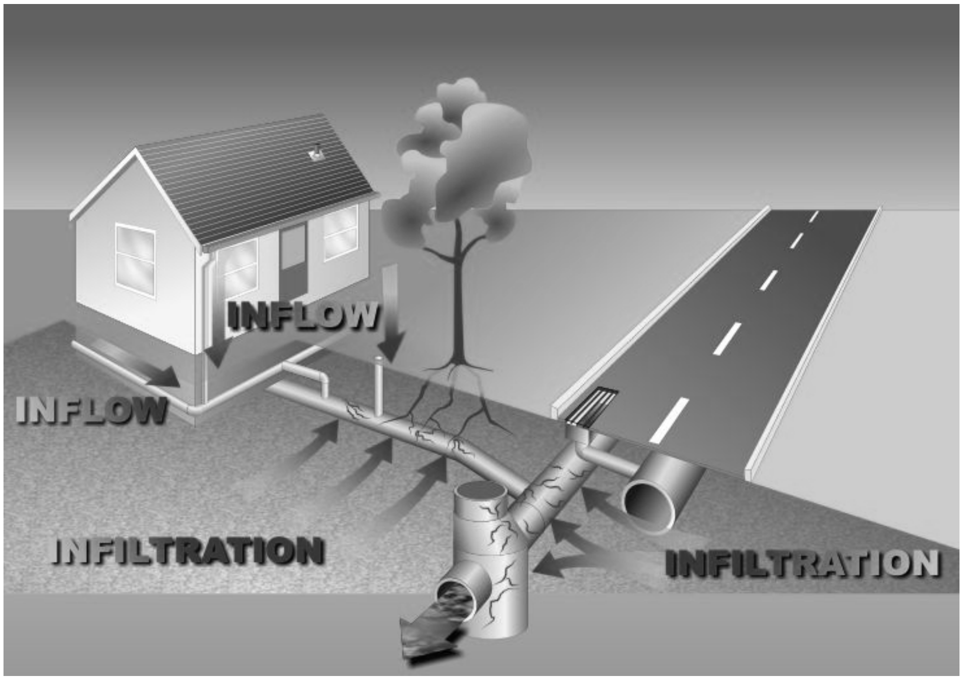


Figure ES-3. Schematic of I/I

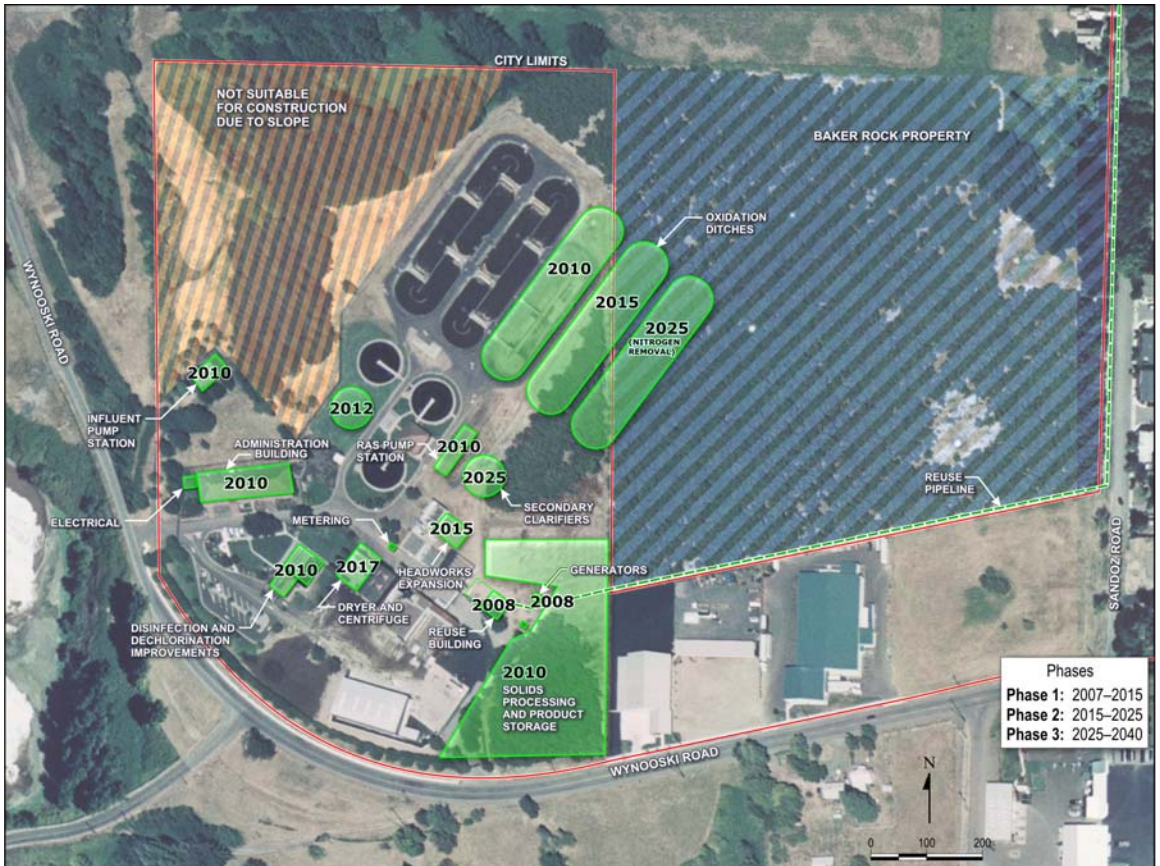
I/I entering the collection system has a profound effect on the wastewater quantity that flows to the WWTP influent pumping station (IPS). Currently the IPS cannot convey peak flows with one pump out of service for the design storm event. The Oregon Department of Environmental Quality (DEQ) design standard for wastewater pumping requires that capacity with one pump out of service must convey the peak hour flow for a defined storm event to prevent unauthorized overflows by 2010. All downstream treatment plants must be able to convey the pumped flows.

The impacts of the Newberg I/I elimination program will affect the capacity of the WWTP Repair, Renovation, and Expansion Projects (RRE Projects). However, these impacts will not immediately reduce the first planned RRE Project scope, but will delay, reduce, and/or, postpone future project expansions. The first phase RRE is needed to convey and treat the I/I flows until collection system improvements result in decreased I/I. Reductions in I/I are not expected to occur until after the first phase RRE is implemented.

Solids handling capacity is also a critical component of the WWTP. The City composts the solids and sells the compost to the public. The composting process is currently limited and out of capacity because the moisture content in the sawdust and solids feeding the composter is too high. Recent changes in the sawdust market have resulted in the availability of only high moisture sawdust. New technology is available for drying the sawdust and removing more moisture from the WWTP solids.

ES 1.4 RRE Projects

Figure ES-4 shows the needed improvements to meet the regulatory requirements, guide the future direction of capital improvements projects, and define the land area needed for the City's wastewater treatment that will be phased through 2025.



Newberg City Phase 2 Wastewater Expansion Proposal

Figure ES-4. Recommended Improvements and Phasing through 2025

The unit processes that need RRE include:

- IPS
- Headworks, including screening and grit removal
- Secondary treatment, including oxidation ditches and secondary clarifiers
- Effluent disinfection and dechlorination
- Effluent conveyance and discharge to the Willamette River (outfall)
- Effluent reuse (currently planned for implementation in October 2008)
- Solids processing and handling systems, including dewatering and composting
- Administration Building
- WWTP support systems

ES.2 PROJECT GOALS

The project goals are listed below.

- Plan for facilities to comply with existing and predictable-potential-future regulations.
- Provide for incremental capacity expansion through 2025 through a CIP and ultimate expansion in 2040.
- Provide for reliability, ease of operations and maintenance (O&M), and safety.
- Plan an efficient Administration Building office space and laboratory.
- Recommend back-up power engine generator requirements.
- Coordinate with the Reuse Water Project- the Reuse Water Project includes the new back-up power engine generator.
- Evaluate staffing requirements for the existing and future WWTP operations.

ES.3 PLANNING PROCESS

The facility planning process includes the following:

- Using existing and future population projections (residential, commercial, and industrial) to estimate significant increases in wastewater flows and loads.
- Identifying capacity needs that ensure that the WWTP will be able to convey and treat the wastewater through service area build-out.
- Evaluating treatment processes with regard to growth and regulatory requirements and identifying needed plant expansions and improvements.
- Developing recommendations to modernize and optimize the system where practicable, and to ensure compliance with local, state, and federal regulations.
- Evaluating and recommending energy efficient alternatives.
- Developing planning-level cost estimates (with 35 percent contingency) for the recommended improvements based on current cost estimating practices and the timing of the improvements.
- Creating a recommended CIP for the facility in increments for the fiscal year period 2007 through 2025.
- Evaluating the Administration Building to meet current and future staff needs (including those of a new water treatment plant (WTP), to be located south of the WWTP across Wynooski Road).

ES.4 PLANNING CRITERIA

The planning criteria used to evaluate the WWTP ability to project the future wastewater quantities, treat the City's wastewater to the required quality, and provide hydraulic capacity are summarized below. The planning is consistent with the current Newberg city boundaries and the UGB as shown in Figure ES-5.

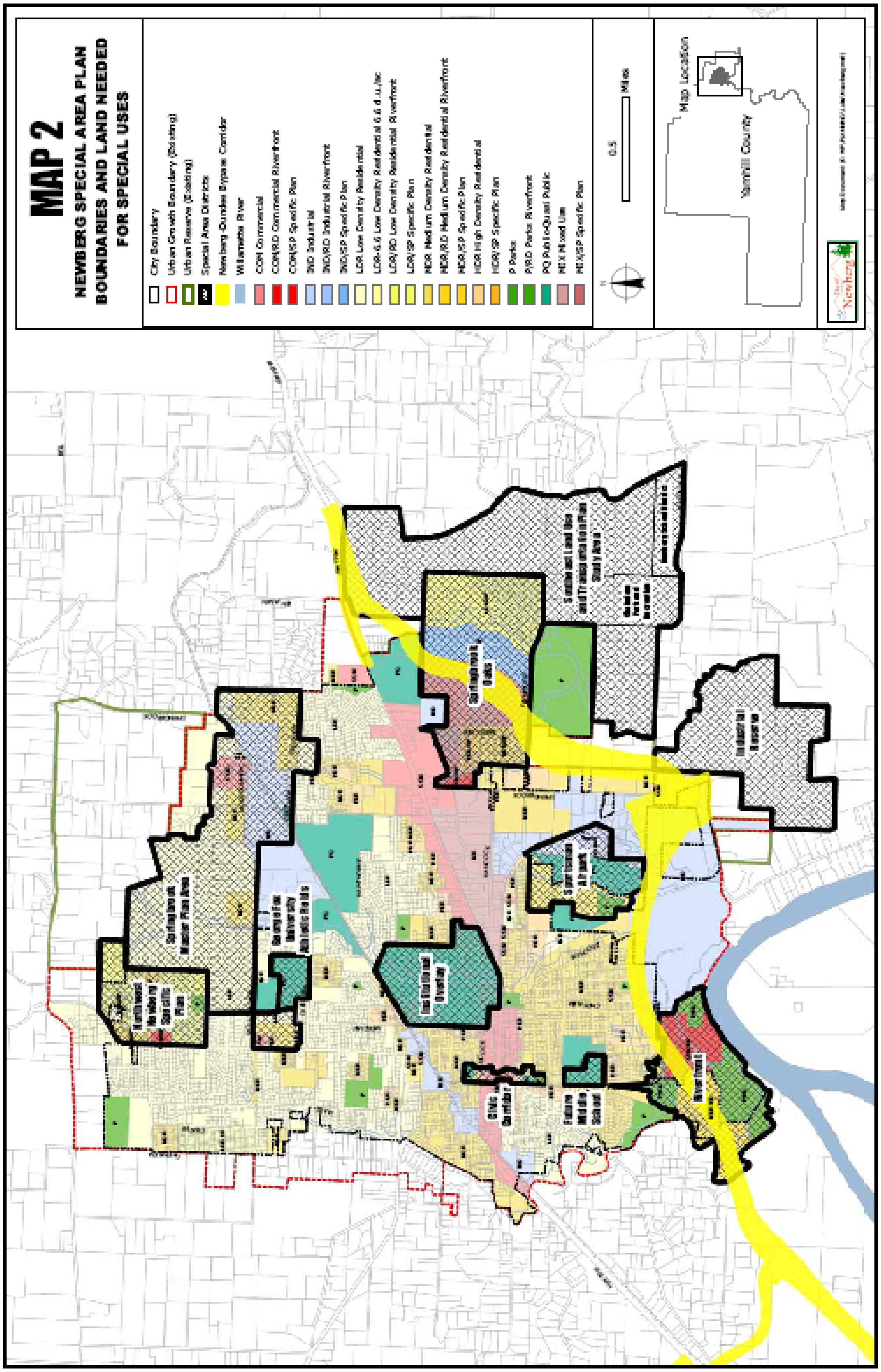


Figure ES-5. Current Newberg City Boundaries and UGB

ES.4.1 Population

Newberg is a fast-growing community in the Willamette Valley. Its current population is just over 20,000 people. Population projections for the service area are integral to projecting sewage flows. The population forecasts for the Newberg UGB are from the Johnson Gardner Report (July 2004). These forecasts are in line with those officially adopted by the City in December 2005. Table ES-1 lists the projected populations for a range of potential growth rates: low growth, median growth, and high growth. The median projected population in 2025 and at the end of the planning period in 2040 are 38,352 and 54,097 respectively. The median growth rate was used for planning the phased CIP. The high growth rate was used to determine land area requirements for ultimate build-out.

Table ES-1. Population Projections

Year	Low growth population	Median growth population	High growth population
2005	20,623	21,132	22,180
2010	23,332	24,497	26,985
2015	26,691	28,712	33,190
2020	30,561	33,683	40,859
2025	33,957	38,352	48,833
2040	44,505	54,097	79,701

ES.4.2 Flows

Planning criteria related to projected flow rates are summarized in Table ES-2. The flow projections were developed by analyzing WWTP operating data from January 1996 to December 2004. The projected average annual flow for 2005 is 3.11 million gallons per day (mgd). For comparison, the actual average annual flow for 2005 was 2.73 mgd. The projected peak hour flow for 2005 is 20.81, the plant has seen higher flows than that after rehabilitating influent pumps. The projected 2005 maximum month wet weather flow (MMWWF) is 7.52 mgd. In December 2006, the maximum month flow was 8.1 mgd, and plant staff had to make significant process modifications to avoid violating the permit. Permit compliance for most water quality parameters is based on a monthly average performance. Therefore, the flow projections for these water quality parameters are based on monthly WWTP data. Peak hour flow projections are used to plan for hydraulic capacity.

Table ES-2. Flow Projections (mgd) Based on Median Growth Projections

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
Average dry weather flow (ADWF)	2.07	2.40	2.81	3.30	3.76	5.30
Maximum month dry weather flow (MMDWF)	3.52	4.08	4.78	5.61	6.39	9.01
MMWWF	7.52	8.71	10.21	11.98	13.64	19.24
Peak hour flow (PHF)[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1] PHF peaking factor (varies) decreases with time (0.2 mgd subtracted for every 5 years of population growth) because peaking factors usually decrease with increasing service area.

The flow projections for low, median, and high growth scenarios for 2040 are listed in Table ES-3. The median growth projections were used to develop the capital improvements projects recommendations. The projections for 2040 were used to determine the potential WWTP land area requirements for ultimate buildout.

Table ES-3. Flow Projections for 2040

	Low growth estimate	Median growth estimate	High growth estimate
Population	44,505	54,097	79,701
ADWF	4.36	5.30	7.81
Average annual flow	6.55	7.97	11.74
Annual wet weather flow	9.12	11.08	16.32
MMDWF	7.41	9.01	13.28
MMWWF	15.83	19.24	28.35
Peak week flow[1]		26.19	
Peak day flow[2]		41.40	
PHF[2, 3]		45.86	

[1] Existing data based on a running 7-day average. Daily minimums and maximums do not apply.

[2] Peak flows are not directly related to population, but rather I/I in the pipes that serve the population. Assumes no I/I removal.

[3] PHF peaking factor (varies) decreases with time (0.2 mgd subtracted for every 5 years of population growth).

The City's Sewerage Master Plan Update (by Brown and Caldwell, June 2007) initial results in April 2007 show that the peak flows that the collection system will currently convey to the WWTP are 17.6 mgd in 2007 and 34.2 mgd in 2040 with undersized pipes replaced. This compares well for 2007. However, the plant is projected to see peak flows of 35 mgd in 2025 rather than 2040 using the Facilities Plan methodology. The Facilities Plan projections assume that I/I is not removed, while the SMPU assumes that the I/I the new pipes will not have high I/I. To help account for this difference, the recommended hydraulic improvements have been phased for incremental expansion. Should the I/I be removed by 2025, no additional hydraulic improvements are expected to be needed to serve 2040 peak flows.

ES.4.3 Loads

The design loads for 2005 to 2040 based on the median growth rate are summarized in Table ES-4.

Table ES-4. Load Projections from 2005 to 2040 Based on Median Population Growth

Parameter	Year					
	2005	2010	2015	2020	2025	2040
5-day carbonaceous biochemical oxygen demand ($CBOD_5$), pounds per day (ppd)						
Maximum month	5,034	5,836	6,840	8,025	9,137	12,888
Average month	2,862	3,318	3,888	4,562	5,194	7,326
Total suspended solids (TSS), ppd						
Maximum month	7,603	8,814	10,330	12,119	13,799	19,464
Average month	4,423	5,128	6,010	7,050	8,028	11,323

Table ES-5 summarizes the load projections for 2040 for the three growth scenarios.

Table ES-5. Load Projections for 2040

Parameter	Low growth estimate, ppd	Median growth estimate, ppd	High growth estimate, ppd
Average $CBOD_5$	6,027	7,326	10,794
Maximum month $CBOD_5$	10,603	12,888	18,988
Average TSS	9,316	11,323	16,683
Maximum month TSS	16,013	19,464	28,676

The projections for influent ammonia will be an average monthly ammonia concentration of 15.9 milligrams per liter (mg/L) and a maximum monthly concentration of 25.4 mg/L.

ES.5 REGULATORY REQUIREMENTS

The following summarize current and proposed regulations and establish the design criteria to be used in the development of the various treatment and disposal alternatives for the City's wastewater treatment system. The DEQ criteria listed include the Willamette Basin standards, Willamette River discharge criteria, reuse criteria for land application of effluent and biosolids, and U.S. Environmental Protection Agency (EPA) criteria for reliability and redundancy.

ES.5.1 NPDES Discharge Permit—Treatment and Discharge Requirements

The City was issued an NPDES permit from DEQ on June 22, 2004, for its Level III Collection System and Level IV treatment system that discharges to the Willamette River. A copy of the permit is provided in Appendix A. The City currently directs all treated water to the Willamette River. This practice is covered by the NPDES permit. In 2006, the City requested that the DEQ modify the NPDES permit to include a reuse outfall for irrigation on local golf courses, an approved overflow manhole in Hess Creek for the pump station, and acceptance for the revised Biosolids Management Plan. DEQ is currently working on the open permit. The reopened permit is expected to include new discharge requirements to limit temperature discharges to the Willamette River based on the 2006 Willamette River Total Maximum Daily Loads (TMDLs).

The current permit requirements are listed in Tables ES-6 through ES-8. The WWTP has had no permit violations.

Table ES-6. Current Permit Requirements, May 1 – October 31

	Limitation				
	Average concentration, mg/L		Mass load[1]		
Parameter	Monthly	Weekly	Monthly average, ppd	Weekly average, ppd	Daily maximum, pounds
$CBOD_5$[2]	10	15	330	500	660
TSS	10	15	330	500	660

[1] The daily mass load limit is suspended on any day in which the daily flow to the treatment facility exceeds 8 mgd (twice the design ADWF).
[2] The $CBOD_5$ concentration limits are considered equivalent to the minimum design criteria for BOD_5 specified in Oregon Administrative Rules (OAR) 340-041. These limits and $CBOD_5$ mass limits may be adjusted (up or down) by permit action if more accurate information regarding $CBOD_5/BOD_5$ becomes available.

Table ES-7. Current Permit Requirements, November 1 – April 30

Parameter	Limitation				
	Average concentration, mg/L		Mass load[1]		
	Monthly	Weekly	Monthly average, ppd	Weekly average, ppd	Daily maximum, pounds
$CBOD_5$[2]	25	40	1,400	2,000	2,700
TSS	30	45	1,600	2,400	3,200

[1] The daily mass load limit is suspended on any day in which the daily flow to the treatment facility exceeds 8 mgd (twice the design ADWF).

[2] The $CBOD_5$ concentration limits are considered equivalent to the minimum design criteria for BOD_5 specified in OAR 340-041. These limits and $CBOD_5$ mass limits may be adjusted (up or down) by permit action if more accurate information regarding $CBOD_5/BOD_5$ becomes available.

Table ES-8. Current Permit Requirements, Year Round

Parameter	Permit requirement
E. coli	Shall not exceed 126 organisms per 100 milliliters (mL) monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL. If a single sample exceeds 406 organisms per 100 mL, then five consecutive resamples may be taken at 4-hour intervals beginning within 28 hours after the original samples were taken. If the log mean of the five resamples is less than or equal to 126 organisms per 100 mL, a violation shall not be triggered.
pH	6 to 9
$CBOD_5$ and TSS removal efficiency	Shall not be less than 85 percent monthly average for $CBOD_5$ and 85 percent monthly for TSS.
Total residual chlorine	Shall not exceed a monthly average concentration of 0.02 mg/L and a daily maximum concentration of 0.05 mg/L. When the total residual chlorine limitation is lower than 0.10 mg/L, DEQ will use 0.10 mg/L as the compliance evaluation level (i.e., daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitation).

ES.5.2 Biosolids Management Plan

The City developed a Biosolids Management Plan in May 2004, included in Appendix B (to be approved as part of the 2007 open permit process) in accordance with the WWTP permit and OAR 340-050, *Land Application of Domestic Wastewater Treatment Facility Biosolids, Biosolids Derived Products, and Domestic Septage* and 40 CFR, §503. All waste sludge must be managed in accordance with the DEQ-approved Biosolids Management Plan to ensure compliance with the federal biosolids regulations (40 CFR, §503) and the state rules (OAR 340-050).

ES.5.3 Pretreatment Program

An Industrial Pretreatment Program has been developed and is being implemented in accordance with federal regulations governing pretreatment programs, as required by EPA's Code of Federal Regulations Title 40 (40 CFR, §403) and approved by DEQ. The City's Industrial Pretreatment Program is designed to protect its Publicly-Owned Treatment Works; the Newberg WWTP, solids quality, the City's collection system, the Willamette River, and worker health and safety. The Pretreatment Programs have undergone informal review by DEQ and are approvable by DEQ.

ES.5.4 Regulatory Criteria

The important regulatory criteria that could influence the direction of the Facilities Plan are summarized below:

- Mass limits
- I/I removal
- 85 percent removal
- Nutrients
- TMDLs for temperature
- Mixing zone
- Redundancy and reliability
- Class A biosolids

Mass Limits. Allowable mass limits should reflect design flows at effluent concentrations of 10 mg/L $CBOD_5$ and 10 mg/L TSS (10/10). Oregon Environmental Quality Commission (EQC) approval is required to increase mass loads due to increased flows. The Facilities Plan should preserve maximum flexibility by using an incremental approach for phased expansion to accommodate the need for more or less stringent requirements, triggered by water quality requirements.

If necessary, the City may request new loads of the EQC. Environmental, economic decision-guiding criteria and existing water quality management policies need to be addressed prior to requesting EQC approval. If the plant continues to perform at its current level, mass load increases would not be needed.

I/I Removal. Cost-effective I/I removal should be performed along with continued flow equalization. The City must demonstrate that I/I will be reduced to the cost-effective point based on EPA requirements. No plant capacity will be provided for excess I/I. In addition, the following Newberg NPDES permit language for emergency overflow outfalls applies:

> *"No wastes shall be discharged from these outfalls, unless the cause of the discharge is due to storm events as allowed under OAR 340-041-0120 (13) or (14) as follows: Raw sewage discharges are prohibited to waters of the State from November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm, and from May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm. If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm."*

85 Percent Removal. The WWTP can meet the 85 percent removal requirement. The plant should not be required to achieve 85 percent removal of $CBOD_5$ and TSS at all times, as long as permitted effluent concentration limits are being met and I/I is being removed to the extent that is cost-effective.

Nutrient Removal. The need for nutrient removal should be driven by water quality. Nutrient removal will probably not be required initially, but the Facilities Plan describes the approach to be taken if nitrogen and/or phosphorus limits are imposed. The EPA is currently reviewing the need for nutrient removal requirements from WWTPs to protect the nation's waters. This is generally the first step in establishing standards for criteria in the future. Should the EPA promulgate nutrient removal requirements, DEQ would allow Oregon treatment facilities time to comply by incorporating compliance schedules into the next permit renewal following promulgation.

TMDLs for Temperature. The temperature TMDL for the Willamette River was adopted September 21, 2006. DEQ will insert temperature Waste Load Allocations (WLAs) into the currently open permit. The City plans to implement additional effluent reuse to address thermal loads discharge limitations.

Mixing Zone. Mixing zones are allowed by regulatory agencies. DEQ is studying the impacts if mixing zones on water quality. With the current mixing zone, Newberg meets current water quality regulations.

Redundancy and Reliability. Class II reliability is appropriate for the Newberg WWTP.

Class A Biosolids. The City is planning to continue to produce Class A biosolids since a market has developed for the Class A product.

ES.6 BASIS FOR COST ESTIMATES

The following paragraphs cover the basis and limitations for cost estimates.

ES.6.1 Precision of Cost Estimates

The precision of a cost estimate is a function of the detail to which alternatives are developed and the techniques used in preparing the actual estimate. The American Association of Cost Engineers defines the order-of magnitude cost estimate as:

> *"An estimate is made without detailed engineering data. Techniques such as cost-capacity curves, scale-up or scale-down factors, and ratios are used in developing this type of estimate. This type of estimate is normally accurate within +50 percent or -30 percent. That is, the final cost may be as much as 50 percent more or 30 percent less than the estimated amount. A relatively large contingency is normally included to reduce the probability of underestimating."*

The estimates presented in this document are order-of-magnitude estimates because the design has not been developed in sufficient detail for a more precise estimate. A 35 percent contingency is included in the cost estimates. Although the final project cost may vary significantly from these estimates, the estimates are useful in evaluating alternatives because they are fairly accurate relative to each other.

ES.6.2 Basis for Costs over Time

Future changes in the costs of material, labor, and equipment will cause comparable changes in the costs presented in this analysis. However, because the relative economy of the alternatives is expected to change only slightly with overall economic changes, the decisions based on the economic evaluation should remain valid.

The construction costs developed for the recommended phasing for the City's CIP are in March 2007 dollars unless otherwise noted. Phase 1—Immediate Improvements costs are escalated to the midpoint of construction, assuming the midpoint is in 2011. Future phases cannot be realistically escalated and are in 2007 dollars only. The cost of steel and concrete has increased significantly in the last year and this trend is continuing due to the natural disasters that occurred in 2005. The costs are expected to increase 10 percent each year over the next 2 years and cannot be predicted past this point.

ES.7 ALTERNATIVES ANALYSIS SCREENING CRITERIA

The alternatives analysis included using the screening criteria for each individual process to prioritize the alternatives to receive further investigation. Liquids treatment processes that met the regulatory requirements were included in the initial analysis. Only Class A biosolids treatment options were considered since the City has developed a market for Class A product, and the industry trend is moving toward Class A technology.

ES.8 EVALUATION PROCESS

The evaluation process included two Liquid Solids Workshops conducted by Brown and Caldwell. Liquids Solids Workshop No. 1, held on May 23, 2006, consisted of identifying unit process deficiencies and brainstorming technologies to be included in the analysis of wastewater treatment and biosolids alternatives analyses. An initial viability evaluation and screening was used to eliminate alternatives from further consideration. The screening criteria include:

- Relative present worth costs
- Energy conservation
- Regulatory compliance
- Flexibility
- Reliability
- O&M
- Safety
- Viability at the Newberg WWTP

The initial screening used the ratings +, 0, and – for relative scoring. The evaluation was used in Liquids Solids Workshop No. 2, held on December 14, 2006, to verify the ranking of the alternatives in the group setting. If the alternative was not viable at the Newberg WWTP, it was so noted and no scoring was completed. An evaluation of the remaining viable alternatives was conducted by the Brown and Caldwell team.

The alternatives evaluated for the major unit process and the recommendations are summarized below.

ES.9 IPS

The IPS is an essential component of the WWTP. It pumps the wastewater approximately 100 feet between the lowest point in the collection system up to the headworks that provides screenings and grit removal. The pump station is currently under capacity. It cannot convey peak flows when one unit is out of service. Typical high influent flow events could cause permit violations. In addition, there are safety concerns with the existing pump station wet well. The wet well is inefficient and causes frequent problems from rags and debris clogging the pump impellers, which decreases the pumping capacity and requires frequent cleaning. The IPS upgrades and expansion are needed immediately.

The alternatives considered for upgrade and expansion of the IPS to meet current needs and provide for future service include:

Alternative 1: Building additional capacity at the north end of the plant

Alternative 2: Expanding the existing facilities

Alternative 3: Replacing the existing IPS with a new structure next to the existing structure

Alternative 4: Building additional capacity next to the existing and upgrading the existing IPS

Alternative 4 is the recommended expansion alternative. The recommended improvements to the IPS, for safety and capacity reasons, include building additional capacity next to the existing IPS for base flows and upgrading the existing wet well for overflow capacity pumping. The range of flows expected at the IPS is best accommodated by a dual pump station–low and moderate flows would be pumped by a station with a self-cleaning wet well, while higher wet weather flows would be pumped by the overflow pump station with confined inlet pumps. The recommended IPS improvements include modifying the inlet pipe slope, wet well, and related structure for 2040 flow conditions. The pumps selected and installed will be for 2025 flow conditions. The pump station will be able to pump flows in excess of 2015 flows because of the pump sizing constraints that more ideally fit the 2025 phasing. Variable-frequency drives for these pumps are included in the cost estimate. The expansion to Phase 3 will only require modifications or replacement of pumps. The IPS Electrical Room (by others) is sized for future space requirements.

The proposed pump station layout is shown in Figure ES-6.

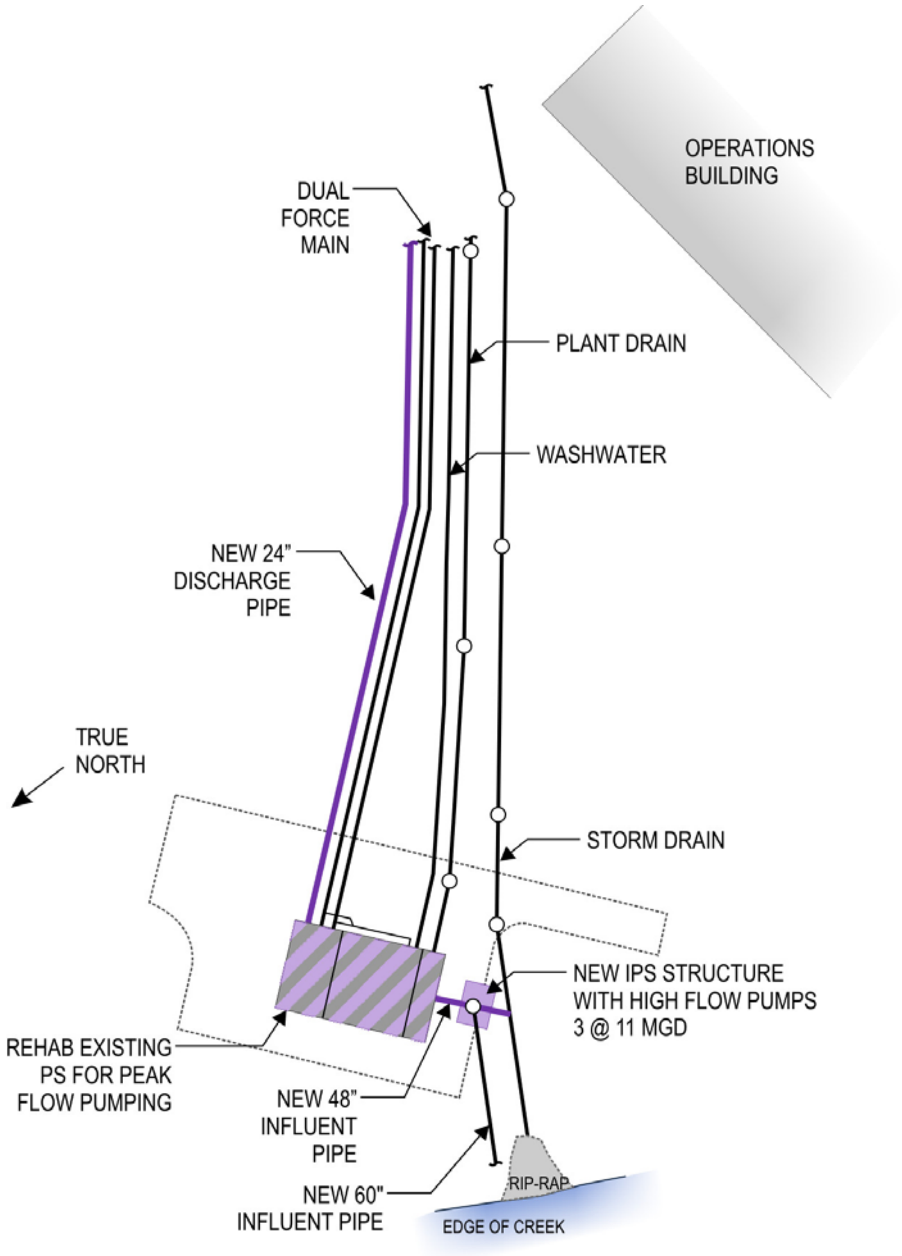


Figure ES-6. IPS Yard Piping Plan

It is also recommended that a section of the influent pipe be elevated sufficiently to remove the slope to the IPS that causes poor influent characteristics and high velocities at peak flows in the IPS. The influent pipe will be a new 60-inch diameter pipe at a slope of 0.0007 foot per foot to limit inflow velocities to less than 4 feet per second. This size pipe is satisfactory for both current and 2040 flow rates so that replacement in the future will not be necessary. When the influent pipe is re-laid, the slope into the wet well will be improved, and the new self-cleaning wet well will be located adjacent to the existing IPS but at a higher elevation.

During the facilities planning process, the Motor Control Center Building location for the IPS was discussed as part of the reuse design process. It was determined that a location to the west of the Administration Building would be optimum. This location avoids the influent piping at the east of the Administration Building, is adequately proximate to the IPS, and avoids the additional costs of construction on a steep slope and where the site is already constrained adjacent to the IPS.

The phased improvements, based on peak hour flow requirements, will provide the incremental IPS capacity, as shown in Figure ES-7.

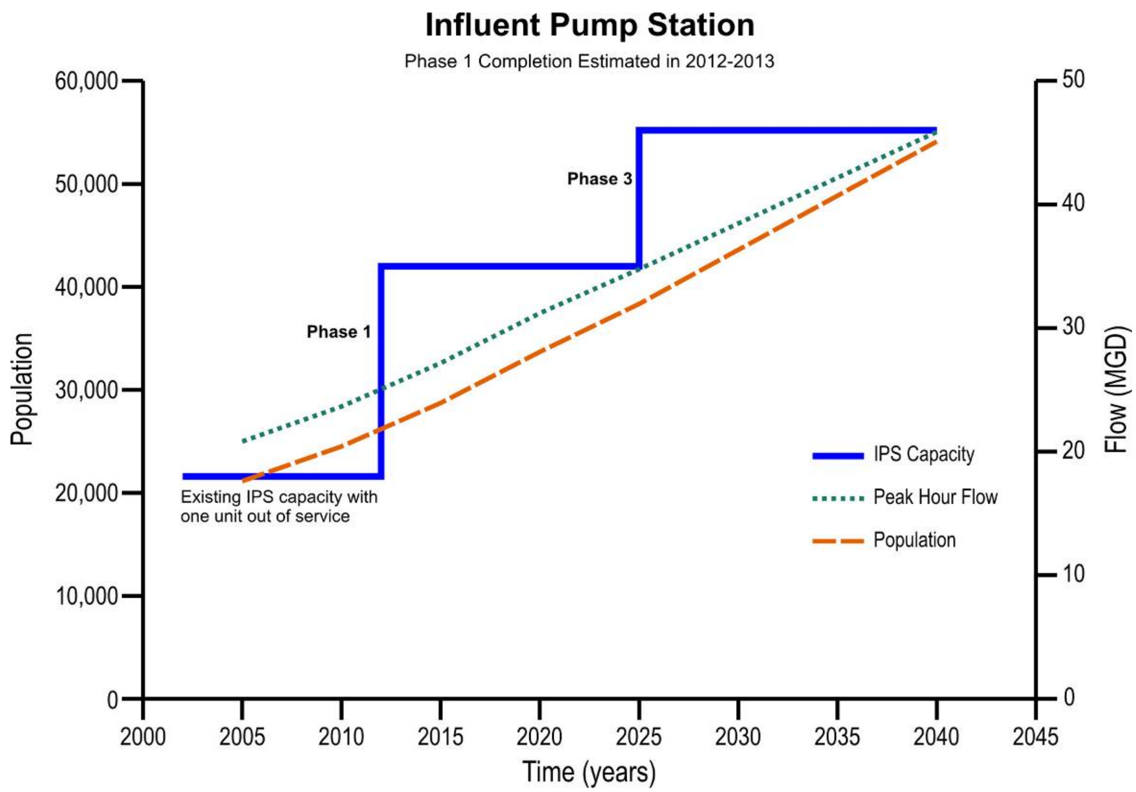


Figure ES-7. Incremental IPS Capacity

ES.10 HEADWORKS

The headworks processes include screening and aerated grit. The screens remove particles greater than 10 millimeters in diameter. The grit is removed with an aerated grit chamber. Although the screens were recently replaced with new, more reliable screens, the existing channel configuration does not allow conveyance and treatment of the total influent flow when one unit is out of service without bypassing around the process.

It is assumed that expansion will include the same type of screens as existing for ease of O&M and because they were determined to be cost-effective in 2002 during the Newberg Dump Station and

Headworks Study conducted by Brown and Caldwell. The most cost-effective screen was chosen at that time. Plant staff have had positive experiences with these screens.

The screens will be installed in channels on the east side of the existing headworks, as shown in Figure ES-8. Emergency power should be added to ensure that critical headworks functions can continue in the event of a power outage. Odor control should be provided also as a good neighbor policy and to maintain compliance with OAR 208 that prohibits nuisance conditions such as odors.

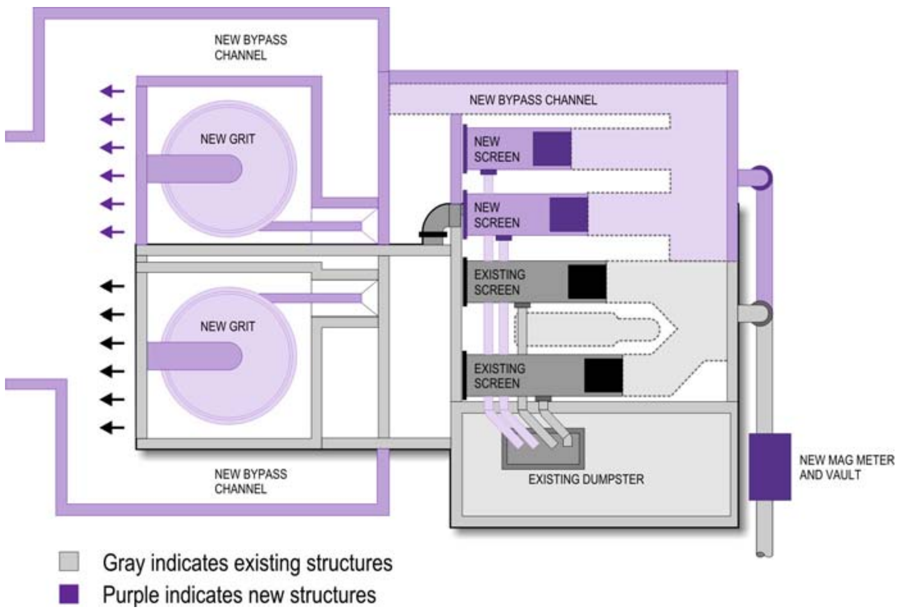


Figure ES-8. Headworks Improvements

The grit removal process is currently undersized, and the recommendation is to provide full grit removal for all flows. Therefore, additional grit removal capacity is needed immediately.

The initial screening analysis for grit improvements includes the following five alternatives:

Alternative 1: Stacked tray separator
Alternative 2: Vortex grit settling with agitation
Alternative 3: Air vortex grit separator
Alternative 4: Free vortex separator
Alternative 5: Expand existing system

The plate gravity settling system that removes grit using a series of stacked plates is the recommended grit removal system to provide the capacity. The stacked plate type grit removal system is shown in Figure ES-9.

Figure ES-9. Photo of gravity plate type settler for grit removal

New flow distribution and flow monitoring will need to be provided. The existing magmeters are not installed for accurate flow measurement. Magmeters will be installed approximately 10 to 20 feet upstream of the headworks to more accurately measure flow. The phased improvements, based on peak hour flow requirements, will provide the incremental headworks capacity as shown in Figure ES-10.

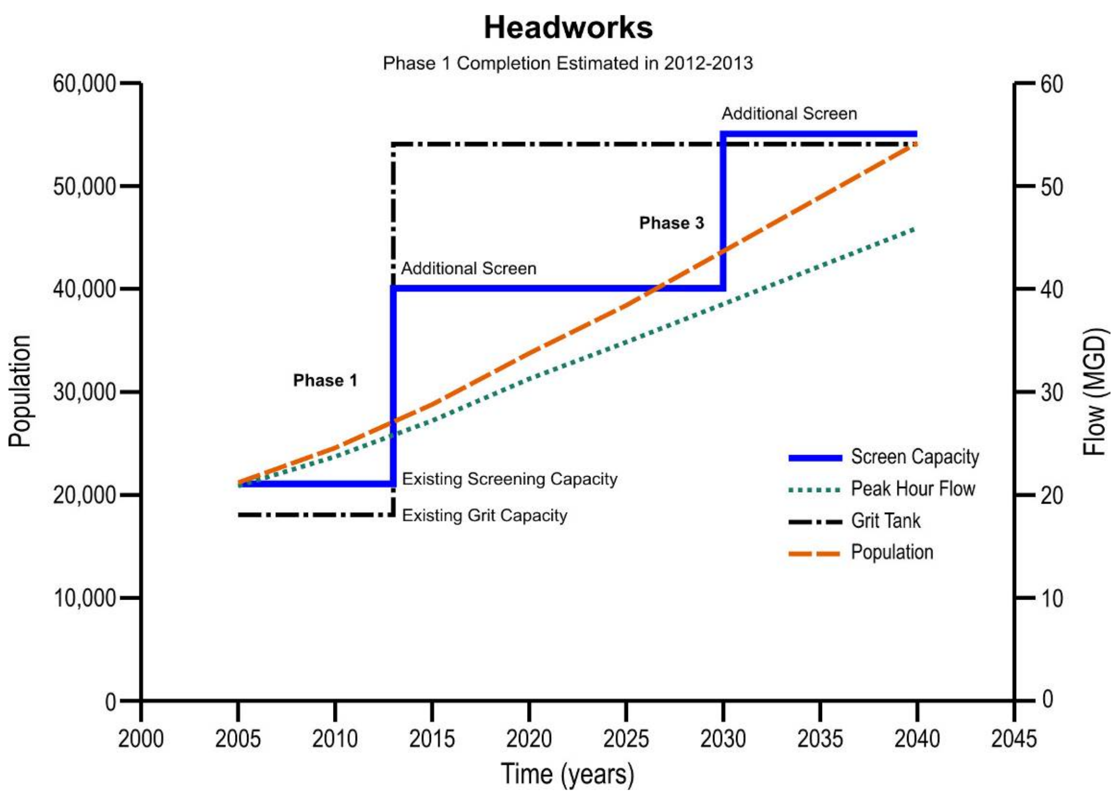


Figure ES-10. Headworks Phased Capacity

ES.11 SECONDARY TREATMENT

The Newberg WWTP currently uses two oxidation ditches for secondary biological treatment to meet regulatory permit requirements. The secondary system is currently undersized for maximum month flow conditions. The analysis for the oxidation ditches and secondary clarifiers were conducted with a static model of both systems as their operations are inter-related in performance capacity.

ES.11.1 Oxidation Ditches

The recommended expansion includes continuing to use the oxidation ditch process because of its low energy and maintenance costs and its ability to treat a wide variation in flows and loads. By 2010, a third oxidation ditch is needed to provide adequate treatment to meet effluent quality requirements. A fourth oxidation ditch is needed by 2015. The City has an interest in acquiring the adjacent Baker Rock property for expansion of the secondary system. However, in the event this land area expansion does not take place, additional processes were considered. The initial screenings evaluation for oxidation ditches included the following alternatives:

Alternative 1: Conventional oxidation ditch
Alternative 2: Vertical loop reactor oxidation ditch
Alternative 3: Cannibal
Alternative 4: Membrane bioreactor

Based on the results of this analysis, a present worth cost comparison, and consensus reached at Liquids Solids Workshop No. 2, expansion with the current oxidation ditch and secondary clarifier processes is the preferred alternative. Should site constraints or significantly more stringent effluent quality become an issue, membrane treatment could be added either in conjunction with the oxidation ditches or by replacing the oxidation ditches and secondary clarifiers with MBRs which would significantly reduce the footprint requirements. The phased capacity expansions for the oxidation ditch process, based on maximum month flow and nitrogen reduction requirements, are shown in Figure ES-11.

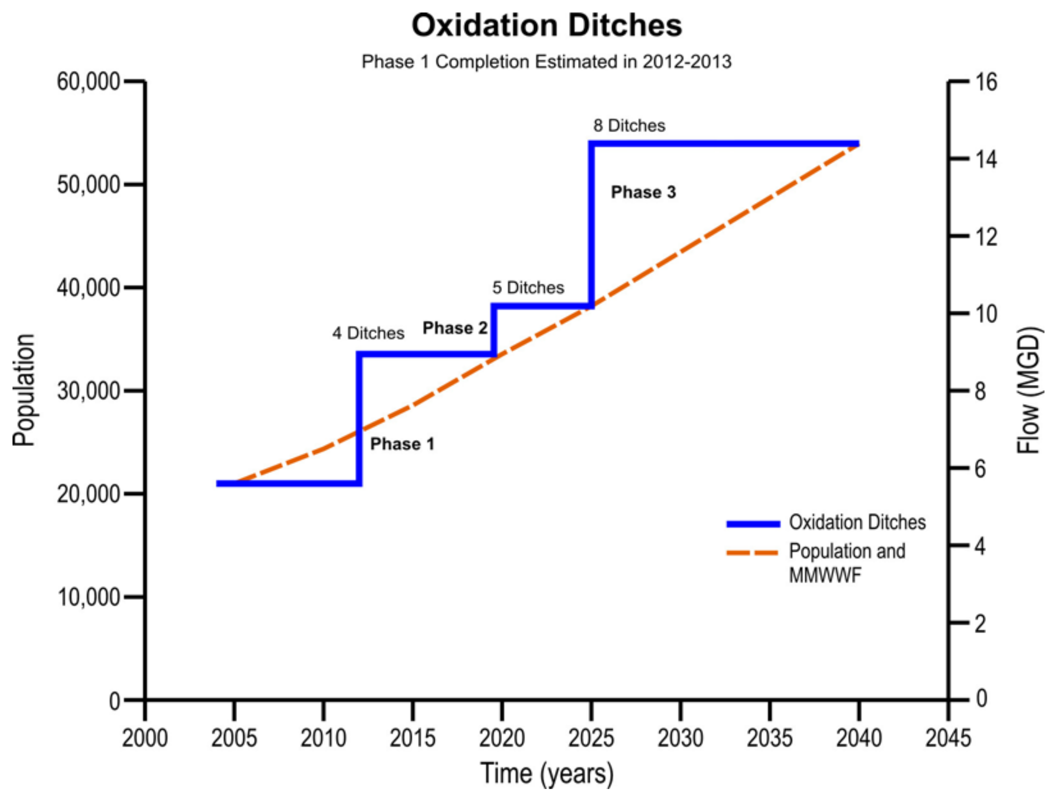


Figure ES-11. Phased Oxidation Ditch Capacity with Nitrogen Reduction Requirements

ES.11.2 Secondary Clarification

Secondary clarifiers separate the biological organisms from the biologically treated wastewater prior to disinfection. The capacity of the secondary clarifiers is related to both hydraulic flow and the mass of biological solids from the oxidation ditches. The secondary system model of both the oxidation ditches and secondary clarifier operation predicted that the secondary clarifier process will need to be expanded with increased population and to match the additional oxidation ditch capacity. By 2012, a fourth secondary clarifier will be needed to meet effluent quality requirements. The phased capacity of the secondary clarifier system, based on maximum month flow requirements, is shown in Figure ES-12.

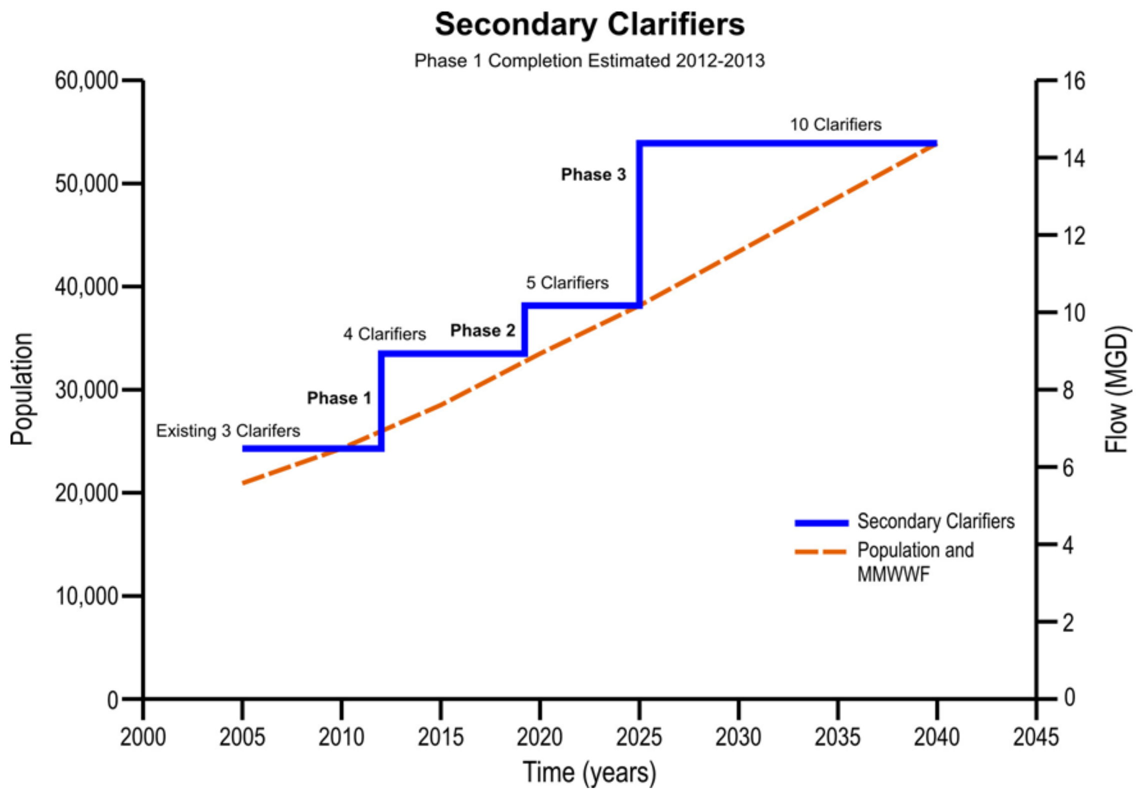


Figure ES-12. Phased Secondary Clarification Capacity with Nitrogen Reduction Requirements

ES.12 DISINFECTION PROCESS

Clarified effluent must be disinfected prior to discharge or reuse. Currently, the disinfection process consists of a chlorination system that uses ton cylinders of chlorine gas. Immediate changes are needed to improve the reliability of the effluent quality to continue to meet disinfection permit requirements. These include chemical induction mixer(s) at the chlorine injection point, scum removal, improved effluent flow monitoring, and automatic disinfection control strategy. Roof drainage needs to be re-routed out of the contact basin. The initial screening of the disinfection alternatives for expansion of the disinfection process includes the following:

Alternative 1: High-rate disinfection
Alternative 2: Additional contact basin
Alternative 3: Additive of onsite generation of sodium hypochlorite
Alternative 4: Ultraviolet (UV) disinfection

The City will continue with gas chlorine for the first 5-year permit cycle as well as the existing contact basins. The City is considering phasing in hypochlorite when the Newberg WTP is constructed in closer proximity to the WWTP. High-rate disinfection can be used to increase the effectiveness of the disinfection to accommodate the limited contact time in the existing contact chamber. The City is also investigating the applicability of phasing in UV treatment at a later date. UV disinfection may not be feasible at the WWTP since the effluent has iron which can inhibit UV effectiveness.

Disinfected wastewater is currently dechlorinated at the outlet of the chlorine contact basins. The dechlorination system requires complete replacement to be more effective, but currently capacity is limited by the configuration of the equipment. A new 1,050-gallon high-density polyethylene storage tank, two new feed mechanical diaphragm pumps and a new control system is recommended for immediate implementation. The phased disinfection capacity, based on peak hour flow requirements, is shown in Figure ES-13.

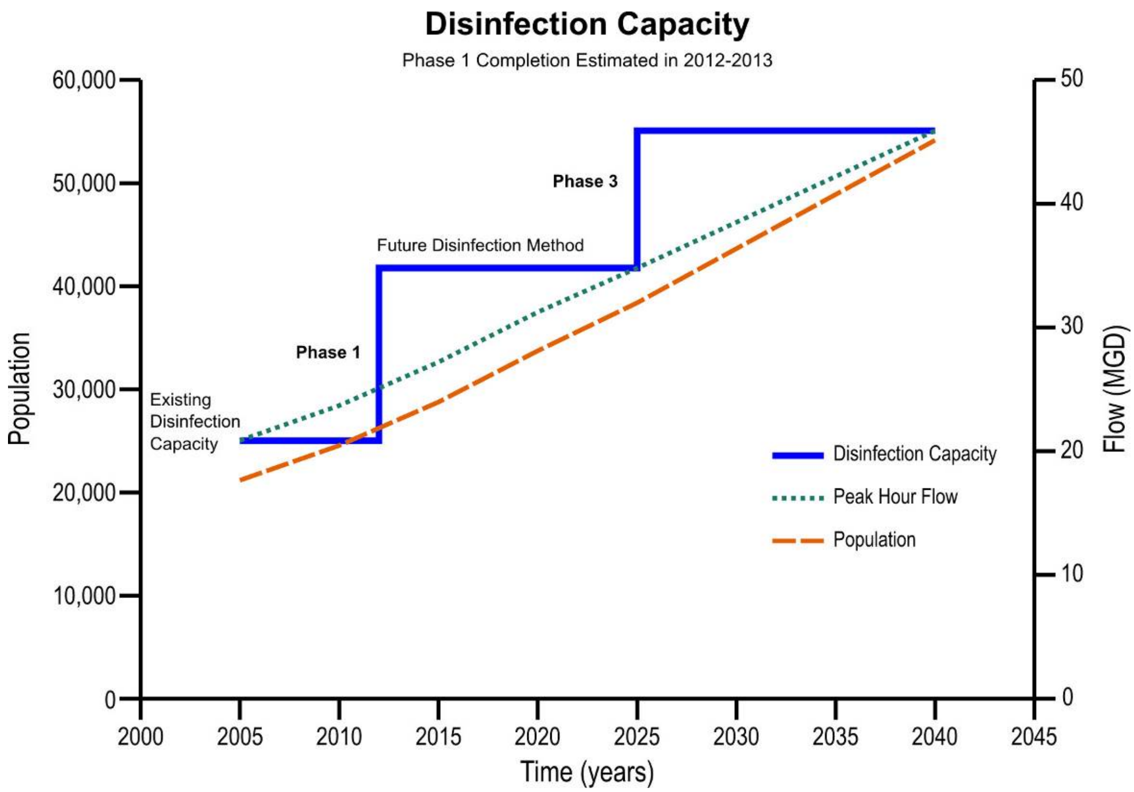


Figure ES-13. Disinfection Capacity

ES.13 OUTFALL

The outfall is primarily a conveyance unit process and the capacity is needed to convey peak flows to the river discharge point. Due to hydraulic conditions caused by air entrainment at high flows that are called a hydraulic cannon, the outfall has experienced structural damage to the uphill manhole. In order to alleviate the hydraulic cannon effects, a parallel outfall down the slope is recommended to be implemented immediately for safety reasons. This will prevent the air entrapment and alleviate the hydraulic effects. The phased outfall capacity increase, based on peak hour flow requirements, is shown in Figure ES-14.

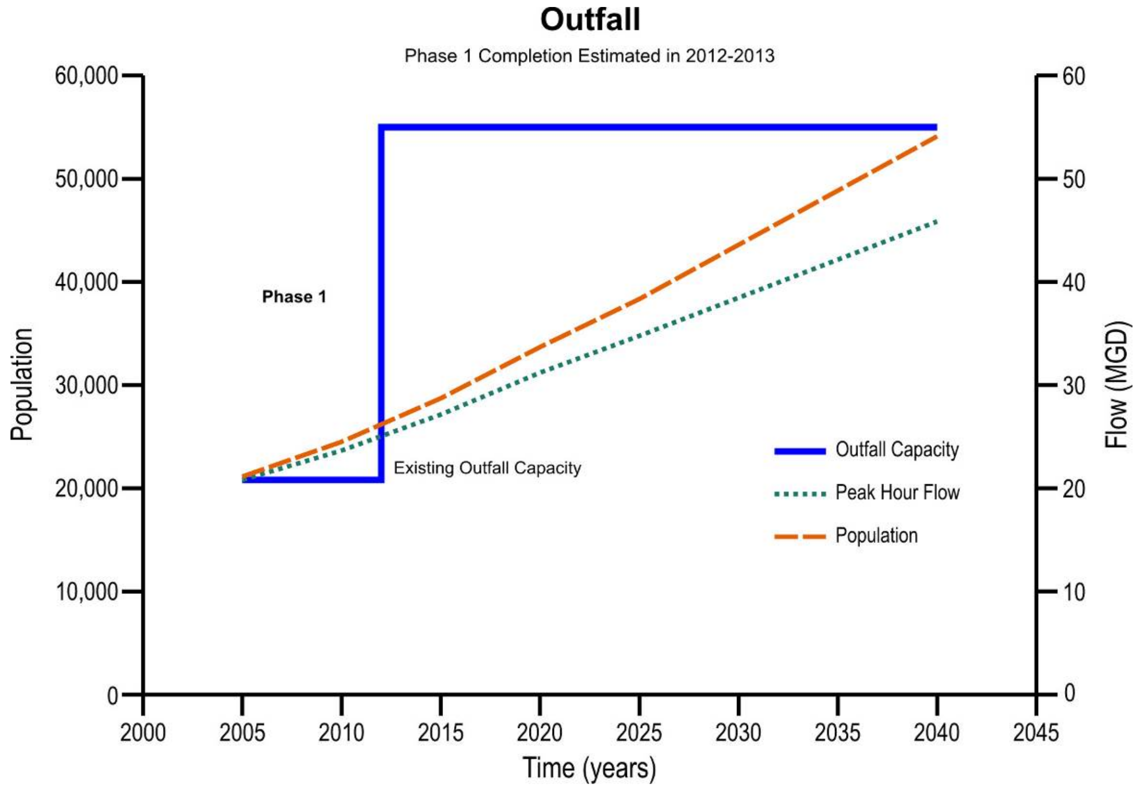


Figure ES-14. Phased Outfall Capacity

ES.14 REUSE

The City is implementing plans to use treated effluent for irrigation of a local golf course.

ES.14.1 Irrigation

Tertiary treatment using membranes has been selected by the City after a predesign evaluation and recommendation documented in the *Reuse Water System Predesign Study* (CH2M Hill, October 2005). Membranes will be assumed to be the preferred technology for future tertiary treatment for reuse at local golf courses (by others). The City is currently planning to provide variable reuse water from April through October, with the lowest demand expected in April. The peak delivery capacity for the hottest summer months is 1 mgd.

ES.14.2 Temperature Compliance

DEQ will be implementing the Willamette TMDL WLAs in the City's open NPDES permit. The City has the opportunity to track river and effluent temperature and flow on a 7-day running average to comply. The City conducted preliminary analyses showing that it will be able to add approximately 40 to 44 million kilocalories of heat energy per day to the Willamette River without violating the WLA. The WLA is based on a 7-day average. In 2005, the summer the maximum 7-day temperature was 23.5 degrees Celsius. According to the City's analysis, this would result in a maximum allowable discharge of approximately 3.0 to 3.5 mgd, though this could vary slightly depending on the temperature of the Willamette River. The maximum 7-day summer flow (May to October) was 4.1 mgd. The City is implementing a reuse program to irrigate local golf courses that will decrease its effluent discharge by 1 mgd.

A temperature management plan may be required in the future to show how the City will maintain compliance with the temperature TMDL. The City currently meets the TMDL requirements, so a plan is not included with the temperature allocations in the open permit. Options to maintain compliance include but are not limited to:

- Increasing reuse and storage for peak flows
- Storing effluent using a combination of night-time discharge when the ambient air and effluent is cooler
- Cooling the effluent prior to discharge through subsurface discharge to the hyporheic zone
- Implementing best management practices at the WWTP to minimize heating across the treatment processes
- Treating effluent using other methods such as wetlands mitigation
- Temperature trading

The City plans to add additional reuse to address the temperature WLA in the future. Depending on the final temperature management plan, some storage may need to be provided. The golf course that will use the treated water for irrigation has 3 million gallons of storage capacity.

ES.15 SOLIDS HANDLING AND TREATMENT

The compost process has reached capacity because the compost feed mix has a high moisture content. Compost capacity is based on peak week solids production, solids, and feed sawdust moisture content. Recent market demands for sawdust has resulted in smaller buyers (including the City) receiving wetter sawdust product. This has resulted in an immediate need to provide static compost piles in addition to the mechanized composting operation. Decreasing the moisture in the sawdust with a sawdust dryer would result in a capacity increase and is recommended for immediate implementation. Capital costs are substantially lower than that of mechanical dewatering, and operation can provide the maximum immediate benefit in terms of compost system capacity. An investigation is in progress to determine potential grant funding (up to 40 percent) to reduce required capital investment. Potential energy and labor savings as a result of providing drier compost feedstock are also being evaluated.

After the sawdust dryer capacity is realized, upgrading the dewatering system is recommended for Phase 2 implementation to provide an additional increase in capacity for solids composting, to improve operational performance, and to reduce required bulking agent cost and material (recycle) handling. Centrifuge dewatering is considered a fundamental dewatering system that will benefit existing and future process technologies. Centrifuge dewatering, the only technology that achieves the highest solids content, will improve performance of the existing compost system and increase effective capacity by approximately 30 percent by increasing dewatered solids concentration. The higher solids content that results from centrifuge dewatering requires less bulking agent and reduces materials handling requirements. City staff indicate that the system can handle current solids flow of 3,750 wet tons (600 dry tons at 16 percent solids concentration). The City will experience a 30 percent reduction in solids volume and, effectively, a 30 percent increase in available compost capacity (on a dry ton basis) when the centrifuge is added.

For the Newberg WWTP, the most viable options for accommodating future growth with Class A product are:

Alternative 1: Composting
Alternative 2: Thermal drying
Alternative 3: Offsite energy recovery

For Class A process technologies, composting and thermal drying are nearly equal in cost, while offsite energy recovery is much less. Initial evaluations favor offsite energy recovery. Plant staff have indicated that a backup strategy using a simplified composting technology (aerated static pile) is desired until offsite energy recovery has been implemented locally and has been proven reliable for long-term service.

ES.16 ADMINISTRATION BUILDING

As part of the Facilities Planning process, an evaluation of the Administration Building at the WWTP was conducted. The purpose of the Administration Building evaluation was to develop a concept for a functional, secure, and energy-efficient facility that will improve operations. Built in 1987 and in operation since then, the Administration Building has undergone a number of significant changes in its programmatic functions over the past 20 years. Few design changes and upgrades have occurred over this period leading to a building that is highly inefficient in the use of its available space. For example, major functions such as the maintenance workshop have been moved out of the building into more appropriate locations on the plant site leaving underutilized voids of space; while remaining critical functions, such as the laboratory, administrative areas, and staff support areas, have developed increasing needs for space and technical updating. Most critically, emergency generator exhaust entered the buildings' ventilation system creating worker safety considerations. The recommendation to move the engine generator out of the existing building is already being implemented.

The planning considered the needs for 2025 and the potential to house the City's Water Plant administrative personnel and certain water treatment plant functions (shop, laboratory, etc.). The Administration Building improvements are recommended to be implemented immediately.

The proposed layout for the Administration Building is shown in Figure ES-15. When complete, the remodeled building will be a much improved facility with increased flexibility for growth, greater efficiency, and expanded functionality; and it will be a more productive environment for the WWTP staff and potentially the WTP staff to carry out its mission to the community.

ES.17 WASTEWATER TREATMENT SUPPORT SYSTEMS

Emergency generator needs were established as part of the Administration Building Predesign report. The emergency generator project is being completed by others as part of the reuse improvements.

Based on several meetings and a site walk-through on September 29, 2006, miscellaneous improvements were recommended to the following buildings:

- Chlorine Building, chlorine scrubber, and duct
- Secondary Return Activated Sludge/Waste Activated Sludge (WAS) Pump Building
- Solids Building
- Compost Building
- Compost Building doors

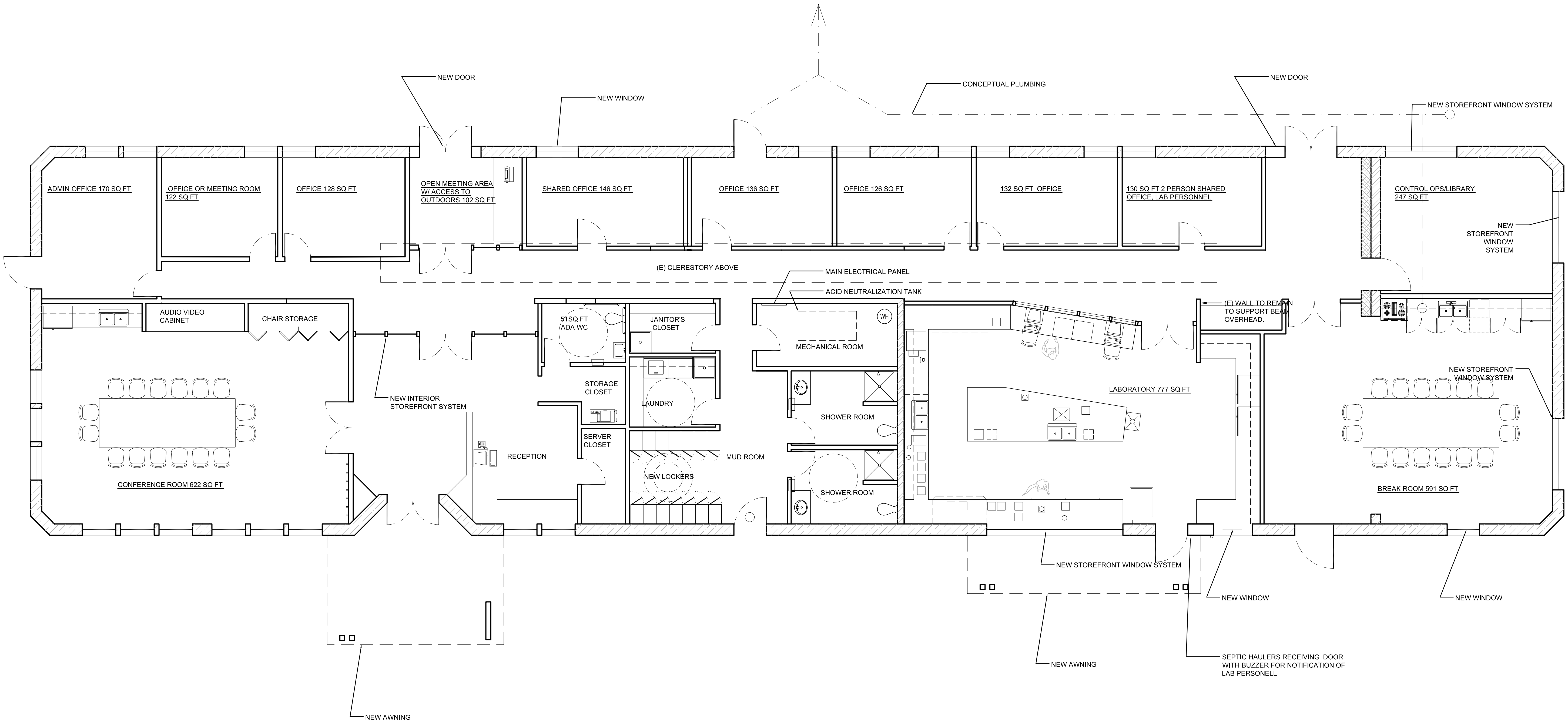
Stormwater generated onsite is conveyed by gravity to the IPS along with recycle streams. In-plant stormwater handling alternatives were studied and documented in a previous report entitled *Final Report for the Recommended Plan City of Newberg Dump Station/Headwork Studies* (*Final Dump Station/Headworks Studies* report) (Brown and Caldwell, June, 2002). The pump station will be located in the vicinity of Stormwater Manhole No. 1 and will be connected to the stormwater and recycle water systems through new gravity sewers.

The current reclaimed water system filters for in-plant use are inadequate and the screening size is too large to be effective. A looped plant water system is recommended that includes adding a source of plant water at the headworks and providing more hose bibs for cleaning at the aeration basins.

New septage receiving facilities are recommended. Septage receiving was studied in *Final Dump Station/Headworks Studies* report. The recommended improvements include modifications to the road southeast of the headworks (including a trench drain and catch basin), a Lakeside 31SAP-type septage receiving station, a buried septage receiving tank, duplex pumps in the septage receiving tank, piping to transfer the septage to the screening channel of the headworks, and a new access road around the north side of the headworks.

ES.18 PHASING OF RECOMMENDED IMPROVEMENTS

The phasing of the recommended improvements is shown in Figure ES-16. Phasing is planned in three increments. Phase 1 is to be completed as soon as funding is available. Figure ES-16 also shows the estimated population projections for low, median, and high growth scenarios, year of the estimated growth is expected to occur and the planned capacity phasing. As mentioned previously, an effective I/I elimination program could potentially postpone the Phase 2 construction numerous years.



WALL TYPE LEGEND

- EXISTING BRICK AND CMU WALL
- EXISTING CMU WALL
- NEW CMU WALL
- FRAMED WALL

Note Regarding Scheme A and B:
Schemes A and B are identical except for the configuration of the entry/reception and restroom core and laboratory. Scheme A attempts to retain the existing restroom configuration and update the configuration to current ADA requirements. Scheme B reconfigures the restroom core to provide a more flexible and efficient use of the required spaces and meeting current ADA requirements.

PLAN N

1 / 2.1 FLOOR PLAN - LOBBY/RESTROOM CONFIGURATION B

SCALE: 3/16" = 1'-0"

Project Client: City of Newberg

Newberg Waste Water Treatment
Administration Building Renovation
2301 Wynooski Rd
Newberg, OR 97132

SCHEME B PLANS

Date:

Project No: 0505_

Sheet No: A2.2

BROWN AND CALDWELL

Burgee architecture LLC

20% Schematic Design - Draft 11/16/2005

Newberg Waste Water Treatment
Administration Building Renovation
2301 Wynooski Rd
Newberg, OR 97132

Figure ES-15. Proposed Layout for the Administration Building

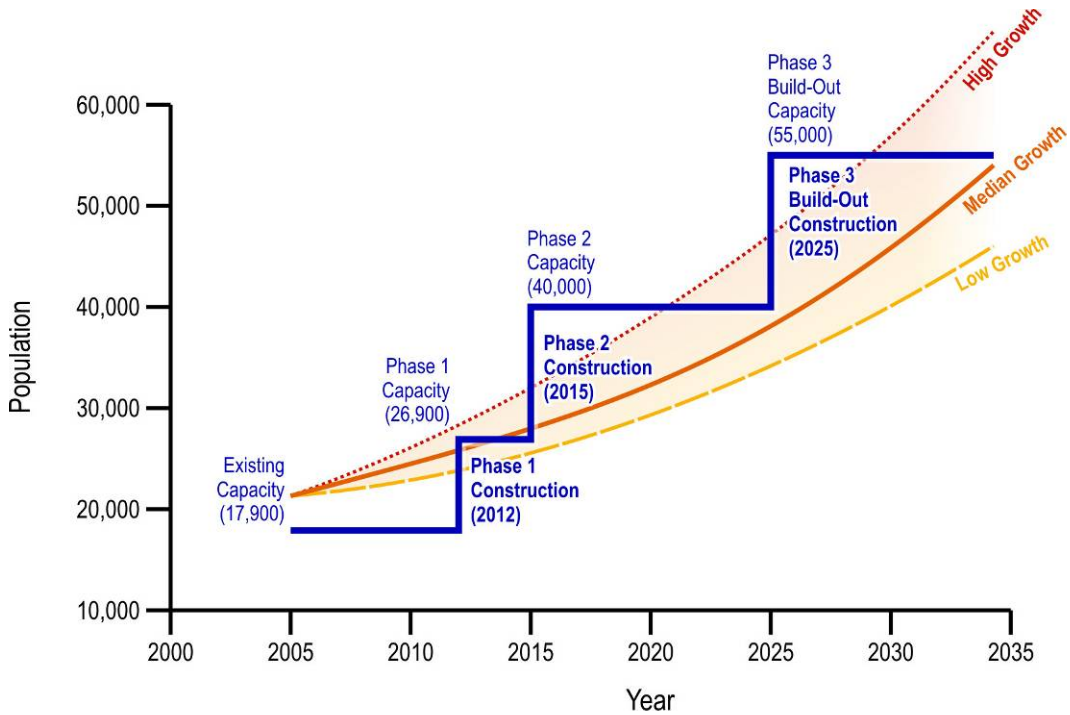


Figure ES-16. Planned Phased Construction Assuming no I/I Removal

ES.18.1 Phase 1, 2007 to 2015

The RRE projects that need to be completed immediately to provide service through 2015 are shown in Figure ES-17 and the order-of-magnitude costs are summarized in Table ES-9.

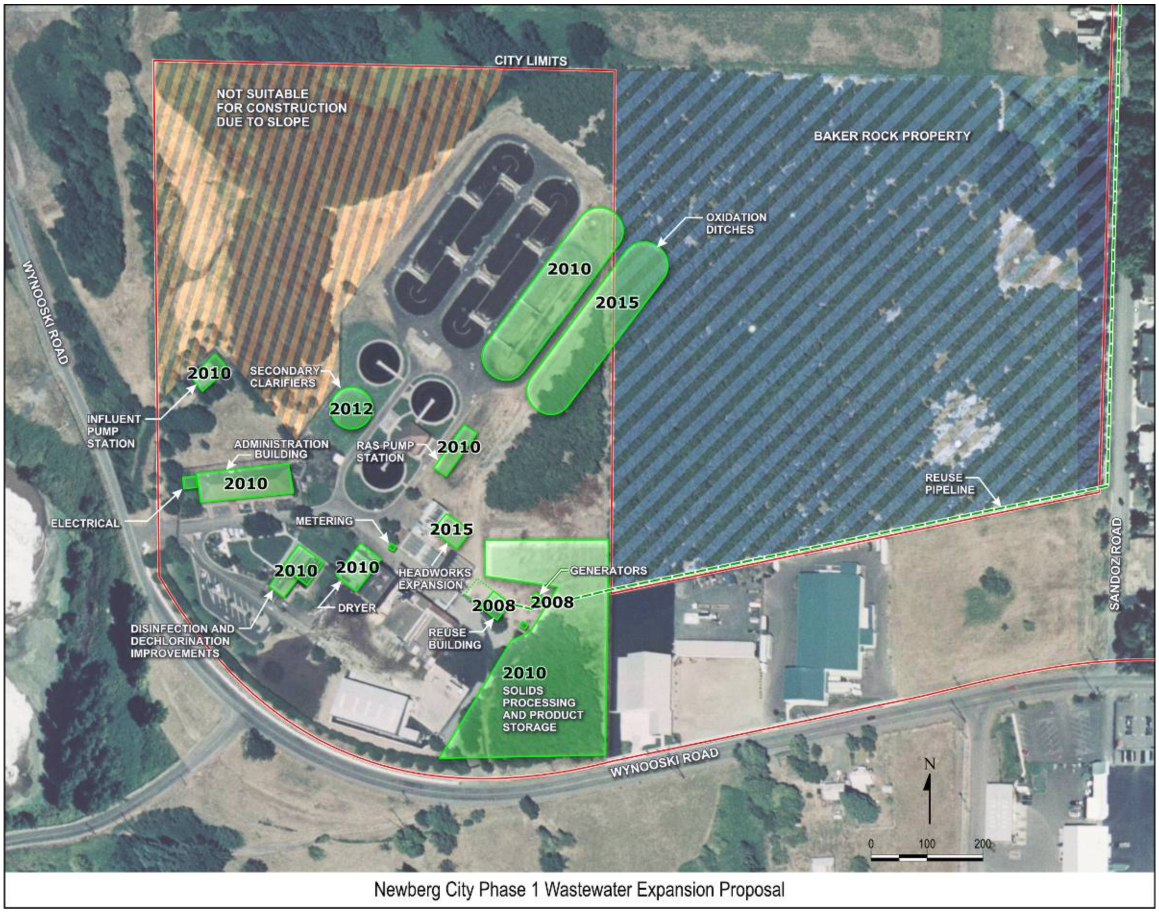


Figure ES-17. Recommended Improvements for Phase 1

Table ES-9. Capital Costs for Phase 1 Improvements 2007 to 2015

WWTP improvements	Cost, dollars	Comments
IPS and parallel discharge pipe	3,124,700	Needed immediately
Influent pipeline improvements	287,000	Needed with IPS.
Influent metering	250,000	
Headworks improvements	4,145,700	
Headworks odor control first phase	70,000	
Septage receiving	395,500	
Third and fourth oxidation ditch	6,565,000	
Existing oxidation ditch repairs	573,500	
Fourth secondary clarifier	3,251,200	
Splitter structures	650,000	
Disinfection	425,300	Needed immediately
Dechlorination	339,000	Needed immediately
Outfall	367,900	Needed immediately
In-plant reuse water	85,000	
In-plant stormwater pump station	474,300	
Building upgrades		
Chlorine Building	77,200	
Chlorine scrubber and duct	833,300	
Secondary Building	346,300	
Solids Handling Building	348,100	
Compost Building	468,400	
Sawdust dryer	533,000	2007 dollars; Needed immediately; Energy funding available
Level IV reuse facilities (by others) and storage	Not included	Provided by others
Administration Building	1,496,100	
Subtotal, construction cost	25,106,500	
Administration/engineering costs at 25 percent	6,276,600	
Total capital cost	**31,383,100**	**Escalated to 2011 mid-point of construction except as noted**

ES.18.2 Phase 2, RRE Projects for 2015 to 2025

The RRE projects that need to be completed to meet the Phase 2 needs from 2015 to 2025 are shown in Figure ES-18 and the order-of-magnitude costs are summarized in Table ES-10. The fifth oxidation ditch will be required in 2025 if nitrogen reduction becomes a regulatory requirement. If nitrogen reduction is not required, the fifth oxidation ditch will not be needed until 2040. For the purposes of cost estimating, it was assumed that nitrogen reduction was required to meet NPDES discharge requirements. This is a conservative estimate. Actual Phase 2 implementation will be based on the NPDES requirements at that time.

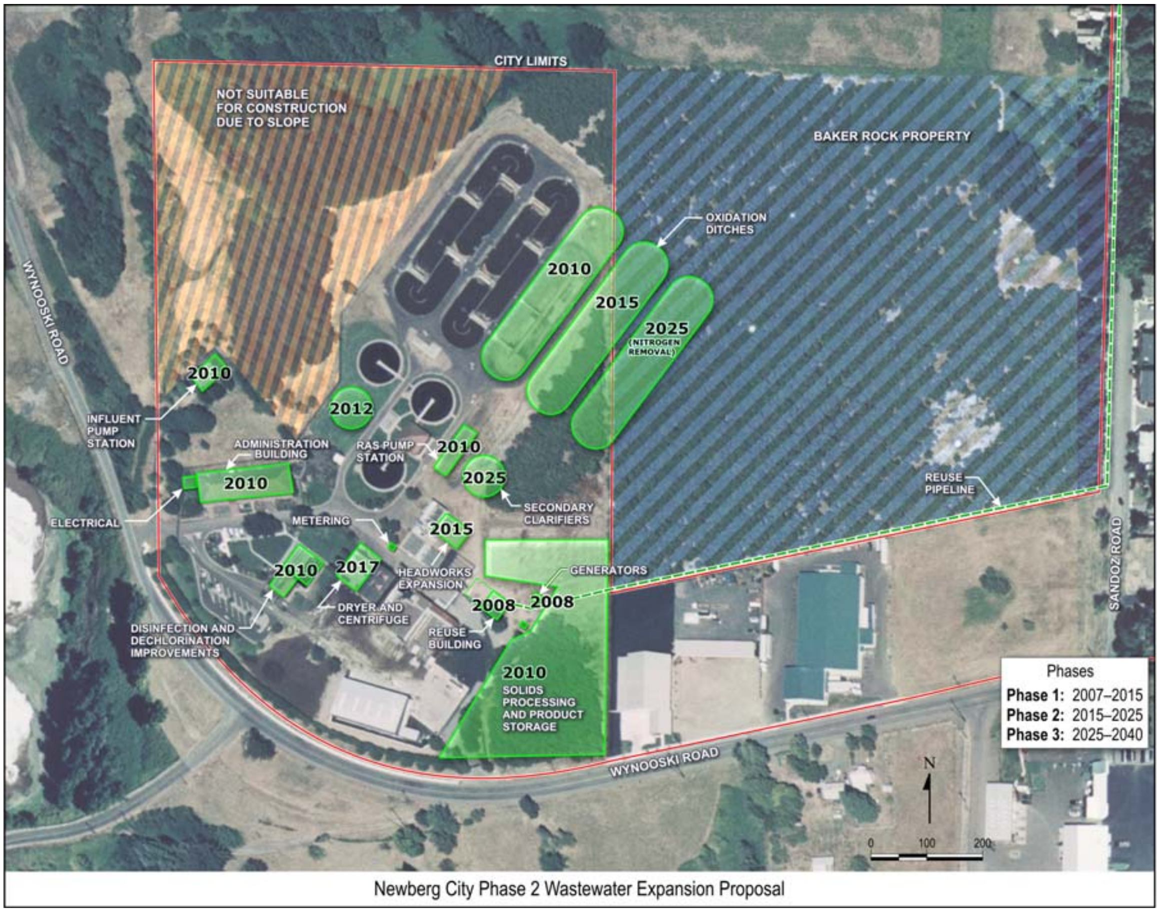


Figure ES-18. Newberg WWTP Phase 2 Improvements 2015 to 2025

Table ES-10. Capital Costs for Phase 2 Improvements 2015 to 2025

WWTP improvements	Cost, dollars	Comments
IPS and parallel discharge pipe	N/A	
Influent pipeline improvements	N/A	
Influent metering	N/A	
Headworks (screenings and grit) improvements	N/A	
Headworks odor control first phase	300,000	Potential for more odor control
Septage receiving	N/A	
Fifth oxidation ditch	4,363,000	Assumes nitrogen reduction requirements
Fifth secondary clarifier	3,251,000	
Splitter structure	600,000	
Electrical building	500,000	
Disinfection	3,065,000	Assumes conversion to UV
Dechlorination	N/A	
Outfall	N/A	
In-plant reuse water	N/A	
In-plant stormwater pump station	N/A	
Building upgrades	N/A	
Composting expansion	3,283,500	
Centrifuge Dewatering	3,508,500	
Level IV reuse facilities and storage	N/A	Level IV reuse by others
Administration Building	N/A	
Subtotal, construction cost	18,871,000	
Administration/engineering costs at 25 percent	4,717,800	
Total capital cost	23,588,800	**(in March 2007 dollars)**

ES.18.3 Phase 3, RRE Projects for 2025 to 2040

The RRE projects to meet the ultimate buildout needs are shown in Figure ES-19. These were identified to define the potential land requirements to serve the population at ultimate build-out of the urban reserve area. Ultimate build-out is assumed to occur by 2040. The scenarios shown on Figure ES-16 include improvements needed to serve median growth estimates as well as improvements needed if high population growth estimates are realized.

Costs for the RRE projects for ultimate buildout are not included in the planning effort. The ultimate buildout was included to define the potential land requirements only.

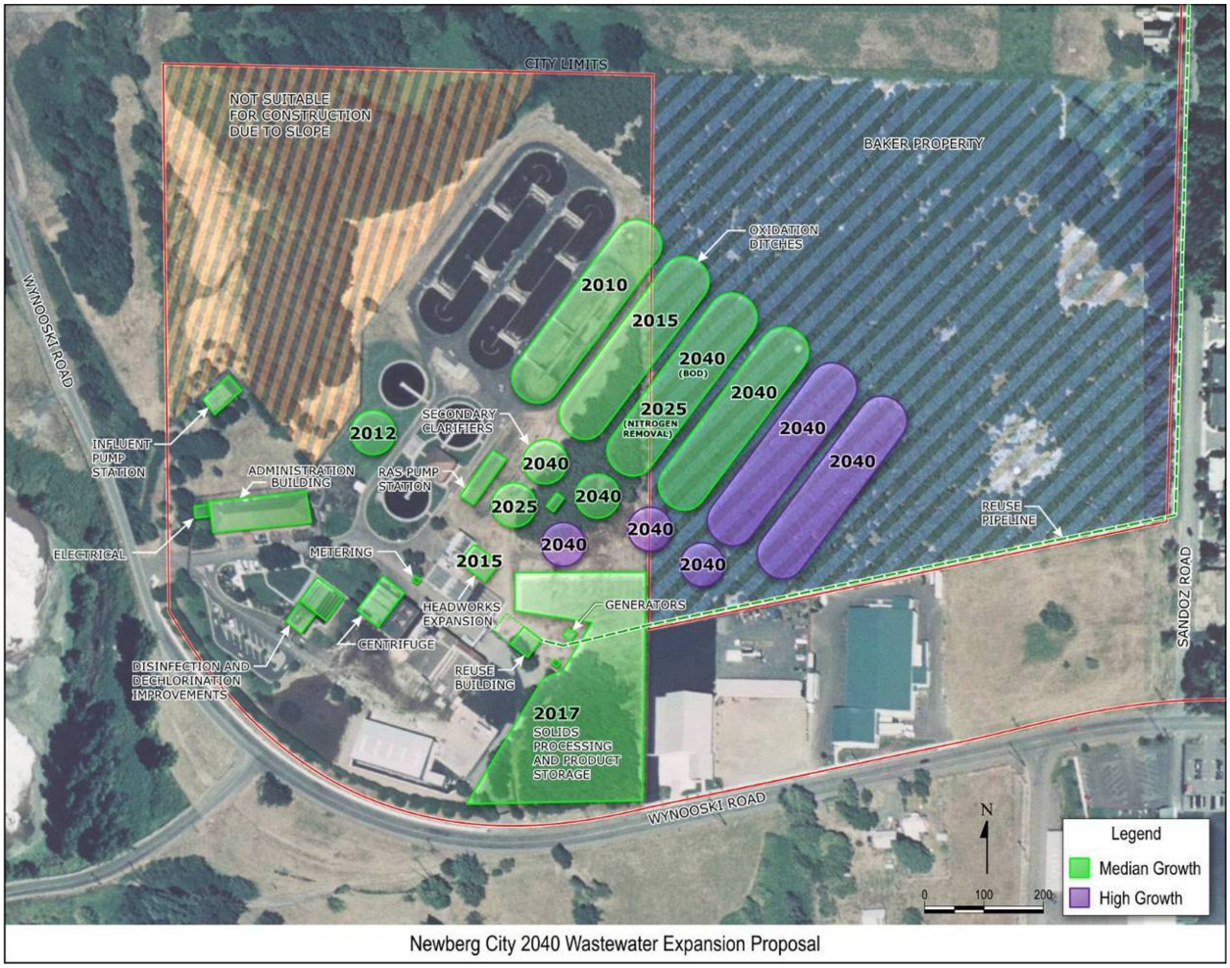


Figure ES-19. Newberg WWTP Ultimate Buildout Improvements

ES.19 MANPOWER REQUIREMENTS

A review of the current staffing level was conducted as part of the Facilities Planning process, and recommendations were developed for three future time periods relating to modifications and additions to the wastewater treatment plant (WWTP). Baseline information for current staffing is presented, as well as estimated staffing needs for the periods of 2007 to 2015, 2015 to 2025 and 2025 to 2040.

It is recognized that many factors will have an impact on staffing recommendations, and they will need to be updated as more of the elements of the plan become firm. Table 1 summarizes recommended staff additions over the course of the three phases of plant modifications and additions.

Table ES-11. Recommended Additional Personnel by Title

Position Title	No.	Responsibilities
Phase 1. 2007 to 2015		
Senior Laboratory Technician/Environmental Specialist	1	Perform water quality testing for the water treatment plant (WTP), WWTP, industrial pretreatment, and receiving stream
Operator II	1	Perform operation duties predominantly in the wastewater treatment plant.
Utility Worker	1	Perform multiple semi-skilled tasks in both the wastewater and water utilities
Phase 2. 2015 to 2025		
Plant Mechanic	1	Perform general mechanical work at the WWTP and assist maintenance workers on water system projects as needed
Senior Environmental Technician	1	Administer pretreatment program and drinking water program
Operator II	1	Perform operation duties in both the wastewater and water utilities
Phase 3. 2025 to 2040		
Operator I	1	Perform operation duties in the WWTP
Utility Worker	1	Perform multiple semi-skilled tasks in both the wastewater and water utilities
Environmental Technician	1	Perform routine sampling in both the wastewater and water utilities

ES.20 PUBLIC INVOLVEMENT

The City held an open house for the public on October 17, 2006, to provide outreach on public works projects, including the Newberg WWTP Facilities Plan Update. The handout explaining the WWTP Facilities Plan Update and Collection System Master Plan is included in Appendix C.

CHAPTER 1
STUDY AREA CHARACTERISTICS AND BASIS OF PLANNING

The City of Newberg (City) owns and operates a secondary wastewater treatment facility located in Newberg, Oregon. The Newberg Wastewater Treatment Plant (WWTP) is located at 2301 Wynooski Road, and was placed into service in 1987. The facility is a Class IV oxidation-ditch type, activated sludge plant with Class A in-vessel biosolids composting. The treatment train consists of influent pumping, screening and grit removal, oxidation ditch activated sludge, clarification, solids dewatering, composting, odor control, chlorination, dechlorination, and effluent discharge to the Willamette River. Key improvements include the 1997 Instrumentation and Control Improvements, the 2004 Headworks project, and the 2004 Composter Odor Control project. The City is implementing a reuse system for irrigation of golf courses to be operational by 2008.

The City currently provides wastewater collection and treatment services to its residents, commercial establishments, institutional customers, and a number of industries. Sewer service is provided only to customers within the city limits, with the exception of a few residences outside of the city and SP Newsprint Company, which discharges only domestic wastewater to the municipal system. The last Facilities Plan was completed as part of the Sewerage Master Plan Update (KCM, 1985), after which the City constructed the existing WWTP on Wynooski Road with federal grants. The purpose of the Newberg WWTP Facilities Plan Update is to provide the planning for required modifications to meet projected growth within the urban growth boundary (UGB) and the urban reserve area (URA) to maintain compliance with its National Pollutant Discharge Elimination System (NPDES) permit and potential future regulations.

In this chapter, the study area is defined and its characteristics are summarized. Recommended improvements will be phased over a 20-year period (to 2025) to address both immediate needs, as well as to provide long-term planning for the year 2040, to guide the future direction of capital improvements projects and define the land area needed for the WWTP.

The project goals are listed below.

- Plan for facilities to comply with existing and predictable-potential-future regulations.
- Provide for incremental capacity expansion through 2025 through a Capital Improvement Program (CIP) program and ultimate expansion in 2040.
- Provide for reliability, ease of operations and maintenance (O&M), and safety.
- Plan an efficient Administration Building office space and laboratory.
- Recommend back-up power engine generator requirements.
- Coordinate with the Reuse Water Project. The Reuse Water Project includes the new back-up power engine generator.
- Evaluate staffing requirements for the existing and future WWTP operations.

The facilities planning process includes the following:

- Using existing and future population projections (residential, commercial, and industrial) to estimate significant increases in wastewater flows and loads.
- Identifying capacity needs to ensure that the WWTP will be able to convey and treat the wastewater through service area build-out.
- Evaluating treatment processes with regard to growth and regulatory requirements and identifying needed plant expansions and improvements.
- Developing recommendations to modernize and optimize the system where practicable, and to ensure compliance with local, state, and federal regulations.
- Evaluating and recommending energy efficient alternatives.
- Developing planning-level cost estimates (with 35 percent contingency) for the recommended improvements based on current cost estimating practices and the timing of the improvements.
- Creating a recommended CIP for the facility in increments for the fiscal year period 2007 through 2025.
- Evaluating the Administration Building to meet current and future staff needs (including those of a new water treatment plant (WTP), to be located south of the WWTP across Wynooski Road).

1.1 PROJECT BACKGROUND

The Newberg WWTP is a biological activated sludge plant that uses the oxidation-ditch process, as depicted in Figure 1-1. Treated effluent and biosolids are the two main products that treatment plants produce. Treatment plant effluent is discharged to the Willamette River or beneficially reused by irrigating at the plant site. Beneficial reuse of effluent is seasonal because crops uptake water from about May through September. Biosolids are composted in-vessel to Class A compost and sold to the public.

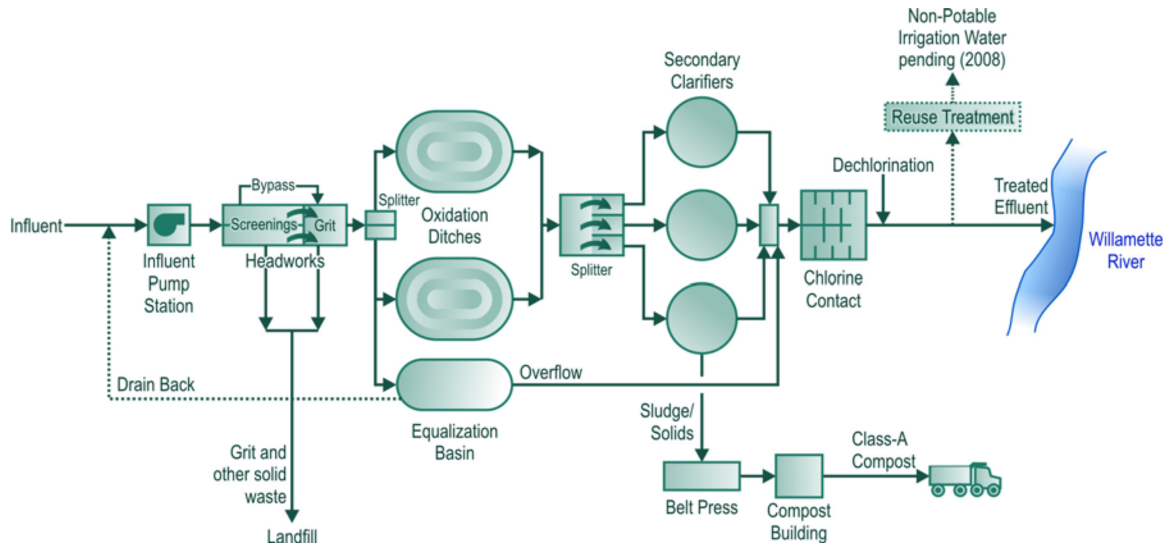


Figure 1-1. Schematic of Newberg WWTP

The treatment facility serves the entire city. Very little service is currently provided outside the city limits and it is provided to only a few hardship cases approved by the City Council. The facilities consist of a raw influent pump station, headworks, activated sludge oxidation ditches, secondary clarifiers, chlorine disinfection, dechlorination, effluent outfall, and biosolids composting. The plant accepts septage from local septic pumpers on a regular basis.

The raw sewage pump station contains four centrifugal pumps that convey all wastewater to the headworks. The headworks currently consist of two influent channels with mechanically cleaned perforated screens with washer/compactors and one bypass pipe. The facility has an aerated grit removal system with two cyclone grit classifiers.

Secondary treatment is provided by two oxidation ditches and three circular 80-foot-diameter, center-feed secondary clarifiers. An equalization basin is designed to take influent flows above 18 million gallons per day (mgd) for peak flow storage. However, depending on the influent pumping and number of oxidation ditches in service, flows below 18 mgd are sometimes diverted. Flows from the equalization basin are overflowed to disinfection or drained back to the influent pump station.

Disinfection is performed with chlorine gas. Treated and disinfected effluent is dechlorinated with sodium bisulfite prior to flow measurement and discharge. The outfall is a single port diffuser in the Willamette River at River Mile 49.7.

The facility is unmanned at night, but it has 24-hour monitoring of alarms through telemetry. The facility also has redundant power and some standby electric generation at the treatment plant. Some lift stations have standby power generators while others can be served by mobile generators.

Waste activated sludge from the secondary clarifiers (and solids dredged from the oxidation ditches when necessary) is pumped to the solid treatment processes. Sludge is stored in two 80,000-gallon sludge storage tanks or directly thickened with two 2-meter belt filter presses. Dewatered sludge is mixed with sawdust and recycled compost, and enters one of two compost reactor vessels to produce Class A biosolids. Each reactor tunnel is 18 feet wide, 12 feet high, and 66 feet long. At maximum loading, corresponding to seasonal variations in feed moisture content, each tunnel has a detention time of approximately 14 days.

Modifications have been made to the facility since 1987. Dechlorination of the effluent was implemented toward the end of 1998. Headworks modifications and compost odor control were added in 2004. With the new headworks, peak instantaneous hydraulic capacity has been rated at 27 mgd.

Population, land use patterns, and economic growth within the UGB determine wastewater treatment system demands and design capacities. For this study, the planning period is 20 years, from 2005 through 2025, and long-term in the year 2040 within the UGB. This section presents population projections based on historical data for the City.

There is a possibility that the City's WWTP may accept sewage from the City of Dundee at some time in the future. When Dundee requests connection to the Newberg system, the City will look at the flow and load impacts on the existing and future capacity of the WWTP.

1.2 PHYSICAL AND SOCIOECONOMIC FACTORS (POPULATION)

Newberg is located in Yamhill County along U.S. Highway 99W, 23 miles southwest of Portland and 12 miles northeast of McMinnville, the county seat of Yamhill County. The study area is shown on Figure 1-2, including the URAs. The boundary of the study area is the City's UGB, as defined by the most recently adopted Comprehensive Plan (revised November 2004). The study boundary generally extends to the expected limits of urban development. The City recently completed a citizen study of the URA and UGB and has recommended changes (expansions) which will likely to be implemented. The recommendations are depicted in Figure 1-3.

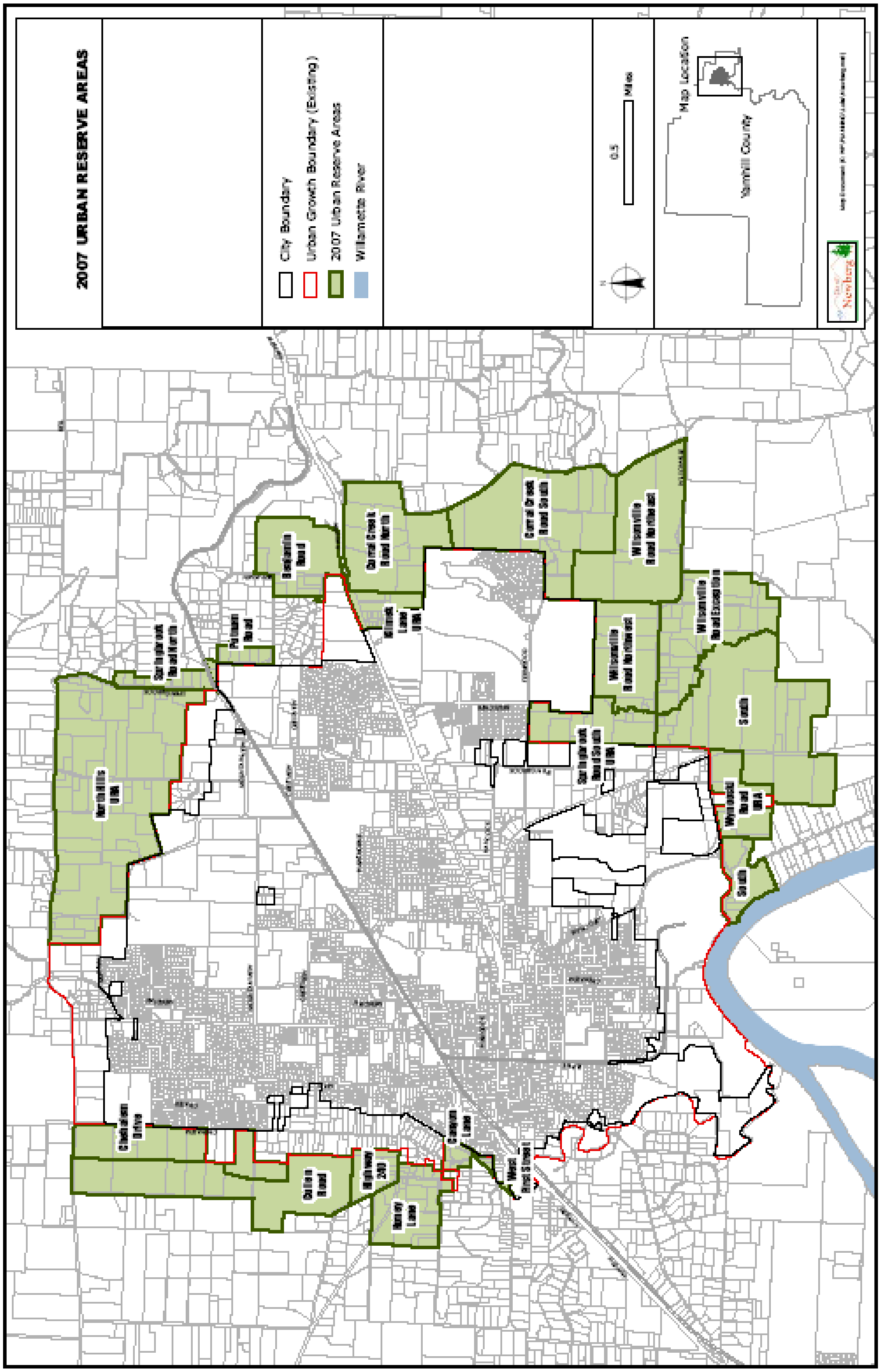


Figure 1-2. URAs

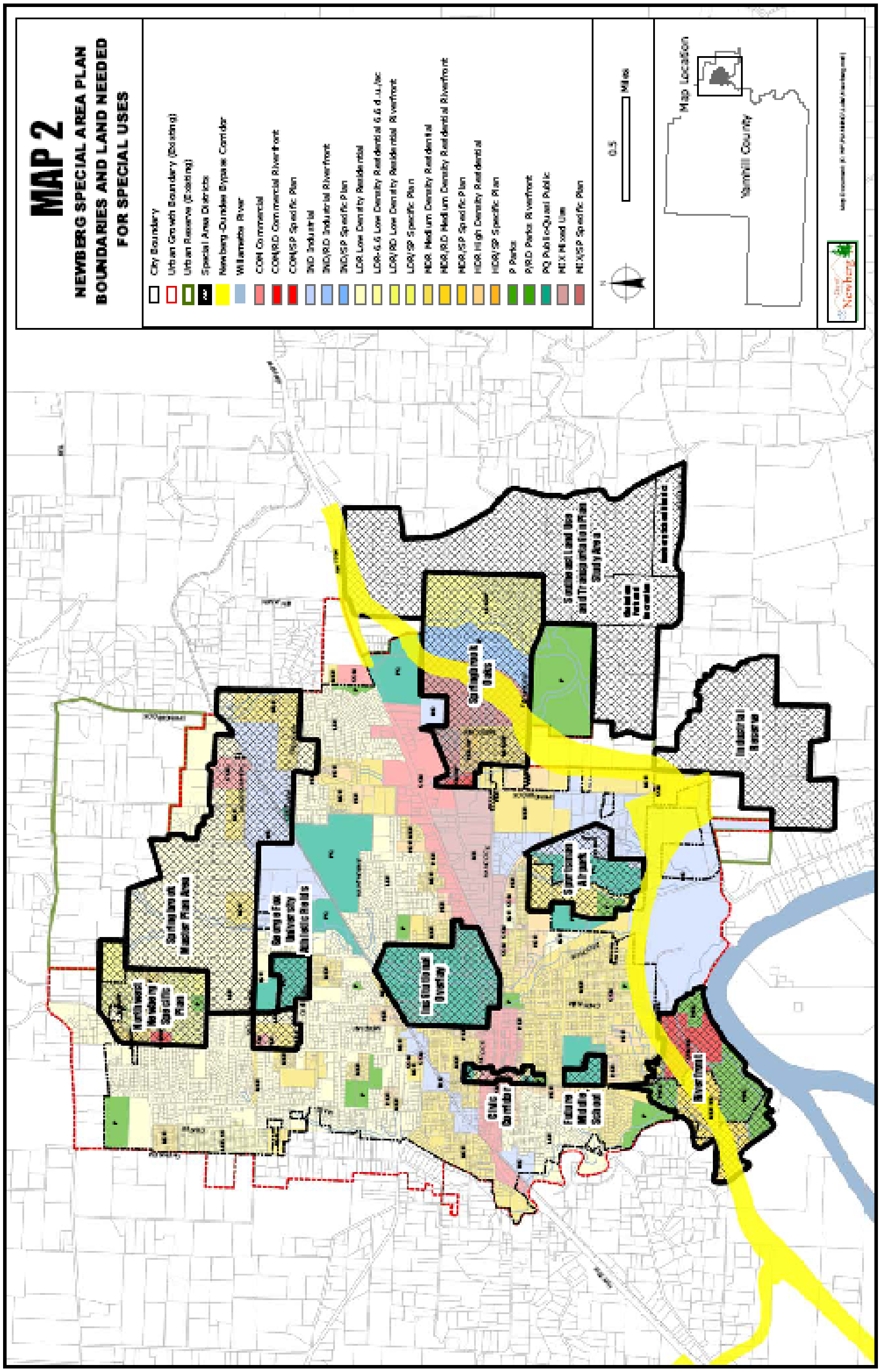


Figure 1-3. URA and UGB Expansions

1.2.1 Physical Environment

The physical environment includes the topography, geology, soils, climate, and water resources of the region.

Topography. Newberg is situated on an elevated terrace just north of the Willamette River at the confluence of the Chehalem Creek and Willamette River valleys. The terrace lies at an elevation of about 160 feet mean sea level and is quite level, with slopes ranging between 0 and 3 percent. This level terrain facilitates development for residential, commercial, and industrial uses. Surrounding the terrace on three sides are hills: to the north is the Chehalem Mountain group; to the east is Parrett Mountain; and to the southwest are the Red Hills of Dundee. To the south is the Willamette River. These topographic features form an envelope around the terrace within which the City can reasonably be expected to develop. In the north of the city, the land slopes increase at the foot of Chehalem Mountain to a degree that would inhibit development to urban densities and limit the economical extension of utility services such as water and sewer.

Geology. Newberg lies in the Willamette River Basin, a very fertile agricultural area. The upper terrace on which Newberg is sited is underlain by Willamette silts. Lying approximately 60 feet below the surface is the Troutdale Formation. Characteristically, the Willamette silts are well drained, with moderate permeability. Agriculturally, Willamette silts are used for grapes, orchards, vegetables, berries, and small grain crops. Some pasture use and hay production also occur.

Climate. With an elevation of only 160 feet above sea level and a location relatively close to the Pacific Ocean, Newberg enjoys a very moderate climate. The annual air temperature is 53 degrees Fahrenheit (F). The average high temperature is 65 degrees F (16 degrees Celsius[C]) and the average low temperature is 39 degrees F (7 degrees C). The annual average rainfall is 42 inches. Rainfall occurs predominantly during the fall, winter, and spring. The summers are warm and dry, often approaching drought conditions for 60 to 90 days during July, August, and September. Water demand peaks during this period. The local growing season is approximately 174 days.

Water Resources. The Newberg water supply system includes two types of water sources: springs and wells. Four springs have provided up to 420,000 gallons per day to the Newberg system. Snider, Skelton, Reynolds, and Oliver Springs are located to the north of town at the foot of Chehalem Mountain. The Reynolds Spring is no longer being used. Water from the springs flows directly into the distribution system. The fifth spring system, Otis, is located to the northeast of Newberg at the foot of Rex Hill, with a production capability approximately 0.35 mgd of non-potable irrigation water. Otis Springs has been determined to be "surface water influenced" by the Oregon Department of Environmental Quality (DEQ) and no longer is connected to the City's potable water system. The four previously mentioned springs operate by gravity. All of these are constant, year-round sources of water that need no treatment other than chlorination.

The City placed new wells in operation in 2002 and 2006, and the well water is treated and distributed. The City is looking at augmenting water resources with reuse water for irrigating local golf courses, cemeteries, parks, etc.

1.2.2 Land Use

The UGB is shown in Figure 1-2. Land use and development are largely governed by the local topography and the intersecting U.S. Highway 99W.

The commercial district extends along U.S. Highway 99W and is concentrated in downtown. A hospital and a dental equipment manufacturer are in the service area. Commercial establishments are largely service-oriented. The rural areas are mostly farms and vineyards.

The Newberg-Dundee Transportation Improvement Project is planning a transportation corridor that will be adjacent to the northeast corner of the WWTP, as shown in Figure 1-4. The corridor is not expected to impact the plant's footprint, as only approximately two-thirds of the area shown is needed for the roadway.

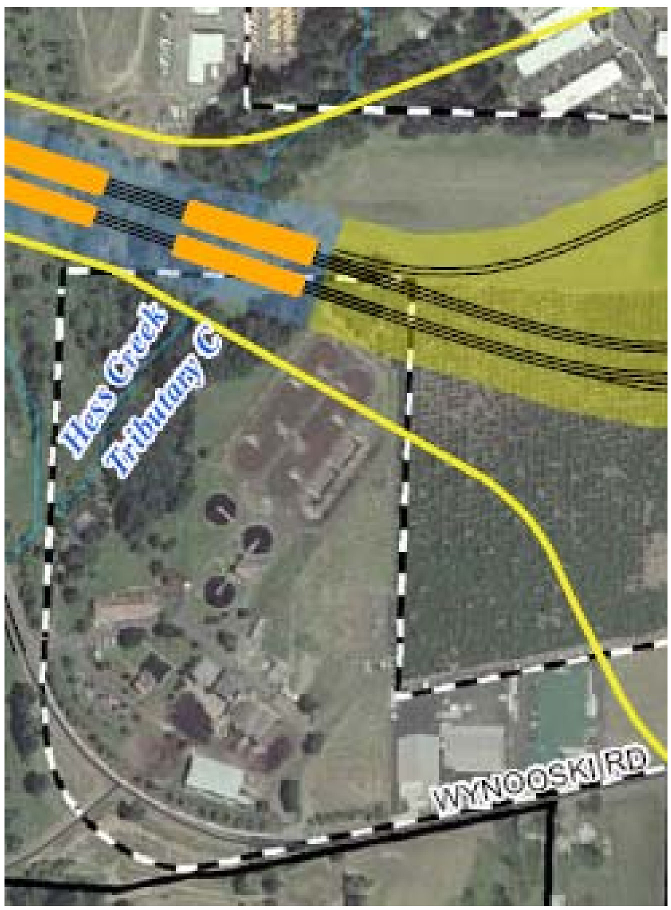


Figure 1-4. Highlight of Newberg-Dundee Transportation Improvement Project Corridor Adjacent to the Newberg WWTP

This footprint of the transportation interchange and the approved bypass corridor shows impacts on the existing oxidation basins, and could potentially restrict the use of the Baker Rock property. This issue will need to be resolved with the Oregon Department of Transportation in order to properly plan for expansion of the WWTP.

In addition, the City is considering relocating the local animal shelter on land adjacent to the WWTP. Siting in this area could limit the expansion capability of the WWTP to the east.

The City intends to site its future potable WTP near the site of the existing WWTP. Other City facilities are also being considered for relocation to adjacent properties to the northeast and east (known as the Baker Rock Property). This Facilities Plan will define the WWTP site requirements for 2040 so that adequate land can be made available for future expansion.

1.2.3 Population within the UGB

Newberg is a fast-growing community in the Willamette Valley. Its current population is just over 21,000 people. Population projections for the service area are integral to projecting sewage flows. The population forecasts for the Newberg UGB are from the Johnson Gardner Report (July 2004). These forecasts are in line with those officially adopted by the City in December 2005. Table 1-1 and Figure 1-5 list the projected populations for a range of potential growth rates: low growth, median growth, and high growth. The median projected population in 2025, and at the end of the planning period in 2040, are 38,352 and 54,097, respectively. The median growth rate was used for planning the phased CIP. The high growth rate was used to determine land area requirements for ultimate build-out.

Table 1-1. Population Projections

Year	Low growth population	Median growth population	High growth population
2005	20,623	21,132	22,180
2010	23,332	24,497	26,985
2015	26,691	28,712	33,190
2020	30,561	33,683	40,859
2025	33,957	38,352	48,833
2040	44,505	54,097	79,701

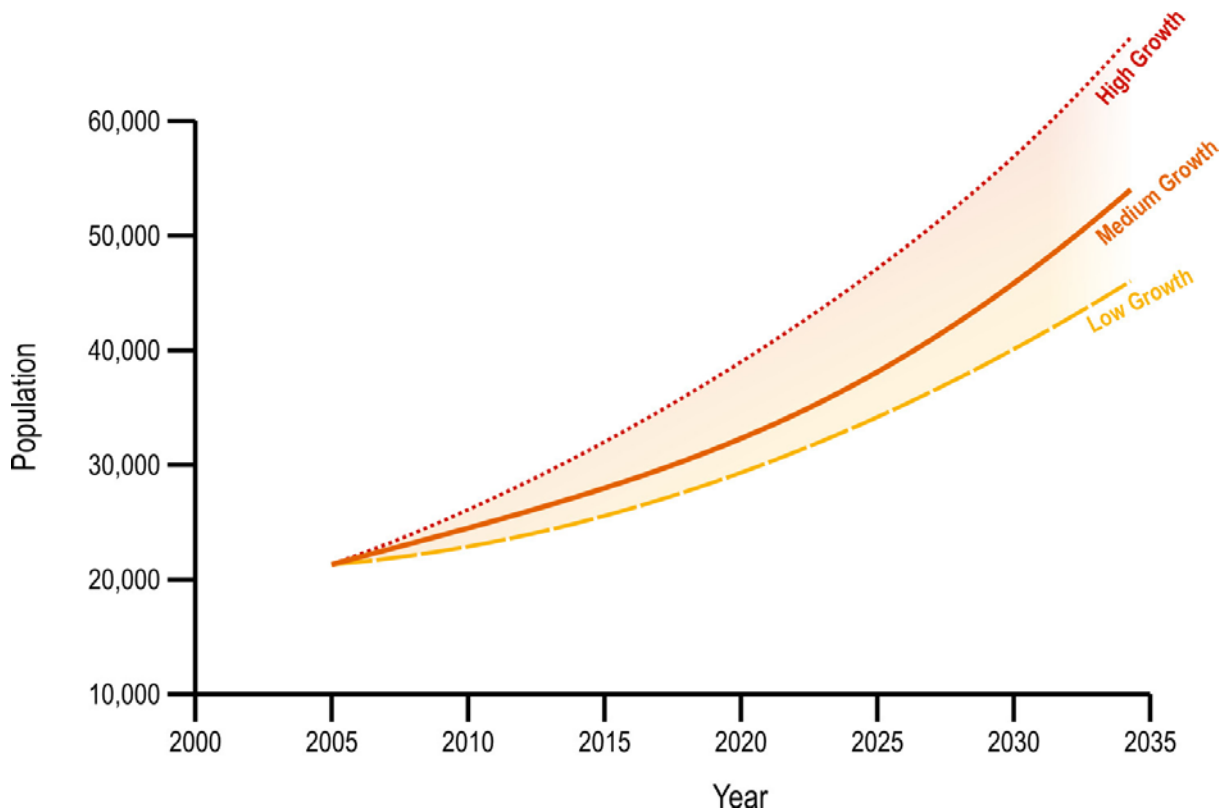


Figure 1-5. Newberg Population Projections, 2004

1.3 PERMIT REQUIREMENTS

The City operates the WWTP that discharges to the Willamette River, as shown in Figure 1-6, and manages the biosolids as a Class A product. The City is considering the development of a reuse program to irrigate the land adjacent to the WWTP, a local golf course, and other venues. These activities are regulated by an NPDES permit in conjunction with the City's Biosolids Management Plan. Each plan includes management options, monitoring requirements, and analysis of any previously collected data to ensure that groundwater is protected. This section details the regulatory history, monitoring requirements, information about future regulations, and their possible affects on the Newberg WWTP. It also evaluates other code compliance issues.

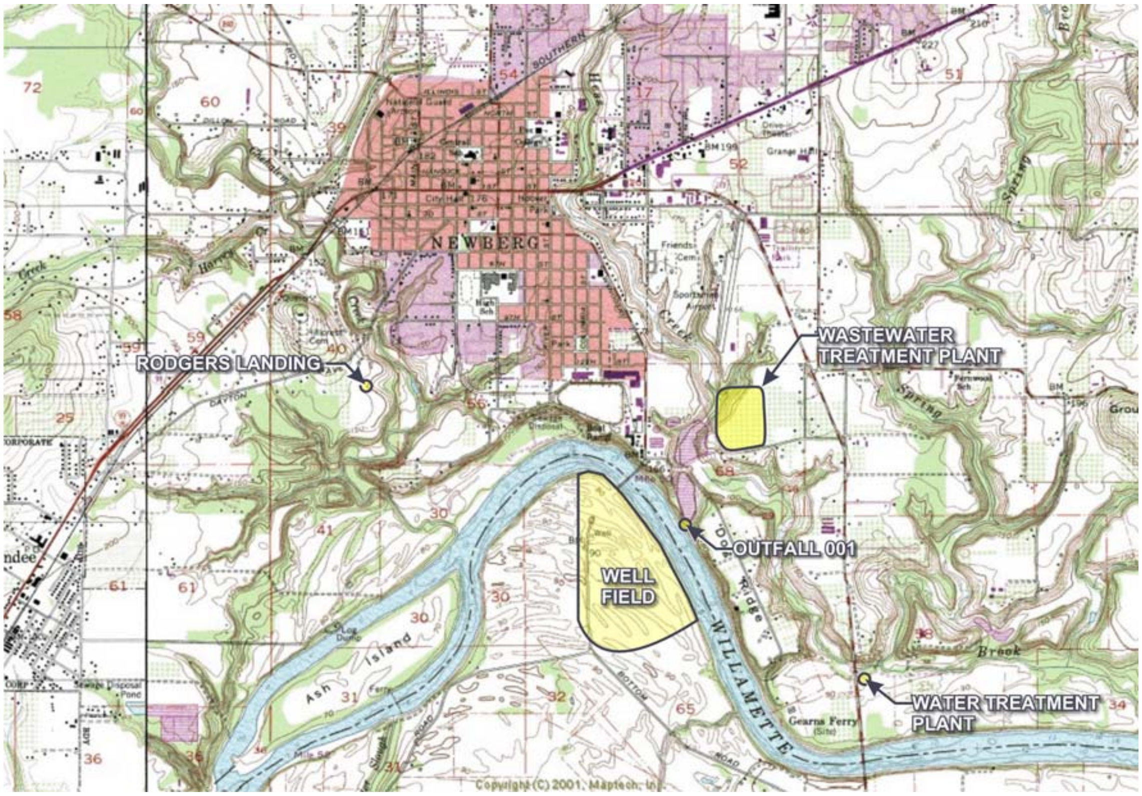


Figure 1-6. Newberg WWTP Location

The following subsections summarize current and proposed regulations and establish the design criteria to be used in the development of the various treatment and disposal alternatives for the City's wastewater treatment system. The criteria listed include the DEQ criteria for the Willamette Basin standards, Willamette River discharge criteria, reuse criteria for land application of effluent and biosolids, and U.S. Environmental Protection Agency (EPA) criteria for reliability and redundancy.

1.3.1 NPDES Permit Requirements

The City was issued an NPDES permit on June 22, 2004, for its Level III Collection System and Level IV treatment system that discharges to the Willamette River. A copy of this permit is included in Appendix A. The City directs all treated water to the Willamette River. This practice is covered by the NPDES permit. The current permit requirements are listed in Tables 1-2 through 1-4.

Table 1-2. Current Permit Requirements, May 1 to October 31

Parameter	Limitation				
	Concentration, milligrams per liter (mg/L)		Mass load[1]		
	Monthly average	Weekly average	Monthly average, pounds per day (ppd)	Weekly average, ppd	Daily maximum, pounds
5-day carbonaceous biochemical oxygen demand ($CBOD_5$)[2]	10	15	330	500	660
Total suspended solids (TSS)	10	15	330	500	660

[1]The daily mass load limit is suspended on any day in which the daily flow to the WWTP exceeds 8 mgd (twice the design average dry weather flow).

[2]The $CBOD_5$ concentration limits are considered equivalent to the minimum design criteria for BOD_5 specified in Oregon Administrative Rules (OAR) 340-041. These limits and $CBOD_5$ mass limits may be adjusted (up or down) by permit action if more accurate information regarding $CBOD_5/BOD_5$ becomes available.

DEQ can and has altered the Table 1-2 requirements to extend for longer periods (into November) based upon prolonged hot dry weather patterns and low river flows.

Table 1-3. Current Permit Requirements, November 1 to April 30

Parameter	Limitation				
	Concentration		Mass load[1]		
	Monthly average, mg/L	Weekly average, mg/L	Monthly average, ppd	Weekly average, ppd	Daily maximum, pounds
$CBOD_5$[2]	25	40	1,400	2,000	2,700
TSS	30	45	1,600	2,400	3,200

[1] The daily mass load limit is suspended on any day in which the daily flow to the WWTP exceeds 8 mgd (twice the design average dry weather flow).

[2] The $CBOD_5$ concentration limits are considered equivalent to the minimum design criteria for BOD_5 specified in OAR 340-041. These limits and $CBOD_5$ mass limits may be adjusted (up or down) by permit action if more accurate information regarding $CBOD_5/BOD_5$ becomes available.

Table 1-4. Current Permit Requirements, Year Round

Parameter	Permit requirement
E. coli	Shall not exceed 126 organisms per 100 milliliters (mL) monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL. If a single sample exceeds 406 organisms per 100 mL, then five consecutive resamples may be taken at 4-hour intervals beginning within 28 hours after the original samples were taken. If the log mean of the five resamples is less than or equal to 126 organisms per 100 mL, a violation shall not be triggered.
pH	6 to 9
$CBOD_5$ and TSS removal efficiency	Shall not be less than 85 percent monthly average for $CBOD_5$ and 85 percent monthly for TSS.

Parameter	Permit requirement
Total residual chlorine	Shall not exceed a monthly average concentration of 0.02 mg/L and a daily maximum concentration of 0.05 mg/L. When the total residual chlorine limitation is lower than 0.10 mg/L, DEQ will use 0.10 mg/L as the compliance evaluation level (i.e., daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitation).

The permit contains $CBOD_5$ and TSS removal efficiency limits of 85 percent.

DEQ has developed a statewide permit issuance plan that moves the water quality permits throughout the state on the same permit schedule within a basin. That means that some permits may be renewed prior to their expiration date, and some permits may be administratively extended. The Newberg NPDES permit renewal date as stated on the permit is May 31, 2009. DEQ has scheduled the actual renewal for 2012 to coincide with the basin permitting schedule.

In 2006, the City requested that the permit be re-opened to include a reuse outfall for irrigation on local golf courses, an approved overflow manhole in Hess Creek for the pump station, and acceptance for the revised Biosolids Management Plan. DEQ is currently working on the open permit.

1.3.2 Monitoring Requirements

The City is required to measure plant flow. The current monitoring requirements are listed in Table 1-5. The facility effluent's cyanide, bacteria, pH, chlorine residual grab samples, and all measurements are taken from the Cipolletti weir discharge. Composite and metals samples are taken just before the Cipolletti weir. The composite sampler is located in the reclaimed water pump room.

Table 1-5. Current Monitoring Requirements

Item or parameter	Minimum frequency	Type of sample
Total flow, mgd	Daily	Calculated based on the influent flow and adjusted by measured and/or estimated side stream flows.
Flow meter calibration	Semiannually	Verification
$CBOD_5$	2 per week	Composite
Ammonia (NH_3-N)	2 per week	Composite
TSS	2 per week[1]	Composite
Hardness (mg/L $CaCO_3$)	[1]	Grab
pH	3 per week	Grab
Effluent temperature, daily maximum	Daily	Continuous (Record time between readings; submit annual report; audit continuous monitors in June and December using DEQ guidelines; and visually check monitors monthly to ensure that they are still in place and submerged.)
E. coli	2 per week	Grab (use method number 9213 D, 9222 G, 9223 B in *Standard Methods for the Examination of Water and Wastewater, 19th Edition* or any test procedure that has been authorized by DEQ.)
Quantity chlorine used	Daily	Measurement
Total chlorine residual	Daily	Grab
Pounds discharged, $CBOD_5$ and	2 per week	Calculation

Table 1-5. Current Monitoring Requirements (continued)

Item or parameter	Minimum frequency	Type of sample
TSS		
Average percent removed, $CBOD_5$ and TSS	Monthly	Calculation
TKN, NO2+NO3-N, total phosphorus	1 per week	24-hour composite
Metals (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Zn) and cyanide, measured as total in mg/L[1]	Semiannually using three consecutive days between Monday and Friday, inclusive	24-hour daily composite For cyanide samples, at least six discrete grab samples shall be collected over the operating day. Each aliquot shall not be less than 100 mL and shall be collected and composited into a larger container, which has been preserved with sodium hydroxide for cyanide samples to ensure sample integrity. Daily 24-hour composite samples shall be analyzed and reported separately. Toxic monitoring results and toxics removal efficiency calculations shall be tabulated and submitted with the Pretreatment Program Annual Report as required in Schedule E of the NPDES permit.
Iron	Monthly	24-hour daily composite During the first year after permit issuance, monitoring for iron shall be conducted on the effluent at the frequency specified. The method detection limit must be lower than 0.3 mg/L. After the first year, iron monitoring of the effluent may be eliminated unless the City is notified otherwise in writing by DEQ. For all tests, the method detection limit shall be reported along with the sample result.
Priority Pollutants. The City shall perform all testing required in Part D of EPA Form 2A. The testing includes all metals (total recoverable), cyanide, phenols, hardness, and the 85 pollutants included under volatile organic, acid extractable, and base-neutral compounds. In addition, the City shall monitor for the pesticide pollutants listed in Table II of Appendix D of 40 CFR §122.	Three scans are required during the 4½ years after permit issuance. Two of the three scans must be performed no fewer than 4 months and no more than 8 months apart. The effluent samples shall be 24-hour daily composites, except where sampling volatile compounds. In this case, six discrete samples (not less than 100 mL) collected over the operating day are acceptable.	24-hour daily composite The City shall take special precautions in compositing the individual grab samples for the volatile organics to ensure sample integrity (i.e., no exposure to the outside air). Alternatively, the discrete samples collected for volatiles may be analyzed separately and averaged.
Whole effluent toxicity (WET)	Annually	Acute and chronic Beginning in 2004, the City shall conduct WET testing for a period of 4 years in accordance with the frequency specified. If the WET tests show that the effluent samples were not toxic at the dilutions determined to occur at the zone of initial dilution (ZID) and the mixing zone, no further WET testing will be required during this permit cycle. Note that four WET test results will be required along with the next NPDES permit renewal application.

[1] During the first 2 years after permit issuance, special monitoring for cadmium, copper, lead, mercury, and silver shall be conducted on the effluent during at least one of the 3 consecutive days of monitoring. TSS and hardness shall be monitored simultaneously. The special monitoring for cadmium, copper, lead, and silver shall be conducted using a clean sampling method, and ultra-clean sampling method, EPA Method 1669 or any other test method approved by DEQ. The special monitoring for mercury shall be conducted in accordance with EPA Method 1631. At the City's option, the results of the special monitoring may be used for one or more of the 3 consecutive days of monitoring required on a semiannual basis. After the first 2 years, special monitoring of the effluent for cadmium, copper, lead, mercury, and silver may be eliminated unless otherwise notified in writing by DEQ. For all tests, the method detection limit shall be reported along with the sample result.

1.3.3 Other Permit Requirements

There are other permit requirements with which the WWTP must comply. These are discussed below.

Sanitary Sewer Overflows (SSOs). Collection system overflows can result from catastrophic failure of the treatment plant or pump station or high flows due to storm events. According to the Newberg NPDES permit and OAR 340-041-0009(6) and (7), the City is prohibited from discharging raw sewage during the period of November 1 through May 21, except during a storm event greater than the 1-in-5-year, 24-hour duration storm. In addition, it cannot discharge raw sewage during the period from May 22 through October 31, except during a storm event greater than the 1-in-10-year, 24-hour duration storm. The City has seven emergency overflow outfalls at the City's pump stations, except the influent pump station. During the current permit period, there has been one surcharge to Hess Creek near the influent pump station during the December 14, 2006 storm. This storm event had a return frequency of between 1 in 25 and 1 in 50 years.

85 Percent Removal. The permit contains $CBOD_5$ and TSS removal efficiency limits of 85 percent.

Groundwater. All wastewater and process-related residuals shall be managed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

Outfall. The NPDES permit allows the treatment facility to discharge treated effluent into the Willamette River approximately one-third mile southwest of the plant at River Mile 49.7. Treated, disinfected, and dechlorinated effluent is discharged through a pipe to an outfall in the Willamette River.

Seven emergency overflow points are identified in the June 2004 permit. In the current permit all pump stations are designated as emergency outfalls. Their use is restricted to storm events as allowed under OAR 340-041-0009(6) and (7) and instances of upset as defined in the General Conditions. During the current permit period, the collection system is known to have overflowed only on rare occasions.

Mixing Zone Analysis. The current permit provides for a mixing zone that consists of the portion of Willamette River contained within a band extending out 75 feet from the west bank of the river and extending from a point 15 feet upstream of the outfall to a point 150 feet downstream from the outfall. The ZID is defined as the portion of the allowable mixing zone located within 15 feet of the point of discharge.

The defined mixing zone overlaps with the defined mixing zone for the SP Newsprint Company's discharge. However, the effluent plumes do not mix until they are outside the defined mixing zones. The two outfall pipes are at different elevations and the plumes are vertically separated. For the WWTP, outfall, and mixing zone as currently configured, the *Combined Mixing Zone Study*, prepared by Parametrix in November 1993, determined that the dilution factor at the edge of the ZID is 2.4 during critical low stream flow conditions, while the dilution factor at the edge of the mixing zone is 28.5 during critical low flow conditions.

Temperature. Prior to the completion of a Willamette River temperature total maximum daily load (TMDL), requirements each NPDES point source that discharges into a temperature water quality limited water body is allowed a human use allowance. Each point source may cause the temperature of the water body to increase up to 0.3 degree C above the applicable criteria after mixing with either 25 percent of the stream flow or at the edge of the mixing zone, whichever is more restrictive.

Based on the existing discharge and the 7Q10 river flow, which is the annual flow for seven consecutive days that has a recurrence interval of 10 years, DEQ calculated in-stream temperature increases (using the existing facility design flow and maximum effluent temperatures) by two separate methods as required by OAR 340-041-0028(12)(b):

- Based on 25 percent of the 7Q10 stream flow
- Based on the estimated dilution achieved in the mixing zone at 7Q10 stream flow

Because the in-stream temperature increase is significantly smaller than the allowable increase, this facility has no reasonable potential to violate the temperature standard. Therefore, a summer period excess thermal load limit has not been included in the City's current permit.

A similar evaluation was performed for the winter period. There is no reasonable potential for this facility to violate the temperature standard, and therefore no winter period excess thermal load limit is included in this permit.

Since permit issuance, the Willamette TMDL was completed and wasteload allocations have been determined for the Newberg WWTP based on a 7Q10 river flow of 5460 cfs. They are listed in Table 1-6. The permit has been reopened and the new wasteload allocations are expected to be included in the permit.

The composite sampler is located in the reclaimed water pump room.

Table 1-6. Newberg WWTP Temperature TMDL Allocations

January 1 through December 31 salmon and steelhead migration corridor					
Lookup Table waste load allocation (WLA)					
Flow (Q_{River})	T_{RC}	Human use allowance (HUA)	WLA	HUA	WLA
River flow greater than, cfs	River temperature criteria, C	a = 0 Allowed temperature increase, C	a = 0 Thermal load, million kcals/day	a> 0 Allowed temperature increase, C	a > 0 Thermal load, million kcals/day
0	20.0	0.0026	35	0.0024	32
6,289	20.0	0.0023	35	0.0021	32
6,531	20.0	0.0023	37	0.0021	34
7,664	20.0	0.0020	38	0.0018	34

Table 1-6. Newberg WWTP Temperature TMDL Allocation (continued)

January 1 through December 31 salmon and steelhead migration corridor					
Lookup Table WLA					
9,353	20.0	0.0017	39	0.0016	37
16,454	20.0	0.0012	48	0.0011	44
118,140	20.0	0.0005	145	0.0005	145

Iron Issues. DEQ does not have any information concerning the discharge of iron from this source. The permit requires the City to monitor the effluent for iron monthly for one year after permit issuance. Since the WTP recently started pumping its backwash water to the WWTP, DEQ added a second year of monitoring. This monitoring will enable DEQ to determine if iron in the discharge has a reasonable potential for causing or contributing to water quality standard violations. DEQ may require additional monitoring or reopen the permit to include new limits, conditions, or requirements if it is determined that this discharge causes or contributes to the violations of the in-stream iron criteria.

Other Toxics (PCB, Aldrin, Dieldrin, DDT, DDE). The TMDL does not address these pollutants, but it is not likely this discharge is a significant source of these pollutants. However, DEQ does not have any information concerning the discharge of these pollutants under this permit. Therefore, the permit includes the pesticide fraction in the annual monitoring of priority pollutants in Schedule B.

1.3.4 Groundwater

The treatment plant is constructed entirely of impervious structures. It is not anticipated that the treatment process and discharge to surface waters will cause groundwater impacts.

1.3.5 Biosolids Management Plan

The City developed a Biosolids Management Plan, May 2004 (included as Appendix B) (to be approved as part of the 2007 open permit process) in accordance with the WWTP permit and OAR 340-050, *Land Application of Domestic Wastewater Treatment Facility Biosolids, Biosolids Derived Products, and Domestic Septage* and 40 CFR, §503.

All waste sludge must be managed in accordance with the DEQ-approved Biosolids Management Plan to ensure compliance with the federal biosolids regulations (40 CFR §503) and the state rules (OAR 340-050). The City's Biosolids Management Plan was originally approved June 22, 1989. An updated management plan was approved with the last permit in 2004. The biosolids consistently meet the vector attraction and Class A pathogen reduction requirements and the Class A metal content limit in 40 CFR §503. After treatment necessary to comply with vector attraction and pathogen reduction requirements, the Class A biosolids can be sold, given away, or beneficially land-applied with few additional restrictions. The plan also allows land application of Class B biosolids (should it become necessary or desirable in the future). The site selection criteria for land application include all of Oregon.

At maximum loading, each composting tunnel has a detention time of approximately 14 days. All batches must meet the minimum vector attraction reduction requirement of aerobic treatment of the sludge for at least 14 days at over 40 degrees C, with an average temperature of over 45 degrees C. The City uses Option 5 (composting time and temperature) to demonstrate compliance with vector attraction requirements. The compost pile must be over 40 degrees C for at least 14 days, with the average temperature of over 45 degrees C.

The City uses salmonella monitoring of the compost and Alternative 5 of Processes to Further Reduce Pathogens to demonstrate compliance with Class A pathogen reduction requirements. The compost pile must be at a minimum temperature of 55 degrees C for 3 consecutive days. The compost (Class A biosolids) is sold to interested parties for home and commercial use.

If Class B biosolids are produced, the biosolids are recycled back through the reactor. However, the City no longer has authorized land-application sites. Any future land-application sites must conform to the site selection criteria in the Biosolids Management Plan and must be located in Oregon.

1.3.6 Pretreatment Program

An Industrial Pretreatment Program must be developed and implemented in accordance with federal regulations governing pretreatment programs, as required by EPA's Code of Federal Regulations Title 40 (40 CFR §403) and approved by DEQ. The City's Industrial Pretreatment Program is designed to protect its Publicly Owned Treatment Works (POTWs); the Newberg WWTP, solids quality, the City's collection system, the Willamette River, and workers' health and safety.

The City has a DEQ-approved Industrial Pretreatment Program. Federal and state pretreatment requirements were included in the previous NPDES permit for this facility. However, the City's Industrial Pretreatment Program has been inactive since the last significant industry closed. The requirement to implement an Industrial Pretreatment Program could be deleted from the permit, but the City wishes to retain its program in order to attract new significant or categorical industries. The City is updating its pretreatment program and developing documentation for implementation and enforcement. The City is submitting the revised Pretreatment Program documentation as a substantial change for DEQ approval.

1.4 STATE AND FEDERAL REGULATIONS

State regulations take precedence over federal regulations, where applicable. In some instances, state regulations may impose more stringent requirements than federal regulations. However, federal regulations apply if no state regulations are declared.

1.4.1 Water Quality Requirements

The standards for river basins in Oregon are established by DEQ through OAR 340-4 1-445. These rules are reviewed on a yearly basis for setting new or modifying existing standards. Oregon's water quality standards for specific reaches of the Willamette River and its tributaries are discussed below.

The City's discharge to the Willamette River is at River Mile 49.7. The discharge is within the Willamette basin and the middle Willamette sub-basin. The designated beneficial uses of the receiving stream are public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life (including salmon and steelhead migration corridor), wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydropower. The water quality standards for the Willamette Basin (OAR 340-041) were developed to protect the beneficial uses of the basin.

The Willamette River is included on DEQ's List of Water Quality Limited Water Bodies (also called the 303(d) List) as water quality limited for the parameters listed in Table 1-7.

Table 1-7. Willamette River Water Quality Limitations (from Permit Evaluation Sheet (March 2004))

Record	River Mile	Parameter	Season	Criteria
6038	24.8 to 54.8	Fecal coliform	Winter/spring/fall	Geometric mean of 200, no more than 10 percent >400
9220	24.8 to 54.8	PCB	Year-round	Public health advisories
9221	24.8 to 54.8	Aldrin	Year-round	Public health advisories
9223	24.8 to 54.8	Dieldrin	Year-round	Public health advisories
9224	24.8 to 54.8	DDT	Year-round	Public health advisories
9225	24.8 to 54.8	DDT metabolite (DDE)	Year-round	Public health advisories
8381	24.8 to 54.8	Iron	Year-round	Table 20
5864	24.8 to 54.8	Temperature	Summer	Rearing: 17.8 C
7087	24.8 to 54.8	Mercury	Year-round	Public health advisories
6125	24.8 to 54.8	Biological criteria		Waters of the state shall be of sufficient quality

Fecal Coliform TMDL. Fecal bacterial levels exceed the standard during fall, winter, and spring, but no specific TMDL will be developed for NPDES point source dischargers. The NPDES permit represents the Bacteria Control Management Plan for the City. As long as the discharge remains in compliance with the permit's bacteria limits, the treated effluent discharge will not have a negative impact on the water quality of the Willamette River with respect to bacteria. The sewage collection system has undergone minimal raw sewage overflows during the last several years. Those overflows may have contributed slightly to the ambient fecal bacteria violations.

Temperature TMDL. In the preliminary analysis of the Willamette River TMDL, the City of Newberg was not shown to have a significant effect on the Willamette River temperature. The Willamette River TMDL addressing temperature was issued September 2006. The TMDL assigns WLAs to point sources. The WLA for the Newberg WWTP is being incorporated into the permit during the City's currently open permit process.

Mercury Issues. DEQ has used an incremental approach for the mercury TMDL. Beginning in 2007, DEQ will require selected municipal and industrial facilities, including the City, to increase monitoring and reporting of mercury for 2 years, and take steps to reduce known sources of mercury by developing mercury minimization plans. DEQ will also work with communities and businesses to reduce soil erosion that can carry mercury to rivers. Best management practices to reduce soil erosion in agricultural, forested, and urban sectors will also serve to keep mercury out of the basin's waterways. By 2011, DEQ will evaluate the effectiveness of this implementation strategy and update the mercury TMDL, as necessary. A mercury minimization plan may be required as part of the TMDL.

Dissolved Oxygen. For water bodies identified by DEQ as providing cool-water aquatic life, the dissolved oxygen may not be less than 6.5 mg/L, at an absolute minimum. At the discretion of DEQ, when the agency determines that adequate information exists, the dissolved oxygen may not fall below 6.5 mg/L as a 30-day mean minimum, 5.0 mg/L as a 7-day mean minimum, and below 4.0 mg/L as an absolute minimum.

pH. pH values in the Willamette River outside the mixing zone shall not fall outside the range of 6.5 to 8.5.

Turbidity. No more than a 10 percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction, or other legitimate activities that cause the standard to be exceeded may be authorized by DEQ, provided all practicable turbidity control techniques have been applied.

Biocriteria. Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.

Total Dissolved Solids. A concentration of 100 mg/L shall not be exceeded in the Willamette River and its tributaries.

Toxic Substances. Toxic substances may not be introduced in the waters of the state in amounts, concentrations, or combinations that may be harmful, may chemically change to harmful forms in the environment, may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses. Toxic substances should be controlled through Industrial Pretreatment Programs.

Mixing Zone. Federal regulations (40 CFR §131.13) allow for the use of mixing zones, also known as allocated impact zones. When using mixing zones, acute toxicity to drifting organisms must be prevented and the integrity of the water body as a whole may not be impaired. Mixing zones allow the initial mixing of waste and receiving water, but they are not designed to allow for treatment. EPA does not have specific regulations pertaining to mixing zones. Each state must adopt its own mixing zone regulations that are subject to review and approval by EPA. In states that lack approved mixing zone regulations, ambient water quality standards must be met at the end of the pipe.

DEQ has adopted the aquatic life criterion and developed mixing zone regulations. The regulations are primarily narrative and essentially require the permit writer to use the City's best professional judgment in establishing the size of the mixing zone. Based on EPA guidance and DEQ's mixing zone regulations, two mixing zones may be developed for each discharge that reflect acute and chronic effects: 1.) the acute mixing zone, also known as the ZID; and 2.) the chronic mixing zone, usually referred to as the mixing zone. The ZID is designed to prevent lethality to organisms passing through it. The chronic mixing zone is designed to protect the integrity of the entire water body as a whole. The allowable size of the mixing zone should be based upon the relative size of the discharge to the receiving stream, beneficial uses of the receiving stream, location of other discharges to the same water body, location of drinking water intakes, and other considerations. More specific guidance is available from EPA regarding criteria used in appropriately sizing a ZID. Primarily, the ZID must be designed to prevent lethality to drifting organisms.

DEQ's mixing zone regulations state that the mixing zone must be less than the total stream width as necessary to allow passage of fish and other aquatic organisms. Early recommendations regarding the size of the zone of passage originated in a document from the Department of the Interior (1968). That document recommended a zone of passage of 75 percent of the cross-sectional area and/or volume of flow of the receiving stream. Based on this recommendation, DEQ's standard practice is to allow no more than 25 percent of the stream flow for mixing zones.

Temperature Thermal Plume Limitations. Temperature mixing zones and effluent limits authorized under OAR 340-041-0028(12)(b) will be established to prevent or minimize adverse effects to salmonids inside the mixing zone.

Turbidity. Turbidity is measured by nephelometric turbidity units (NTU). The current Oregon water quality standard of an increase of 10 percent turbidity in the receiving stream (see OAR 340-41-205(2) (ç and related standards) is summarized below. No more than a 10 percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity. However, limited-duration activities necessary to address an emergency or to accommodate essential dredging or construction, or other legitimate activities that cause the standard to be exceeded may be authorized by DEQ, provided all practicable turbidity control techniques have been applied. This standard is not enforced and will be revised during the next triennial review period.

1.4.2 Wastewater Effluent Reuse Criteria

Reuse is the practice of using treated effluent from a sewage treatment system which, as a result of treatment, is suitable for a direct beneficial purpose. Reuse options include irrigation of agricultural crops, irrigation of parks, irrigation of golf courses, toilet flushing, industrial process water use (i.e., cooling water), landscape irrigation, fire protection, or constructed wetlands.

The WWTP reclaimed water use is within the fence line of the WWTP. Potable water is used to irrigate outside the fence line. Reuse plans are currently being implemented for offsite reuse on a local golf course.

Rules regarding the use of reclaimed water from treatment plants are designed "to protect the environment and public health in Oregon" (OAR 350-055-0005). Through OAR 340-55, DEQ has established treatment and monitoring requirements for potential agricultural and nonagricultural uses of the treated effluent. DEQ has classified reclaimed water into four categories and assigned a minimum degree of treatment required:

Level I: Less than biological treatment or biological treatment without disinfection

Level II: Biological treatment plus disinfection

Level III: Biological treatment plus disinfection with more stringent effluent requirements than Level II

Level IV: Biological treatment, clarification, coagulation, and filtration treatment plus disinfection

The current regulatory environment surrounding reuse water is in transition. Level IV is currently the highest quality reuse water. However, two additional levels of higher quality are being discussed, and standards within each quality classification are likely to change.

Limits for total coliform (organisms per 100 mL) and turbidity (NTU) have been established for the four categories. These standards serve as a general guideline for defining the anticipated water quality required for the various uses. In addition to the water quality limits, DEQ has provided standards for the minimum monitoring required for total coliform and turbidity based on the four categories. Table 1-8 summarizes the treatment and monitoring requirements for the four reuse categories. DEQ may include additional permit effluent limitations and/or permit conditions other than those listed in Table 1-8 if it has reason to believe that the reclaimed water may contain physical or chemical contaminants that would pose potential health hazards to the public or environment.

Table 1-8. Treatment, Water Quality Limits, and Monitoring Requirements for Agricultural Use of Reclaimed Water

Regulations Pertaining to the use of reclaimed water from wastewater treatment facilities				
Category	Level I	Level II	Level III	Level IV
Biological treatment	X	X	X	X
Disinfection		X	X	X
Clarification				X
Coagulation				X
Filtration				X

Regulations Pertaining to the use of reclaimed water from wastewater treatment facilities				
Category	Level I	Level II	Level III	Level IV
Total coliform (organisms/100 mL):				
Two consecutive samples	No limit	240	Not applicable	Not applicable
7-day median	No limit	23	2.2	2.2
Maximum	No limit	Not applicable	23	23
Sampling frequency	Not required	Once per week	Three times per week	Daily
Turbidity (NTU);				
24-hour mean	No limit	No limit	No limit	2
5 percent of the time during a 24-hour period	No limit	No limit	No limit	5
Sampling frequency				Hourly

Note: OAR 340-55.

Oregon regulations encourage the use of reclaimed water for beneficial purposes, using methods that protect the health of Oregonians and the environment. The standards for effluent reuse are established by DEQ through OAR 340-055. Reuse activities:

- Are authorized by an NPDES or WWTP permit.
- Must meet all requirements for groundwater protection established in OAR 340-040.
- Require development of a Reclaimed Water Use Plan for offsite reuse.

Application Rates. The goal of reuse on agricultural land is to beneficially reuse treated effluent by applying at rates to meet the crop's gross irrigation and nutrient requirements, which are commonly referred to as agronomic rates.

The nutrient requirement is the amount of fertilizer, such as available nitrogen, phosphorus, and potassium that is needed to obtain an optimum crop yield. The available nitrogen is made up of organic nitrogen, ammonia-nitrogen, and nitrate-nitrite nitrogen. Organic nitrogen is a long-term, slow-release fertilizer. As organic matter decomposes in the soil, microorganisms convert the organic nitrogen to inorganic ammonium nitrogen, a process called mineralization. The assumptions that will be used to determine the available nitrogen are:

- Ninety percent of mineralized organic nitrogen (total Kjeldahl nitrogen-ammonia nitrogen) will be available to the crop in the first year. The balance will be lost to volatilization.

- There will be a 50 percent loss of ammonia from volatilization as a result of application with sprinklers; therefore, 50 percent will remain available.

- One hundred percent of nitrate-nitrogen will be available for crop use.

Table 1-9 summarizes the fertilizer requirements typically used in the Willamette Valley for various crops.

Table 1-9. Example Fertilizer Requirements of Various Crops for Willamette Valley Region, pounds per acre

Nutrient	Pasture grass/turf grass	Field corn	Alfalfa hay	Spring grains	Winter grains	Fall grass seed
Nitrogen	180 to 250	150 to 180	200 to 480	40 to 50	100 to 140	100 to 140
Phosphorus	50 to 75	20 to 30	20 to 30	40 to 60	30 to 60	30 to 60
Potassium	240 to 290	100	160 to 200	40	30 to 100	60

Notes: 1. Nutrient uptake rates for pasture/turf grass, alfalfa, and field corn were taken from EPA's *Process Design Manual for Land Treatment of Municipal Wastewater.*
2. Nutrient uptake rates for spring grains, winter grains, and grass seed were taken from Oregon State University fertilizer guides.
3. Alfalfa hay does not require nitrogen fertilization, but is capable of utilizing the rates indicated.

Seasonal Limitations/Storage Requirements. There are seasonal limitations to an effluent reuse system because during parts of the year (November through February) crops do not require water, and in October they require very little water. Most of the crops grown in the Newberg area will typically have a growing season from April through September.

General Requirements. A number of general requirements have been outlined in OAR 340-55. These requirements address agricultural and nonagricultural uses that are acceptable based on the effluent water quality level, irrigation system, public access requirements, and buffer zones for irrigation. Tables 1-10 and 1-11 summarize the general requirements according to different levels of reclaimed water quality. For the purposes of the tables, the following terms are defined:

Surface: Surface irrigation where application of reclaimed water is by means other than spraying so that contact between the edible portion of any food crop and reclaimed water is prevented.

Spray: Spray irrigation where application of reclaimed water to crops is by spraying it from orifices in piping.

Processed food crops: Those that undergo thermoprocessing sufficient to kill spores of *Clostridium botulinum*. Washing, pickling, fermenting, milling, or chemical treatments are not sufficient.

Table 1-10. Agricultural Use Allowed with Different Levels of Reclaimed Water Quality

Category level	I	II	III	IV
Required treatment	Biological treatment	Biological treatment plus disinfection	Biological treatment plus disinfection with more stringent effluent requirements than Level II	Biological, clarification, coagulation, and filtration treatment plus disinfection
Public access	Prevented (fences, gates, locks)	Controlled (signs, rural or nonpublic lands)	Controlled (signs, rural or nonpublic lands)	No direct public contact during irrigation cycle
Buffers for irrigation	Surface: 10 feet Spray: site-specific	Surface: 10 feet Spray: 70 feet	10 feet	None required
Irrigation method allowed				
Food crops	Not allowed	Not allowed	Not allowed	Unrestricted
Processed food crops	Not allowed	1	1	Unrestricted
Orchards and vineyards	Not allowed	2	2	Unrestricted
Fodder, fiber, and seed crops not for humans	3	1	1	Unrestricted
Pasture for animals	Not allowed	4	4	Unrestricted
Sod	Not allowed	1	1	Unrestricted
Ornamental nursery stock	Not allowed	1	1	Unrestricted
Christmas trees	Not allowed	1	1	Unrestricted
Firewood	Not allowed	1	1	Unrestricted
Irrigation method allowed				
Commercial timber	2	1	1	Unrestricted
Firewood: not customer cut	Surface or spray	Surface or spray	Surface or spray	Surface or spray

[1]Advisory Notice Only: the Oregon Health Division (OHD) recommends that there should be no irrigation of this level of effluent for 3 days prior to harvesting.

[2]Surface irrigation where edible portion of crop does not contact the ground, and fruit or nuts shall not be harvested off the ground.

[3]DEQ may permit spraying if it can be demonstrated that public health and the environment will be adequately protected from aerosols. Advisory Notice Only: OHD recommends that there should be no irrigation of this level of effluent for 30 days prior to harvesting.

[4]Surface or spray irrigation: no animals shall be on the pasture during irrigation. Source: OAR 340-55.

Table 1-11. Nonagricultural Use Allowed with Different Levels of Reclaimed Water Quality

Category level	I	II	III	IV
Required treatment	Biological treatment	Biological treatment plus disinfection	Biological treatment plus disinfection with more stringent effluent requirements than Level II	Biological, clarification, coagulation, and filtration treatment plus disinfection
Public access	Prevented (fences, gates, locks)	Controlled (signs, rural or nonpublic lands)	Controlled (signs, rural or nonpublic lands)	No direct public contact during irrigation cycle
Buffers for irrigation	Surface: 10 feet Spray: site-specific	Surface: 10 feet Spray: 70 feet	10 feet	None required
Irrigation method allowed				
Parks, playgrounds, schoolyards, golf courses with contiguous residences	Not allowed	Not allowed	Not allowed	1, 2
Golf courses without contiguous residences	Not allowed	1, 3	1, 3	1, 2
Cemeteries, highway medians, landscapes without frequent public access	Not allowed	1, 3	1, 3	1, 2
Industrial or commercial use	Not allowed	5, 6, 7, 8	5, 6, 7, 8	5, 6, 8
Construction use	Not allowed	5, 6, 7, 8, 9	5, 6, 7, 8, 10	5, 6, 8, 9
Unrestricted impoundments	Not allowed	Not allowed	Not allowed	4, 6
Restricted impoundments	Not allowed	Not allowed	4, 6, 10	4, 6
Landscape impoundments	Not allowed	4, 6, 10	4, 6, 10	4, 6

[1]Signs shall be posted around the perimeter of the facility and other locations indicating that reclaimed water is used for irrigation and is not safe for drinking, and in the case of effluent quality Levels II and III for body contact (e.g., for Level IV, ATTENTION: RECLAIMED WATER USED FOR IRRIGATION. DO NOT DRINK. ATENCION: RECLAMADO DESPERDICIO DE AGUA USADO PARA LA IRRIGACION. NO BEBA EL AGUA; for Levels II and III, ATTENTION: RECLAIMED WATER USED FOR IRRIGATION. AVOID CONTACT. DO NOT DRINK. ATENCION: RECLAMADO DESPERDICIO DE AGUA USADO PARA LA IRRIGACION. EVITE EL CONTACTO. NO BEBA EL AGUA.).

[2]Reclaimed water shall be applied in a manner so that it is not sprayed onto areas where food is prepared or served, or onto drinking fountains.

[3]Reclaimed water shall be applied in a manner so that it is not sprayed within 100 feet from areas where food is prepared or served, or where drinking fountains are located.

[4]Signs shall be posted around the perimeter and other locations indicating that reclaimed water is used and is not safe for drinking, and in the case of effluent quality Levels II and III for body contact (e.g., for Level IV, ATTENTION: RECLAIMED WATER. DO NOT DRINK. ATENCION: RECLAMADO DESPERDICIO DE AGUA. NO BEBA EL AGUA; for Levels II and III, ATTENTION: RECLAIMED WATER USED. AVOID CONTACT. DO NOT DRINK. ATENCION: RECLAMADO DESPERDICIO DE AGUA. EVITE EL CONTACTO. NO BEBA EL AGUA.).

[5]DEQ may impose more stringent limits on the use of reclaimed water if it believes it is necessary to protect public health and the environment.

[6]There shall be no disposal of reclaimed waters into surface or groundwater without authorization by an NPDES or water pollution control facility permit.

[7]Use of reclaimed water in evaporative cooling systems shall be approved only if the user can demonstrate that aerosols will not present a hazard to public health.

[8]Members of the public and employed personnel at the site of the use of reclaimed water shall be notified that the water is reclaimed water. Provisions for how this notification will be provided shall be specified in the reclaimed water use plan.

[9]Unless decontaminated in a manner approved in writing by OHD, tanker trucks or trailers that transport and/or use reclaimed water shall not be used to transport potable water intended for use as domestic water. A tanker truck or trailer used to transport and/or use reclaimed water shall have the words NONPOTABLE WATER written in 6-inch high letters on each side and the rear of the truck. The words NONPOTABLE WATER shall not be removed until decontamination as approved by the OHD has occurred.

[10]Aerators or decorative fixtures which may generate aerosols shall not be used unless approved in writing by the DEQ. Approval will be considered if it can be demonstrated that aerosols will be confined to the area of the impoundment or a restricted area around the impoundment.

Agricultural and Nonagricultural Uses. Agricultural uses include irrigation for food crops, processed food crops, orchards and vineyards, fodder, fiber, seed crops, and pasture for animals. Nonagricultural uses include irrigation at parks, playgrounds, golf courses, cemeteries, highway medians, and other landscape irrigation.

The potential uses for Level II quality effluent range from the irrigation of agricultural crops processed before human consumption or crops not for human consumption, to irrigation at golf courses without contiguous residences. Level IV effluent is the least restrictive with respect to the types of uses for which the treated effluent can be beneficially reused, and it is the most costly to produce.

DEQ provides guidelines on public access and buffer zones for irrigation systems depending on the effluent water quality level beneficially reused. As listed in Tables 1-8 and 1-9, public access requirements for the different effluent levels range from prevented (fences, gates, locks) to no direct public contact during the irrigation cycle. The public access under a Level II effluent quality reuse program must be controlled. This means that irrigation using this effluent can occur only on rural or nonpublic lands that limit the potential for direct public contact. The site used would also require signs indicating the use of reclaimed water in the irrigation system. This level of public access control would be similar for Level III effluent quality. It would be reduced to no restrictions except prevention of direct public contact during the irrigation cycle under a reuse program using Level IV effluent quality.

Buffer zones for surface and spray irrigation systems are intended to protect public health and the environment. As with the public access requirements, the buffer zones are least restrictive for Level IV effluent quality. When irrigating with Level II effluent, the buffer zones for surface (flooding and overland flow) and spray irrigation systems are 10 feet and 70 feet, respectively. DEQ may reduce the buffer distances, as identified in Tables 1-10 and 1-11, if it determines that alternative controls would adequately protect public health and the environment.

To achieve Level IV, additional treatment such as clarification, coagulation, and filtration would be required. More stringent disinfection and turbidity effluent levels would also need to be met.

Other Reuse Design Requirements. Other requirements to consider in designing a wastewater reuse system are alarm devices, standby power, redundancy, cross-connection, and construction and marking of piping, valves, and other portions of the reclaimed water system. As outlined in OAR 340-55, alarm devices are used to provide the necessary warning of loss of power and/or failure of process equipment essential to the proper operation of the WWTP. This requirement is consistent with the design guidelines of any WWTP, whether or not a wastewater effluent reuse system is implemented. In addition to the alarms, appropriate redundancy is required so that a sufficient level of treatment facilities and monitoring equipment is available to effectively prevent use or discharge of inadequately treated water.

There is no cross-connection allowed between a potable water system and the distribution system that carries the reclaimed water unless the connection is through either an unrestricted air gap or a reduced-pressure-principle backflow preventer. This backflow preventer must be tested and serviced professionally at least once per year. Unless otherwise approved by DEQ, the construction and marking of piping, valves, and other portions of the reclaimed water system must conform with requirements outlined in the *Guidelines for Distribution of Nonpotable Water* of the California-Nevada

Section of the American Water Works Association. In general, the requirements that have not already been discussed are:

- *Pipe Separation:* Potable pipelines must maintain a separation of 10 feet horizontally and 1 foot vertically with parallel reclaimed water (nonpotable) pipelines. When potable pipelines cross reclaimed water pipelines, the potable water pipeline must maintain a separation of 1 foot above the reclaimed water pipeline.

- *Pipe and Valve Identification:* Reclaimed water pipeline must be adequately marked with a warning tape. The warning tape should be prepared with specified purple color and printing with the words CAUTION: RECLAIMED WATERLINE. Aboveground or exposed facilities should be marked to differentiate reclaimed water pipelines from potable water systems or wastewater facilities.

Reuse Siting Requirements. Reuse siting requirements are regulated by Senate Bill 212 (2001). Specified requirements for siting reuse facilities outside the UGB include:

- DEQ determination that facility will apply reclaimed water at agronomic rates
- Continued agricultural, horticultural, or silvicultural production
- No reduction in productivity
- Compliance with the Land Use Compatibility (LUC) process
- Limit to future uses of the land
- Restoration of the land to its original condition
- Not applicable to biosolids application

After applying for LUC approval, the local government issues the public notice of its intent to make a decision. The applicant must respond to each alternative identified in public comments in sufficient detail to allow consideration of the alternative. The response must explain how the alternatives were considered and, if not used, why they were not used. As long as explanations are provided, approval of the application cannot be reversed or remanded.

If the application is approved, the uses allowed outside the UGB include:

- Treatment resulting from land application
- Onsite facilities
  - Accessory to and reasonably necessary for land application
  - Buildings (storage, sheds, etc.)
  - Equipment (pumps, hoses, tractors, etc.)
  - Water impoundments (aerated and nonaerated)

- Offsite facilities
  - Building and equipment if located in the public right-of-way or other land with owner's written permission
  - Return of land to its original condition

If the application is approved, the following uses are not allowed by Senate Bill 212:

- Establishment and use of treatment facilities
- Establishment and use of utility facility service lines except in specific circumstances where they are allowed (Oregon Regulatory Statutes 215.213(1)(b) and 215.283 (1)(y))

1.4.3 Biosolids Management Criteria

Biosolids are a primarily organic solid product produced by wastewater treatment processes that can also be beneficially recycled. Various state and federal rules govern use of biosolids.

Regulations. Title 40 of the Code of Federal Regulations, Part 503 (40 CFR §503) discusses standards for the use or disposal of biosolids, also known as sewage sludge. The Part 503 rule establishes requirements for the final use or disposal of biosolids when they are:

- Applied to land to condition the soil or fertilize crops or other vegetation grown in the soil
- Placed on a surface disposal site for final disposal
- Fired in a biosolids incinerator

The Part 503 rule is designed to protect public health and the environment from any reasonably anticipated adverse effects of certain pollutants and contaminants that may be present. As such, the rule includes five subparts: general provisions, requirements for land application, surface disposal, pathogen and vector attraction reduction, and incineration. Part 503 does not replace any existing state regulations; rather, it sets minimum national standards for the use or disposal of biosolids. In some cases, the state requirements may be more restrictive or administered in a manner different from the federal regulation.

Although biosolids can be beneficially used, they can also be placed in a landfill under the provisions of 40 CFR §258. DEQ promotes the beneficial use of biosolids for agricultural production in Oregon. Almost all the biosolids generated in Oregon are used to grow crops on DEQ-approved sites by agronomic rate applications. Biosolids applications are controlled by detailed site authorization letters, which, together with biosolids management plans, are linked directly to the permits for wastewater treatment facilities.

The state biosolids regulations were most recently revised in July 1995. They incorporate by reference many of the federal technical biosolids regulations (40 CFR §503), including limits on trace pollutants and pathogens. Currently, both the state and federal regulations are proposed for amendment, but the state rule-making process has been halted pending issuance of the revised federal regulations. When the state rule-making process restarts, public notice will be made of additional opportunities to comment on the proposed state regulations.

The regulations described in OAR 340-50 and a biosolids program home page are available at www.deq.state.or.us/wq/Biosolids/BiosolidsHome.htm. This website includes links to state and federal regulations, information about biosolids management plans, site authorization letters, information to help with annual reports, and links to other biosolids websites. Biosolids management plans serve as a central administrative tool to guide the production, storage, transportation, and land application of beneficial use of biosolids in Oregon. The City has completed a Biosolids Management Plan that will be discussed in Chapter 2 of the Facilities Plan. Site authorization letters specify the conditions for beneficial use of biosolids at particular sites. The rest of this report addresses product quality, site identification and approval, and special management considerations.

Biosolids Quality. According to current state and federal regulations (40 CFR §503), biosolids samples should be analyzed for the parameters listed in Table 1-12.

Table 1-12. Sampling Requirements for the EPA 503 Biosolids Regulations

Parameter	Units
Arsenic	Milligrams per kilogram (mg/kg) dry weight
Cadmium	mg/kg dry weight
Chromium	mg/kg dry weight
Copper	mg/kg dry weight
Lead	mg/kg dry weight
Mercury	mg/kg dry weight
Molybdenum	mg/kg dry weight
Nickel	mg/kg dry weight
Selenium	mg/kg dry weight
Zinc	mg/kg dry weight
Total nitrogen	percent dry weight
Nitrate nitrogen	percent dry weight
Ammonia nitrogen	percent dry weight
Phosphorus	percent dry weight
Potassium	percent dry weight
pH	standard units
Total solids	percent
Volatile solids	percent

The nitrogen, phosphorus, and potassium content of the biosolids is important for determining agronomic rates. Nitrogen content can vary significantly depending on source, age, and history. The concentration levels of these nutrients should be determined near the time biosolids are applied because stored biosolids can lose nitrogen rapidly. The assumptions used to determine the available nitrogen in the biosolids are:

- 30 percent of the organic nitrogen will mineralize and be available.
- 50 percent of the ammonia nitrogen will be lost to volatilization with surface application.
- 100 percent of the nitrate-nitrite nitrogen will be available.

Under the Part 503 rule, ceiling concentrations, cumulative pollutant loading rates, exceptional quality or clean biosolids, and annual pollutant loading rates have been established for heavy metals. Table 1-13 lists the acceptable levels for land application based on federal regulations. These limits are the same as those specified in OAR 340-050. The limits are used to determine site life, which is the number of years that biosolids with a uniform metal content can be applied to a specific site. However, almost without exception, biosolids in Oregon fall below the pollutant concentration limit. In this case, tracking cumulative loadings at a site is not required.

Table 1-13. Federal Regulations (Part 503) for Heavy Metals

Parameter	Ceiling limit, mg/kg	Cumulative loading, kg/hectare (ha)	Pollutant concentration limit, mg/kg	Annual pollutant loading rate, kg/ha/year
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	--[1]	--[1]	--[1]
Nickel	420	420	420	21
Selenium	100	100	100	5.0
Zinc	7,500	2,800	2,800	140

[1]When 40 CFR §503 was amended in 1994, it deleted pollutant limits for molybdenum in biosolids applied to land but retained the molybdenum ceiling limits.

Site Identification and Approval. Before approving any potentially sensitive application site (with respect to residential housing, runoff potential, or groundwater threat), DEQ may require an opportunity for public comment and public hearing. A statement of land use compatibility from the responsible planning jurisdiction should accompany requests for approval of biosolids land application sites. New sites or expansion of existing sites must be proposed to DEQ before use. Newly approved sites become part of the Biosolids Management Plan.

Site criteria for land-applying biosolids include physical features (geological formation, floodplain proximity, and groundwater and surface water proximity, topography, and soils), and method of application. DEQ's specific criteria are outlined in Table 1-14.

Table 1-14. Oregon DEQ Site Criteria for Biosolids Application

Parameter	Criteria
Geology	Must have a stable formation.
Floodplain	Restricted period of application and incorporate biosolids if in a floodplain.
Groundwater	At time of application, the minimum depth to permanent groundwater is 4 feet; the minimum depth to temporary groundwater is 1 foot.
Topography ▪ Slope less than or equal to 12 percent ▪ Well-vegetated slopes up to 30 percent	Liquid biosolids application with appropriate management to eliminate surface runoff ▪ May be used for liquid, dewatered, or dried biosolids ▪ May be used for dewatered or dried biosolids or liquid biosolids with appropriate management
Soils	▪ Minimum rooting depth of 24 inches ▪ No rapid leaching (coarse material) ▪ Avoid saline or alkaline soil
Method of application and proximity to water bodies	Buffer strips may be required to prevent nuisance odors and to protect water bodies. Size depends on method of application and proximity to sensitive area (variable with local conditions and left to discretion of DEQ), as described below: ▪ Direct injection: no limit required ▪ Truck spreading: less than 200-foot buffer strip ▪ Spray irrigation: 50- to 500-foot buffer strip ▪ Cake or dried solids: 0- to 50-foot buffer strip ▪ Near highways: discretion of DEQ ▪ Near ditch, pond, channel, or waterway: greater than 50-foot buffer strip ▪ Near domestic water source or well: greater than 200-foot buffer strip

Source: OAR 340-50, as amended.

Special Management Considerations. Land receiving biosolids for agricultural use requires special management considerations. These relate to site access, types of crops grown, plant nutrient rates, timing and duration of biosolids land application (seasonal constraints), and grazing restrictions. Biosolids are defined as Class A or Class B based on pathogen reduction and processing method. Exceptional quality biosolids are below federal requirements for trace pollutant concentrations that have been treated by a Class A pathogen reduction process and vector attraction reduction procedure. Class A biosolids are recognized as soil amendments which are acceptable for distribution and marketing to the public. Class B biosolids are most common, and they are appropriate for agricultural use as long as limits on cropping are followed.

Access. Controlled access to bulk Class B domestic biosolids and domestic septage land-application sites is required for a minimum of 12 months following surface application of solids. Controlled access means that public entry or traffic is unlikely. Rural private land is assumed to have controlled access, while parks or other public lands may require fencing to ensure control.

Crops. As a general rule, crops grown for human consumption should not be planted for at least 14 months after application of bulk Class B biosolids or domestic septage. This requirement may be waived if the edible parts will not be in contact with the biosolids-amended soil, or if the crop is to be treated or processed before marketing in such a way that pathogen contamination is not a concern. Most often, Class B biosolids are applied to forage or hay crops, so this is not an issue. The only requirement is that biosolids should not be applied within 30 days of harvest or grazing.

No restrictions on planting times are required where Class A biosolids derived products are land-applied to sites used for the cultivation of fresh market vegetables.

Nutrient Loading. Biosolids application to agricultural land should not exceed the annual nitrogen loading required for maximum crop yield and is, therefore, managed according to its fertilizer value. Biosolids may be applied to approved sites above agronomic rates on a one-time basis or less than once per year as long as runoff, nuisance conditions, or groundwater contamination does not occur. Nitrogen accumulation from higher than agronomic rates and annual nitrogen use will determine the acceptable loading rate and frequency.

Seasonal Constraints. In areas where soil damage may occur from application equipment traffic in the wet season, biosolids application should be restricted to the dry season. The main consideration in land application on sloping ground is to avoid surface runoff and soil erosion.

Grazing Restrictions. Grazing animals should not be allowed on pasture or forage and livestock feed should not be harvested for 30 days after application of bulk Class B biosolids or domestic septage.

1.4.4 Groundwater Protection Requirements

Groundwater is a critical natural resource providing water supply for domestic, industrial, agricultural, and other beneficial uses. Groundwater also provides base flow for rivers, lakes, streams, and wetlands. Because groundwater is difficult to clean up once it is polluted, DEQ has implemented an antidegradation policy so that the highest quality groundwater is maintained.

1.4.5 Pretreatment

Updated pretreatment regulations were issued by EPA in October 2005 that will streamline the pretreatment program requirements. EPA's Pretreatment Streamlining Rule revises certain program requirements to be consistent with NPDES requirements for direct dischargers to surface waters. The action will reduce the regulatory burden on both industrial users, state and control authorities without adversely affecting environmental protection; and it will allow control authorities to better focus oversight resources on industrial users with the greatest potential for affecting the POTW or the environment. The streamlining rule addresses 12 specific issues and a few miscellaneous changes pertaining to the general pretreatment regulations.

1.4.6 Reliability and Redundancy

EPA policy requires new or expanding treatment works that discharge to a receiving stream to meet minimum standards for mechanical, electrical, fluid systems, and component reliability. Redundancy and reliability refer to the level of protection required for the receiving stream classification.

Receiving water criteria are set to ensure minimum reasonable protection of the receiving waters as described in the NPDES permit. Reliability is therefore defined primarily as a function of the receiving water requirements, while the required redundancy is a function of the reliability required. The EPA, as part of its July 1984 Technical Bulletin, identifies three classes of reliability. The required level and grant-fundable elements of redundancy are defined in terms of these three classifications.

- Class I: Works that discharge into navigable waters that could be permanently or unacceptably damaged by effluent that was degraded in quality for only a few hours. Examples of Class I works are those discharging near drinking water reservoirs or into shellfish waters.

- Class II: Works that discharge into navigable waters that would not be permanently or unacceptably damaged by short-term effluent quality degradations, but could be damaged by continued effluent quality degradation (i.e., several days). Examples of Class II works are those that discharge into recreational waters.

- Class III: Works not otherwise classified as Class I or Class II.

The Newberg WWTP, like other dischargers to the Willamette River, is a Class II Treatment System. The Class II redundancy requires that preliminary and primary treatment and disinfection have redundant components so that if one basin is out of service for several days, the treatment plant can still meet monthly treatment requirements.

Table 1-15 lists the minimum backup requirements for plant components that may be provided at the Newberg WWTP in accordance with the EPA's Works Design Criteria, Reliability Class II, for sewage treatment plants. In addition to these standards, unit operations must be designed to pass the peak hydraulic flow with one unit out of service. Also, mechanical components in the facility must be designed to enable repair or replacement without violating the effluent limitations or causing control diversion.

Table 1-15. Reliability Class II Requirements

Plant component	Requirement
Raw sewage pumps	Peak flow with largest unit out of service. Peak flow is defined as the maximum wastewater flow expected during the design period of the treatment works.
Mechanical bar screens	One backup with either manual or mechanical cleaning (manual cleaning if only two screens).
Grit removal	Minimum of two units.
Primary sedimentation	50 percent of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Activated sludge process	A minimum of two equal volume basins; no backup basin required.
Aeration blowers	Supply the design air capacity with the largest unit out of service; provide a minimum of two units.
Air diffusers	Isolation of largest section of diffusers (within a basin) without measurably impairing oxygen transfer.
Secondary sedimentation	50 percent of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Disinfectant contact basin	50 percent of the design flow with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Effluent pumps	Peak flow with largest unit out of service. Peak flow is defined as the maximum wastewater flow expected during the design period of the treatment works.
Electrical power	Provision of two separate and independent sources of electrical power, either from two separate utility substations or from a single substation and a works-based generator. Designated backup source shall have sufficient capacity to operate all vital components, critical lighting, and ventilation during peak flow conditions, except that components used to support the secondary processes need not be included as long as treatment equivalent to sedimentation and disinfection is provided.

The reliability criteria for sludge processes presented in Table 1-16 are also based on the guidance offered in EPA's Works Design Criteria.

Table 1-16. Sludge Handling System Reliability

System components	Required capacity/backup
Sludge holding tanks	The volume of the holding tank shall be based on the expected time necessary to perform maintenance and repair of the component in question.
Anaerobic sludge digestion	At least two digestion tanks shall be provided. At least two of the digestion tanks provided shall be designed to permit processing all types of sludges normally digested.
Aerobic sludge digestion	A backup basin is not required. At least two blowers or mechanical aerators shall be provided. Isolation of largest section of diffusers without measurably impairing oxygen transfer is allowed.
Sludge pumping	Pumps shall be sized to pump peak sludge quantity and maintain velocities above 2 feet per second. Provide a minimum of two pumps.

According to a recent study, *Efficient Redundancy Design Practices* (Water Environment Research Foundation, 2003), most treatment plants have redundant units for operational needs rather than to meet state or federal standards.

1.5 POTENTIAL FUTURE REGULATIONS

Potential future regulations that could influence the direction of the Newberg Facilities Plan are summarized below:

- Nutrients
- Mixing Zones
- Blending
- Capacity, Management, Operations and Maintenance Requirements (CMOM)

The Facilities Plan should preserve maximum flexibility by using an incremental approach for phased expansion to accommodate the need for more or less stringent requirements, triggered by water quality requirements.

1.5.1 Nutrients

This issue pertains to two nutrients nitrogen and phosphorus. The Willamette River is not, nor is it expected to be, water quality limited for nutrients. The need for nutrient removal should be driven by water quality. Nutrient removal will probably not be required initially, but the Facilities Plan describes the approach to be taken if nitrogen and/or phosphorus limits are imposed. The EPA is currently reviewing the need for nutrient removal requirements from WWTPs to protect the nation's waters. This is generally the first step in establishing standards for criteria in the future. Should the EPA promulgate nutrient removal requirements, DEQ would allow Oregon treatment facilities time to comply by incorporating compliance schedules into the next permit renewal following promulgation.

1.5.2 Mixing Zone

There is current public debate about removing the mixing zone and basing compliance on samples taken at the end of the pipe. This is not expected to occur.

1.5.3 Blending

There has been a national effort at EPA to develop a policy on blending. No funding is allocated for the blending policy development at this time. DEQ has stated that blending will be allowed as it has been in Oregon, into the foreseeable future.

1.5.4 CMOM

EPA is considering proposing NPDES permit regulations to improve the CMOM of municipal sanitary sewer collection systems and to improve prevention and public notification of sanitary sewer overflow events. The proposed rule would reduce health and environmental risks caused by exposure to raw sewage, improve the performance of treatment facilities, and protect the nation's collection system infrastructure by enhancing and maintaining system capacity, reducing equipment and operational failures, and extending the life of sewage treatment equipment. Under the new regulations, all avoidable SSOs will be prohibited. The regulations call for sound asset management practices by which agencies can safely operate, maintain, and manage their wastewater collection systems.

Many in the wastewater collection system business are predicting that CMOM regulations from the EPA will become a reality in the near future. The impact that these new regulations will have on wastewater utilities is broad—affecting all aspects of collection system management. Utilities will have to improve collection system performance by enhancing and maintaining system capacity to eliminate SSOs. Understanding the capacity of the collection system through hydraulic modeling will be a key requirement, together with developing and implementing an O&M program to prevent blockages and backups. Recordkeeping, reporting, and public notification procedures will also require enhancement. Implementation of these activities will improve system performance and extend the life of the collection system infrastructure through good asset management practices. Many utilities have started upgrading their collection system management programs in order to be better prepared when the regulations finally take effect.

1.6. WASTEWATER CHARACTERISTICS

Developing accurate estimates of current plant flows and loads is a critical step in the facilities planning process. Recent historical flows and loads serve as the basis for estimating future flows and loads. These flow and load projections are in turn used in estimating current capacity and the sizing of future wastewater treatment and conveyance facilities. For this evaluation, Newberg WWTP records for January 1998 through December 2004 were analyzed according to DEQ guidelines for developing wet weather and peak flow projections for sewage treatment in western Oregon.

1.6.1 Wastewater Flows

Average and peak flow rates are determined for different aspects of facility design. These flows are defined below.

Definitions of Flow Terms. Flow rates that are important in the design and operation of treatment plants include:

- A*verage dry weather flow* (ADWF) is the average flow at the plant during the dry weather season, usually defined as May through October. DEQ uses ADWF to calculate mass discharge limits to receiving streams for BOD and TSS for the dry weather season.

- *Average wet weather flow* (AWWF) is the average flow at the plant during the wet weather season, typically November through April. AWWF is used to calculate mass discharge limits for $CBOD_5$ and TSS for the wet weather season.

- *Average annual flow* (AAF) is the average flow at the plant during the calendar year.

- *Maximum month dry weather flow* (MMDWF) is defined by DEQ as the flow at the WWTP when rainfall quantities are at the 1-in-10 year probability level for the month of May. MMDWF is important in the design of plant's secondary process.

- *Maximum month wet weather flow* (MMWWF) is defined by DEQ as the flow at the WWTP when rainfalls are at the 1-in-5 year probability level for the month of January. Typically, this period is October through April. MMWWF is also used in the design of a plant's secondary process.

- *Peak day flow* (PDF) is the flow rate at the plant that corresponds to a 1-in-5-year, 24-hour storm event that occurs during a period of high groundwater and saturated soils. For the hydrologic/hydraulic modeling analysis, this term is defined as the 24-hour flow that has an expected recurrence interval of once in 5 years. This measure is used for sizing disinfection systems.

- *Peak week flow* is the flow rate into the plant that is measured as the running average of the consecutive 7-day flows. This flow is used to calculate temperature compliance.

- *Peak hour flow* (PHF) is expected to occur during the peak day flow. PHF is the highest flow at the plant sustained for 1 hour and dictates the hydraulic capacity of the WWTP. This flow is also known as the peak instantaneous flow or peak wet weather flow.

Flow Records. In evaluating wastewater flow records, the first step is to identify any limitations in flow measurement, pumping capacity, or collection system capacity. In addition, any unique or unusual conditions that could affect historical flow records should be ascertained. Daily data used are from 2000 through 2004. Monthly data used are from 1998 through 2004. The plant flow meter is calibrated every 6 months. The available flow data and their limitations are discussed below.

Daily Flows. Daily flows for January 2000 through December 2004 are shown in Figure 1-7. Daily flows for the period of record range from 1.3 mgd to 14.9 mgd.

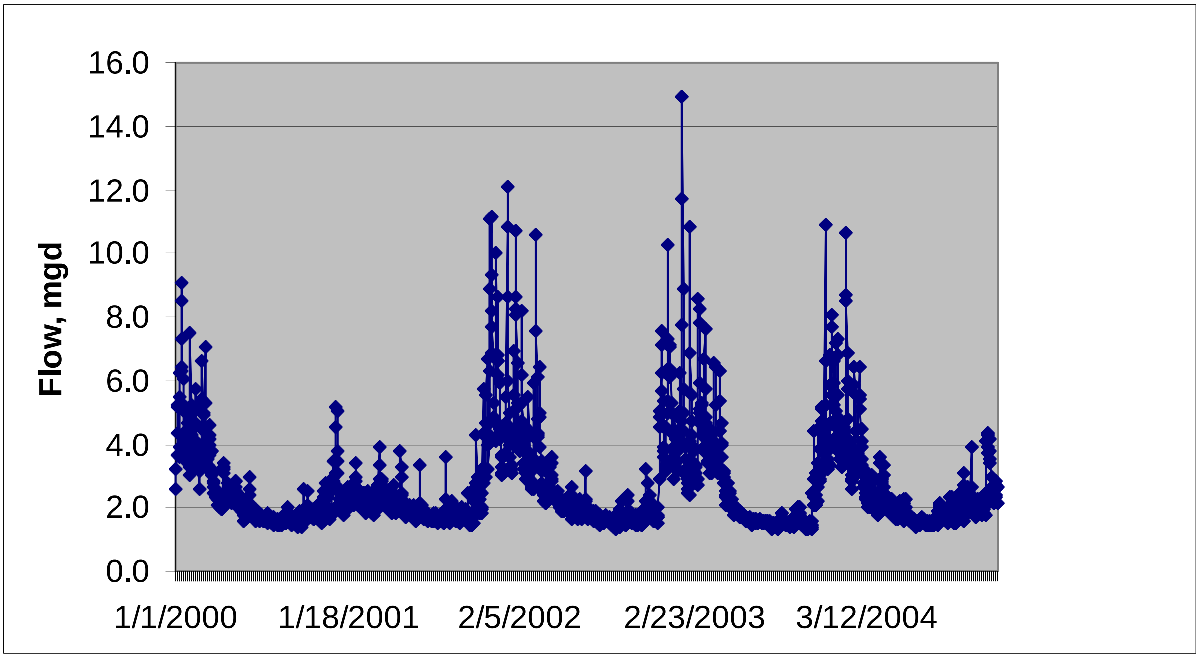


Figure 1-7. Newberg WWTP Historical Daily Influent Flows, 2000 to 2004

Monthly Flows. Monthly flows for the period of record are summarized in Table 1-17. Although outside the period of record, it should be noted that in January 2006, the monthly average was reported to be 8.1 mgd, related to an unusually wet month.

Table 1-17. Monthly Flows for Period of Record, mgd

Month	1996	1997	1998	1999	2000	2001	2002	2003	2004	Average	Maximum
January	5.32	4.86	5.24	5.52	4.77	2.18	5.69	5.14	5.21	4.88	5.69
February	6.15	3.48	4.31	6.18	4.34	2.33	4.10	4.18	4.20	4.36	6.18
March	2.95	4.93	4.07	4.23	3.68	2.33	4.01	4.77	2.76	3.75	4.93
April	3.72	2.78	2.35	2.79	2.38	2.26	2.51	4.06	2.35	2.80	4.06
May	2.96	2.03	2.95	2.17	2.23	2.12	2.03	2.30	1.87	2.29	2.96
June	1.86	2.12	2.09	1.79	1.93	1.92	1.89	1.73	1.73	1.89	2.12
July	1.71	1.58	1.71	1.62	1.66	1.72	1.77	1.58	1.54	1.65	1.77
August	1.53	1.57	1.62	1.63	1.55	1.76	1.57	1.49	1.64	1.60	1.76
September	1.82	1.78	1.66	1.61	1.62	1.78	1.68	1.53	1.76	1.69	1.82
October	2.31	2.44	1.86	1.69	1.80	1.95	1.69	1.62	2.04	1.93	2.44
November	4.11	3.70	4.32	3.49	1.89	3.85	1.93	2.13	2.06	3.05	4.32
December	6.58	3.27	5.61	4.61	2.72	5.58	4.16	4.89	2.82	4.47	6.58

PHF. The records for PHF are not accurate due to the limitations of the influent flow meter and configuration of the pump station and recycle flows. Plant staff estimate that the PHF is limited by the influent pumping capacity. It is important to note that the two influent pumps that have a rated capacity of 4.5 mgd actually discharged only 3.5 mgd when the pumps are worn. Likewise, the two pumps that have a rated capacity of 9 mgd actually discharged only 6.5 mgd when worn. Therefore, the combined peak pumping capacity of the available pumps is estimated to be 20 mgd when the pumps are worn. After pump repairs in September 2006, the pumps were tested and found to pump 25 mgd.

Rainfall Records. Peak wastewater flows can be heavily influenced by rainfall. Therefore, the techniques suggested by DEQ for calculating plant flows require the consideration of statistical recurrences of rainfall quantities. Monthly average rainfall values for the Newberg area are listed in Table 1-18.

Table 1-18. Monthly Average Rainfall Values, inches

Month	1998	1999	2000	2001	2002	2003	2004
January	8.18	8.74	6.87	1.50	8.96	7.60	5.09
February	6.00	10.56	4.70	1.41	3.84	3.24	4.19
March	4.67	4.89	3.02	2.87	4.90	6.19	1.61
April	1.12	1.28	2.27	1.89	3.02	5.58	2.19
May	4.87	2.44	2.44	1.38	1.57	1.15	1.12
June	0.86	0.81	1.47	1.70	1.61	0.19	1.25
July	0.06	0.05	0.07	0.48	0.09	0.00	0.02
August	0.00	0.57	0.08	0.84	0.34	0.21	2.21
September	0.63	0.03	0.34	0.70	1.55	0.99	1.96
October	3.22	2.03	2.42	3.35	0.53	2.03	3.11
November	11.66	8.31	2.49	7.76	3.32	4.90	1.92
December	9.19	5.57	3.58	7.59	9.39	8.13	3.82

Current flow characteristics for the Newberg WWTP are summarized in Table 1-19.

Table 1-19. Summary Current Wastewater Flow Characteristics

Flow, mgd	1998	1999	2000	2001	2002	2003	2004	Average	Maximum
Annual average	3.15	3.11	2.55	2.48	2.75	2.95	2.04	2.72	--
ADWF (May through October)	1.98	1.75	1.80	1.87	1.77	1.71	1.76	1.81	--
AWWF (November through April)	4.32	4.47	3.30	3.09	3.73	4.19	3.23	3.76	--
MMDWF	2.95	2.17	2.23	2.12	2.03	2.30	1.87	2.24	2.95
MMWWF	5.61	6.18	4.77	5.58	5.69	5.14	5.21	5.45	6.18
PWF	--	--	7.12	8.84	7.52	8.33	7.31	--	8.84
PDF	--	--	9.06	11.17	12.08	14.94	10.63	11.58	14.94
Minimum day flow	--	--	1.37	1.46	1.33	1.32	1.39	1.37	--
Peak 4-hour influent flow	--	--	20	20	20	20	20	20	20

Peak Flows. The peak flows of interest are the PDF, PWF, and PHF. The PDF of 16.99 mgd occurred on February 9, 1996. The plant undergoes significant but not extreme levels of infiltration/inflow (I/I). The peak day occurred on February 9, 1996 with a total I/I of 11.43 mgd. The peak week occurred in November to December 2001, with 8.84 mgd average of 7 days. As previously discussed, the PHF rate with all pumps running is 20 mgd (two pumps at 3.5 mgd each and two pumps at 6.5 mgd each).

According to plant staff, on September 30, 2005, influent flows measured 1.6 to 2.0 mgd until about 2 p.m. (14:00). At about 2:45 p.m. (14:45), the plant received a peak of 4.6 mgd and an average of about 4.0 mgd. Rainfall effects on the system were rapid considering the previous long spate of dry weather. This type of flow response is typically indicative of system inflow. Inflow could potentially be removed cost-effectively. The cost-effectiveness of I/I rehabilitation should be evaluated for the Newberg collection system as part of the planned sewer master plan work.

I/I Flows. The I/I flows are estimated by subtracting the winter water usage flows from the flows reaching the treatment plant. The I/I estimation has yet to be completed and will result from the ongoing Collection System Master Plan.

Per Capita Flows. The per capita flows are summarized in Table 1-20. These flows are calculated by dividing the yearly flows by the population. The ADWF value of 98 gallons per capita per day (gcd) is close to the 100 gcd typically used for municipal wastewater. The AWWF is 148 gcd, which is 50 percent higher than the dry weather flow.

Table 1-20. Per Capita Wastewater Flows

Flows, gcd	Value	Peaking factor
AAF	148	1.5
ADWF	98	1.0
AWWF	205	2.1
MMDWF	170	1.7
MMWWF	356	3.6
PWF	484	4.9
PDF[1]	765	7.8
PHF	1,005	10.2

[1] PDF may have been caused by housekeeping procedures.

Peaking Factors. The ADWF is the base flow used to determine peaking factors. The peaking factor for the other flow conditions are derived from dividing each flow condition by the ADWF. For example, the peaking factor for AAF is calculated by dividing 148 mgd by 98 for a peaking factor of 1.5. The peaking factor for PHF is high for typical municipal wastewater, indicating I/I. It is recommended that a collection system master plan be conducted to confirm future PHF.

Industrial Flows. Industrial flows are expected to grow at the same rate as domestic flows and remain at the same ratio of domestic to industrial flows as currently seen.

1.6.2 $CBOD_5$ and TSS Loads

The $CBOD_5$ and TSS loads at a treatment plant affect the following factors:

- *Secondary process sizing.* The design of a secondary process is based on the $CBOD_5$ load.
- *Aeration system design.* The capacity of the aeration system is determined by the peak $CBOD_5$ load.
- *Biosolids production.* $CBOD_5$ and TSS removed by the plant are converted into biosolids that must be stabilized and recycled.
- *Solids treatment and handling system design.* Solids handling facilities, such as digesters and thickeners, must be sized to accommodate expected biosolids quantities.

Current plant $CBOD_5$ and TSS loadings are evaluated below.

Monthly Plant Loading. Average monthly $CBOD_5$ and TSS influent loadings for January 1998 through December 2004 are shown in Figure 1-7 and listed in Table 1-21. Figure 1-8 shows that the $CBOD_5$ and TSS loads have remained fairly steady over the last 6 years. Both the $CBOD_5$ and the TSS loading data show a slow but steady increase over time, which is consistent with a slow, but steady, population growth. However, the TSS data also indicate that the TSS loading seems to have become more varied over the last 2 years. Since 2002, the range of TSS loadings has definitely increased, with many months showing lower TSS loadings than in the past while other months are having significantly increased loadings. Some of the loading variation may be from the discharge of the Newberg WTP solids that contain high iron.

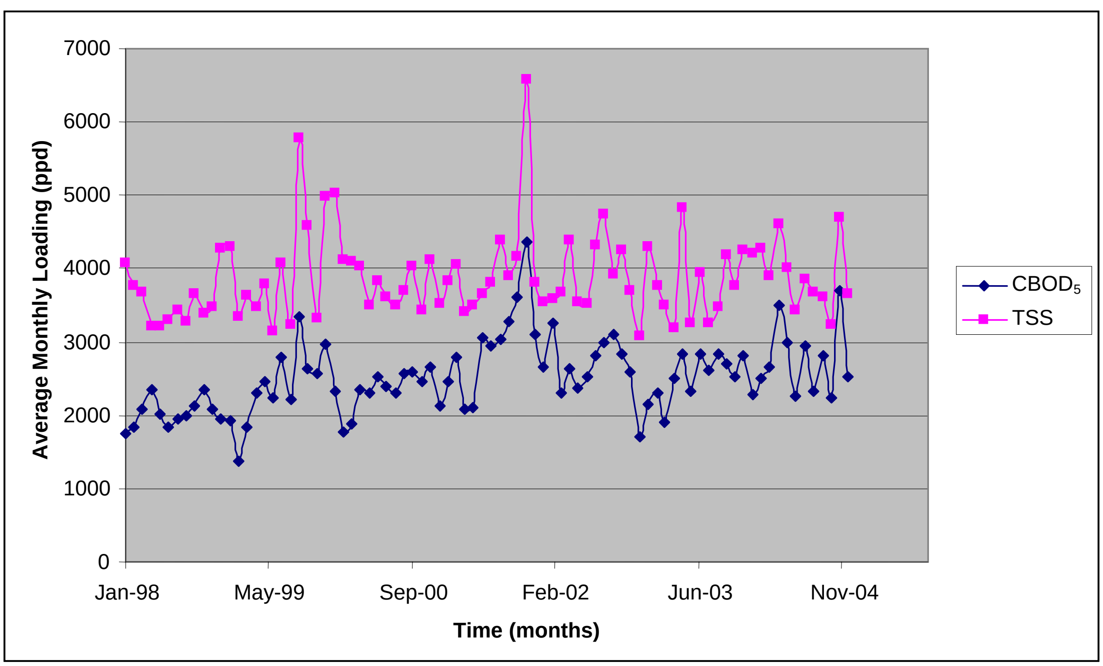


Figure 1-8. Average Monthly Plant Loading, $CBOD_5$ and TSS, 1998 to 2004

Table 1-21. Monthly Plant Loading, $CBOD_5$ and TSS, 1998 to 2004

Parameter	Average monthly influent loading, 1998 to 2004			
	$CBOD_5$		TSS	
	mg/L	ppd	mg/L	ppd
Minimum	28	1,372	68	3,089
Maximum	255	4,355	440	6,577
Average	138	2,511	203	3,872
Winter maximum	214	3,554	274	6,577
Summer maximum	255	3,610	440	4,833

The highest monthly $CBOD_5$ load of 4,355 ppd occurred in November 2001 and is an unusually high value. Similarly, the highest monthly TSS load was 6,577 ppd and also occurred in November 2001. The $CBOD_5$ loading for that month was actually 18 percent higher than any other month on record, while the TSS loading was more than 30 percent higher than any other month on record.

Examining the monthly loading can reveal whether seasonal variations in load occur. While there is definitely an increase in loading and flow during the winter months, the average monthly loading is not significantly higher than in summer.

Per Capita Loadings. For the period of record, 1998-2004, the average monthly $CBOD_5$ unit load was 0.14 pounds per capita per day (pcd), while the maximum monthly average $CBOD_5$ unit load in the same period was 0.24 pcd. These values fall in the range of typical design values, which range from 0.13 to 0.25 pcd. The average and maximum monthly TSS unit loads in the period of record were 0.21 pcd and 0.36 pcd, respectively. The average TSS unit load falls within the range of typical values; however, the maximum month unit value is significantly higher than the typical range of 0.13 to 0.25 pcd. Loads are summarized in Table 1-22.

Table 1-22. Summary of Per Capita Mass Loading Conditions for 1998 to 2004

Flow Related Description of Per capita loading, pcd	$CBOD_5$	TSS
Average month	0.14	0.21
Minimum month	0.10	0.18
Maximum month	0.24	0.36
Winter maximum month	024	0.36
Summer maximum month	0.20	0.33
Maximum peak week	0.64	0.57
Average peak week	0.36	0.44
Peak week–maximum with created data[1]	0.41	0.49
Peak week–average with created data[1]	0.31	0.42

[1] The 2001 peak week TSS 7-day running average resulted in an artificially high value of 10,472 pcd on November 28, 2001 because daily TSS loading data prior to that date were unavailable, and that date had a high TSS load. Data were created to compensate for the lack of data, resulting in what is likely a more realistic value of 9,000 pounds for the maximum 7-day average.

The 2004 peak week $CBOD_5$ 7-day running average resulted in an artificially high value of 12,697 pcd on November 30, 2004 because daily values $CBOD_5$ loading data prior to that date were unavailable, and that date had a high $CBOD_5$ load. Data were created to compensate for the lack of data, resulting in what is likely a more realistic value of 7,659 for the maximum 7-day average.

Industrial Loadings. Industrial flows are expected to grow at the same rate as domestic flows and remain at the same ratio of domestic to industrial flows as currently seen.

Other Wastewater Constituents. The Newberg WWTP has no nitrogen effluent limits in its current NPDES permit.

Ammonia. The average monthly influent ammonia concentration in the Newberg WWTP is only 15.9 mg/L. Figure 1-9 shows the monthly average ammonia influent at the Newberg WWTP for the period of record, 1998 to 2004. The maximum monthly influent concentration was 25.4 mg/L. Ammonia concentration in average domestic wastewater is typically about 25 mg/L.

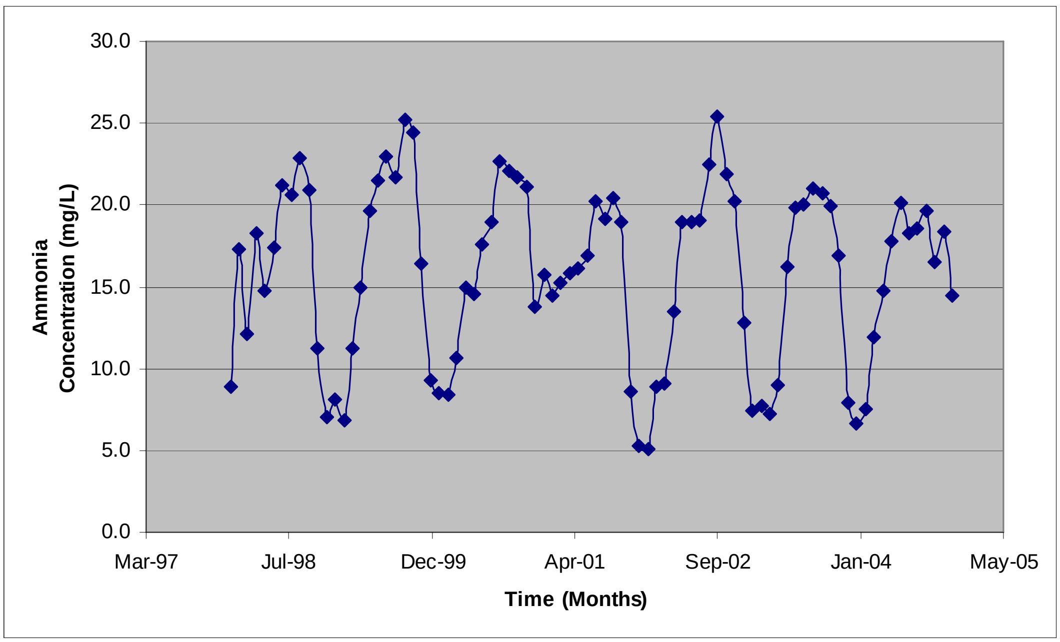


Figure 1-9. Influent Ammonia Concentrations, 1998 to 2004

1.6.3 Flow Condition Calculations using DEQ Method

To calculate maximum month flows, DEQ recommends plotting monthly plant flows and associated rainfall values for January through May of the most recent year. This plot was constructed but was later expanded, as shown in Figure 1-9, to include selected flows and rainfalls from all years of record (1995 to 2004), because little population growth occurred in this period and greater confidence in the results is gained with a longer record. MMWWF is estimated as the flow at the plant corresponding to the 1-in-5 year January rainfall. For the weather station at McMinnville, the 1-in-5 year January rainfall is 11.16 inches. This value was determined by analyzing 75 years of rainfall data for the 1-in-5 year recurrence of monthly January rainfall. Therefore, from Figure 1-10, MMWWF is estimated at 5.4 mgd. The highest monthly average flow reported for the period of record was 6.18 mgd in February 1999, a month with a rain total of 10.56 inches.

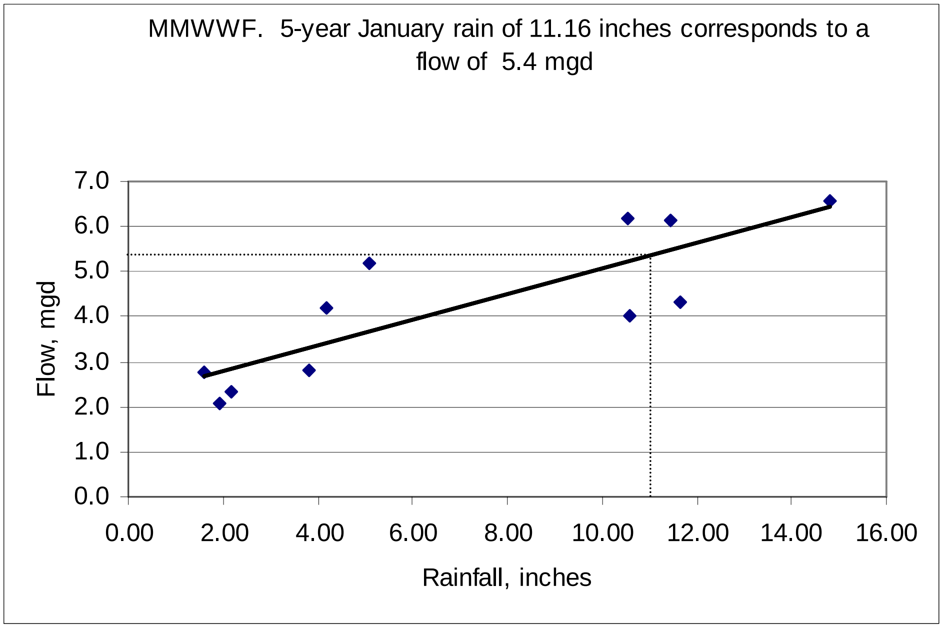


Figure 1-10. Maximum Month Wet Weather Flow, 1998 to 2004

MMDWF is approximated as the flow associated with a 1-in-10 year May rainfall (3.30 inches). This value was determined in a fashion similar to that for the 1-in-5 year MMWWF. As indicted in Figure 1-11, MMDWF is 2.1 mgd. The highest dry weather flow reported since May 1998 was 2.95 mgd in May 1998, a month with 4.87 inches of rain.

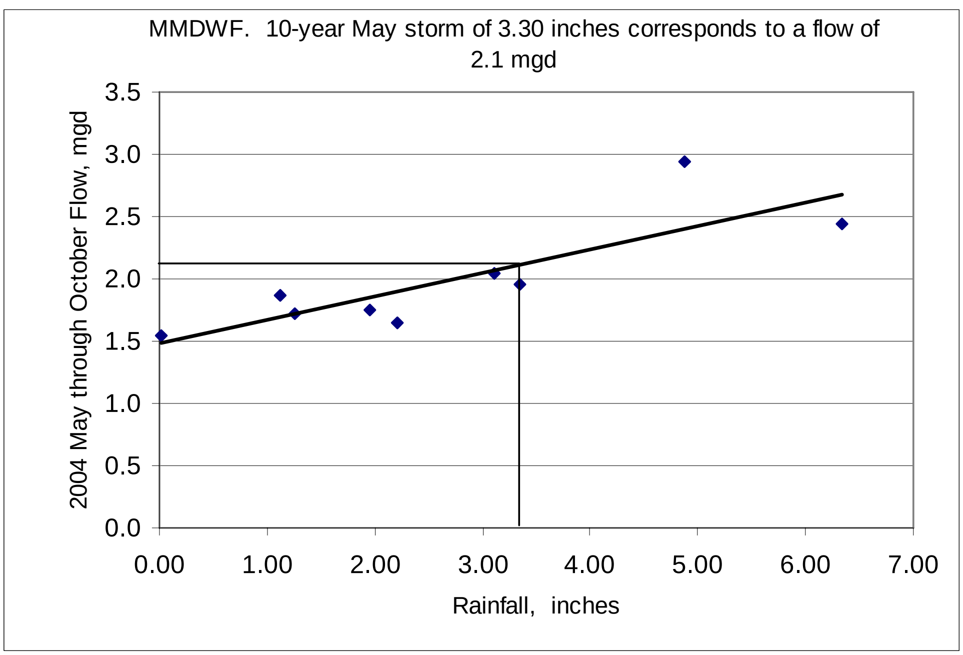


Figure 1-11. Maximum Month Dry Weather Flow, 1998 to 2004

Peak Flows. The peak flows of interest are the PDF, PWF, and PHF. PDF is estimated as the flow associated with the 1-in-5 year, 24-hour storm event. For Newberg, this storm event has been estimated as 3.0 inches of rainfall (Information provided by the National Weather Service Office of Hydrologic Development). However, it is also important to ensure that the appropriate period is selected such that representative antecedent rainfall conditions occurred. That is, the groundwater level should be high and there should be several days of significant rainfall prior to the 1-in-5 year, 24-hour storm event to ensure soil saturation. Only past storm events with probable high groundwater conditions and several days of rainfall preceding the storm were considered to ensure an accurate estimate of high flow events. Table 1-23 lists the storm events considered in estimating peak day flow. Figure 1-12 indicates that a first-order regression line through these points reflects a peak day flow of 11.1 mgd.

Table 1-23. Storm Events, 2003-2004

Event date	Rainfall, inches	Flow, mgd
1/4/2003	0.31	5.316
1/12/2003	0.46	4.919
1/13/2003	0.31	4.422
1/26/2003	0.47	4.726
1/31/2003	2.17	8.871
2/17/2003	1.52	6.850
3/7/2003	1.27	7.793
3/9/2003	0.74	5.907
3/21/2003	0.77	7.602
4/11/2003	0.27	6.531
4/12/2003	0.92	6.401
4/20/2003	0.25	3.670
4/23/2003	0.89	5.354
1/29/2004	0.67	8.476
1/30/2004	0.52	6.877
2/6/2004	0.20	3.738
2/17/2004	0.45	5.540
2/29/2004	0.42	5.081
3/3/2004	0.23	3.907

Note: Dates listed correspond to the date of the rainfall. Flow values listed correspond to the flow recorded on the following day at the WWTP, which more closely represents the peak flow generated by the storm event.

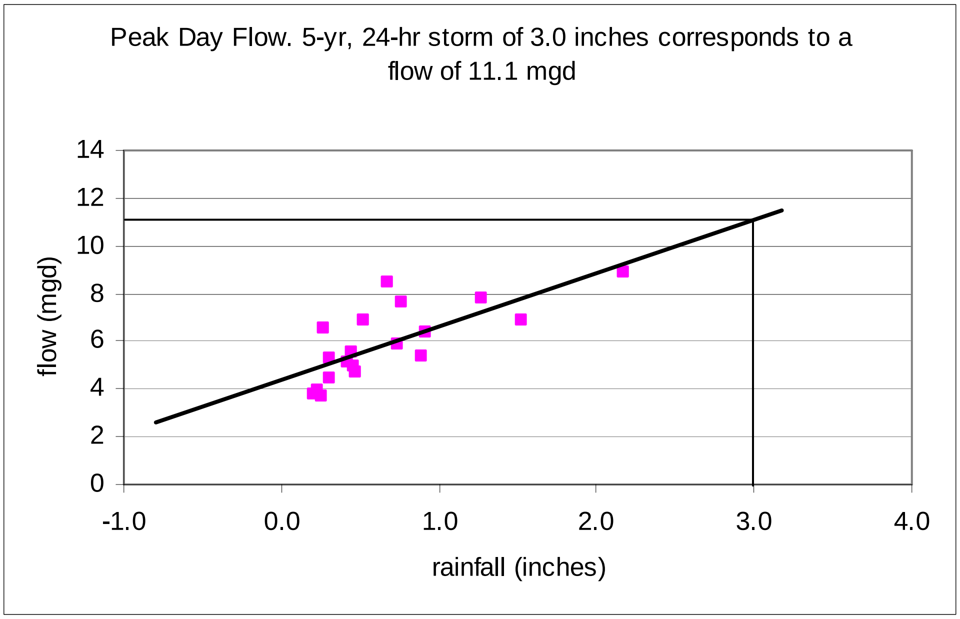


Figure 1-12. PDF, 2003 to 2004

DEQ suggests using probability methods to estimate other peak flows. From the above analysis of rainfall and historical flow data, three flow rates and their associated recurrence probability are known: AAF, MMWWF, and PDF. AAF has a recurrence probability of 50 percent. Assuming that the wet weather flows of interest all occur during a year with 1-in-5 year recurrence probability rainfall, the MMWWF has a recurrence probability of 1 month in 12 months, or 8.33 percent. Similarly, the PDF has a recurrence probability of 1 day in 365 days, or 0.27 percent. As predicted in the DEQ flow calculation guidelines, plotting these three points on log-probability scales approximates a straight line, as shown in Figure 1-13.

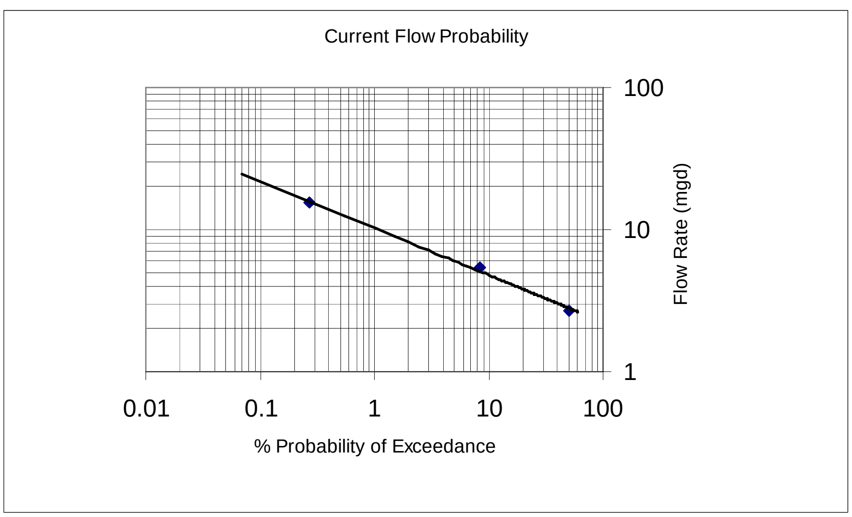


Figure 1-13. Current Flow Probability Analysis

Figure 1-13 can now be used to estimate PHF and PWF (indicated by three small diamonds on the figure). PHF is defined as the peak flow sustained for 1 hour. PHF has a recurrence probability of 1 hour in 8,760 hours (1 year), or 0.011 percent. Based on Figure 1-13, the current estimated PHF is about 26.9 mgd. The current actual capacity of the influent pumps, as indicated by plant staff, is 20 mgd.

PWF is estimated in the same manner as PHF. PWF has a recurrence probability of 1 week in 52 weeks (1.92 percent); this corresponds to a flow of about 6.9 mgd.

Current flows based on the period of record 1999 through 2004 for the Newberg WWTP are summarized in Table 1-24. The flows predicted by the DEQ methodology are less conservative than the flow calculations based on actual flows, except for PHF. The most conservative value for the flows will be used. These flow conditions should be updated after the Collection System Master Plan is completed that will provide a deeper understanding of the peak flows that can reach the plant.

Table 1-24. Current Wastewater Flow Comparison

Description	Estimated flow, mgd (DEQ method)	Flow, mgd[1]
ADWF	--	1.81
AAF	2.1	2.72
AWWF	--	3.76
MMDWF	--	2.95
MMWWF	5.4	6.18
MMWWF[2]	6	6.18
PWF	6.9	8.84
PDF	11.1	14.94
PHF	26.9	20

[1]Using most conservative value
[2]2-year peak wet weather month

The City's Sewerage Master Plan Update (SMPU) June 2007, projects current peak flows to be 17.6 mgd based on the 5-year storm event. The SMPU's projected peak flow is in alignment with the peak flow the plant has reported to date.

1.7 FLOW AND LOAD PROJECTIONS

To develop flow and load projections, unit design values are established based on current flows and loads and current population. These values are then used in conjunction with the future design population to develop flow and load projections. The median growth population estimates will be used for projecting flows from 2005 to 2025. The City desired that a range of low to high growth be used to project the 2040 flows to show the impact of the different population growth rates.

1.7.1 Unit Design Values

The current per capita flows and loads are summarized in Table 1-25. These unit design values will be used to projecting future flows and loads. The ADWF flow value of 98 gcd is near the typical range expected for wastewater flow rates (100 gcd); therefore 98 gcd will be used in future projections. The AAF per capita value is 148 gcd, which is 50 percent higher than the dry weather flow. The average $CBOD_5$ unit value of 0.14 pcd and the average TSS rate of 0.21 pcd are within the expected design value range. Design values are typically in the range of 0.13 to 0.25 gcd. The actual per capita values based on the period of record will be used to calculate the future loading conditions.

Table 1-25. Per Capita Flows and Loads

Parameter	Per capita value	Peaking factor
Flows, gcd		
AAF	148	1.51
ADWF	98	1.0
AWWF	205	2.09
MMDWF	170	1.7
MMWWF	356	3.63
PWF	484	4.94
PDF	765	7.81
PHF	1,005	10.05
Loads, pcd		
Average $CBOD_5$ load	0.14	-
Maximum month $CBOD_5$ load	0.24	-
Peak week $CBOD_5$ load[1]	0.41	-
Average TSS load	0.21	-
Maximum month TSS load	0.36	-
Peak week, TSS load[1]	0.49	-

[1]Loading values for peak week are maximum values with created data. See footnote to Table 1-23.

1.7.2 Projected Wastewater Flows

Based on a breakdown of land use types, wastewater comes primarily from residential sources, commercial sources, and schools. Commercial sources and schools are expected to grow at approximately the same rate as the overall population. Therefore, the projections for the three sources can be combined into one projection based on population growth. The projected population is multiplied by the unit per capita design to get the ADWF. For example, applying the unit design value of 98 gcd to the design population of 38,352 in 2025 yields a projected ADWF of 3.76 mgd. The projected flows for the other conditions are determined by multiplying their associated peaking factors listed in Table 1-25 by the ADWF for that year. These projected flows are summarized in Table 1-26.

Table 1-26. Monthly Flow Projections from 2005 to 2025

Year	2005	2010	2015	2020	2025	Peaking factor
Population	21,132	24,497	28,712	33,683	38,352	
ADWF	2.07	2.40	2.81	3.30	3.76	1
AAF	3.11	3.61	4.23	4.96	5.65	1.5
AWWF	4.33	5.02	5.88	6.90	7.86	2.09
MMDWF	3.52	4.08	4.78	5.61	6.39	1.7
MMWWF	7.52	8.71	10.21	11.98	13.64	3.63
PWF	10.23	11.86	13.90	16.31	18.57	4.94
PDF	16.17	18.75	21.98	25.78	29.35	7.81
PHF[1]	20.81	23.65	27.15	31.19	34.77	10.05

[1]PHF peaking factor (varies) decreases with time (0.2 mgd subtracted for every 5 years of population growth).

Typically, as the population increases, the peak hour and day peaking factors decrease. What this implies is that although the ADWF rate will increase as the population increases, the flow rate from the peak I/I events (during large rain events) will stay more constant. The current amount of I/I at the peak day flow is approximately 13 mgd. This is considered high for a town the size of Newberg. As the city develops, typically the new infrastructure will allow proportionally less I/I as new technology and construction methods are able to decrease I/I in new construction. Also, as the City continues to upgrade and replace its old infrastructure, it is expected that these improvements would decrease the amount of I/I caused by the current infrastructure. Therefore the peaking factor of 10.05 (the smaller value resulting from the two methods of calculations in Table 1-26) will be used for PHF projections starting with 2005. For subsequent years, 2010, 2015, 2020, and 2025, 0.25 mgd will be subtracted from the PHF for every 5-year period to account for the decrease in peaking factors as the population increases.

The projected flows for 2040 were determined in a similar manner. The flow rates for 2040 are calculated for a range of expected population projections, as are summarized in Table 1-27. The projected flows are summarized in Figure 1-14.

Table 1-27. Flow Projections for 2040

	Low growth estimate	Median growth estimate	High growth estimate	Peaking factor
Population	44,505	54,097	79,701	
ADWF	4.36	5.30	7.81	1
AAF	6.55	7.97	11.74	1.5
AWWF	9.12	11.08	16.32	2.09
MMDWF	7.41	9.01	13.28	1.7
MMWWF	15.83	19.24	28.35	3.63
PWF		26.19		4.94
PDF		41.40		7.81
PHF[1]		45.86		10.05

[1]PHF peaking factor (varies) decreases with time (0.2 mgd subtracted for every 5 years of population growth).

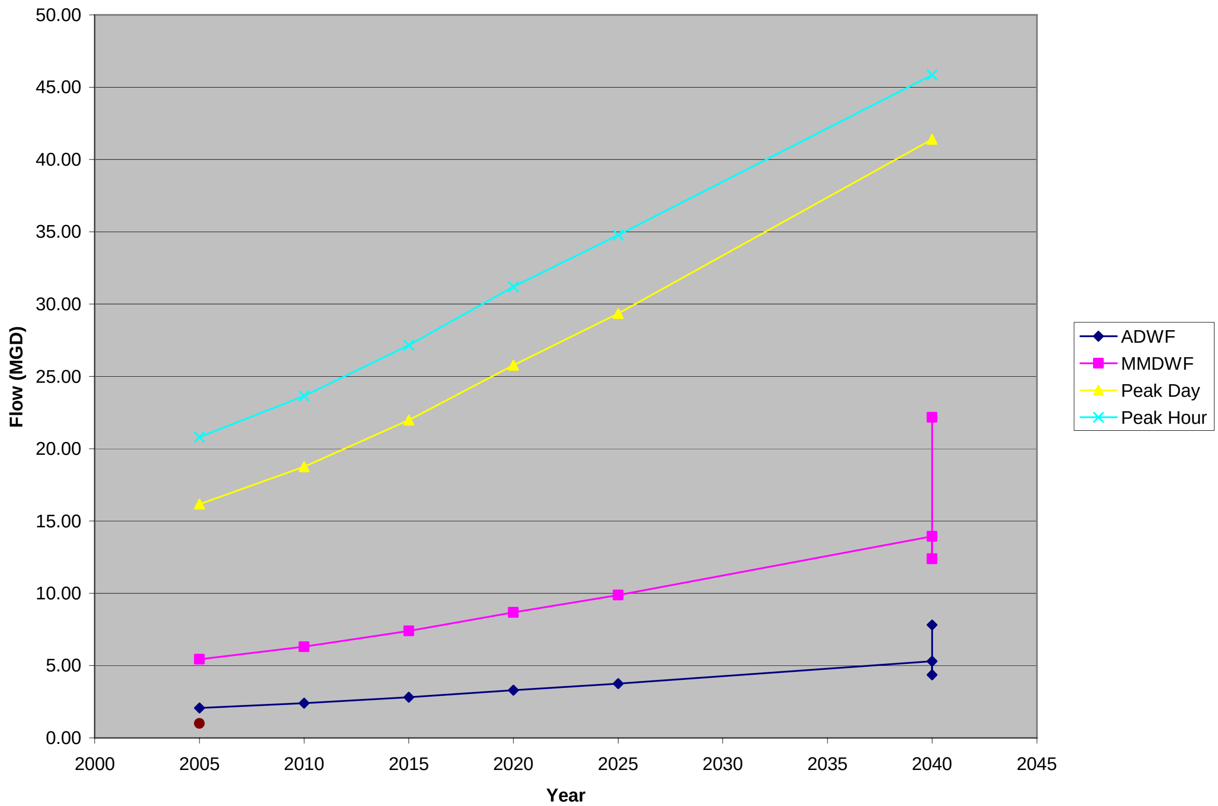


Figure 1-14. Projected Flows

A comparison of the projected flows based on historical data averaging to arrive at peaking factors versus the flow projections based on DEQ methodology is discussed below. To determine flows by DEQ methodology, a probability exceedance curve is developed from the average and peak day flows, as shown in Figure 1-15. This technique is similar to that used previously to develop the current peak flows. Peak month, week, and hour flows are determined based on the fraction of the year that these periods represent. Generally, these points fall in a straight line, assuming no limitations to the collection system. These points are indicated in Figure 1-15. The corresponding flows are listed in Table 1-28.

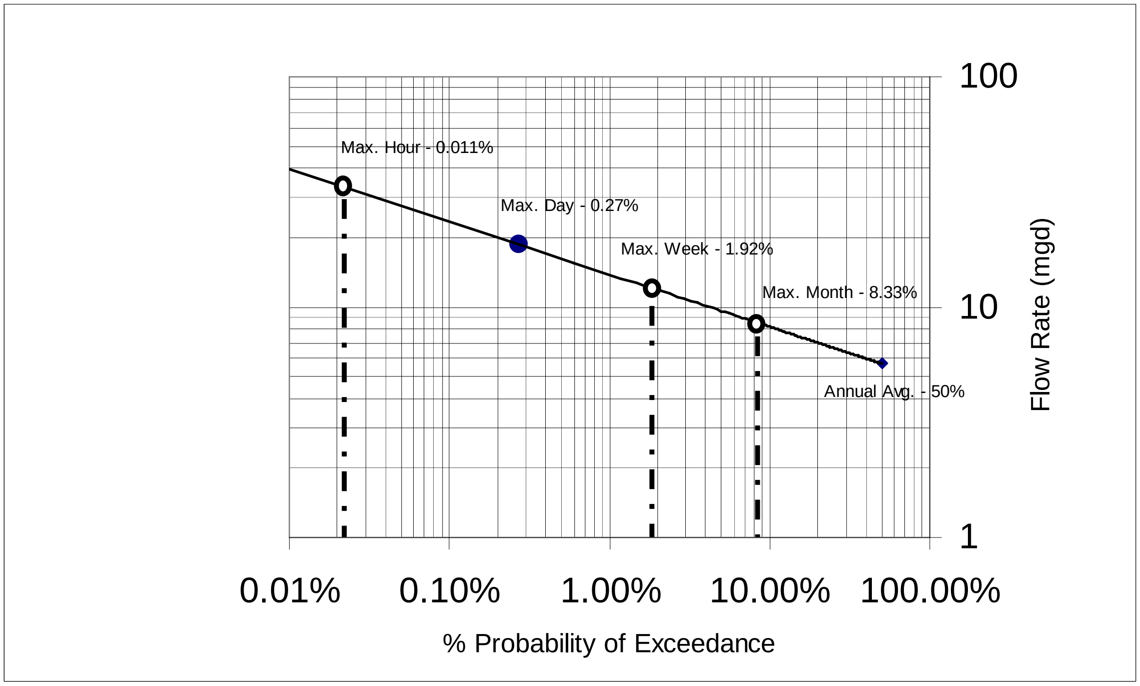


Figure 1-15. Future Peak Flow Projection

Table 1-28. Future Peak (2025) Flows

Flows	Percent probability of exceedance	Flow, mgd (DEQ method)	Flow, mgd (traditional method)
ADWF		--	3.76
AAF	50	5.68	5.65
MMWWF	8.33	8.56	13.64
2-year MMWWF	4	10.12	13.64
PWF	1.92	11.97	18.57
PDF	0.27	18.74	29.35
PHF	0.011	38.95	34.77

The recommended flows for design are derived by the traditional method, which results in comparable or more conservative values for the design flows (except for PHF). For example, Table 1-29 presents the traditional method result of 13.64 mgd for MMWWF, whereas the DEQ method results in 8.56 mgd. Table 1-29 presents flow projections for 2005 to 2025, and for 2040 using the traditional method. Table 1-30 presents the flow projections for 2040 with low, median, and high population estimates using the traditional method. Peak flows associated with the median growth rate will be used for all the growth assumptions in 2040.

Due to inherent limitations in the collection system, a smaller peaking factor is expected for future PHFs as population increases. Peak flow predictions should be refined with the upcoming collection system master planning information that will take into account the collection system capacity to deliver peak flows to the plant.

The recommended flow projections for 2005 through 2040 based on median projected growth rates are summarized in Table 1-29 and Figure 1-16.

Table 1-29. Incremental Flow Projections

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
ADWF	2.07	2.40	2.81	3.30	3.76	5.30
AAF	3.11	3.61	4.23	4.96	5.65	7.97
AWWF	4.33	5.02	5.88	6.90	7.86	11.08
MMDWF	3.52	4.08	4.78	5.61	6.39	9.01
MMWWF	7.52	8.71	10.21	11.98	13.64	19.24
PWF	10.23	11.86	13.90	16.31	18.57	26.19
PDF	16.17	18.75	21.98	25.78	29.35	41.40
PHF	20.81	23.65	27.15	31.19	34.77	45.86

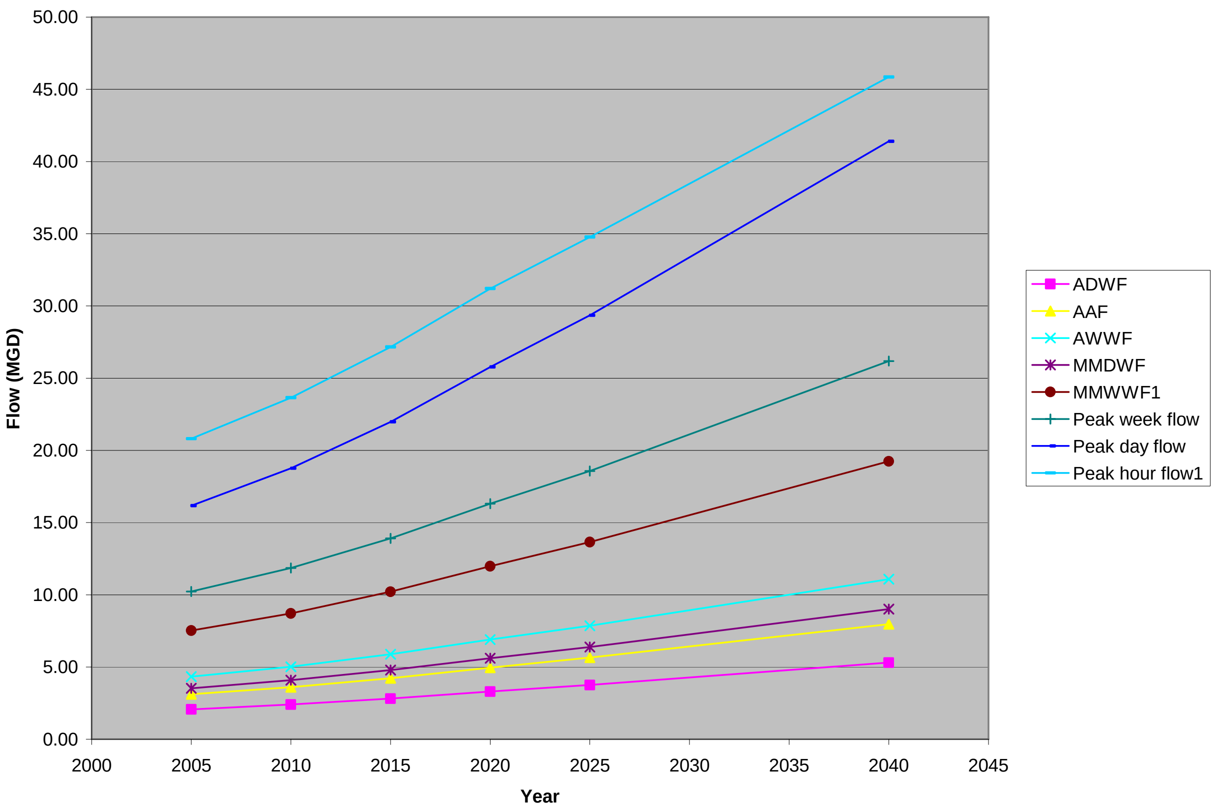


Figure 1-16. Recommended Flow Projections

The range of MMDWF for 2040 varies from 11.5 mgd for low growth to 20.5 mgd for high growth.

Table 1-30. Flow Projections for 2040

	Low growth estimate	Median growth estimate	High growth estimate	Peaking factor
Population	44,505	54,097	79,701	
ADWF	4.36	5.30	7.81	1
AAF	6.55	7.97	11.74	1.5
AWWF	9.12	11.08	16.32	2.09
MMDWF	7.41	9.01	13.28	1.7
MMWWF	15.83	19.24	28.35	3.63
PWF		26.19		4.94
PDF		41.40		7.81
PHF		45.86		10.05

1.7.3 Projected Wastewater Loads

Wastewater load projections are developed by applying the unit design values to the design population. The loads are assumed to increase in proportion to population. The design loads for 2005 to 2025 are presented in Table 1-31.

Table 1-31. Load Projections from 2005 to 2025

	2005	2010	2015	2020	2025
$CBOD_5$, ppd					
Minimum	2,080	2,411	2,826	3,315	3,774
Maximum	5,034	5,836	6,840	8,025	9,137
Average	2,862	3,318	3,888	4,562	5,194
Winter maximum	5,034	5,836	6,840	8,025	9,137
Summer maximum	4,173	4,838	5,670	6,652	7,574
TSS, ppd					
Minimum	3,705	4,295	5,034	5,906	6,725
Maximum	7,603	8,814	10,330	12,119	13,799
Average	4,423	5,128	6,010	7,050	8,028
Winter maximum	7,603	8,814	10,330	12,119	13,799
Summer maximum	6,929	8,032	9,414	11,044	12,575

Table 1-32 lists load projections for 2040.

Table 1-32. Load Projections for 2040

ppd	Low growth estimate	Median growth estimate	High growth estimate
Average $CBOD_5$ load	6,027	7,326	10,794
Maximum month $CBOD_5$ load	10,603	12,888	18,988
Peak week $CBOD_5$ load[1]	18,447	22,423	33,036
Average TSS load	9,316	11,323	16,683
Maximum month TSS load	16,013	19,464	28,676
Peak week TSS load[1]	21,912	26,635	39,241

[1]Per capita values for peak week are maximum values with created data (see footnotes in Table 1-23).

The projections for influent ammonia will be based on current influent concentrations. An average monthly influent ammonia concentration of 15.9 mg/L and a maximum monthly influent concentration of 25.4 mg/L will be used. Ammonia concentration in average domestic wastewater is typically about 25 mg/L.

1.8 BIOSOLIDS CHARACTERISTICS

The biosolids characteristics at the Newberg WWTP are discussed below.

1.8.1 Historical Biosolids Information

The City produced approximately 545 metric dry tons of composted biosolids in 2004 as listed in Table 1-33.

Table 1-33. Total Annual Production

Parameter	Million gallons	Dry tons
Amount generated	12.23	545.1
Amount composted	12.23	545.1

The City conducts quarterly chemical tests of the composted sludge, including analyses of nutrients and metals, and pathogens (Tables 1-34 and 1-35). Based on the analyses, there are no known potential impacts from the compost distribution program.

Table 1-34. Biosolids Data

Parameter	mg/dry kg	§503.13 Table 3 limit	Parameter	mg/dry kg	§503.13 Table 3 limit
Arsenic	5.7	41 mg/kg	Molybdenum	3.2	No limit
Cadmium	1.5	39 mg/kg	Nickel	13.7	420 mg/kg
Chromium	15.6	No limit	Selenium	4.4	100 mg/kg
Copper	150	1,500 mg/kg	Silver	8.92	No limit
Lead	21.2	300 mg/kg	Zinc	442	2,800 mg/kg
Mercury	0.77	17 mg/kg			

Table 1-35. Pathogen Analyses

Date	March 2004	June 2004	September 2004	December 2004	Average
Salmonella	<3/4 gram (g)	<3/4g	<3/4g	<3/4g	<3/4g
Fecal coliform	----	----	----	----	----

Note: results reported as colonies per grams of sample. June and December analyses done on three separate samples (all reported as <3/4g).
Laboratory: Alexin Analytical Laboratories, Tigard, Oregon

1.9 BASIS FOR COST ESTIMATES

To make a valid comparison among alternatives, a present worth analysis is needed in order to incorporate both capital and annual costs in the evaluation. In developing costs for the present worth analysis, many assumptions must be made to compensate for the lack of detail available during the facilities planning process. The analysis techniques and assumptions made are described below.

1.9.1 Present Worth Analysis

In a present worth analysis, annual costs over the economic life of the alternative are brought from the future back to the present and are discounted by an annual percentage rate called the discount rate. Once the annual costs are brought to the present as a single sum, they can be added to the capital cost to derive the total present worth. For this analysis, a discount rate of 4 percent is assumed for the comparative analysis. The analysis period, or economic life, is assumed to be 20 years. Salvage values, or the value at the end of the 20-year study period, are not considered in this analysis.

1.9.2 Precision of Cost Estimates

The precision of a cost estimate is a function of the detail to which alternatives are developed and the techniques used in preparing the actual estimate. The American Association of Cost Engineers divides estimates into three basic categories:

1. *Order-of-Magnitude Estimate.* An order-of-magnitude estimate is made without detailed engineering data. Techniques such as cost-capacity curves, scale-up or scale-down factors, and ratios are used in developing this type of estimate. This type of estimate is normally accurate within +50 percent or -30 percent. That is, the final cost may be as much as 50 percent more or 30 percent less than the estimated amount. A relatively large contingency is normally included to reduce the probability of underestimating.

2. *Budget Estimate.* This estimate is prepared using process flow sheets, layouts, and equipment details. An estimate of this type is usually accurate within +30 percent and -15 percent.

3. *Definitive Estimate.* As the name implies, this estimate is prepared from well-defined engineering data, including construction plans and specifications. At a minimum, the data would include comprehensive plot plans and elevations, piping and instrument diagrams, electrical diagrams, equipment data sheets and quotations, structural drawings, soil data and drawings, and a complete set of specifications. The definitive estimate is expected to be accurate within +15 percent and -5 percent.

The estimates presented in this document are order-of-magnitude estimates because the design has not been developed in sufficient detail for a more precise estimate. Although the final project cost may vary significantly from these estimates, the estimates are useful in evaluating alternatives because they are fairly accurate relative to each other.

1.9.3 Basis for Costs over Time

Future changes in the costs of material, labor, and equipment will cause comparable changes in the costs presented in this analysis. However, because the relative economy of the alternatives are expected to change only slightly with overall economic changes, the decisions based on the economic evaluation should remain valid.

Costs can be expected to undergo long-term changes in keeping with corresponding changes in the national economy.

The cost of steel and concrete has increased significantly in the last year and this trend is continuing due to the natural disasters that occurred in 2005. Construction costs are expected to increase by as much as 10 percent per year in the next 2 years.

1.9.4 Construction Costs

Construction costs include a 35 percent contingency.

1.9.5 Engineering and Administrative Costs and Contingencies

The cost of engineering services for major projects typically covers special investigations, a predesign report, surveying, foundation exploration, preparation of contract drawings and specifications, construction management, start-up services, preparation of O&M manuals, and performance certifications. Depending on the size and type of project, engineering costs may range from 15 to 25 percent of the construction contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small, complicated projects and projects that involve extensive remodeling of existing plants.

The City has its own administrative costs associated with any major construction project. These include internal planning and budgeting, administration of engineering and construction contracts, legal services, and liaison with regulatory and funding agencies. For a typical project of this size, the City's administrative costs are assumed to be approximately 4 percent of the construction contract cost. The total cost for engineering and administration is assumed to be 25 percent. The costs associated with services during construction are assumed to be 12 percent.

1.10 SUPPORTING DOCUMENTATION

The following documents provided resources for this Facilities Plan update:

- *Sewer Master Plan*, KCM, June 1985
- *Wastewater Treatment Plant Construction Drawings*, KCM, 1987
- *Comprehensive Land Use Plan*, City of Newberg, January 2000
- *NPDES Permit and Permit Evaluation Sheet*, Oregon DEQ, June 2004
- *Reuse Water System Predesign Study*, CH2M HILL, October 2005
- *Dump Station and Headworks Study*, Brown and Caldwell, 2002
- *Headworks and Odor Control Design*, Brown and Caldwell, 2003
- WWTP process records and equipment records
- Others, as identified

1.11 SUMMARY OF PLANNING CRITERIA

The recommended planning criteria are summarized below.

1.11.1 Flows

Planning criteria related to flow rates are summarized in Table 1-36.

Table 1-36. Monthly Flow Projections from 2005 to 2040 Based on Median Growth Projections

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
ADWF	2.07	2.40	2.81	3.30	3.76	5.30
AAF	3.11	3.61	4.23	4.96	5.65	7.97
AWWF	4.33	5.02	5.88	6.90	7.86	11.08
MMDWF	3.52	4.08	4.78	5.61	6.39	9.01
MMWWF	7.52	8.71	10.21	11.98	13.64	19.24
PWF	10.23	11.86	13.90	16.31	18.57	26.19
PDF	16.17	18.75	21.98	25.78	29.35	41.40
PHF[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1]PHF peaking factor (varies) decreases with time (0.2 mgd subtracted for every 5 years of population growth).

The two flow condition scenarios, median and high growth for 2040 are listed in Table 1-37.

Table 1-37. Flow Condition Scenarios for 2040 Based on Median, and High Growth Projections

	Scenario 1: Median growth estimate	Scenario 2: High growth estimate
ADWF	5.30	7.81
AAF	7.97	11.74
AWWF	11.08	16.32
MMDWF	9.01	13.28
MMWWF	19.24	28.35
PWF	26.19	
PDF	41.40	
PHF	45.86	

The City has completed the SMPU and has verified the peak flows that the collection system will convey to the WWTP. The Facilities Plan Update calculation of current peak flows agrees with the SMPU current peak flows.

1.11.2 Loads

The design loads for 2005 to 2040 based on the median growth rate are summarized in Table 1-38.

Table 1-38. Load Projections from 2005 to 2040 Based on Median Population Growth

	2004	2005	2010	2015	2020	2025	2040
$CBOD_5$, ppd							
Minimum	[1]	2,080	2,411	2,826	3,315	3,774	
Maximum	[1]	5,034	5,836	6,840	8,025	9,137	12,888
Average	2,759	2,862	3,318	3,888	4,562	5,194	7,326
Winter maximum	[1]	5,034	5,836	6,840	8,025	9,137	
Summer maximum	[1]	4,173	4,838	5,670	6,652	7,574	
TSS, ppd							
Minimum	[1]	3,705	4,295	5,034	5,906	6,725	
Maximum	[1]	7,603	8,814	10,330	12,119	13,799	19,464
Average	3,915	4,423	5,128	6,010	7,050	8,028	11,323
Winter maximum	[1]	7,603	8,814	10,330	12,119	13,799	
Summer maximum	[1]	6,929	8,032	9,414	11,044	12,575	

[1]Existing data based on a running 7-day average. Daily minimums and maximums do not apply.

Table 1-39 summarizes the load projections for 2040 for the two scenarios.

Table 1-39. Load Projections for 2040 Based on Median and High Growth Projections

ppd	Scenario 1: Median growth estimate	Scenario 2: High growth estimate
Average $CBOD_5$ load	7,326	10,794
Maximum month $CBOD_5$ load	12,888	18,988
Peak week $CBOD_5$ load	22,423	33,036
Average TSS load	11,323	16,683
Maximum month TSS load	19,464	28,676
Peak week TSS load	26,635	39,241

The projections for influent ammonia will be an average monthly ammonia concentration of 15.9 mg/L and a maximum monthly concentration of 25.4 mg/L.

1.11.3 Regulatory Criteria

The important regulatory criteria that could influence the direction of the Facilities Plan are summarized below:

- Mass limits
- I/I removal
- 85 percent removal
- Nutrients
- TMDLs
- Mixing zone
- Redundancy and reliability
- Class A biosolids

Mass Limits. Allowable mass limits should reflect design flows at effluent concentrations of 10 mg/L $CBOD_5$ and 10 mg/L TSS (10/10). The Oregon Environmental Quality Commission (EQC) approval is required in order to increase mass loads due to increased flows. The Facilities Plan should preserve maximum flexibility by using an incremental approach for phased expansion to accommodate the need for more or less stringent requirements, triggered by water quality requirements.

The City may request new loads, if necessary, of the EQC. Environmental, economic decision-guiding criteria, and existing water quality management policies need to be addressed prior to requesting EQC approval.

I/I. Cost-effective I/I removal should be performed along with continued flow equalization. The City must demonstrate that I/I will be reduced to the cost-effective point based on EPA requirements. No plant capacity will be provided for excess I/I.

85 Percent Removal. The plant should not be required to achieve 85 percent removal of $CBOD_5$ and TSS at all times, as long as permitted effluent concentration limits are being met and I/I is being removed to the extent that is cost-effective.

Nutrient Removal. The need for nutrient removal should be driven by water quality. Nutrient removal will probably not be required initially, but the Facilities Plan describes the approach to be taken if nitrogen and/or phosphorus limits are imposed. The EPA is currently reviewing the need for nutrient removal requirements from WWTPs to protect the nation's waters. This is generally the first step in establishing standards for criteria in the future. Should the EPA promulgate nutrient removal requirements, DEQ would allow Oregon treatment facilities time to comply by incorporating compliance schedules into the next permit renewal following promulgation.

TMDLs. The Temperature TMDL for the Willamette River was adopted September 21, 2006. The current minimum excess thermal load (ETL) allocation for Newberg calculated for the past two summers is 47 million kilocalories per day. The actual ETL was calculated to be 27 in 2004 and 25 in 2005. Therefore, the effluent flows could double before an impact might be seen for allowable effluent flow and temperature combinations at the 7Q10 river flow. The City's effluent reuse program initially using 1 mgd of effluent will extend the time before thermal loads will need to be addressed. The City plans to implement additional effluent reuse to address thermal loads.

Mixing Zone. The capacity and dilution of the Newberg outfall (Treated Effluent Outfall 001) is evaluated in Section 3. The evaluation considers the ability of the outfall and mixing zone to meet future water quality criteria for trace contaminants, such as mercury and other heavy metals, ammonia and dissolved oxygen. Dechlorination is currently provided so that total residual chlorine is not a water quality issue.

Redundancy and Reliability. Class II reliability is appropriate for the Newberg WWTP.

Class A Biosolids. The City is planning to continue to produce Class A Biosolids since a market is developed for the Class A product.

1.11.4 Industrial Contribution

For this Facilities Plan effort, it is assumed that the proportion of industrial flows increases at the same proportion to domestic flows as currently seen.

CHAPTER 2
EVALUATION OF PLANT PERFORMANCE

2.1 PROJECT BACKGROUND

The Newberg Wastewater Treatment Plant (WWTP) is an activated sludge plant that uses the oxidation ditch process. Treated effluent and biosolids are the two products that the plant produces. Treatment plant effluent is discharged through an outfall to the Willamette River. Biosolids are composted to Class A and sold to the public. The plant was constructed in 1987, and the headworks were updated in 2003. The antiquated screen was replaced; screening compaction and redundancy were provided. Biosolids treatment and handling at the Newberg WWTP consists of belt filter press (BFP) dewatering prior to composting to produce a Class A biosolids product.

The WWTP is designed to treat municipal wastewater using the following sequence of unit processes, as shown in Figure 2-1.

- Influent pump station (IPS)
- Headworks screening
- Aerated grit tank
- Secondary treatment with two oxidation ditches and three secondary clarifiers
- Overflow basin
- Effluent disinfection with chlorine
- Effluent conveyance and discharge to the Willamette River
- Solids processing and handling systems: dewatering and composting
- WWTP support systems

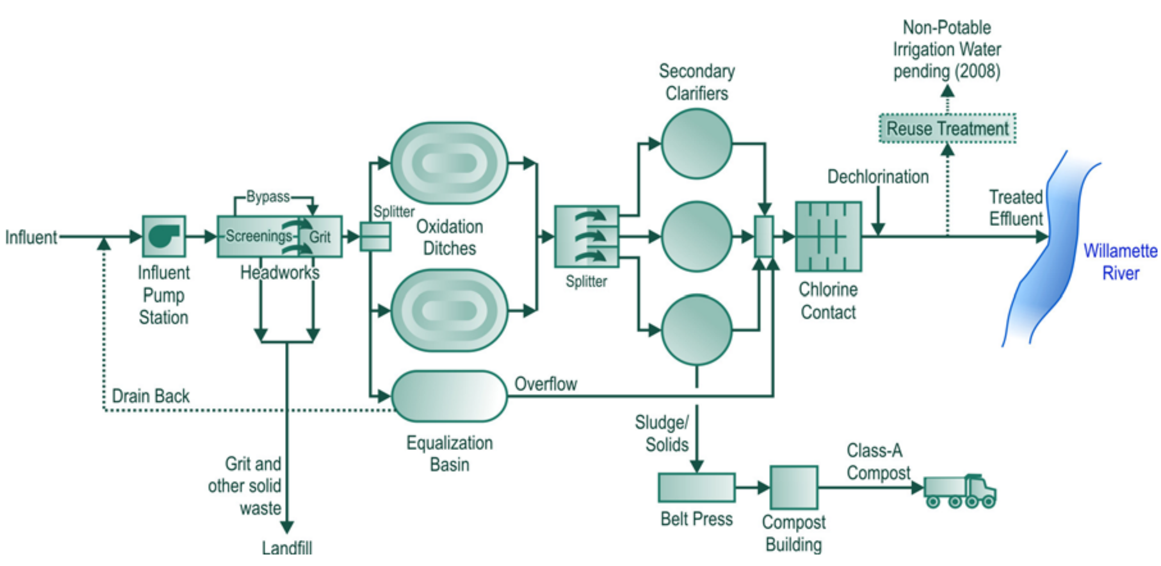


Figure 2-1. Newberg WWTP schematic

2.1.1 Liquid Treatment Performance

The design criteria for the existing Newberg WWTP are listed in Table 2-1. These are summarized from the Newberg Sewerage System Improvements, KCM, 1985. The design average dry weather flow (ADWF) is 4.0 million gallons per day (mgd) and the peak wet weather flow is 18 mgd.

Table 2-1. Existing Newberg WWTP Design Data Summary

Process or design criteria	Unit	Value
Influent flows and loads		
Flow rates		
ADWF	mgd	4.0
Maximum day dry weather flow (MDDWF)	mgd	6.0
Maximum day wet weather flow (MDWWF)	mgd	8.7
Peak (unequalized) wet weather flow (peak hour flow)	mgd	18.0
Biochemical oxygen demand (BOD) average day (AD)	pounds per day (ppd)	7,200
BOD maximum day (MD)	ppd	10,800
Total suspended solids (TSS) AD	ppd	5,000
TSS MD	ppd	7,500
Ammonia concentration	milligrams per liter (mg/L)	30
Effluent requirements		
Dry weather monthly average		
5-day carbonaceous BOD ($CBOD_5$)	mg/L	10
TSS	mg/L	10
Wet weather monthly average		
$CBOD_5$	mg/L	25
TSS	mg/L	30
Liquid unit process criteria		
Screen		
Mechanical		
Units	each	2
Type		Traveling plate screen
Capacity	mgd	27
Screen opening	millimeters (mm)	10
Motor	type	2-speed
Screenings washer/compactor		
Units	each	2
Capacity	cubic feet per hour	70
Type		Screw
Motor	horsepower (hp)	2
Estimated screenings production	cubic yards/mgd	.75
Screenings dumpster		
Capacity	cubic yards	10

Table 2-1. Existing Newberg WWTP Design Data Summary (continued)

Process or design criteria	Unit	Value
Grit tank		
Units	each	1
Size	feet	24 by 18
Depth	feet	12
Total volume	cubic feet	5,184
Detention time	minutes	14 at 4 mgd
Grit tank aeration equipment		
Rotary blower, unit	each	1
Capacity	cubic feet per minute	154
Motor, drive	hp	10, constant speed
Depth	feet	12
Grit pumps		
Units	each	2
Capacity	gallons per minute (gpm)	200
Motor, drive	hp	10, constant speed
Cyclone grit separator		
Units	each	2
Capacity	gpm	200
Inlet pressure	pounds per square inch (psi)	10
Underflow rate	gpm	15
Spiral classifier grit washer		
Capacity	tons per hour	0.5
Motor	hp	0.5
Oxidation ditches		
Total volume, each	million gallons (MG)	2
Total volume, each	cubic feet	267,000
Hydraulic retention time (HRT)	hours at mm flow	15 at 6.5 mgd
Solids retention time (SRT)	days (mm)	20 days summer, 25 days winter
Design, mixed liquor suspended solids (MLSS)	mg/L (mm)	2,000
Aeration equipment		
Surface aerators, each basin		
Units	each	4
Type		rotating brush
Capacity	pounds oxygen per hp per hour	2.0
Total connected hp per basin		200 (two-speed)
hp	each	50
Equalization basin		
Total volume	mgd	1.3
Maximum return rate	mgd	2
Equalization basin aeration and mixing pumps	type	jet aeration
Units	each	2
Motor	hp	7.5

Table 2-1. Existing Newberg WWTP Design Data Summary (continued)

Process or design criteria	Unit	Value
Secondary clarifiers		
Units	each	3
Size	diameter, feet	80
Sidewater depth	feet	15
Total surface area, each	square feet	15,020
2 mgd/clarifier	gallons per square foot per day (gsfd)	400
4 mgd/clarifier	gsfd	800
6 mgd/clarifier	gsfd	1,200
8 mgd/clarifier	gsfd	1,600
Return activated sludge (RAS) pumps		
Units	each	4
Capacity, each	gpm	2,800
Motor	hp	40
Maximum RAS rate	mgd	8
Waste activated sludge (WAS) pumps		
Units	each	3
Capacity, each	gpm	300
Drive	type	variable
Motor	hp	7.5
Chlorine contact basin volume		
Units	each	2
Chlorine contact basin volume, total	gallons	269,000
Detention time at 6.5 mgd	minutes	60
Detention time at 4 mgd	minutes	97
Detention time at 12 mgd	minutes	32
Chlorinators		
Units	each	2
Capacity, each	ppd	500
Container size	pounds	2,000
Dechlorination		
Storage tank	gallons	300
Dechlorination pumps		
Units	each	2
Capacity, each	gallons per hour	0.58
Maximum head	psi	250
Outfall		
Diameter	inches	24
Number of ports	each	1

2.1.2 Liquid Stream Performance

Permitted effluent limitations, as discussed in Chapter 1, are for $CBOD_5$ and TSS and vary based on the season. These effluent limitations are summarized in Table 2-2. The permit also limits on the total pounds of $CBOD_5$ and TSS that can be discharged to the Willamette River. See Tables 1-2 and 1-3 in Chapter 1.

Table 2-2. Summary of Effluent $CBOD_5$ and TSS Effluent Concentrations

Parameter	May 1 to October 31		November 1 to April 30	
	Monthly, mg/L	Weekly, mg/L	Monthly, mg/L	Weekly, mg/L
$CBOD_5$	25	40	10	15
TSS	30	45	10	15

There are currently no effluent limits for ammonia, nitrogen, or phosphorus; however the City of Newberg (City) is required by its permit to monitor these constituents as well as metals and priority pollutants on a regular schedule.

2.1.3 Historical Plant Performance

$CBOD_5$ and TSS. Figure 2-2 shows that the average monthly effluent concentration for both TSS and $CBOD_5$ is around 2 to 4 mg/L for the period of record (2000 to 2004), which is well below the allowable effluent concentrations of 10 mg/L in the dry weather summer months. As noted on the graph, the concentrations above 4 mg/L that occurred in January 2004 were still well below the allowable wet weather limit of 30 mg/L TSS.

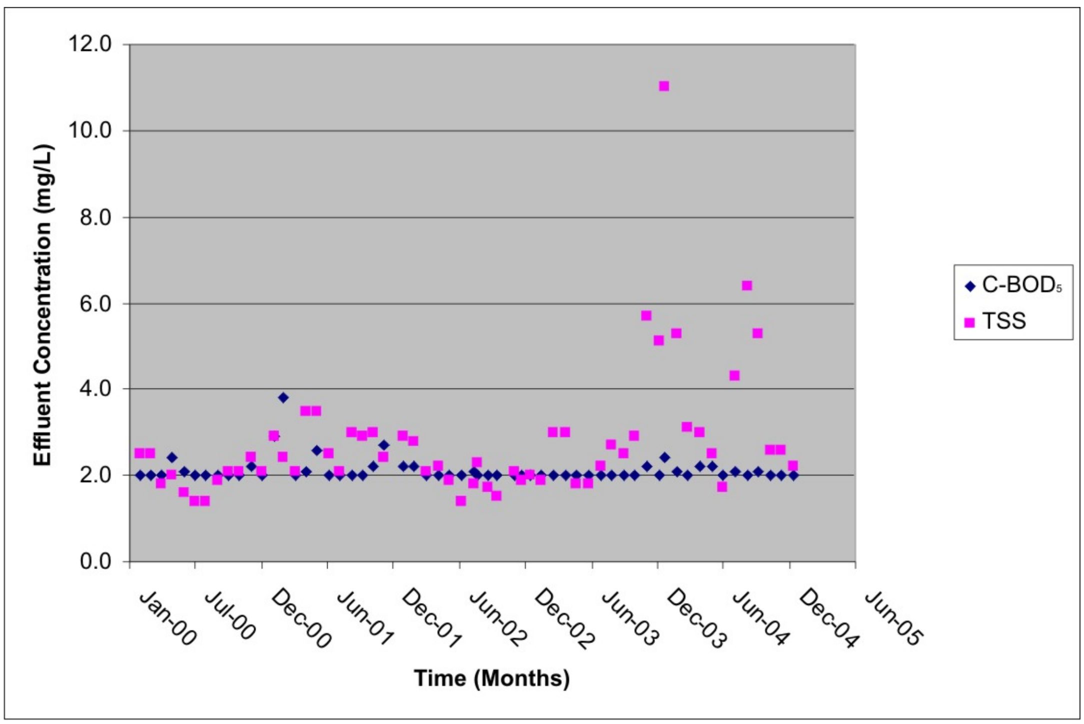


Figure 2-2. Effluent $CBOD_5$ and TSS Concentration

Figure 2-3 shows a similar result for the total ppd in the effluent. The maximum allowable ppd of 3,200 TSS and 2,700 $CBOD_5$ were not exceeded because of the low concentration in the effluent. What should be noted is that although the effluent averages meet the National Pollutant Discharge

Elimination System (NPDES) permit requirements, the WWTP is allowed to exclude data from flows that exceed 8.0 mgd from the daily mass load limit calculation. The reason for this is that the Oregon Department of Environmental Quality (DEQ) understands that the Newberg WWTP is heavily influenced by rainwater infiltration.

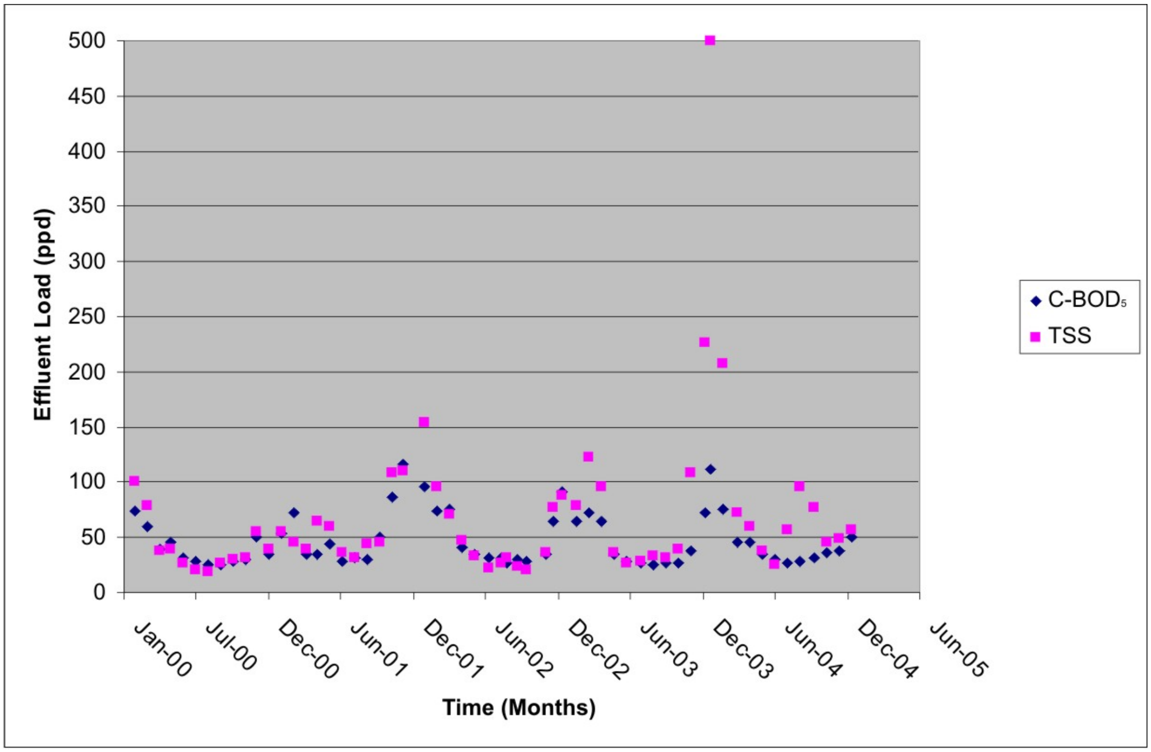


Figure 2-3. Average Daily Effluent $CBOD_5$ and TSS Loading

Ammonia. Ammonia concentration in average domestic wastewater is typically about 25 mg/L. Figure 2-4 shows the average monthly ammonia influent and effluent concentrations at the Newberg WWTP for the period of record 2000 through 2004. The average monthly influent ammonia concentration in the Newberg WWTP is 15.9 mg/L, while the average monthly ammonia effluent concentration is 0.3 mg/L; the last 4 years had only two average monthly values exceeding 0.32 mg/L. This illustrates that the Newberg WWTP is effectively nitrifying and currently reducing ammonia the majority of the time. There is no ammonia limit in the discharge permit, as the WWTP discharge does not have the potential for ammonia toxicity to fish.

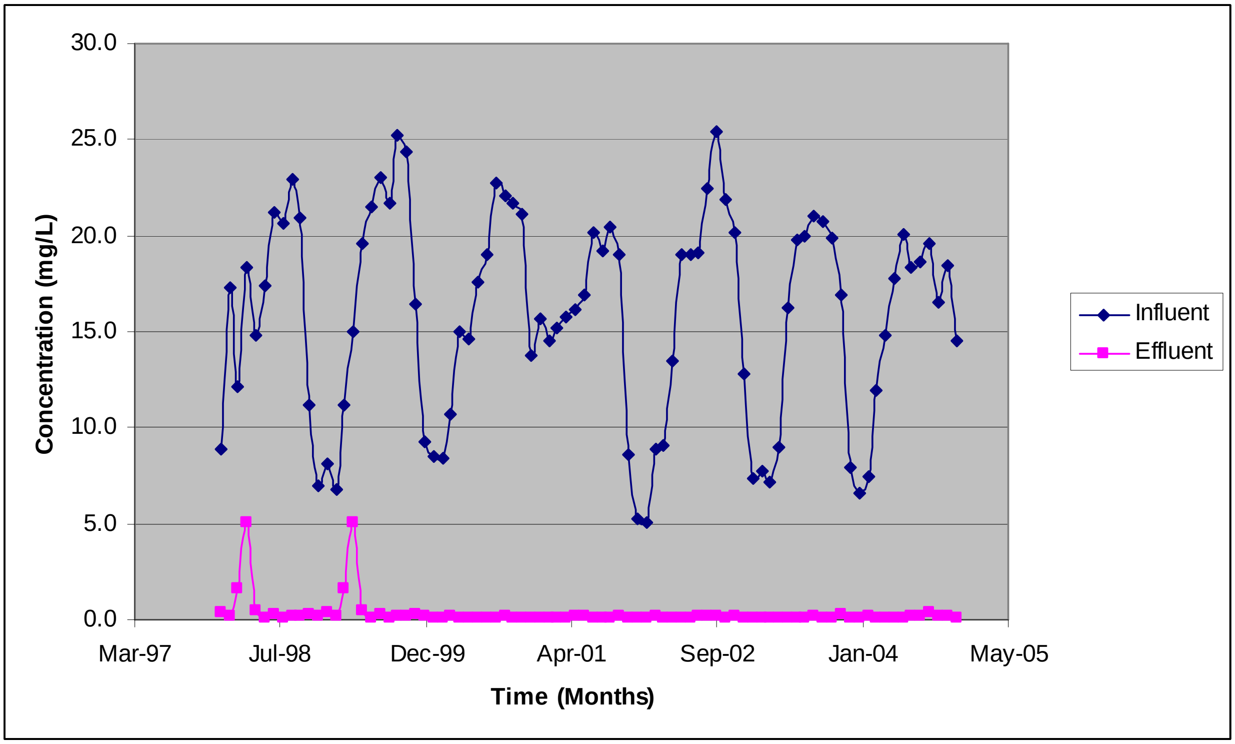


Figure 2-4. Average Monthly Ammonia Concentrations

Total Nitrogen, Nitrite, Nitrate, and Organic Nitrogen. The summer of 2004 was the first time that the effluent total Kjeldahl nitrogen (TKN), nitrite, and nitrate were measured at the Newberg WWTP. TKN is the sum of ammonia nitrogen and organic nitrogen. Organic nitrogen is not as readily oxidized as ammonia nitrogen, so therefore tends to travel through a WWTP unchanged. The average effluent TKN was 1.5 mg/L over the 4-month period.

These parameters were measured for 4 months. The data indicate that the influent ammonia is being oxidized (nitrification) to nitrite and nitrate in the effluent, since the effluent nitrite and nitrate values are approximately equal to the influent ammonia values. This indicates that denitrification is not occurring effectively.

Chlorine Residual. The NPDES permit regulates the total allowable chlorine residual to be discharged into the Willamette River since high chlorine residual is toxic to aquatic life. Figure 2-5 shows the monthly average chlorine residual over the period of record. The NPDES permit allows for a maximum monthly average chlorine residual of 0.02 mg/L. However, the permit adds a note that states that daily maximum concentrations below 0.10 mg/L is considered within compliance. The monthly average data indicate that the City has been operating within its permit limits.

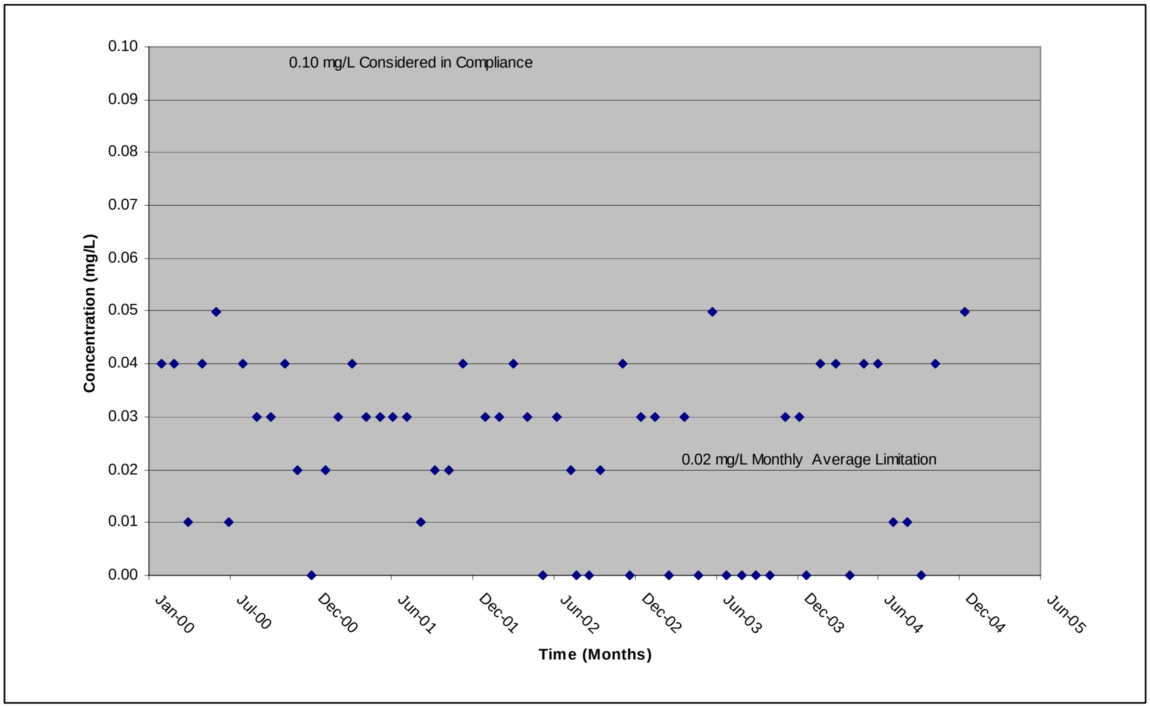


Figure 2-5. Average Monthly Chlorine Residual

E. coli **Bacteria.** *E. coli* is used as an indicator organism to determine how well disinfection is being performed at the WWTP. The NPDES permit regulates the total allowable number of organisms that can be discharged per 100 milliliters (mL) of treated wastewater. The limit is 126 organisms per 100 mL. If the sample exceeds 126 organisms per 100 mL, then additional sampling is required to show compliance. Figure 2-6 shows the average monthly concentration of *E. coli*. The WWTP did have several individual grab samples that exceeded the maximum limit; however, following samples were within the acceptable ranges so no violation was triggered.

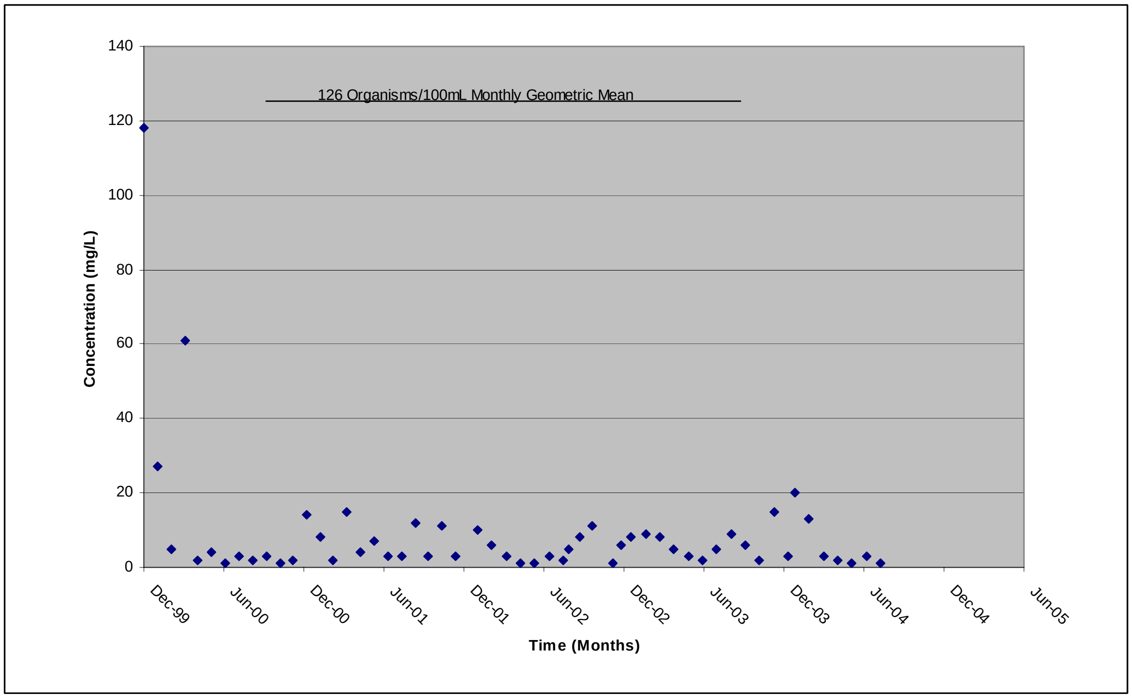


Figure 2-6. Average Monthly *E. coli* Concentration

2.2 LIQUID PROCESS PERFORMANCE EVALUATION

The following section evaluates the existing treatment processes in terms of their capacity limitations. The only concerns about performance at this time are capacity issues. The main capacity concern relates to the high peak flows experienced at the Newberg WWTP. When the WWTP receives peak flows over 18 mgd, the flow is pumped through the screens to the oxidation ditch distribution box and the flow in excess of 18 mgd overflows to the equalization basin. Flows over 18 mgd are stored in the equalization basin until the influent flows decrease. Flows greater than the storage capacity overflow to the disinfection process. The equalization basin is drained back to the IPS. It should be noted that observations in January 2006 indicate that the diversion to the equalization basin begins at approximately 15 mgd, not the design condition of 18 mgd. The peak wet weather flows overflow and blend with secondary effluent for disinfection. It is ineffective at containing all the wet weather storm flows.

2.2.1 IPS

The IPS is an essential component of the WWTP. It pumps the wastewater approximately 100 feet between the lowest point in the collection system up to the headworks that provides screenings and grit removal.

The pump station is currently under capacity. It cannot convey peak flows when one unit is out of service. Typical high influent flow events could cause permit violations, and there are safety concerns with the existing pump station wet well. The wet well is inefficient and causes frequent problems from rags and debris clogging the pump impellers, which decreases the pumping capacity and requires frequent cleaning. In addition, grit from the City's sewerage system and from the WWTP internal plant drains cause severe wear on the pumps, decreasing pumping capacity.

The IPS should be sized to accommodate the peak hour flow (PHF) requirements with the largest unit out of service. It is critical that the IPS be able to handle the capacity hydraulically to keep the influent flow from backing up in the collection system. There is no designed pump station overflow. The existing IPS is sized to handle a peak flow of 27 mgd with all units in service. However, based on City correspondence dated January 12, 2006, the actual maximum pumping rate seen at the IPS is 21 mgd with all units in service. The decreased capacity of the pump station is believed to be caused by the wear and age of the pumps and problems with the design of the pump station that accumulates rags and grit that clog the pumps.

After repair of the influent pumps, the peak flow capacity was seen to increase to 23 mgd with all units in service. This would theoretically equate to 18 mgd with the largest unit out of service. This does not meet the Oregon Standards for Design and Construction of Wastewater Pump Stations (May 2001) that requires the pumping capacity to deliver the rated flow with the largest unit out of service. For current flow conditions, this pump station needs to be able to handle 17.6 mgd (from the Sewerage Master Plan Update, June 2007) with the largest unit out of service. Figure 2-7 shows the current capacity versus future flows and population. The pump station expansion would have to meet the Oregon Standards for Design and Construction of Wastewater Pump Stations.

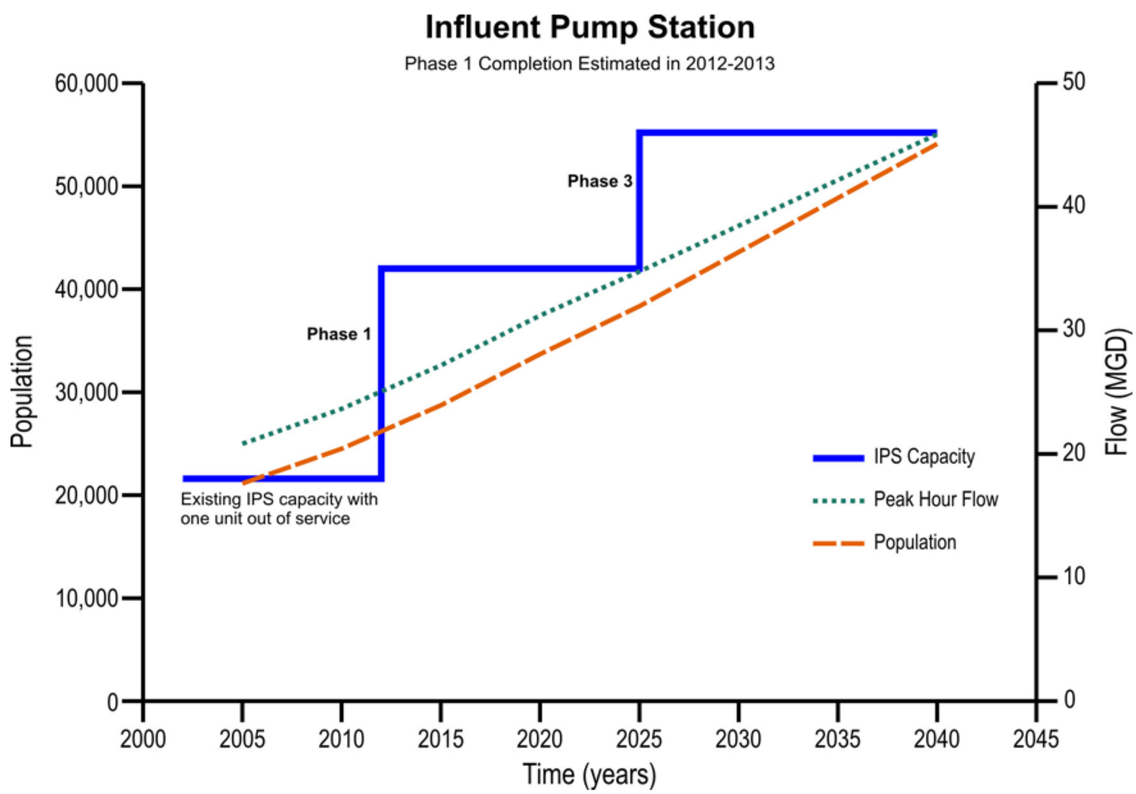


Figure 2-7. IPS Capacity Chart

2.2.2 Headworks

The headworks is sized to accommodate the PHF requirements. It is critical that the headworks be able to handle the hydraulics to keep from overflowing its structure. However, it is not critical that the headworks achieve the same level of treatment for these brief periods of time when the flows are at their peaks.

The headworks consists of two screens, a bypass pipe, and an aerated grit tank. The screens are FSM Traveling Band screens that have a nominal screen opening of 10 mm. The screens were installed in 2003 and each screen is rated for a peak capacity of 21 mgd. If one screen is out of service, a bypass pipe is designed to handle 6 mgd. If power goes out, the emergency generator is not wired nor currently sized to handle the screens. When the power goes out, at least one screen must be rotated out of the channel.

The City currently reports that the screens are performing very well with no maintenance issues. The headworks upgrade also included screenings washer/compactors and a redundant grit washer.

The aerated grit tank is sized to meet a peak influent flow of 18 mgd while maintaining a theoretical hydraulic detention time of 3 minutes. Flows greater than 18 mgd can be manually bypassed to the equalization basin. Figure 2-8 shows the projected plant flows with the existing capacity of the headworks and grit tank versus the projected future flows.

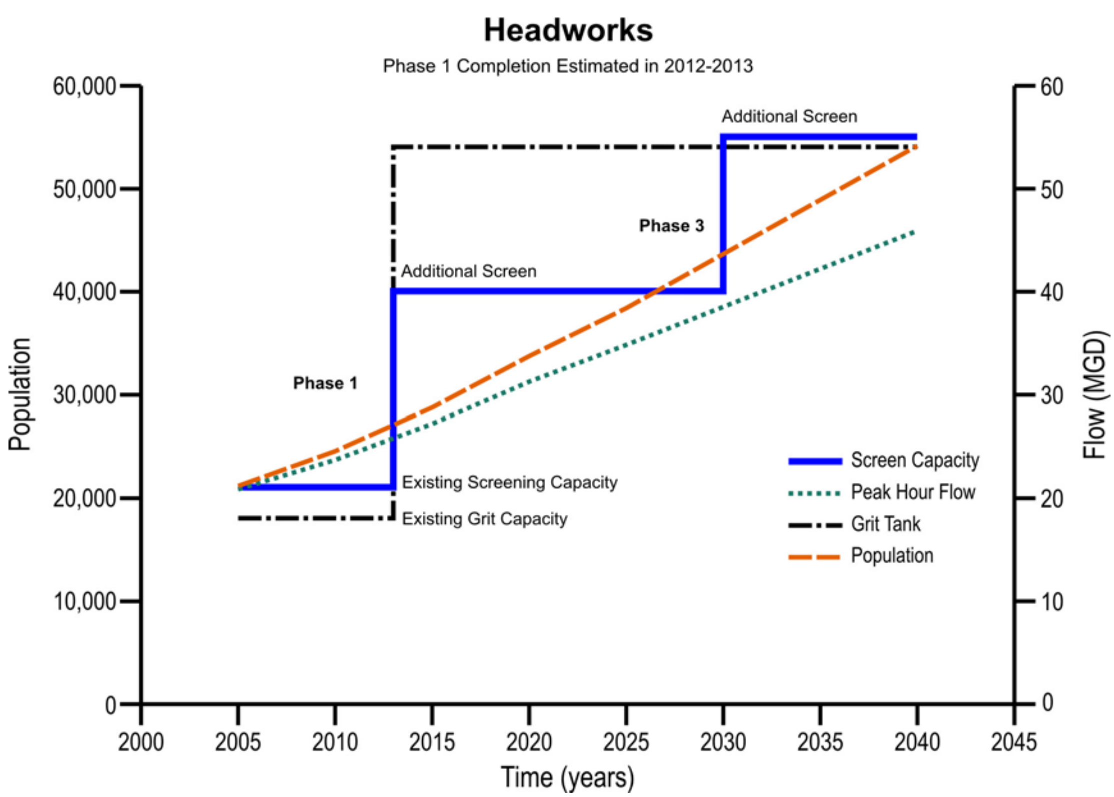


Figure 2-8. Future Projected Flows and Headworks Capacity

Figure 2-8 shows that the capacity of the headworks (screens/overflow pipe and the grit tank plus the overflow) of 27 mgd will be exceeded around 2015, based on PHF.

2.2.3 Secondary Treatment

The Newberg WWTP currently uses two oxidation ditches for secondary biological treatment. Each ditch has a volume of 267,000 cubic feet (2 MG), and is equipped with four 50-hp rotating brush aerators. The two tanks are capable of delivering approximately 800 pounds of oxygen per hour. The current operating SRT for the two oxidation ditches is 20 days in the summer and 25 days in the winter under maximum month wet weather flow (MMWWF) conditions. The HRT in the ditches is 15 hours during MMWWF, and the target MLSS concentration is 2,000 mg/L. Current NPDES permit requirements are 10 mg/L for both BOD and TSS during the summer months. No ammonia or nutrient limitations are specified in the permit.

The plant currently consists of three secondary clarifiers each with a diameter of 80 feet, a side water depth of 15 feet, and a volume 605,000 gallons.

Although future permit requirements for the City are not expected to change, nutrient removal may become a requirement. Significant population growth is expected to occur around Newberg over the next 35 years. Analyses were performed to calculate the secondary treatment expansion needs through 2040 based on median growth. The results of the analyses are listed in Table 2-3.

Table 2-3. Summary of Oxidation Ditch and Clarifier Expansion Needs Based on Median Growth Load Estimates from 2010 through 2040

Removal requirement	Design parameter	2010	2015	2020	2025	2040
Oxidation ditches						
BOD only	Number of ditches	3	3	4	4	6
	Aerators per ditch	4	4	4	4	4
	Percent of volume–aerobic	100	100	100	100	100
	Percent of volume–anoxic	0	0	0	0	0
	MLSS, mg/L	1,500	1,700	1,480	1,690	1,600
	WAS, dry ppd	3,775	4,420	5,190	5,910	8,330
Nitrogen and BOD	Number of ditches	3	4	4	5	6
	Aerators per ditch	3	3	3	3	3
	Percent of volume, aerobic	72	72	72	72	72
	Percent of volume, anoxic	28	28	28	28	28
	MLSS, mg/L	1,500	1,770	1,550	1,770	1,660
	WAS, dry ppd	3,775	4,420	5,190	5,910	8,330
Secondary clarifiers						
Same removal requirement for both scenarios	Peak day flow, mgd	18.8	22.0	25.8	29.4	41.4
	Number	3	4	4	5	6
	Surface overflow rate, gsfd	1,250	1,095	1,285	1,170	1.375

The analyses assume that clarifier performance can be increased with deeper more efficient clarifiers than exist. The recommended peak overflow rate is 1,200 to 1,300 gsfd. Analyses were also performed to examine the oxidation ditch capacity that will be required in 2040 to meet both the current NPDES permit limits and the number and configuration of oxidation ditches that would be needed to meet a supplementary requirement for an effluent total nitrogen limit of 10 mg/L. Flows and loadings for 2040 based on median and high growth estimates for Newberg are listed in Tables 2-4 and 2-5.

Table 2-4. 2040 Flow Scenarios Based on Median and High Growth Projections

Projected flow, mgd	Median growth estimate	High growth estimate
ADWF	5.30	7.81
Average annual flow	7.97	11.74
Average wet weather flow	11.08	16.32
MMDWF	9.01	13.28
MMWWF	19.24	28.35

Table 2-5. Load Projections for 2040 Based on Median and High Growth Forecasts

Projected load, ppd	Median growth estimate	High growth estimate
Average $CBOD_5$	7,326	10,794
Maximum month $CBOD_5$	12,888	18,988
Peak day $CBOD_5$	19,332	28,482
Average TSS	11,323	16,683
Maximum month TSS	19,464	28,676
Peak day TSS	29,196	43,014

For all calculations, it was assumed that the size, configuration, and aeration strategy of the oxidation ditches would remain the same. Results of the oxidation ditch analyses are listed in Table 2-6.

Table 2-6. Summary of Oxidation Ditch Requirements Based on 2040 Median and High Growth Load Estimates

Removal requirement	Design parameter	Median growth estimate	High growth estimate
BOD only	Number of ditches	6	8
	Aerators per ditch	4	4
	Percent of volume, aerobic	100	100
	Percent of volume, anoxic	0	0
	MLSS, mg/L	1,660	1,830
	WAS, dry ppd	8,340	12,260
Nitrogen and BOD	Number of ditches	6	8
	Aerators per ditch	3	3
	Percent of volume, aerobic	72	72
	Percent of volume, anoxic	28	28
	MLSS, mg/L	1,660	1,830
	WAS, dry ppd	8,340	12,260

2.2.3.1 BOD Removal Only

The analysis showed that eight total oxidation ditches of the same configuration would be required to meet the high growth load projections for 2040. This requirement is based solely on the oxygen transfer limitations of the current configuration of four brush aerators. The peak day oxygen required to meet the effluent BOD removal standards is 3,100 pounds per hour (pph). This oxygen requirement includes oxygen for both BOD and nitrification because nitrification will occur at a 20-day SRT. Because each basin can supply only 400 pph with the current brush aerator configuration, eight basins are required. The MLSS concentration in an eight-basin configuration (volume = 16 MG) would be approximately 1,830 mg/L. The corresponding WAS production rate would be approximately 12,260 ppd of dry solids.

For the median growth estimate, six basins would be required due to the lower BOD and nitrogen loads. The corresponding oxygen requirement is 2,110 pph. Both MLSS concentrations and WAS production quantities are also lower (1,660 mg/L and 8,340 dry ppd, respectively).

2.2.3.2 BOD and Nitrogen Removal

Nitrogen removal can be achieved using the same number of basins as for BOD removal alone. Incorporation of anoxic denitrification provides for oxygen and alkalinity recovery. For a target effluent concentration of 10 mg TN/L, an anoxic zone that is 28 percent of the total oxidation ditch volume would be required. The oxygen requirement for BOD oxidation and nitrogen removal is 82 percent of that required for aerobic BOD removal (discussed above). To accommodate the oxygen requirement and anoxic zone volume for denitrification, modifications would be needed to the aeration system, possibly by switching to fine bubble diffusion or using a mechanical aerator with higher oxygen transfer efficiency.

For denitrification to 10 mg/L total nitrogen, 28 percent of the total basin volume would need to be operated in an anoxic mode, and the air requirement would be 82 percent of that required for aerobic BOD removal.

2.2.3.3 Aeration Requirement

It should be noted that, because the required number of oxidation ditches is based on the aeration efficiency of the current brush aerators, eight basins is not a firm requirement. The total number of oxidation ditches could be reduced during expansion by retrofitting the current and newly constructed basins with fine bubble diffusers or with more efficient brush aerators that would increase oxygen transfer capacity. This would facilitate a decrease in the treatment volume, and the overall footprint of the treatment facility. It would, however, increase MLSS concentrations accordingly. There is significant capacity in the secondary clarifiers to accommodate the higher solids loading associated with the higher MLSS concentrations. The clarifier capacity will also need to be increased with increasing flows and loadings.

2.2.3.4 Secondary Clarifiers

The typical design values for secondary clarifier overflow rates are outlined in Tables 2-1 and 2-3. During peak hour flows the overflow rate is 1,600 gsfd at 8 mgd per clarifier, if the flows are not equalized. The design values for the existing secondary clarifier are outlined in Table 2-7. The values are for typical extended aeration plants with oxidation ditches and shallow clarifiers.

Table 2-7. Secondary Clarifier Design Criteria

Parameter	Units	Value
Average overflow rate	gsfd	400
Maximum month peak overflow rate	gsfd	600 to 800
Peak day overflow rate	gsfd	1,200 to 1,300
Average solids loading	pounds per square foot per day (psfd)	20
Peak solids loading	psfd	40

Using the design criteria from Table 2-7, Figure 2-9 was developed to project the number of clarifiers that would need to be in service to meet the median growth projected demands if the same type and depth clarifiers were constructed. The graph in Figure 2-9 indicates that seven clarifiers are needed to meet the maximum month conditions for 2040 and maintain 600 gsfd. The calculations summarized in Table 2-3 predict that only six secondary clarifiers are needed for median growth projections. The number can be adjusted in future planning activities as more operating experience is gained with deeper clarifiers and future regulations are better defined.

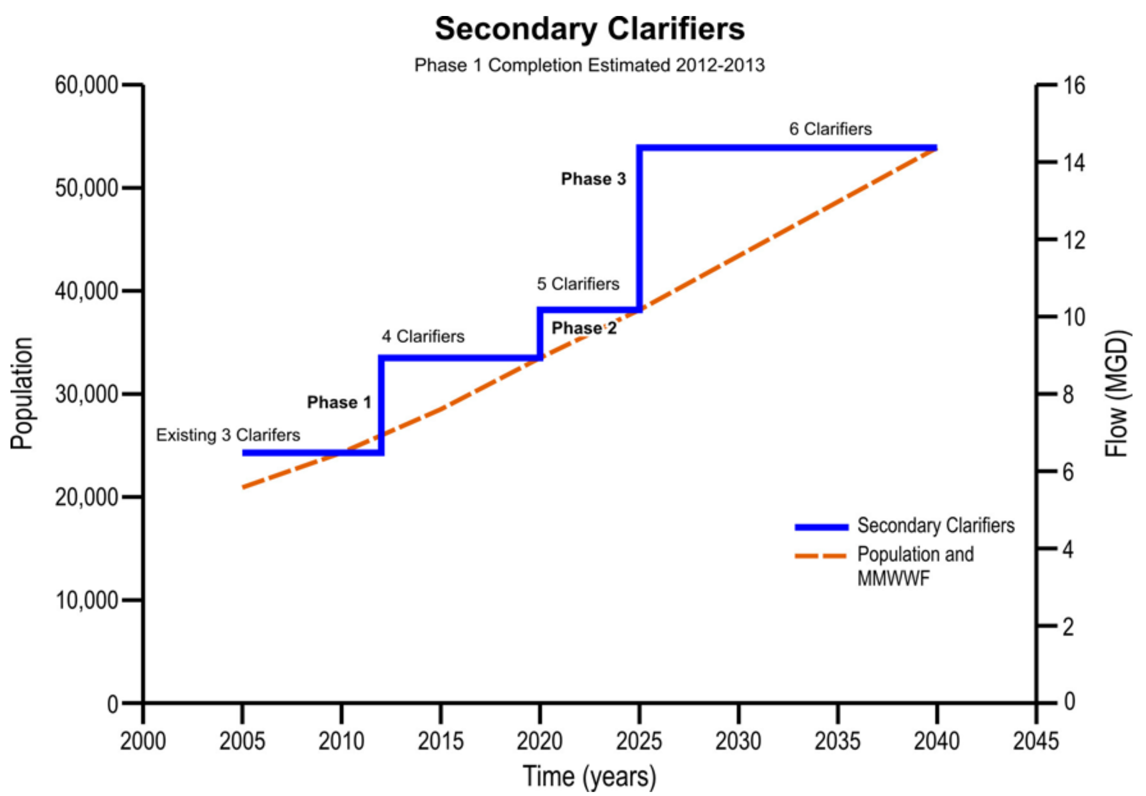


Figure 2-9. Secondary Clarifier Capacity

As shown in Figure 2-10, from 6 to 10 clarifiers may be needed depending on the growth rate actualized in 2040 and using the current design criteria for shallow clarifiers.

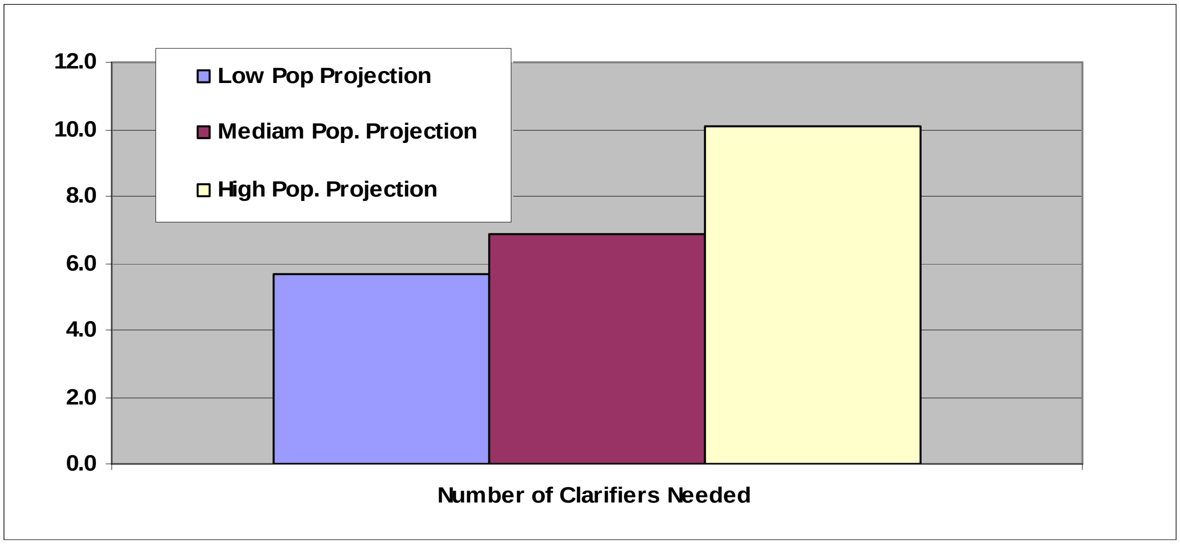


Figure 2-10. Number of Secondary Clarifiers Required for 2040 Peak Flow Projections using Existing Design Criteria

2.2.3.5 RAS/WAS Pumping

The RAS pumping system consists of four pumps. One problem is that rags frequently get caught in the pumps, requiring them to be disassembled. This takes excessive maintenance time. This problem should decrease, since the new screenings facility captures rags. Although the RAS pumps are oversized, they run at low speed and are functional. WAS pump No. 3 has a cracked volute and should be replaced.

The RAS building has no cooling upstairs where the motor control centers (MCCs) are located. To protect the MCCs, the building needs to be retrofitted with a new HVAC system including cooling, exhaust fan and inlet dampers.

2.2.4 Chlorine Contact Tank

The chlorine contact tanks are designed to provide disinfection to the wastewater prior to it being discharged to the Willamette River. Chlorine contact tanks are generally designed to provide 20 minutes of contact time at normal maximum flow, which is generally sufficient to disinfect wastewater that has already undergone secondary wastewater treatment. The current contact time for the peak hour flow is 14 minutes. Additional contact time is not provided in the outfall since the effluent is dechlorinated prior to the outfall.

The existing chlorine contact tank has a total volume of 269,000 gallons. Figure 2-11 shows the available contact time versus the average flow, peak day flow (PDF), and PHF.

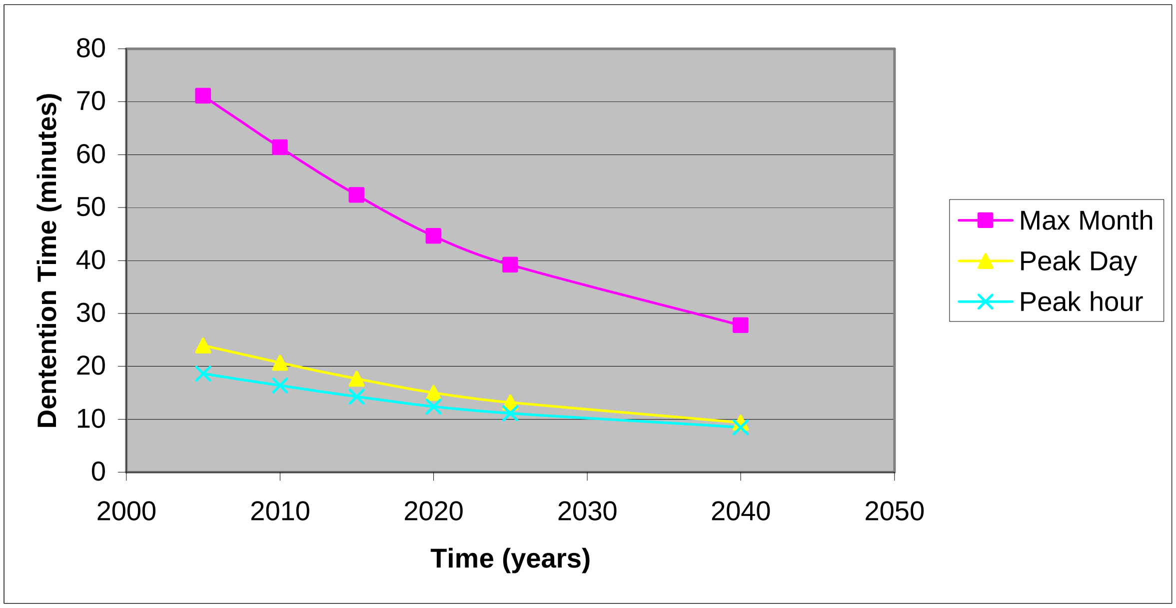


Figure 2-11. Existing Chlorine Contact Time for Future Flows

Figure 2-11 shows that the existing chlorine contact tank is able to easily meet the 20-minute recommended detention time for maximum month and average day flows until 2040. However, the existing facility is not able to provide much detention time for either PDF or PHF without using the equalization basins now. The outfall provides an additional 12 minutes of detention time at a peak flow of 18 mgd. Although Oregon does not have a standard for detention time, 20 minutes at normal PDF is commonly used. Improvements are needed to continue to ensure adequate disinfection.

2.2.5 Chlorine Disinfection System

The chlorination system uses ton cylinders of chlorine gas for disinfection. It has been upgraded in the last 4 years to include a new scale for the chlorine cylinders, new injector system, and new V-notch roto-meters. The upgrades replaced worn equipment and did not increase chlorination capacity. The chlorination system uses reclaimed water with a backup to allow the system to run off of potable water if the power fails or there is some other type of failure. The chlorination system is not automated; operators make manual adjustments based on plant flow and season. The operators anticipate rainfall-induced plant flow and adjust the chlorine accordingly. The chlorine is fed at the secondary clarifier effluent splitter box and is mixed as the chlorine is split to the two contact basins.

The plant has not had disinfection violations. During peak flow periods the plant has had individual samples that have been higher than 126 *E. coli organisms per mL* . The maximum allowable sample should not exceed 406 organisms per mL. The plant then adjusts the chlorine dosage and re-samples. This results in a decrease the geometric mean of several samples with extremely low *E. coli* counts.

There has been increased concern about the safety of using chlorine gas. Many municipalities in urban areas are converting their disinfection systems away from chlorine gas for safety reasons.

2.2.6 Dechlorination System

The dechlorination system was replaced in 1998 under a very stringent time schedule. The system was designed quickly to meet a deadline that was imposed by DEQ, and DEQ has mandated that the chlorine residual does not exceed 0.5 mg/L. The system operates by metering dilution water which is then fed to the effluent from the two chlorine contact tanks. It is delivered through polyvinyl chloride Tees that have diffuser holes. One grab sample per day is taken to measure chlorine residual.

The bisulfite tank holds only around 300 gallons of bisulfite, and there are two pumps that feed it into a box at the end of the chlorine contact basin. Since the bisulfite tank is relatively small for the application, the tanks have to be refilled a minimum of once a week and frequently twice a week during periods of high flows. Each refill is about 150 gallons because when the tank is down to about 1/3 capacity the chemical feed pumps begin to lose pressure and are unable to feed the bisulfite to the system. There is also a lot of buildup of bisulfite crystals around the fittings, which are causing further operational problems. Improvements are needed immediately to alleviate these problems.

2.3 SOLIDS TREATMENT PERFORMANCE

Solids treatment consists of WAS dewatering followed by in-vessel composting.

2.3.1 Solids Treatment Process and Design Criteria Overview

WAS is pumped to the sludge storage tanks (SSTs) by the WAS pumps. Sludge from the SSTs is pumped to the BFPs for dewatering by centrifugal sludge transfer pumps. Polymer is added to the sludge and the sludge is dewatered by two 2-meter BFPs. Dewatered solids cake (16 percent solids concentration) are fed into a storage bin in the compost building, blended with sawdust and recycled compost, and sent to the tunnel reactors. Assuming temperature criteria are met in the reactors to document Class A pathogen reduction, compost product is then moved to an aerated cure building. If temperature criteria are not met, compost is recycled back into the system. In summary, the solids processing components include:

- Sludge storage—Two 80,000-gallon tanks with air injection for mixing
- Sludge dewatering—Two 2-meter BFPs and polymer feed system
- Composting—In-vessel type compost system with two tunnel reactors
- Cure bays—Three, aerated plus non-aerated amendment storage

2.3.2 WAS Pumps

Sludge is removed from the secondary clarifiers and pumped to sludge holding tanks using the WAS pumps prior to being dewatered by BFP. Each clarifier has its own dedicated WAS pumps with a nominal capacity of 300 gpm. Each of these pumps is equipped with a variable-speed drive. The pumps have enough capacity to keep up with solids loading from the clarifier.

2.3.3 Dissolved Air Flotation Thickener (DAFT)

The two DAFT units were taken out of service since they did not improve dewatering performance. The WWTP has been able to perform adequately without thickening, although the lack of thickening may require more capacity out of the sludge storage basins.

2.3.4 Sludge Storage Basins

The sludge holding tanks store the solids prior to being dewatered by the BFPs. The storage basins are aerated to provide mixing and prevent odor. There is a discrepancy between the total amount of WAS and the amount of sludge that is dewatered. The difference between the two numbers is about 15 percent which may be accounted for in the measurement device's inaccuracies.

2.3.5 Sludge Transfer Pumps

There are two 10-hp centrifugal transfer pumps feeding the BFPs. The pumps are Gorman Rupp trash pumps with variable-speed drives. They have been effective in meeting only BFP requirements in the 2 percent solids range. As a result, there is no thickening in the tanks and capacity for storage is compromised. Upgrading to positive displacement pumps in the future is recommended to increase storage capacity and provide a wider spot in the line in the event of required maintenance on other equipment.

2.3.6 BFPs

The plant has two BFPs onsite to dewater the sludge before it is sent to the composting facility to be processed to Class A biosolids. The two presses are capable of producing 30.6 wet tons per day in a single shift based on original design data which is all the capacity that is currently needed. If the presses are retained, booster pumps should be added to supplement recycle water pressure for washdown. The presses have been in operation for nearly 20 years. Newer technology has added benefits, and replacement of the BFPs with centrifuges should be considered. Centrifuge technology would increase solids concentration which is needed for compost feedstock to increase composter capacity.

2.3.7 Composter

Dewatered sludge, sawdust or wood shavings, and recycled compost are fed by variable-speed screw conveyors to a paddle-type mixer, where it is thoroughly mixed and then fed by drag chain conveyors to two tunnel reactors. There is no redundancy in the blending and conveyance system, and this is considered a weak link in the compost operation. The sawdust hoppers were recently upgraded by adding new augers to minimize bridging, and this has improved performance. Additional improvements or replacement of the feedstock blending hopper should also be considered.

Each tunnel is 18 feet wide by 12 feet high by 66 feet long, with an approximate detention time of 14 days at maximum loading rates. The infeed mixture is fed into the tunnels in a batch process. Each batch is compacted and the compost mass is moved through the tunnel by a hydraulically powered push door at the infeed end of the tunnel. Material is removed from the outfeed end of the tunnel by front-end loader, and moved to either the recycled compost bin or to an aerated cure pile.

Aeration is provided by two positive displacement pressure blowers located in an aeration gallery between the two tunnels. Each tunnel is divided into seven zones. Each zone has six air headers embedded in the floor of the tunnel. Air is blown up through the diffusers of each zone, using the pressure blowers. The temperature of each zone is monitored by a probe running through the compost mass the full length of each tunnel.

The composting process is monitored and controlled by a programmable logic controller (PLC). Mix ratios are determined by the PLC based on percent solids and bulk density of the sludge, sawdust, and recycled compost as entered into the PLC by the operator. Also, the feed rates can be set manually by the operator. Compost temperature is controlled by varying the output of the pressure blowers (done by the PLC), and by adjusting the header valves for each zone (done manually by the operator). Output of the pressure blowers is varied by the PLC according to the average temperature of any combination of the seven zones (selected by the operator) and a temperature set point entered by the operator. Pressure in the air headers feeding the tunnels is also monitored and the PLC controls the blowers to maintain a minimum pressure (selected by the operator). The minimum pressure setting overrides the temperature setting, i.e., the PLC will maintain the minimum header pressure regardless of the tunnel temperatures. This maintains air flow to the tunnels regardless of the tunnel temperature and thereby prevents the compost in the tunnels from becoming anaerobic.

Compost is cured in a covered structure that has three curing bays with air headers embedded in the floor. A fan-type variable-speed centrifugal blower pulls ambient air through the cure piles and exhausts it to the odor control system. Each cure bay has a modulating damper that controls air flow through the cure pile. Temperature of the cure piles is monitored by two temperature probes in each pile. Temperatures of the three cure piles are charted continuously. The system is controlled by a software program independent of the compost tunnel reactor control system. Blower speed is adjusted automatically to maintain an operator entered minimum vacuum, ensuring that ambient air is always being drawn through the cure piles. The temperature of each pile is maintained within operator entered set points by adjusting the dampers on each bay, also done automatically by the PLC.

Finished compost is sold in bulk at the composting facility on a first-come, first-serve basis. All off-site transportation of compost is done by the purchasers.

Construction of new odor control and curing systems, begun in 2003, was completed in 2004. The project consisted of construction of a covered cure pile structure and associated cure pile blower building, installation of new cure pile blowers, installation of a packed tower ammonia scrubber and modular biofilter, and installation of additional piping and a new blower to improve capture of odorous air from the sludge bin, mixer, conveyors, and work spaces. In addition, the existing vacuum blowers, previously used for tunnel aeration, were converted to capture odorous air from the top of the tunnel reactors. New doors at the discharge end of the tunnels were also installed.

Design problems and blower failures, however, prevented the curing and odor control systems from being fully functional. The cure system was not functional for all of 2005. The tunnel reactors were used for both pathogen reduction and vector attraction reduction, with no curing. Material discharged from the tunnels that had not met both the pathogen and vector attraction reduction requirements was either recycled back through the tunnels immediately or segregated in a reject pile on the opposite side of the facility from the finished compost pile, then recycled later.

In 2005, the odor control and curing system was modified from the original design. The two multi-stage centrifugal blowers in the cure building were replaced with a single fan-type centrifugal blower. The aeration trenches in each cure bay were also retrofitted with modified trench plates. The two original multi-stage centrifugal vacuum blowers and the new multi-stage centrifugal ventilation blower (installed in 2004) were also replaced with a single fan-type centrifugal blower. Testing of the new equipment was completed in December 2005. The cure system description reflects the new system operation. The tunnel doors failed and were removed.

No major equipment failures or process failures occurred in 2005, except for the cure system. Short-term shutdowns were required for replacement of portions of the mixing system, including the recycle bin live bottom screws, the sawdust feed screw, and the tunnel reactor infeed conveyor.

Detention time is approximately 22 days at average loading rates. Reject material that has not met the pathogen reduction requirements is recycled back through the tunnel reactors and material that does not meet the requirements is not released for sale. If reject material must be stockpiled, it is isolated from the finish pile and cure piles until it can be recycled back through the tunnel reactors. The measured concentration of all metals was below the Environmental Protection Agency's 40 CFR §503.13 Table 3 values. Compost produced at the Newberg WWTP meets the pollutant concentrations in 40 CFR §503.13(b)(3), the Class A pathogen requirements in §503.32(a), and the vector attraction reduction requirements in §503.33(b)(5), and is therefore exempt from the general requirements in §503.12 and the management practices in §503.14 (as stated in §503.10(c)(1)).

The annual amount of biosolids composted in 2005 is summarized in summarized in Table 2-8. The compost system is believed to be at or near capacity with this quantity of solids, although improvements may increase capacity in the future (see below). In 2040, solids production will increase to 8,340 ppd based on the median growth estimate (Brown and Caldwell, December 2005). This will more than double solids production to nearly 1,500 dry tons per year. Therefore, additional avenues for solids production need to be explored.

Table 2-8. Amount Composted in 2005

Value	Unit
11.89	mg
574.1	dry tons

Solids Capacity Analysis. The detailed composter tunnel capacity analysis is included in Appendix D. The objective of this analysis was to evaluate the capacity of the tunnel reactor for composting dewatered biosolids using sawdust and recycle from the composting process to provide the moisture content of the initial mix required for mixing and tunnel operation. A previous evaluation concluded that the system capacity ranged from 1.5 to 2 dry tons of solids per day in the dry season, and 1 dry ton of solids per day in the wet season (CH2M Hill, 1996). The original design specification was 3.5 dry tons per day (PWT, 1995). Operating experience has shown that the compost system has already been exceeded.

The capacity of the tunnel reactors will vary with the feedstocks used and the initial mix moisture content required for mixer and tunnel operation. The current capacity is estimated to vary seasonally between 1.1 and 1.4 dry tons per day.

Capacity Defining Variables. Since composting is a biological process, the primary objective of the facility design and operation is to provide conditions in the reactor that are suitable (and optimized if possible) for the activity of the organisms that do the desired work. For composting organisms, the environment is a warm, moist, and oxygenated condition. To facilitate the availability of nutrition for the organisms, it has been observed that mixing the material during composting also facilitates the composting process.

- *Compaction*—The degree of compaction associated with this style of tunnel composting is unusual. This process requires a unique aeration method designed to lift the pile to reduce friction when moving the pile as well as to help oxygen permeate throughout the composting mass.

- *Moisture content*—Biosolids moisture defines the quantity of sawdust and recycle needed to provide suitable conditions in the reactor for composting. The moisture content of the resulting mix is important for mixer function with the current mixer and for the composting function in the tunnel. The mix moisture content is affected by the moisture content of the biosolids, sawdust, and recycle.

Impact of Recycle Drying on Tunnel Capacity. Theoretically, the capacity of the tunnel can be increased by reducing the water content of any of the three components. Improved dewatering, use of dried sawdust or producing a drier recycled product will provide an increase in capacity. Figure 2-12 indicates the potential capacity for composting biosolids on a dry ton per day basis (assuming 16 percent total solids [TS]) for a range of possible recycled solids contents. As shown, an increase in recycled product moisture content from 50 to 55 percent TS increases the potential capacity by 30 percent from 1.35 to 1.75 dry tons per day. Since the analysis assumes that the sawdust to biosolids ratio is 1:1.5, the sawdust requirement would increase at the same rate as the biosolids.

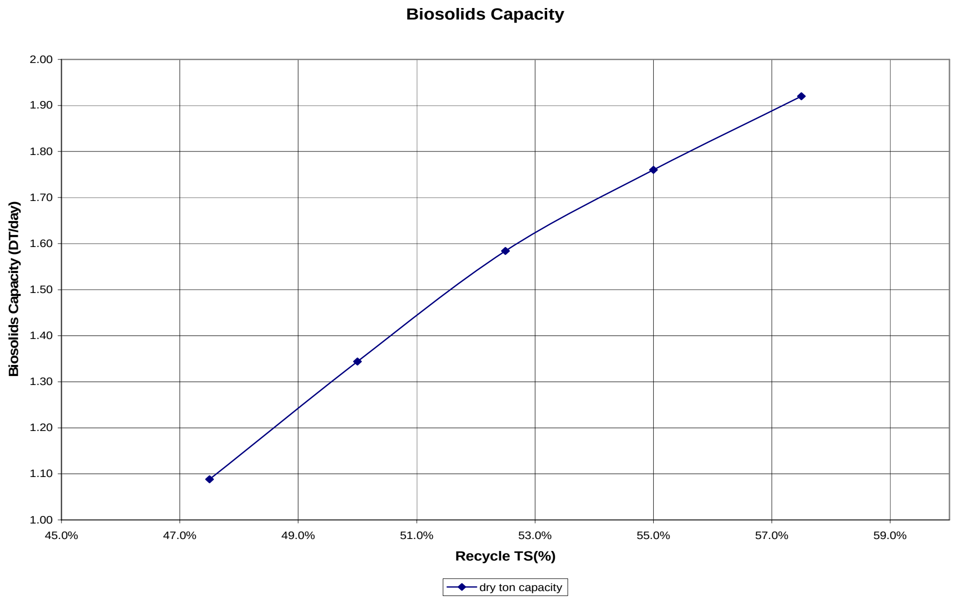


Figure 2-12. Potential Composter Capacity

Figure 2-13 shows the impact of recycled solids content on the amount of recycled product required per day. The same increase in recycled solids content (from 50 to 55 percent total solids) reduces the required recycled product from 43 to 35 cubic yards per day or a decrease of 19 percent.

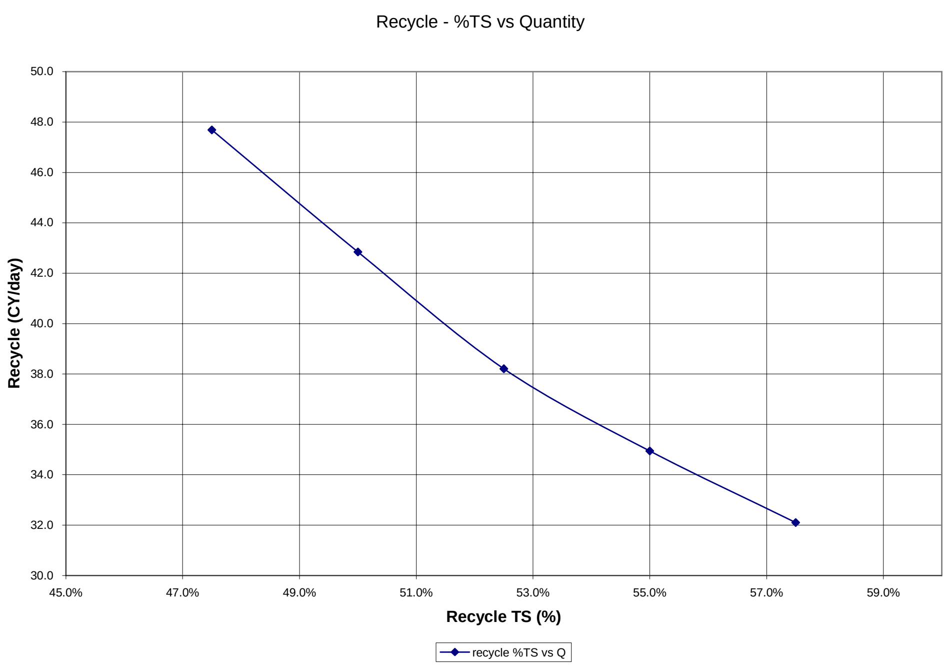


Figure 2-13. Impact of Recycled Solids Content on Amount of Recycled Product Required

The analysis assumes that the ratio of new sawdust to biosolids remains constant. However, it may be possible to replace a portion of the sawdust with the drier recycled product. This reduction in sawdust could produce a significant cost savings. On the other hand, if insufficient recycled product from the curing area is available to meet the demand, additional sawdust would have to be used to adjust the feed moisture content.

2.4 FACILITIES REVIEW

A Facilities Review was conducted as part of the Facilities Planning process. An equipment list and the equipment condition was discussed at the kickoff meeting, a walk-through of the plant was conducted, and plant personnel were interviewed. Brown and Caldwell then developed a paper assessment based on a walk-through of the plant and review of notes from interviews with plant personnel. A rating system using a 0 to 4 ranking was used for the assessment. The results were reviewed with the plant staff, and their input was incorporated into the initial spreadsheets. The results of the analysis are included in Appendix E.

Next, those items that were ranked in the 4 range of physical condition or functionality condition, or had other rankings that indicated no immediate problems, were eliminated. Numerous items fell into the equal to 3 category. Using the summary of items equal to 3 or lower, it was requested that staff define their understanding of a 3 ranking by looking at descriptors such as reliability, performance, and structural integrity, etc. An expanded listing resulted as the staff added more information to a spreadsheet to gather specific clarifying comments. Two documents entitled "Estimated Remaining Life" pages 1 and 2 of Appendix E, were then subjected to an expanded analysis using a procedure, with some abbreviations, developed by Brown and Caldwell.

Excerpts from the paper describing the process *Equipment Replacement Decision Support Tool* given at the WEFTEC 2003 conference are included in Appendix E. The paper uses a 1 to 5 ranking for condition with 1 as best, 5 as worst, while we used 0 to 4, with 4 as best and 0 as worst. These are the two documents entitled "Rating Graphs" pages 1 and 2.

Because a number of pieces of equipment which were initially ranked in the 4 category and were not put through the assessment included in the Appendix E, an argument can be made to determine their remaining life using the following generalized formula:

((Expected Life x % Base Life x % Utilization x Condition Grade) - Age) = Estimated Remaining Life, where:

- Expected Life = Useful Life from other Brown and Caldwell assessment data (plant staff have copies of these assessment spreadsheets)
- % Base Life = 1.2
- % Utilization = Estimates from Figure 3 "Utilization Factor"
- Condition Grade = 1
- Age = 20, for most equipment being considered

The results are included in the Appendix E and are used in future Facility Planning analysis and recommendations for Capital Improvements Program.

2.5 STAFFING

City of Newberg water and wastewater utility operation and maintenance (O&M) responsibilities are handled by the Public Works Department Operations Division. Several staff members have assigned duties for both the WTP and the WWTP; others are predominantly performing daily activities in water or wastewater-related facilities. An assessment was made of specific duties identified in time sheets for December 2006 and April 2007. The purpose was to compare workloads during typical wet months and dry months. This information is summarized in Appendix F.

2.5.1 Current Staffing

The City has 12 full-time employees plus one part-time administrative person (0.65 FTE) and a temporary labor man-hour pool of up to 2,000 hours annually an hourly day laborer. The positions are described in Table 2-9.

Table 2-9. Current Positions and Responsibilities

Newberg Public Works Department–Operations Division Staffing		
Positions	No.	Responsibilities
Operations Superintendent	1	Supervise and manage WTP, WWTP, pump stations, wells, and springs
Environmental Supervisor	1	Supervise environmental activities (laboratory, pretreatment program, etc.)
Water Supervisor	1	Supervise WTP, wells, reservoirs, springs, and distribution water sampling
Wastewater Supervisor	1	Supervise wastewater operation including the WWTP and major pump stations
Wastewater Maintenance Sr. Mechanic	1	Maintenance of wastewater system facilities
Water Operations Sr. Operator and Operator I	2	WTP operation and sampling
Water/Wastewater Maintenance Plant Mechanic	1	25 percent WTP maintenance, 75 percent wastewater system maintenance
Wastewater Operations Two Operator II and one Operator I	3	WWTP operator for liquids and solids systems
Laboratory Operations Lab Technician II	1	Sample collection and process lab testing
Utility Laborer	1	Available for a variety of jobs in both the water and wastewater systems, trainee for possible advancement

Newberg Public Works Department–Operations Division Staffing		
Positions	No.	Responsibilities
Administrative Position	0.65	Office Support
Temporary Laborer	varies	Available for a variety of jobs in both the water and wastewater systems. The amount of hours for this position varies with each budget cycle generally averaging 2,000 man-hours annually.

In reviewing the distribution of manpower between several areas, the following observations were made based on a review of data for a typical month, April 2007.

- The level of effort to operate and maintain the composter requires 16 percent of available labor.
- The water treatment and distribution system requires approximately 20 percent of the available labor.
- A commendable level of effort (6.7 percent) is devoted to safety and training this may decrease as the staff experience increases, however current senior staff will become eligible for retirement in the next 5 plus years.
- Earned time off (holidays, sick leave, vacation, etc.) averages 8.1 percent of the time, equivalent to one man month.
- Need to account for remaining 50 percent of the time.

A more comprehensive summary of work allocations for specific work areas is presented in Appendix F. This information was summarized from time sheets for two monthly time periods; November 20 through December 21, 2006 and March 21 through April 20, 2007, representing a wet period and a relatively dry period.

CHAPTER 3
EVALUATION OF ALTERNATIVES

3.1 INTRODUCTION

This chapter summarizes the wastewater treatment evaluations conducted to address the future needs of the Newberg Wastewater Treatment Plant (WWTP). Modifications need to be made in order to provide treatment capacity through 2025 and define the needs for ultimate buildout in 2040.

3.1.1 Evaluations

Options for expansion of the existing wastewater facility, use of new technologies, and inclusion of reuse facilities were analyzed, and the results are included in this chapter. Also included in this chapter are the planning level comparative costs.

3.1.2 Evaluation Process

The evaluation process included two Liquid Solids Workshops conducted by Brown and Caldwell. Liquids Solids Workshop No. 1 held on May 23, 2006, consisted of identification of the unit process deficiencies and brainstorming of technologies to be included in the analysis of wastewater treatment and biosolids alternatives analyses. An initial viability evaluation and screening was used to eliminate alternatives from further consideration. The screening tool is shown in Figure 3-1. The initial screening used the ratings +, 0, and – for relative scoring. An evaluation of the remaining viable alternatives was conducted by the Brown and Caldwell team. The evaluation was brought to Liquids Solids Workshop No. 2 held on December 14, 2006, to rank the alternatives in the group setting. If the alternative was not viable at the Newberg WWTP, it was so noted and no scoring was completed.

Figure 3-1. Example Screening Matrix

	Evaluation criteria								
Technology/description	Relative present worth cost	Energy conservation	Regulatory compliance	Flexibility	Reliability	Operations and Maintenance (O&M)	Safety	Viability at Newberg WWTP	Total score
Alternative 1									
Alternative 2									
Alternative 3									
Alternative 4									

The preliminary list of secondary wastewater treatment and biosolids Class A technologies that were identified in the Liquids Solids Workshop No. 1 were reviewed, and the alternatives were ranked according to non-cost factors. Non-cost criteria included energy conservation, regulatory compliance, flexibility (for expansion), reliability, operability, safety, and viability at Newberg WWTP. A relative non-cost factor was also included.

After the initial screening and alternatives evaluation, the results were documented in the draft Chapter 3 and were discussed in Liquids Solids Workshop No. 2. The alternatives evaluation results were reviewed, and the rankings of the liquid and solids treatment alternatives were reviewed in the workshop. Comparative cost estimates specifically developed for Newberg applications to meet 2025 requirements were brought to the workshop. These comparative costs did not include any items common to all alternatives. The recommended alternative was identified for additional analysis and capital cost estimating for the City of Newberg's (City) capital improvements program (CIP) process.

The workshops provided a mechanism for screening the technologies to be used for the phased improvements to eliminate non-viable options from further consideration and to review the evaluation of the technologies in relation to the plant upgrades.

Comparative cost evaluations were conducted as part of the alternatives evaluation process. The comparative costs were order-of-magnitude net present value costs that included capital cost and operations and maintenance (O&M) costs for facilities needed through 2025. These costs did not include items that are the same for both alternatives. After the second workshop, the recommended alternatives were developed in more detail. The preferred alternatives for each unit process were developed for phased implementation in 2010, through 2025, and ultimate buildout in 2040. Order-of-magnitude costs were developed for the recommended phased implementation and these are included in Chapter 4.

The treatment expansion recommendations address each unit process. The unit processes addressed in this chapter are summarized below.

- Influent pumping
- Headworks
- Septage receiving
- Oxidation ditches
- Secondary clarification/solids separation
- Disinfection
- Outfall
- Reuse (by others)
- In-plant drains
- Solids handling
- Class A biosolids treatment

3.2 INFLUENT PUMP STATION (IPS)

The IPS is located at the base of a hill adjacent to Hess Creek. Influent must be pumped up over 90 feet in elevation to the headworks. The IPS was sized to handle a peak flow of 27 million gallons per day (mgd), although this requires the use of all pumps without redundancy. It lacks the capacity to handle the full range of anticipated influent flows effectively. The pump station should be refurbished in the near future to increase capacity and correct other deficiencies described below. Certain portions of the existing facilities may be incorporated into a refurbished pump station.

The design data for the existing submersible pumps is listed in Table 3-1 based on the design drawings and confirmed with the WWTP personnel.

Table 3-1. Existing Influent Pumps Design Data

Pump no.	Horsepower (hp)	Drive type	Capacity, mgd	TDH[1], feet
1	200	Variable speed	9.0	92
2	200	Variable speed	9.0	92
3	120	Variable speed	4.5	92
4	120	Variable speed	4.5	92

[1]TDH = total dynamic head

Influent flow from the collection system enters the pump station through a 42-inch-diameter pipe from a 72-inch-diameter manhole. The influent flow then is distributed to the four pumps via a lateral chamber with sluice gates on openings leading to the pumps located within confined inlet wells.

The pumps discharge to two parallel 20-inch-diameter force mains that run from the IPS to the headworks. These pipes have a capacity of approximately 24 mgd, but have insufficient velocities at minimum flow rates to keep solids in suspension.

3.2.1 Design Criteria

The IPS should be sized to accommodate the peak hour flow (PHF) requirements as well as the low flow requirements. It is critical that the influent pumping be able to handle the capacity hydraulically to keep the influent flow from backing up in the collection system at high flows and to keep solids in suspension at low flows. Per Oregon Department of Environmental Quality (DEQ) standards, the rated capacity of the IPS should be established with one of the large pumps out of service. The pump station is required to handle the range of flow conditions. The pump station design should be capable of handling low flows during the initial stages of operation and peak hour future flow rates at all stages of operation. The low flows currently are 0.5 mgd. The flow range extends from an instantaneous low of 0.5 mgd for current dry weather minimum to approximately 46 mgd for the peak hour future (2040) flow rate.

PHFs for the design conditions are summarized in Table 3-2. It should be noted that the Collection System Master Plan is ongoing, and it will identify inflow that may be able to be removed by 2020. Therefore, the design criteria should be updated during predesign of the IPS expansion and upgrade to identify the design capacity of the new pump station(s). The IPS design should include phasing that will accommodate flexibility to handle a range of expected peak flows.

Table 3-2. PHF Projections from 2005 to 2040

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
PHF[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1]Projected PHFs may decrease after inflow is removed from the collection system.

3.2.2 Summary of Existing Deficiencies

The IPS lacks the capacity to handle the full range of anticipated influent flows effectively, requires frequent maintenance, and is a safety concern. Due to wear and age of the pumps, the maximum pumping rate seen at the IPS is 21 mgd, based on City correspondence dated January 12, 2006. After a pump was rebuilt, the pump station operated at 23 mgd in November 2006. Flows to the pump station vary significantly, with minimum overnight flow rates of 1.2 to 1.5 mgd in wet weather and 0.5 to 0.7 mgd in dry weather to the peak instantaneous flow of 23 mgd experienced in November 2006. The rated capacity of the IPS should be established with one of the large pumps out of service per DEQ standards. As such, the rated capacity of the IPS is only 18.0 mgd with one large pump out of service. However, as noted above, the IPS has an observed maximum pumping capacity of 23 mgd with all pumps in service due to the condition of the existing pumps. The pumps undergo early wearing ring failure.

The pumps and wet well are hard to maintain, and access to the wet well is a safety concern. The stairs for accessing the submersible pumps and the wet well at the existing pump station are old and need to be replaced. No ventilation is currently available except by the use of portable fans. The remaining useful life of the pump station is estimated to be 5 years or less. Another issue reported is the accumulation of grit at the wet well and the associated wear on the pumps. This is related to low velocities in the pump inlets and discharge force mains during low flows.

Plant staff also report that pump clogging from rags and other debris creates frequent O&M difficulties, particularly after a wet weather flow event. The inlet and flow distribution system is not adequate to ensure that self-cleaning conditions are maintained in the pump approaches. Additionally, the large capacity pumps greatly exceed the overnight low flows. Combined, these conditions create an operating environment that induces pump clogging, particularly after periods of low flow. The low velocities experienced in the wet well for most of the operational time is not sufficient to keep the wet well clean. At the high peak flows, the velocity through the wet well changes dramatically. After long periods without rain, the first big rain that comes through washes everything from the wet well into the pumps, and then the pumps get clogged. Freeing the rags from the clogged pumps requires frequent shutdowns and high O&M costs.

The influent flow velocities at peak flows are too high according to Hydraulic Institute (HI) Standards. HI sets the standards that control the design of pump stations, one of which is that the influent flow to the wet well should not exceed 4.0 feet per second (fps). The velocity of water coming into the wet well at peak flows is 4.5 fps, which is created by the slope of the inlet pipe into the wet well. A flat section of pipe immediately upstream of the IPS is recommended to reduce the inlet velocities.

There are two existing IPS discharge pipelines to the headworks that are 20 inches in diameter. When flows exceed 24 mgd, the pipelines experience velocities exceeding 8 fps, the recommended peak velocity for pipeline design. When the pump station is expanded, the IPS discharge piping capacity must also be expanded. The addition of a parallel 24-inch-diameter pipeline will provide adequate capacity to accommodate peak flow rates through the year 2040. This assumes that the existing 20-inch ductile iron (DI) force mains are in good condition. These pipes should be inspected to determine their condition.

3.2.3 Identification of Expansion Alternatives

The City is considering either replacing the IPS or retrofitting it to allow it to meet either the 27 mgd peak flow demand or possibly to increase its capacity to meet future peak flows.

The IPS alternatives considered include:

Alternative 1: Building additional capacity at the north end of the plant

Alternative 2: Expanding the existing facilities

Alternative 3: Replacing the existing IPS with a new structure next to the existing structure

Alternative 4: Building additional capacity next to the existing and upgrading the existing IPS

Alternative 1. For hydraulic reasons, building additional influent pumping capacity at the north end of the plant was eliminated from further consideration because of the problem conditions at the existing pump station that are exacerbated by low flows. Low velocities in the influent pipe and IPS result in excessive pump clogging from rags and other debris. This condition would not be improved if additional influent pumping capacity was provided to the north. Ideally all flows should be directed to the existing pump station to maintain a high enough flow to improve the low flow conditions. In addition, it is very hard to find a pump that can reliably meet high static head and low flow conditions. If wastewater from the north flows to the existing pump station, the consistent low flow would be higher, thus making the pump selection easier and allowing for more efficient pump operation.

Alternative 2. Expanding the existing facilities is not recommended because the wet well is poorly designed and the peak influent velocity to the wet well is too high. Furthermore, the existing pump station is based on a vendor design concept that has proven to be less than reliable.

Alternative 3. Replacing the IPS is the ideal solution. This would allow the pipe entering the wet well to be re-laid, thereby reducing the velocity coming into the wet well. The new wet well could be designed to minimize the maintenance associated with clogged pumps. Due to site constraints, however, there is insufficient room to replace the existing IPS in its entirety, while maintaining current operations.

Alternative 4. Building additional capacity next to the existing IPS and upgrading the existing IPS includes the advantages of Alternative 3 while requiring a smaller footprint. The range of flows expected at the IPS is best accommodated by a dual pump station with low and moderate flows pumped by a station with a self-cleaning wet well, while higher wet weather flows are pumped by an overflow pump station with confined inlet pumps. The proposed pump station would be sited near the existing pump station and could use a portion of the existing structure. This alternative will also alleviate the conditions caused by low flows, which exacerbate the pump clogging problem. As flows to the pump station increase, this condition will diminish. A self-cleaning wet well will also minimize the clogging problem until the flows increase. Depending on the size of the expansion, this option does not preclude addition of another pump station to the north in the future to reduce the required influent pumping elevation headloss. For the purposes of this initial analysis, costs for adding new capacity and upgrading the existing pump station at the existing IPS location to 2025 flows are included. The initial screening is summarized in Figure 3-2.

Figure 3-2. Initial Screening for IPS Alternatives

	Evaluation criteria								
Technology/description	Relative present worth cost	Energy conservation	Regulatory compliance	Flexibility	Reliability	O&M	Safety	Viability at Newberg WWTP	Total score
Alternative 1: Building additional capacity at the north end of the plant	-	+	0	-	+	-	+	No/unless combined with No. 4	1
Alternative 2: Expanding the existing facilities								No	
Alternative 3: Replacing the existing IPS with a new structure next to the existing structure								No	
Alternative 4: Build additional capacity next to the existing and upgrade the existing IPS	0	0	0	0	+	+	+	Yes	3

Note: A higher score is better.

3.2.4 Evaluation of Viable Alternatives

For the purpose of this analysis, Alternative 4 is considered for expansion to capacity in 2025 in order to increase the minimum flows to the IPS. The IPS requires immediate substantial reconstruction to provide the required flow capacity range and to improve maintainability and safety. A potential pump station layout using the existing wet well for a portion of the flow is included as Appendix G.

It is recommended that a section of the influent pipe be elevated sufficiently to remove the slope to the IPS. If the City decides to remove the influent pipe from the creek, the slope of the influent pipe into the wet well could be improved, and the new pump station could be located adjacent to the existing but at a higher elevation. For this analysis, it is assumed that the Hess Creek pipeline will be raised above the Hess Creek 100-year flood plain.

During the facility planning process, the Motor Control Center building location for the IPS was discussed as part of the reuse design process. It was determined that a location to the west of the Administration Building would be optimum. This location avoids the influent piping at the east of the Administration Building, is in adequate proximity to the IPS, and avoids the additional costs of construction adjacent to the IPS on a steep slope and where the site is already constrained.

3.2.5 Cost Estimate

Order-of-magnitude construction cost for Alternative 4 of the IPS improvements is $2,723,000. Since there were no alternatives to compare, the present worth analysis was not conducted.

3.3 HEADWORKS

The headworks provides a preliminary process that involves screening and grit removal. Screenings removal from wastewater is necessary to allow proper operation of downstream mechanical equipment. Grit erodes mechanical equipment and piping, and collects in downstream treatment process tankage, reducing usable volume.

The headworks was recently upgraded with two new screens, screenings compactors, and a redundant grit classifier. The upgraded headworks was sized for 27 mgd based on the theoretical peak pumping capacity of the existing IPS. The original design criteria for each screen was 27 mgd each. However the capacity was compromised when actual field conditions did not match the as-built drawings and the screens could not be submerged to get the full capacity. With the actual submergence, the screens have a capacity of 21 mgd each and the bypass pipe has a capacity of 6 mgd.

The grit removal process was originally sized for 18 mgd. Above 18 mgd, design provisions allow flows to be manually bypassed around the grit process to avoid grit washout. Plant staff operate the grit removal without using the bypass feature.

3.3.1 Design Criteria

The headworks is typically sized to accommodate the PHF requirements with one unit out of service. It is critical that the headworks be able to handle the hydraulics to keep the influent from overflowing the headworks structure. However it is not critical that the headworks achieve the same level of treatment for these brief periods of time when the flows are at their peaks, since the performance does not impact discharge permit compliance. The headworks consists of two screens, a bypass pipe, and an aerated grit tank. Projected peak flows at the facility are listed in Table 3-3.

Table 3-3. Projected Peak Headworks Flows

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
Peak day flow (PDF)	16.17	18.75	21.98	25.78	29.35	41.40
PHF[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1]Projected PHFs may decrease after inflow is removed from the collection system.

The redundancy and reliability requirements for the headworks are:

- One backup unit for mechanical screens
- A minimum of two units for grit removal

As noted in Chapter 2, the capacity of the headworks (screens/overflow pipe and the grit tank plus the overflow) of 27 mgd will be exceeded around 2015, based on PHF. The grit tank is already undersized and needs to be expanded to treat all flow to protect downstream equipment and minimize tank cleaning intervals. The headworks capacity in relation to flow was summarized in Figure 2-7.

3.3.2 Identification of Siting Alternatives

The alternatives identified at the kickoff meeting held on May 12, 2005 include:

Alternative 1: Adding capacity at new headworks at the north end of the plant to serve a new pump station also to be located at the north end of the plant.

Alternative 2: Expanding the existing headworks.

3.3.3 Initial Siting Evaluation of Viable Alternative

Building another headworks (and IPS) to the north would intercept the influent flow prior to it traveling downgrade to the existing IPS, which is at a lower elevation than the plant site. Alternative 1 is not considered further because it is not advisable to have screenings and grit facilities in more than one location on the site. Alternative 2 is considered further.

3.4 INFLUENT SCREENS

The headworks includes two channels, two perforated-plate screens, and two screenings compactors.

3.4.1 Summary of Existing Deficiencies

The 10-millimeter opening screens were installed in 2003, and each screen is rated for a peak capacity of 21 mgd. If flows exceed 21 mgd, a bypass pipe is designed to handle 6 mgd for a total of 27 mgd when one screen is out of service. The headworks upgrade also included screenings washer/compactors and a redundant grit washer.

An emergency bypass pipe was included to provide peak capacity of 27 mgd through one screen should power to the other screen fail or be out of service. Peak flows in 2025 are expected to be 35 mgd unless infiltration/inflow (I/I) can be reduced. Two channels and one screen would need to be provided to ensure that the headworks has sufficient capacity with one unit out of service. One of the new channels would replace the overflow pipe and be sized to handle to peak flow of 21 mgd if the largest screen is out of service.

3.4.2 Evaluation of Viable Alternatives

The screenings alternatives were evaluated in 2002 during the Newberg Dump Station and Headworks Study conducted by Brown and Caldwell. The most cost-effective screen was chosen at that time. Plant staff have had positive experiences with the existing screens and screenings compactors. These screens can be raised and swiveled out of the channel should the power fail.

Each of the existing screens was designed for installation under the conditions in Table 3-4. Also noted is the capacity based in actual installation. The screens could not be recessed for full capacity.

Table 3-4. FSM Perforated Plate Screen Design Data

Design data	Value
Peak design flow, mgd (with installation per manufacturer's recommendation)	27
Peak actual capacity flow, mgd (could not be installed per manufacturer)	21
Average flow, mgd	4
Minimum flow, mgd	0.5
Channel width, inches	48
Channel depth, inches	68
Maximum upstream water depth, feet	5.67
Minimum downstream water depth, feet	0
Maximum allowable operating headloss through screen, inches	7
Maximum differential head the screen shall withstand, feet	5.75
Channel invert elevation	171
Deck floor elevation	
Upstream	176.67
Downstream	176
Screen angle from horizontal, degrees	60
Screen panel circular opening size, mm	10

For the purposes of this analysis, it is assumed that the expansion will include the same type screening equipment as existing for ease of O&M and because the screening equipment were determined to be cost-effective in the previous study.

At a minimum, a redundant channel and new screen and channel are needed for ultimate buildout at average population projections. An additional 4 to 5 mgd may be needed in 2040 for peak flows if the I/I is not controlled. There are two alternatives for expansion:

Alternative 1: Expand to include two new screens at the headworks. This would provide one more screen to meet peak flows and one screen to provide redundancy.

Alternative 2: Expand to include two more channels and one screen. The channel would have a large bar rack.

These channels will be installed on the east side of the existing headworks as shown in Figure 3-3. It is recommended that at the time of new screen installation, the existing bypass pipe be replaced with a bypass channel that can take all the flow if the largest screen is out of service. The flow will need to be equally distributed between the screens with a new influent flow distribution box. Emergency power should be added to ensure critical headworks functions can continue in the event of a power outage. Odor control should also be provided as a good neighbor policy.

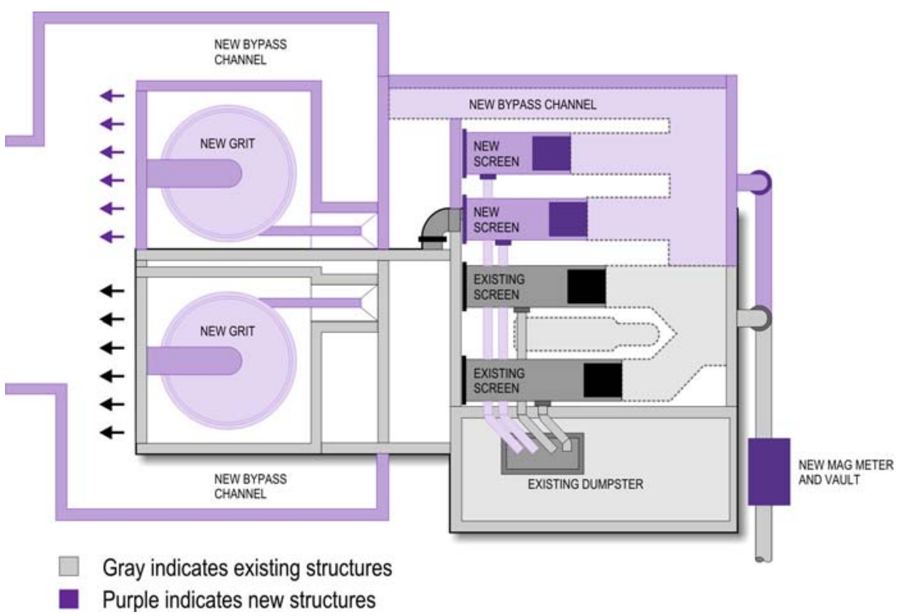


Figure 3-3. Headworks Channel Installation

3.4.3 Comparative Cost Estimates

Order-of-magnitude costs for the screening improvements are summarized in Table 3-5.

Table 3-5. Costs for the Screening Improvements

Technology/description	Construction cost, dollars
Alternative 1: Add two redundant screens (one is the redundant channel)	1,360,000
Alternative 2: Add one new screen and a bypass channel with bar rack	1,060,000

The O&M costs will be similar for both alternatives. The cost of operating the additional bar screen equipment will be offset by the labor cost of maintaining a bypass channel and raking the bar rack that accompanies it.

As a result of the analysis and Liquids Solids Workshop No. 2, Alternative 1 is the preferred alternative. Plant staff have had trouble with a manually-cleaned bar rack in the past and removed it. The rack plugged during high flow events when unattended. Plant staff did not want a manual bar screen, so Alternative No. 2 has been dropped from further consideration.

3.5 INFLUENT FLOW DISTRIBUTION AND METERING

The influent flow rate is measured at flow meters located on the influent piping at the headworks, as shown in Figure 3-4. According to the manufacturer's recommendations, the flow meters are not installed with sufficient straight runs of pipe before and after the meters. Magmeters require a straight run of pipe equivalent to five pipe diameters before the meter and a straight run equivalent to two pipe diameters after the meter to ensure accurate readings.

Figure 3-4. Influent flow meters at the WWTP headworks.

New flow distribution and flow monitoring will need to be provided with any alternative. The new flow monitoring will be provided a sufficient distance upstream of the headworks (approximately 20 feet) for the correct installation of magmeters to more accurately monitor the influent flow rates. The magmeters will be placed in a vault for ease of maintenance.

The capacity of the two existing 20-inch-diameter influent lines into the headworks will be expanded by adding a parallel pipe so that the velocity in the influent pipelines does not exceed 8 fps (about 11 mgd per pipeline). The flow monitoring for the new pipeline will be in the same flow meter vault to be provided for the existing pipes.

3.6 GRIT

The plant has one aerated grit tank and a bypass channel. Grit that settles to the bottom of this tank is pumped to two grit classifiers. Grit classifiers discharge classified grit into a dumpster. The tank is open to the environment, and no odor control mechanisms are in place.

3.6.1 Summary of Existing Deficiencies

Using the planning criteria of providing grit removal at all flows, the grit removal system is already out of capacity. The aerated grit tank is sized to meet a peak influent flow of 18 mgd while maintaining a theoretical hydraulic detention time of 3 minutes. Flows greater than 18 mgd are designed to be bypassed to the equalization basin. Current operation is to send all flows through the grit basin. Grit that is washed out accumulates in the oxidation ditches and can cause wear on downstream equipment. Plant staff expressed interest in planning for adequate grit removal for all flows. A grease blanket builds to 2 to 3 feet and is impossible to remove from the existing basins. An alternate configuration for effluent discharge from the basin is needed to facilitate grease and scum removal.

3.6.2 Alternatives Considered

The merits of several grit system alternatives were evaluated and both the advantages and disadvantages of each configuration were considered. The alternatives are representative of those options most applicable to the conditions to be encountered, but do not represent all possibilities.

The preliminary list of alternatives identified for grit removal include:

Alternative 1: Stacked tray separator
Alternative 2: Vortex grit settling with agitation
Alternative 3: Air vortex grit separator
Alternative 4: Free vortex separator
Alternative 5: Existing system expansion

Table 3-6 provides information about the grit removal alternatives.

Table 3-6. Grit Removal Alternatives

Information	Alternative 1 Stacked tray separator	Alternative 2 Vortex grit settling with agitation	Alternative 3 Air vortex separator	Alternative 4 Free vortex separator	Alternative 5 Existing system expansion
Maintenance requirements	No moving parts so low maintenance; only one unit for flows 1 to 5 mgd to maintain	Impeller/paddle with motor must be maintained	No in-basin moving parts; air system requires compressor	No moving parts so low maintenance requirements	No in-basin moving parts; air system requires compressor
Technology history	Only one permanent installation to date (Florence, OR)	Multiple manufacturers and installations	No known competitor; multiple installations	Multiple installations but only one manufacturer	Engineer designed
Low headloss through equipment	Headloss is less than 12 inches	Headloss is only 1/4-inch (Jeta)	Headloss is less than 1/4-inch	Headloss is 18 to 72 inches depending on number of teacups and size	Headloss would be same as existing
Removal efficiency	95 percent removal for 120 microns (eight 6-foot-diameter trays)	95 percent removal efficiency for 300 micron (Jeta); 65 percent removal efficiency for 150 micron (Jeta)	95 percent removal of grit 50 microns and larger	95 percent of design particle size (generally between 100 to 125 microns)	Has not been effective
Disadvantages	New technology; limited operating experience	Not effective with large variations in flow; manufacturer stated that capacity should be halved	Not effective with large variations in flow	Highest relative cost by order of magnitude; local municipality recently replaced the technology due to shortcomings	Large land area; has not been effective at removing grit

An initial screening analysis is summarized in Figure 3-5.

Figure 3-5. Initial Screening Alternatives

Technology/Description	Evaluation criteria								Total score
	Relative present worth cost	Energy conservation	Regulatory compliance	Flexibility	Reliability	O&M	Safety	Viability at Newberg WWTP	
Alternative 1: Stacked tray separator	+	+	0	+	+	0	0	Yes	4
Alternative 2: Vortex Grit settling with agitation	0	0	0	0	0	0		Yes	0
Alternative 3: Air vortex grit separator	-	-	0	0	0	0		Yes	-2
Alternative 4: Free vortex separator	-							Yes	-1
Alternative 5: Expand existing system	-	-	0	-	0	0	0	Yes	-3

Note: A higher score is better.

The vortex-type and plate gravity settling grit removal systems score the highest and are the most feasible for use at the Newberg WWTP. The added cost of removing the contaminated soils adjacent to the headworks makes Alternatives 3, 4, and 5 are more expensive and less feasible and therefore removed from further consideration.

3.6.3 Evaluation of Economically Viable Alternatives

Alternative 1: Stacked Tray Separator. The stacked tray settling system removes grit using a series of stacked plates. Flow is distributed across the plates and grit settles onto the plates. The plates are slanted to a center well, where grit accumulates before removal. The large surface area created by the stacked plate system increases grit removal efficiency and decreases the footprint. Higher flows are accommodated by increasing the number of plates. Eutek is the only manufacturer under consideration with its Headcell Plate Gravity Settling Grit Removal System. Advantages and Disadvantages of this alternative are provided in Table 3-7.

Table 3-7. Alternative 1—Stacked Tray Separator (Eutek Headcell)

Advantages	Disadvantages
▪ Stainless steel construction ▪ Few mechanical parts ▪ Low maintenance requirements ▪ Low capital cost for manufacturer-provided materials ▪ Lower costs for simpler concrete form work ▪ Grit suspension equipment for pumped grit system included ▪ Performance not affected by influent flow rate ▪ Smaller footprint ▪ Small inlet channels needed ▪ Higher grit removal efficiency ▪ Can be retrofitted into existing grit basin	▪ Grit pump not included with package ▪ Deeper construction

Alternative 2: Vortex Grit Settling with Agitation. Vortex grit removal systems work by creating a vortex flow pattern by both forcing the flow with a rotating turbine and designing a tangential inlet. Settled grit accumulates in a bottom hopper that is periodically pumped down. The vortex pattern helps settle the grit through gravity and centrifugal forces. The vortex flow pattern also creates a longer fluid flow pathway to increase settling time. Together these help to create a smaller footprint than conventional aerated grit removal systems. Because of the strict requirements for creating a vortex pattern, large, straight inlet channels are typically required, which poses problems with settlement of grit in the inlet channel. Manufacturers under consideration include:

- Smith and Loveless Pista Grit Vortex Grit Removal System
- Waste Tech XGT Vortex Grit Removal System
- Hydro International Grit King Vortex Grit Removal System

Information for these products is provided in Tables 3-8 to 3-10.

Table 3-8. Alternative 2—Smith and Loveless Pista Grit Vortex Grit Removal System

Advantages	Disadvantages
▪ Stainless steel construction ▪ Grit pump included with the package ▪ Forced vortex means that performance is not as affected by influent flow rate	▪ Large inlet channels required ▪ Larger footprint ▪ Moderate capital costs associated with manufacturer provided materials ▪ High costs associated with complex formed concrete not included in capital cost ▪ More mechanical parts (mixer motor and grit pump) ▪ More maintenance requirements ▪ Requires additional method to suspend grit prior to pumping ▪ Lower grit removal efficiency

Table 3-9. Alternative 2—Waste-Tech XGT Grit Removal System

Advantages	Disadvantages
▪ Stainless steel construction ▪ Grit pump included with the package ▪ Forced vortex means that performance is not as affected by influent flow rate ▪ Lowest capital cost for manufacturer provided materials ▪ Shallow construction ▪ Grit suspension equipment for pumped grit system included	▪ Large inlet channels required ▪ Larger footprint ▪ High costs associated with complex formed concrete not included in capital cost ▪ More mechanical parts (Mixer motor and grit pump) ▪ More maintenance requirements ▪ Lower grit removal efficiency

Table 3-10. Alternative 2—Hydro International Grit King Grit Removal System

Advantages	Disadvantages
▪ Stainless steel construction ▪ Grit pump included with the package ▪ Fewer mechanical parts ▪ Less maintenance ▪ Grit suspension equipment for pumped grit system included ▪ Higher grit removal efficiency	▪ Large inlet channels required ▪ Larger footprint ▪ Highest capital cost for manufacturers provided materials ▪ High costs associated with complex formed concrete not included in capital cost ▪ Deep construction ▪ Lack of forced vortex means that performance is affected by influent flows

3.6.4 Comparative Cost Estimates

Order-of-magnitude costs for the grit removal improvements are summarized in Table 3-11. These costs were developed for another project and scaled for discussion at the Liquids Solids Workshop No. 2. No additional cost estimating was requested.

Table 3-11. Costs for the Grit Removal Improvements

Information	Stacked tray separator, dollars	Grit settling with agitation, dollars	Air vortex separator, dollars	Free vortex separator, dollars
Approximate capital cost	51,000	92,000 (two stainless steel tanks included)	90,000 (two units excluding a compressor	790,000 to 880,000 (ten units)
Cost per mgd	17,000	30,720	30,000	293,000
Cost per 21 mgd	357,000	645,000	630,000	6,200,000

Note: Comparative cost based on recent experience. Assumes two units in service and incremental cost increasing from 17.5 mgd each (2025) to 21 mgd each (2040) is negligible.

From the above options, we recommend using a Eutek Headcell grit removal system. This system is less expensive and easier to maintain, because it uses a purely physical separation and includes fewer mechanical parts. In addition, the Eutek Headcell does not require long influent channel transition lengths that are required by vortex grit removal systems, and it can be retrofitted into the existing aerated grit chamber. A minimum of two grit removal tanks to meet redundancy requirements will be assumed. A bypass channel will be included in the design if one or both grit removal units are out of service. This will reduce cost and footprint for the grit removal system.

3.7 ODOR CONTROL

There are odors associated with the screenings and dumpster at the headworks. These odors are prominent in the warmer months of the year. Odor control should be considered for the headworks improvements.

3.8 SEPTAGE RECEIVING

Trucks currently discharge septage into a catch basin. The septage then flows down to the IPS and is pumped back up to the headworks. Septage receiving was studied in a previous report entitled *Final Report for the Recommended Plan City of Newberg Dump Station/Headwork Studies* (*Final Dump Station/Headworks Studies* report) (Brown and Caldwell, June 2002). The conclusions are considered to be valid for this analysis.

3.8.1 Design Criteria

Design criteria was based on septage hauler truck size and is noted in the *Final Dump Station/Headworks Studies* report.

3.8.2 Summary of Existing Deficiencies

The catch basin was not designed to receive septage. The septage flows down to the IPS and takes needed influent pumping capacity. The additional pumping is also not cost-effective.

3.8.3 Identification of Expansion Alternatives

The *Final Dump Station/Headworks Studies* report considered several septage receiving stations including Lakeside, JWC, and FSM. Based on the 2002 analysis, the recommended improvements include modifications to the road southeast of the headworks (including a trench drain and catch basin), a Lakeside 31SAP-type septage receiving station, a buried septage receiving tank, duplex pumps in the septage receiving tank, piping to transfer the septage to the screening channel of the headworks, and a new access road around the north side of the headworks. The screenings from the station will be bagged, so no roof over the septage screenings dumpster will be required. Vactor trucks can discharge on the ramp leading to the septage receiving station. Rocks and debris will be manually removed.

3.8.4 Cost Estimate

The updated cost estimate for septage receiving improvements is $695,000.

3.9 SECONDARY BIOLOGICAL TREATMENT

This section evaluates existing secondary process capacity with respect to population growth and effluent permit compliance. The Newberg WWTP currently uses two oxidation ditches for secondary biological treatment. The City has expressed interest in continuing to use the oxidation ditch process because of its low energy and maintenance costs and its ability to treat a wide variation in flows and loads. The City has an interest in acquiring the adjacent Baker Rock property for expansion of the secondary system. However, should land not be available to expand the WWTP with the current technology, additional processes were also considered.

3.9.1 Design Criteria

The design of the secondary treatment system are based on maximum month flows. Design flows to the secondary treatment process for the 2010 and 2025 expansions are listed in Table 3-12.

Table 3-12. Design Flows for Secondary Treatment

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
MMDWF[1]	3.52	4.08	4.78	5.61	6.39	9.01
MMWWF[2]	7.52	8.71	10.21	11.98	13.64	19.24

[1]MMDWF = maximum month dry weather flow
[2]MMWWF = maximum month wet weather flow

The capacity requirements are more stringent if nitrogen removal is considered than if nitrogen removal is not required. The timing for improvements is given for both conditions.

3.9.2 Summary of Existing Deficiencies

The existing secondary treatment units do not have capacity for future flows and loads. The oxidation ditches have structural deficiencies that need to be repaired. For the purposes of this alternatives analysis, it is assumed that the existing basins will be rehabilitated and additional capacity will be provided by new basins and associated secondary clarification.

3.9.3 Identification of Expansion Alternatives

The screening process included evaluation and ranking of potential treatment technology alternatives to upgrade the WWTP to address the anticipated growth, regulatory requirements, and to confirm the cost-effectiveness of continuing the use of the existing technology. Potential treatment technologies were identified in the Liquids Solids Workshop No. 1. These technologies include:

Alternative 1: Conventional oxidation ditch
Alternative 2: Vertical loop reactors (VLR) oxidation ditch
Alternative 3: Cannibal
Alternative 4: Membrane bioreactors (MBRs)

Alternatives 1 though 3 use extended activated sludge which is land-intensive. Alternative 4 was included to compare to a treatment technology with a smaller footprint. The initial screening of the technologies included ranking them against three non-cost factors and relative cost comparison. Table 3-13 lists potentially viable liquid stream technologies.

Table 3-13. Liquid Stream Technology Descriptions Identified as Potentially Viable

Alternative	Technology/description	Comments
Conventional oxidation ditch	Wastewater is treated with a suspended sludge in a biological reactor the shape of a racetrack.	Current technology used at the Newberg WWTP. Low O&M.
VLR oxidation ditch	Wastewater is treated with a suspended sludge in a biological reactor the shape of a racetrack turned on its side. This system differs from a conventional oxidation ditch because the looped flow is made over and under the horizontal baffle. The process uses up-front aerated-anoxic looped reactors with mechanical aeration technology followed by second-stage reactors using fine bubble diffusers.	New technology with few recent municipal installations of this technology in the U.S. A new installation is being planned in the City of Albany, OR. Typical vertical loop reactors tanks are arranged in series, usually with three or more rectangular tanks—all of equal size. Storm flow problems are addressed by diverting raw wastewater (diluted by the rain water) into the second, third or fourth tank. The VertiCel™ process is ideal for medium to large size plants above 10 mgd.
Cannibal	Screens are used in a biological process to reduce solids in basins, which purports to eliminate solids handling.	Theoretically reduces sludge quantities for disposal. Additional solids removed from the system are sent to the landfill. Does not show benefits to plants that accept drinking water treatment plant solids.
MBRs	Modification of conventional activated sludge that uses membranes as a barrier to solids such that secondary clarifiers are not required, and therefore takes up less footprint than the existing oxidation ditches.	MBRs produce high-quality effluent and they provide a high level of process control. Requires smaller footprint but is much higher in present worth costs because of high energy and chemical costs. Membranes clog unless very high mixed liquor is maintained. Sensitive to flow fluctuations greater than 2.5 times average flow.

Based on a previous analysis that compared the oxidation ditch process to other biological processes, the oxidation ditch is still the lower life-cycle cost over MBRs because of the low hp aeration and O&M costs.

The MBR alone does not treat large influent flow variations and therefore is no longer considered a viable option for the Newberg WWTP. However, in the future if land requirements become limiting at the plant, the MBR process should be reconsidered as an expansion alternative to treat a base flow and the existing oxidation ditches can treat the varying peak flows.

The Cannibal manufacturer does not recommend that the process be used when drinking water treatment plant solids are accepted. Drinking water treatment solids from the Newberg Water Treatment Plant (WTP) are accepted at the Newberg WWTP. Therefore the Cannibal process is not viable for the Newberg WWTP.

The alternatives ranking is shown in Figure 3-6.

Figure 3-6. Screening of Liquid Stream Technologies—Rating Table

Technology/description	Evaluation criteria								Total score
	Relative present worth cost	Energy conservation	Regulatory compliance	Flexibility	Reliability	O&M	Safety	Viability at Newberg WWTP	
Alternative 1: Conventional Oxidation Ditch	+	+	0	0	+	+	0	Yes	4
Alternative 2: VLR Oxidation Ditch	+	+	0	0	+	+	0	Yes	4
Alternative 3: Cannibal								No	
Alternative 4: MBR	-	-	0	0	0	-	0	Maybe/future	-3

Note: A higher score is better.

3.9.4 Evaluation of Viable Alternatives

The VLR would provide the added benefit of lowering the surface area exposed to the warming effect of the sun, to minimize the thermal load to the river; and it has additional energy efficiencies from submerged aeration. For the purposes of this comparison, the alternatives for both expansion using the oxidation ditch and vertical loop reactor are considered further. For the analysis, it was assumed that the existing basins would remain conventional activated sludge and the new capacity would be provided by the alternative technologies.

3.9.5 Comparative Cost Estimates

Order-of-magnitude costs for the secondary treatment improvements are summarized in Table 3-14.

Table 3-14. Costs for the Secondary Treatment Improvements

Description	Cost, dollars	O&M	Total present worth
Alternative 1: Conventional oxidation ditch	8,489,000	3,981,000	12,470,000
Alternative 2: VLR	17,417,000	3,785,000	21,202,000

Note: Net present value includes O&M for 20 years to 2025.

Based on the results of this analysis and consensus at the Liquids Solids Workshop No. 2, expansion with the current oxidation ditch process is the preferred alternative.

3.10 DISINFECTION PROCESS

The disinfection process is a chlorination system that uses ton cylinders of chlorine gas. The chlorination system has been upgraded in the last 4 years. The upgrades replaced worn equipment, but did not increase chlorination capacity. Operators make manual adjustments based on plant flow and season. The chlorine is fed at the secondary clarifier effluent splitter box and is mixed as the chlorine is split to the two contact basins.

3.10.1 Design Criteria

Disinfection design is typically based on PHF. The chlorine contact tank is designed to provide disinfection to the wastewater prior to being discharged to the Willamette River. Chlorine contact tanks are generally designed to provide 20 minutes of contact time at normal maximum flow, which is generally sufficient to disinfect wastewater that has already undergone secondary treatment. The 2005 contact time for the PHF is 14 minutes. Since the effluent is dechlorinated at the outlet from the chlorine contact chamber, contact time in the outfall pipe is not effective and is not considered as part of the required capacity.

The PHFs for the design conditions are summarized in Table 3-15. It should be noted that the Collection System Master Plan is ongoing. The Collection System Master Plan will identify inflow that may be able to be removed by 2020. Improvements may be postponed if inflow can be removed.

Table 3-15. Peak Hour Flow Projections from 2005 to 2040

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
PHF[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1]Projected PHFs may decrease after inflow is removed from the collection system.

3.10.2 Summary of Existing Deficiencies of Disinfection

Immediate improvements are needed that include chemical induction mixer(s) at the chlorine injection point, scum removal, improved effluent flow monitoring, and automatic disinfection control strategy. Roof drainage needs to be re-routed out of the contact basin.

Figure 3-7 shows that the existing chlorine contact tank is able to meet the 20-minute recommended detention time for maximum month and average day flows until 2040. However, the existing facility is not able to provide sufficient detention time for either PDF or PHF, unless high-rate disinfection is adopted. DEQ requires that the contact time requirement be met at PHF.

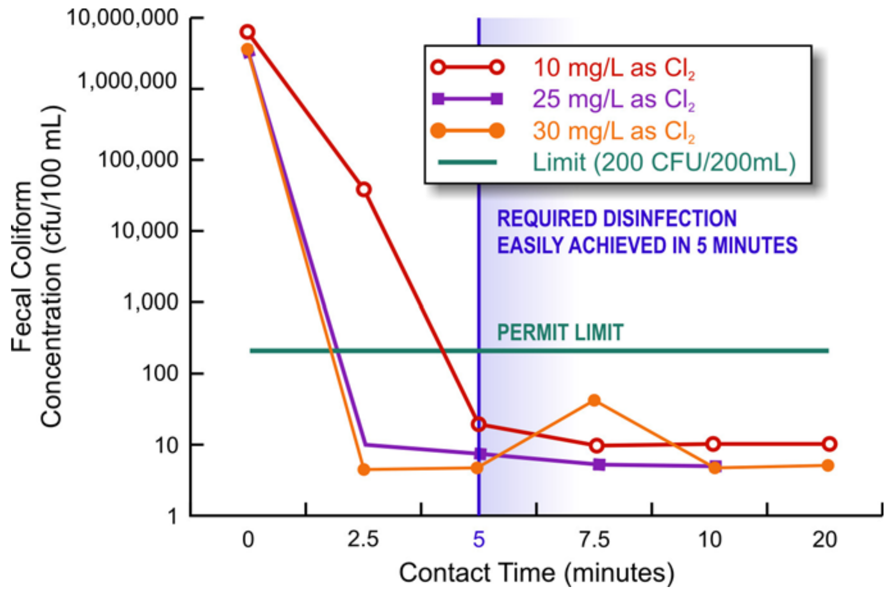


Figure 3-7. Effects of High Rate Mixing on Disinfection

Although the National Pollutant Discharge Elimination system (NPDES) permit is for disinfection to meet an *E. coli* bacteria, the disinfection should be adequate based on the analysis summarized in Figure 3-7. Fecal coliform concentration of 200 is roughly equivalent to an *E. coli* concentration of 126. The existing chlorine contact time provides 11 minutes of detention time at PHF of 35 mgd in 2025. Theoretically, this contact time is sufficient for adequate disinfection using high rate disinfection for this flow. Actual operating experience will verify the adequacy in the near term.

There has been increased concern about the safety of using chlorine gas. The City has expressed interest in the feasibility of other disinfection alternatives including ultraviolet (UV) light disinfection or onsite hypochlorite (HOCl) generation for expansion needs. However, since the reuse facility will require an effluent chlorine residual, a small HOCl system would also be needed if UV were implemented.

3.10.3 Identification of Alternatives

Alternatives for expansion include:

Alternative 1: High-rate disinfection: addition of chemical induction mixer and high chlorine dosing

Alternative 2: Additional contact basin

Alternative 3: Additive to Alternatives 1 and 2 for bulk delivered or onsite generation of HOCl

Alternative 4: UV Disinfection

Alternative 1. High-rate disinfection is defined as disinfection obtained by higher chlorine or hypochlorite doses at shorter detention times. This also requires that increased chemical doses be used for dechlorination. The theory is based on the use of the detention time-dose product. As detention time is shortened, effective disinfection can be maintained by use of higher chlorine application rates. There are limitations to this process that include the need for extremely good initial mixing of chlorine into the flow stream and a minimum detention time.

High-energy mixing using chemical induction mixers and sufficient chlorine dosing should preclude the need for construction of additional contact time through the 2025 planning period. The minimum detention time with high rate disinfection is about 10 minutes since chemical disinfection is both a physical and biological process that requires time to complete. The initial screening is summarized in Figure 3-8.

Figure 3-8. Initial Screening for Disinfection Alternatives

	Evaluation criteria								
Technology/Description	Relative present worth cost	Energy conservation	Regulatory compliance	Flexibility	Reliability	O&M	Safety	Viability at Newberg WWTP	Total score
Alternative 1: High-rate disinfection	+	0	0	+	+	0	0	Yes	3
Alternative 2: Additional contact basin	0	0	0	0	+	+	0	Yes	2
Alternative 3: Additive of onsite generation of HOCl	-	0	0	0	+	0	0	Yes	0
Alternative 4: UV disinfection	-	-	0	0	+	0	+	Yes	0

Note: A higher score is better.

Effective disinfection beyond the 2025 flow rates will require that additional contact basin capacity be constructed.

Both Alternatives 1 and 2 are assumed to include the use of chemical induction mixers, as they reduce the amount of overall chemical needed. The City of Bend, Oregon, reported a 20 percent reduction in HOCl use when induction mixers were installed. One induction mixer is required in each of the two contact basin sides.

Alternative 2. If the high-rate disinfection concept is approved and implemented, construction of additional contact basin capacity can be deferred until after 2025 depending on the growth of flow rates. If chlorine or HOCl disinfection is used after the year 2025, a new contact basin would be required equal in size to one of the two existing contact basins. This decision can be deferred until that time, unless DEQ does not accept the high-rate disinfection concept. It is noted that DEQ approved a very similar high-rate disinfection process at Gresham, Oregon, that has been successful.

Alternative 3. This alternative is applicable to Alternatives 1 and 2 and specific details are discussed below. Many water and wastewater treatment plants have converted from chlorine gas disinfection to HOCl disinfection. The reasons relate to community safety and security, rather than cost or ease of operation. Chlorine gas leak detection and response plans are required to be in place at all larger facilities. The potential for sabotage or vandalism resulting in a chlorine gas leak is also a primary security concern wherever chlorine gas is used. For this reason, the conversion of the disinfection process to either HOCl or UV disinfection is recommended.

HOCl can be purchased for bulk delivery by chemical suppliers, or it can be generated onsite. The existing Newberg WTP uses HOCl generated onsite. There is significant benefit in coordination of equipment in terms of spare parts, training, and redundancy when the WTP moves in closer proximity to the WWTP.

Alternative 4. This alternative involves replacement of chemical disinfection and dechlorination with the use of UV light. UV disinfection is successfully used at a great number of WWTPs in Oregon and throughout the country. Specific UV lamp technologies and design configurations are discussed below. The emphasis is on fitting a UV disinfection system within the existing chlorine contact basins to reduce the plant site area required and to reuse existing tankage.

The benefits of high-rate mixing are shown in Figure 3-8. Initial screening is summarized in Figure 3-9.

3.10.4 Evaluation of Viable Alternatives

All of the disinfection alternatives identified remain viable. The first two alternatives could use either chlorine gas or HOCl. These are described in more detail below.

- Alternative 1: Bulk delivered chlorine gas
- Alternative 2: Bulk-delivered HOCl
- Alternative 3: Onsite HOCl generation
- Alternative 4: UV inactivation with hypochlorite

Table 3-16 contains a comparison of disinfection alternatives.

Table 3-16. Comparison of Disinfection Alternatives

Alternative	Safety	Site requirements	Water quality	Ease of operation
1. Bulk delivered chlorine gas	Most risk	Medium	More THM[1]	Status quo
2. Bulk delivered hypochlorite	Most chemical	Highest	More THM	Simplest one system
3. Onsite generation of hypochlorite	Lower chemical, higher fire	High	More THM	More mechanical
4. UV inactivation with hypochlorite for residual	Lowest chemical	Least	Least THM	Two systems mechanical

[1]THM = trihalomethanes

3.10.5 Bulk Delivered HOCl

The potential hazards and costs associated with handling and use of gas chlorine has led many utilities to convert to the use of liquid HOCl. HOCl is available in 12 percent solution in most locations. This solution is about 2-1/2 times as concentrated as household bleach. It is chemically aggressive, and should be regarded as an exposure hazard for operators and others in the vicinity of storage, transport, or application points. HOCl solution has a pH of over 11 and should not be acidified since it will release a concentrated cloud of chlorine gas.

HOCl solution should be stored in double-contained tanks or a secondary containment basin. Piping should be double-contained. Spill containment in unloading areas is also required.

HOCl decomposes during storage with the rate of decomposition impacted by concentration, temperature, pH, light, and the presence of metallic contaminants in the solution. In general, 12 percent HOCl should be stored for no more than 30 to 60 days. The solution strength will decrease by 20 percent over 30 days at 80 degrees Fahrenheit (F).

The cost of HOCl solution is substantially higher than chlorine gas per pound of equivalent chlorine. HOCl solution (12 percent) may range from $0.40 to $1.25 per pound of equivalent chlorine depending upon the size and location of the treatment plant.

The advantages of HOCl for disinfection include:

- Operators are familiar with storage, pumping, and regulating liquid solutions.
- There is no risk to the general public.
- It provides chlorine residual for reclaimed water.
- No capital improvements are required after current reuse project is complete.

The disadvantages of delivered HOCl for disinfection include:

- Solution strength deteriorates with time.
- Dechlorination is required prior to discharge.

HOCl/Onsite Generated. Onsite generation of HOCl solution has become more widely used in recent years as an alternative to bulk delivery. HOCl is generated onsite electrolytically from brine (sodium chloride in water solution). Hydrogen gas is the only byproduct of electrolytic decomposition of sodium chloride and must be dispersed to the atmosphere. Equipment is available to generate HOCl in various concentrations from 0.8 percent up to 12 percent. Low strength HOCl solution is less hazardous to use and can be stored for longer periods of time. The number and size of the required storage tanks increases as the solution strength decreases.

The advantages of onsite generation of HOCl include:

- Safety concerns related to transport and off-loading of bulk HOCl solution are eliminated.

- Lower strength HOCl solutions are less hazardous to operators.

- Lower strength HOCl solutions degrade at a much slower rate than 12 percent solution.

The disadvantages of onsite HOCl generation include:

- It is a newer technology that may require more supervision.
- It requires dechlorination prior to discharge to the receiving stream.
- Production costs depend upon the cost of power.
- Water used in process must be softened to prevent scaling.
- Electrodes are consumed and require periodic replacement.

UV Disinfection. UV light is generated by germicidal lamps that contain mercury vapor in an inert gas, such as argon, with tungsten electrodes at each end of the lamp. UV light is emitted when the lamp is powered and heated to vaporize the mercury. Power to each lamp is regulated by ballast, which controls electrical frequency and voltage.

The UV light penetrates the bacterial cells which consist of a cell wall and cell nucleus containing genetic material composed of deoxyribonucleic acid or DNA. Microbial inactivation occurs due to the impact of UV light on the cell's DNA.

UV light at 254 nanometers (nm) (or within the range from 220 to 260 nm) has the ability to penetrate the cell wall and disrupt the chemical double bonds of the DNA molecule. The DNA molecule is a double strand of nucleotides. The inactivation mechanism for UV light is dimerization of the thymine double bonds. If a sufficiently high number of thymine double bonds are disrupted, the microbe is unable to replicate and is no longer measurable in standard test methods, or infective in the environment.

There are a number of UV lamp technologies applicable for wastewater disinfection. The available lamp technologies are discussed below. These include conventional low-pressure lamps, low-pressure/high-output lamps, medium-pressure lamps, and pulsed xenon lamps.

The amount of UV light energy applied to water flowing through a UV reactor is called the dose rate, and is expressed in units of µW·s/cm2, mW·s/cm2, or mJ/cm2. Figure 3-9 shows the factors which influence the calculation of UV dose rate for a specific water sample.

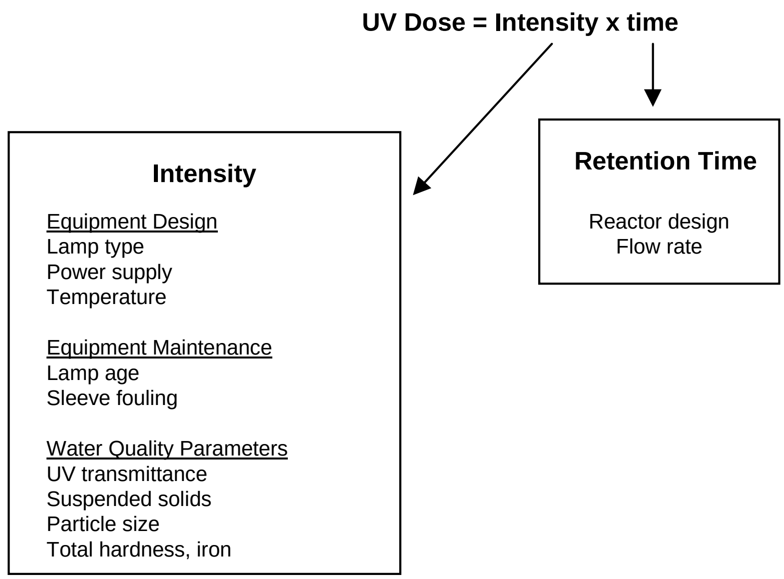


Figure 3-9. Factors Influencing UV Dose Rate

UV dose rate is defined as the product of UV intensity and time, although its actual calculation is far more complicated due to real-life factors. UV dose varies throughout a UV reactor as a function of equipment design, equipment maintenance, water quality and reactor hydraulics. The average UV dose is determined by a mathematical model based on the multiple point source summation approximation method. The actual applied UV dose will always be less than the calculated UV dose due to imperfect mixing within the UV reactor. Equipment manufacturers use hydraulic model testing and computational fluid dynamic analysis to determine the actual mixing characteristics of a specific reactor design. Confirmation of UV dose is also difficult to measure since the UV reactor is a dynamic system. The accepted calibration method is biodosimetry, in which a surrogate microbe (i.e., bacillus subtulis or MS2 coliphage) is used to prepare a dose-response curve for each UV system.

3.10.6 Comparative Cost Estimates

Order-of-magnitude costs for the disinfection improvements are summarized in Table 3-17.

Table 3-17. Costs for the Disinfection Improvements

Description	Capital cost, dollars	O&M cost, dollars	Total present worth, dollars
Alternative 1A+5B: high-rate disinfection/chlorine/dechlorination	400,000	221,000	3,397,000
Alternative 1B+5B: high-rate disinfection/hypochlorite/dechlorination	350,000	292,000	4,322,000
Alternative 3A+5A: high-rate disinfection/onsite generation/dechlorination	1,545,000	306,000	5,697,000
Alternative 2A+5B: conventional disinfection/chlorine/dechlorination	1,145,000	69,000	2,088,000
Alternative 2B+5B: conventional disinfection/hypochlorite/dechlorination	1,085,000	998,000	2,411,000
Alternative 3B+5B: conventional disinfection/onsite generation/dechlorination	1,545,000	445,000	7,586,000
Alternative 4: UV disinfection	3,065,000	64,000	3,940,000

Note: net present value includes O&M for 20 years to 2025.

Based on the results of this analysis and the Liquids Solids Workshop No. 2, high-rate disinfection is recommended for the immediate improvements with UV disinfection phased in for incremental expansion when needed in the future.

3.11 DECHLORINATION

The dechlorination system was added in 1998. Prior to 1998 there was no requirement for dechlorination. DEQ has mandated that the chlorine residual not exceed 0.05 milligrams per liter (mg/L). The tank holds around 300 gallons of bisulfate and there are two pumps that feed the bisulfate into a box at the end of the chlorine contact basin. One grab sample per day is taken to measure chlorine residual.

3.11.1 Design Criteria

The PHFs for the design conditions are summarized in Table 3-18. The NPDES permit includes a requirement that total residual chlorine shall not exceed a monthly average concentration of 0.02 mg/L and a daily maximum of 0.05 mg/L. There is a caveat in the NPDES permit Note No. 4 regarding limits lower than 0.10 mg/L chlorine residual.

Table 3-18. PHF Projections from 2005 to 2040

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
PHF[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1]Projected PHFs may decrease after inflow is removed from the collection system.

3.11.2 Summary of Existing Deficiencies

The bisulfite is not fully usable. The bisulfite tank is only 300 gallons and it has to be refilled a minimum of once a week and frequently twice a week during periods of high flows. Each refill is about 150 gallons, because when the tank is down to about one-third capacity, the chemical feed pumps begin to lose pressure and are unable to feed the bisulfate to the system. The tank needs to be raised. Another concern is that there is a lot of buildup of bisulfite crystals around the fittings. These crystals are causing further operational problems. Existing bisulfite feed water is from the potable system.

3.11.3 Identification of Expansion Alternatives

Design recommendations are provided for immediate improvements for sodium bisulfite feed system, including more advanced control system, updated and larger pumps and raising the tank for increased capacity. No feasible alternatives were identified.

3.12 OUTFALL

The Newberg outfall discharges to the Willamette River. The Newberg outfall (Treated Effluent Outfall) discharges to the Willamette River near River Mile South. The outfall is a 24-inch-diameter open pipe extending approximately 30 feet offshore at a depth of 17 feet at ordinary low water. The outfall is parallel to a 24-inch outfall from the SP Newsprint Corporation. The two outfalls are at different depths and interact only at a marginal level.

Review of outfall analysis information indicates that the mixing provided within the current mixing zone is adequate to meet applicable water quality standards provided that effective dechlorination is provided and trace contaminants, particularly heavy metals such as mercury, are controlled by the enforcement of local limits regulations. Mercury needs to be controlled to meet Willamette River mass loading (TMDL) requirements. Since total residual chlorine is adequate by dechlorination and trace contaminants will be controlled by enforcement of local limits regulations, the existing outfall should be adequate until 2025. The mixing zone is an area that extends 75 feet out from the west bank of the river and from 15 feet upstream to 150 feet downstream to the point of discharge.

Any reduction in the size of the regulatory mixing zone will require reevaluation of the mixing provided by the currently permitted zone and would potentially result in the need for a more effective in-stream diffuser.

3.12.1 Design Criteria

The outfall is sized to accommodate the PHF requirements. The PHF for the design conditions are summarized in Table 3-19.

Table 3-19. PHF Projections from 2005 to 2040

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
PHF[1]	20.81	23.65	27.15	31.19	34.77	45.86

[1]Projected PHFs may decrease after inflow is removed from the collection system. Peak effluent flows may be attenuated through the plant.

3.12.2 Summary of Existing Deficiencies

A simple hydraulic analysis of the Newberg WWTP shows that the outfall should be capable of handling the PHFs through the year 2025 when the PHF is expected to reach 35 mgd. Based on drawings prepared by KCM, the high water level in the Willamette River was assumed to be 83 feet. If the water level exceeds 83 feet, the plant would need to add pumping in order to discharge the PHF through the pipe.

The outfall is constructed for most of its length with 36-inch-diameter pipe at fairly gradual slopes and at some points uses surcharging by relying on the upstream head to push the water up the gradient. When the outfall is approximately 300 feet from the river, the size changes to 24-inch-diameter pipe and the slope becomes very steep. At one section the slope is 21 percent. Where the pipe transitions to 24 inches, there is potential for a hydraulic cannon.

The velocity of water in the pipe at PHFs may exceed 27 fps in the steep 24-inch section, and as the pipe will not be flowing full, there may be a strong likelihood for some hydraulic cannon effects to occur in the pipe. This happens when there is a hydraulic jump in the pipe, and the flow goes from super-critical to sub-critical, trapping air in the pipe. The air becomes pressurized and once it reaches a critical state, it will exit the pipe forcefully. This force can blow off manhole lids, separate manhole risers, and cause other problems with the outfall.

The preliminary calculations show that the City is having problems with the outfall when flows reach 25 to 27 mgd. Plant staff verified that the effects of a hydraulic cannon are evident at the upstream manhole of the outfall pipe. Upon investigation of the manhole and outfall at the conclusion of Liquids Solids Workshop No.2, a hydraulic cannon event was actually witnessed.

3.12.3 Identification of Expansion Alternatives

A viable alternative includes adding a pipe along that length to increase capacity. This can prevent the air entrapment and alleviate the possible hydraulic effects.

3.12.4 Evaluation of Viable Alternatives

No other viable alternatives were identified.

3.13 TERTIARY TREATMENT/REUSE

This section discusses tertiary treatment and reuse.

3.13.1 Irrigation

Tertiary treatment using membranes has been selected by the City after a predesign evaluation and recommendation documented in the *Reuse Water System Predesign Study* (CH2M HILL, October 2005). Membranes are assumed to be the preferred technology for future tertiary treatment.

3.13.2 In-plant Water

The current reclaimed water system filters are inadequate and the screening size is too large to be effective. A looped plant water system is recommended for inclusion in the CIP. Plant water is not currently available at the headworks and will be added to conserve potable water.

3.13.3 Temperature of Discharge and Reuse Requirements

DEQ is implementing the Willamette Total Maximum Daily Load Waste Load Allocations (WLAs) in the City's open NPDES permit. The City has the opportunity to track river and effluent temperature and flow on a 7-day running average or comply based on the WLA discussed in Chapter 1. Preliminary analyses were conducted that show that the City will be able to add approximately 40 to 44 million kilocalories of heat energy per day to the Willamette River without violating the WLAs. The City created a matrix shown in Figure 3-10 that correlates the effluent flow rate and temperature with a total heat energy added to the Willamette River. This table assumes an ambient river temperature. Although the ambient temperature can be variable, it provides a baseline indication. The discharge limits are based on a 7-day average.

In 2005, the maximum 7-day summer temperature was 23.5 degrees Celsius (C). According to the matrix, this would result in a maximum allowable discharge of approximately 3.0 to 3.5 mgd, though this could vary slightly depending on the temperature of the Willamette River. The maximum 7-day summer flow (May to October) was 4.1 mgd. The City is implementing a reuse program to irrigate local golf courses that will decrease its effluent discharge by 1 mgd.

Excess Thermal Load (million k-cals/day)

Eff Temp (*C)

Eff Flow (mgd)	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5	26.0	26.5	27.0	27.5	28.0	28.5	29.0	29.5	30.0
1.0	0	2	4	6	8	9	11	13	15	17	19	21	23	25	26	28	30	32	34	36	38
1.1	0	2	4	6	8	10	12	15	17	19	21	23	25	27	29	31	33	35	37	40	42
1.2	0	2	5	7	9	11	14	16	18	20	23	25	27	30	32	34	36	39	41	43	45
1.3	0	2	5	7	10	12	15	17	20	22	25	27	30	32	34	37	39	42	44	47	49
1.4	0	3	5	8	11	13	16	19	21	24	26	29	32	34	37	40	42	45	48	50	53
1.5	0	3	6	9	11	14	17	20	23	26	28	31	34	37	40	43	45	48	51	54	57
1.6	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	55	58	61
1.7	0	3	6	10	13	16	19	23	26	29	32	35	39	42	45	48	51	55	58	61	64
1.8	0	3	7	10	14	17	20	24	27	31	34	37	41	44	48	51	55	58	61	65	68
1.9	0	4	7	11	14	18	22	25	29	32	36	40	43	47	50	54	58	61	65	68	72
2.0	0	4	8	11	15	19	23	26	30	34	38	42	45	49	53	57	61	64	68	72	76
2.1	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
2.2	0	4	8	12	17	21	25	29	33	37	42	46	50	54	58	62	67	71	75	79	83
2.3	0	4	9	13	17	22	26	30	35	39	44	48	52	57	61	65	70	74	78	83	87
2.4	0	5	9	14	18	23	27	32	36	41	45	50	55	59	64	68	73	77	82	86	91
2.5	0	5	9	14	19	24	28	33	38	43	47	52	57	62	66	71	76	80	85	90	95
2.6	0	5	10	15	20	25	30	34	39	44	49	54	59	64	69	74	79	84	89	93	98
2.7	0	5	10	15	20	26	31	36	41	46	51	56	61	66	72	77	82	87	92	97	102
2.8	0	5	11	16	21	27	32	37	42	48	53	58	64	69	74	80	85	90	95	101	106
2.9	0	5	11	16	22	27	33	38	44	49	55	60	66	71	77	82	88	93	99	104	110
3.0	0	6	11	17	23	28	34	40	45	51	57	62	68	74	79	85	91	97	102	108	114
3.1	0	6	12	18	23	29	35	41	47	53	59	65	70	76	82	88	94	100	106	111	117
3.2	0	6	12	18	24	30	36	42	48	55	61	67	73	79	85	91	97	103	109	115	121
3.3	0	6	12	19	25	31	37	44	50	56	62	69	75	81	87	94	100	106	112	119	125
3.4	0	6	13	19	26	32	39	45	51	58	64	71	77	84	90	97	103	109	116	122	129
3.5	0	7	13	20	26	33	40	46	53	60	66	73	79	86	93	99	106	113	119	126	132
3.6	0	7	14	20	27	34	41	48	55	61	68	75	82	89	95	102	109	116	123	129	136
3.7	0	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140
3.8	0	7	14	22	29	36	43	50	58	65	72	79	86	94	101	108	115	122	129	137	144
3.9	0	7	15	22	30	37	44	52	59	66	74	81	89	96	103	111	118	125	133	140	148
4.0	0	8	15	23	30	38	45	53	61	68	76	83	91	98	106	114	121	129	136	144	151
4.1	0	8	16	23	31	39	47	54	62	70	78	85	93	101	109	116	124	132	140	147	155
4.2	0	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
4.3	0	8	16	24	33	41	49	57	65	73	81	90	98	106	114	122	130	138	146	155	163
4.4	0	8	17	25	33	42	50	58	67	75	83	92	100	108	117	125	133	142	150	158	167
4.5	0	9	17	26	34	43	51	60	68	77	85	94	102	111	119	128	136	145	153	162	170
4.6	0	9	17	26	35	44	52	61	70	78	87	96	104	113	122	131	139	148	157	165	174
4.7	0	9	18	27	36	44	53	62	71	80	89	98	107	116	125	133	142	151	160	169	178
4.8	0	9	18	27	36	45	55	64	73	82	91	100	109	118	127	136	145	154	164	173	182
4.9	0	9	19	28	37	46	56	65	74	83	93	102	111	121	130	139	148	158	167	176	185
5.0	0	9	19	28	38	47	57	66	76	85	95	104	114	123	132	142	151	161	170	180	189
5.1	0	10	19	29	39	48	58	68	77	87	97	106	116	125	135	145	154	164	174	183	193
5.2	0	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
5.3	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	161	171	181	191	201
5.4	0	10	20	31	41	51	61	72	82	92	102	112	123	133	143	153	164	174	184	194	204
5.5	0	10	21	31	42	52	62	73	83	94	104	115	125	135	146	156	167	177	187	198	208
5.6	0	11	21	32	42	53	64	74	85	95	106	117	127	138	148	159	170	180	191	201	212
5.7	0	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
5.8	0	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220
5.9	0	11	22	34	45	56	67	78	89	101	112	123	134	145	156	168	179	190	201	212	223
6.0	0	11	23	34	45	57	68	79	91	102	114	125	136	148	159	170	182	193	204	216	227
6.1	0	12	23	35	46	58	69	81	92	104	115	127	139	150	162	173	185	196	208	219	231
6.2	0	12	23	35	47	59	70	82	94	106	117	129	141	153	164	176	188	199	211	223	235
6.3	0	12	24	36	48	60	72	83	95	107	119	131	143	155	167	179	191	203	215	227	238
6.4	0	12	24	36	48	61	73	85	97	109	121	133	145	157	170	182	194	206	218	230	242
6.5	0	12	25	37	49	62	74	86	98	111	123	135	148	160	172	185	197	209	221	234	246
6.6	0	12	25	37	50	62	75	87	100	112	125	137	150	162	175	187	200	212	225	237	250
6.7	0	13	25	38	51	63	76	89	101	114	127	139	152	165	178	190	203	216	228	241	254
6.8	0	13	26	39	51	64	77	90	103	116	129	142	154	167	180	193	206	219	232	245	257
6.9	0	13	26	39	52	65	78	91	104	118	131	144	157	170	183	196	209	222	235	248	261
7.0	0	13	26	40	53	66	79	93	106	119	132	146	159	172	185	199	212	225	238	252	265
7.1	0	13	27	40	54	67	81	94	108	121	134	148	161	175	188	202	215	228	242	255	269
7.2	0	14	27	41	55	68	82	95	109	123	136	150	164	177	191	204	218	232	245	259	273
7.3	0	14	28	41	55	69	83	97	111	124	138	152	166	180	193	207	221	235	249	263	276
7.4	0	14	28	42	56	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280
7.5	0	14	28	43	57	71	85	99	114	128	142	156	170	185	199	213	227	241	256	270	284

Excess Themal Load Limit = 40-44 million k-cals/day at 7Q10 river flow, depending on river temperture conditions

Temperatures are 7-day average of daily effluent maximums
Flows are 7-day mean effluent flow

Figure 3-10. Newberg Temperature WLA Matrix

3.13.4 Design Criteria

Table 3-20 lists the projected average daily flows and peak week summer flows based on a peaking factor using 2005 average dry weather flow (ADWF) and peak summer week flow of 1.98.

Table 3-20. Projected Average Daily and Maximum Weekly Flows

Year	2005	2010	2015	2020	2025	2040
Population	21,132	24,497	28,712	33,683	38,352	54,097
ADWF	2.07	2.40	2.81	3.30	3.76	5.30
Peak summer week flow	4.1	4.75	5.56	6.53	7.45	10.49

Note: peak summer week based on ratio of ADWF to peak summer week in 2005.

3.13.5 Summary of Deficiencies

The temperature data provided showed a correlation between the higher temperatures and the lower flow rates, and every data point that showed a temperature exceeding 23 degrees C was equal or lower to the average daily flow. Based on the knowledge that 3.0 mgd of flow at 23.5 degrees C will cause the City to violate its temperature and that the temperature of the effluent will not likely reach a concern until the spring rains have run and the flow rates are down, the City can probably assume that the when the ADWF reaches 3.0 mgd there will be concerns about the temperature limits in the NPDES permit. Based on the information in Table 3-20, the ADWF will not reach 3.0 mgd until the 2015-2020 timeframe; however, the peak week currently could cause some concern. Storage for the peak week flows in excess of 3.0 mgd. Storage area requirements need to be coordinated with reuse project by others. The golf course that will use the treated water for irrigation has 3 million gallons of storage capacity.

3.13.6 Identification of Alternatives

A temperature management plan may be required in the future to show how the City will maintain compliance with the temperature TMDL. The City currently meets the TMDL requirements, so a plan is not included with the temperature allocations in the open permit. Options to maintain compliance include but are not limited to:

- Increasing reuse and storage for peak flows
- Storing effluent using a combination of night-time discharge when the ambient air and effluent is cooler
- Cooling the effluent prior to discharge through subsurface discharge to the hyporheic zone
- Implementing best management practices at the WWTP to minimize heating across the treatment processes

- Treating effluent using other methods such as wetlands mitigation
- Temperature trading

The City plans to add additional reuse to address the temperature WLA.

3.14 IN-PLANT DRAINS

Stormwater generated onsite is conveyed by gravity to the IPS along with recycle streams. In-plant stormwater handling alternatives were studied and documented in the *Final Dump Station/Headworks Studies* report.

3.14.1 Design Criteria

Plant staff provided a value of 60,000 gallons of runoff per 1 inch of rain as a design guideline. This value was based upon observation. Applying this amount to a 5-year rainfall amount of 3.10 inches resulted in a total volume of 186,000 gallons. This volume was applied over a 24-hour period, which resulted in a peak runoff rate of 510 gallons per minute (gpm). The 50,000 gallons per day of recycle water was converted to gpm, assuming 6 hours of flow per day. This rate totaled 140 gpm over a 6-hour period. The analysis also included an allowance for pumping 50,000 gpd of recycled water from plant operations. This rate was added to the peak stormwater runoff rate to arrive at a peak flow rate of 650 gpm.

3.14.2 Summary of Existing Deficiencies

Using the IPS to pump in-plant stormwater results in unnecessary pumping costs due to the 90 feet of static head that the IPS pumps against. Having an independent in-plant pump station was found to be more cost-effective.

3.14.3 Identification of Expansion Alternative

Alternatives were investigated to intercept the stormwater flow at a higher elevation than the IPS and pump it directly to the headworks to save on pump operating costs. The results were documented in the *Final Dump Station/Headworks Studies* report. The conceptual design for the stormwater/recycle pumping station assumes two submersible pumps, each pumping at a rate of 325 gpm. The pumps would be installed in a circular wet well consisting of precast manhole sections. The pump station would be located in the vicinity of Stormwater Manhole No. 1 and would be connected to the stormwater and recycle water systems through new gravity sewers. Flow would be conveyed from the new station to the headworks via approximately 320 feet of 6-inch DI pipe. An overflow pipe would allow flows exceeding the capacity of the pumping station to re-enter the existing stormwater system via a new manhole constructed over the stormwater pipe discharging to the IPS.

Based on the results of Liquids Solids Workshop No. 2, it was recommended that a larger pump station be included so that it can handle the future plant site expansion stormwater runoff.

3.15 EMERGENCY GENERATOR

The emergency generator needs were established as part of the Administration Building Predesign Report. The emergency generator is being implemented by others.

3.16 SOLIDS ALTERNATIVES EVALUATION

Sludge is removed from the secondary clarifiers and pumped to sludge holding tanks using the waste activated sludge (WAS) pumps prior to being dewatered by belt filter press. The WAS pumps have enough capacity to keep up with solids loading from the existing clarifiers. Additional pumping will be needed with additional clarifiers.

The plant has two belt filter presses (BFPs) on site that dewater the sludge before it is sent to the composting facility. Each BFP is capable of producing 30.6 tons per day of dewatered sludge at about 16 percent dry solids concentration. Approximately 600 dry tons of waste solids are generated on an annual basis. Annual solids quantity will more than double in 2040 to approximately 1,500 dry tons. Improved dewatering would increase the capacity of the compost system by reducing the amount of bulking agent required. Bulking agent requirements are relatively high at present to offset the low solids concentration in dewatered cake and provide blended feedstock at a minimum of 40 percent solids. Dewatering capacity will need to be expanded for growth as well.

Alternatively, procurement of a sawdust drying system is being considered to reduce compost feedstock moisture content and effectively increase compost system capacity. Partial funding may be available to offset capital cost, making the dryer an immediate priority. In this case, the upgrade for solids dewatering could be postponed until a later date.

3.16.1 Design Criteria

The capacity of the tunnel reactors varies with the feedstocks used and the initial mix moisture content required for mixer and tunnel operation. The current capacity is estimated to vary seasonally between 1.1 and 1.4 dry tons biosolids per calendar day. Additional capacity is provided through aerated curing after feedstock has passed through the tunnels to ensure that time and temperature requirements are met for Class A biosolids product. The system was essentially at capacity when the analysis was first completed. Since that time, the sawdust feed delivery is limited to a wetter product, thus reducing capacity even more. Plant staff have resorted to stockpiling feed solids and implementing a small version of static pile composting.

3.16.2 Summary of Existing Deficiencies

The compost process is at or near capacity. The existing system has been upgraded recently by adding aerated curing bays and additional improvements, and it can continue to meet baseline needs. Upgrading the dewatering would provide an immediate increase in capacity for solids, improve operational performance, and reduce required bulking agent cost, and material (recycle) handling. Drying bulking agent would also relieve existing compost capacity limitations.

Processes to meet expansion needs also need to meet the goal of producing a Class A biosolids product. Technologies that have been considered include high temperature digestion, lime pasteurization, composting (aerated static pile [ASP] process), and thermal drying. Based on operating experience, the existing tunnel reactor system should not be expanded to meet additional capacity needs. In addition, a private entity has proposed receiving dewatered solids at a regional energy recovery facility that will tentatively be located at the S.P. Newsprint mill.

3.16.2 Alternatives for Increasing Capacity of Existing System

Several alternatives have potential for increasing the capacity of the composting facility:

Alternative 1. Upgrade the dewatering system to produce a drier cake.

Alternative 2. Use the curing area aeration system to dry the product and recycle the drier material back to the tunnel.

Alternative 3. Use commercial drying equipment to dry a portion of the sludge, recycle stream or sawdust supply prior to composting.

Alternative 4. Dry sawdust bulking agent to reduce compost feedstock moisture content and increase system capacity.

Transferring the regulatory compliance step for vector attraction reduction from the tunnels to the curing area has already been implemented on a partial basis to address reduced detention in the tunnels. The capacity of the curing area to serve this purpose is not adequate to address growth but is meeting short-term needs.

3.16.3 Identification of Expansion Alternatives

The proven biosolids technologies identified as potentially viable for adding capacity for Class A biosolids production at the existing Newberg WWTP are:

- Thermal drying
- Lime pasteurization
- Temperature-phased anaerobic digestion (TPAD)
- Composting
- Energy recovery (offsite)

These technologies are summarized in Table 3-21.

Table 3-21. Class A Biosolids Technologies Identified as Potentially Viable

Technology	Description	Advantages	Disadvantages
Thermal drying	Heat is applied to the solids to evaporate the water and reduce the mass of solids.	■ Process is volume reducing ■ Product is acceptable to the public and suitable for a variety of uses	■ Requires relatively high energy ■ Requires stabilization prior to drying to minimize odorous product
Lime pasteurization	Undigested biosolids are dewatered and dosed with lime prior to being processed in a pasteurization reactor.	■ Product has lime value which may help marketability ■ Product is moderately acceptable to the public	■ Uses a proprietary system process ■ Requires product that is not highly marketable as opposed to other Class A biosolids ■ Requires additional electrical heat required to meet pathogen reduction requirements ■ Has product odor potential ■ Has quantity increase from lime addition
TPAD	A two-stage anaerobic stabilization process. The first stage is accomplished in the absence of oxygen and at temperatures of 130 to 140 degrees F. The second stage is accomplished in the absence of oxygen and at temperatures of 95 to 100 degrees F.	■ Reduces solids quantity and produces biogas	■ Expensive and perhaps impractical for small-to-medium facilities ■ Least marketable of Class A products and presents product storage problems
Composting	Self-heating, aerobic biochemical process used to stabilize biosolids.	■ Process can be implemented using ASPs, windrows, or in-vessel systems ■ Product is highly acceptable to the public ■ Product market already exists ■ Process has operational familiarity	■ Requires a bulking agent to increase porosity of the biosolids and reduce moisture content ■ Requires significant land area ■ Is labor-intensive ■ Has odor potential with incorrect operation ■ Has quantity increase from bulking
Energy recovery offsite	Private entity receives dewatered biosolids for thermal drying followed by gasification.	■ Operational requirements are minimal ■ Process is cost-effective	■ Feasibility not confirmed ■ Long-term reliability not confirmed

3.16.4 Evaluation of Viable Alternatives

For the Newberg WWTP, the most viable options for accommodating future growth are composting, thermal drying, and off-site energy recovery. TPAD would require a substantial investment, and the process would not result in a highly marketable Class A product. Experience on other Brown and Caldwell projects has shown that for small-to-medium facilities, initiating anaerobic digestion and TPAD is much more expensive than process technologies that do not require digestion. Lime pasteurization would be cost-competitive with other technologies but generates a product that is less compatible with existing markets. Lime pasteurization works best at plants with primary sludge in which a high percent solids cake can be produced by the dewatering equipment. Dewatered biological sludge has resulted in a mud-like product from lime pasteurization which is difficult to manage and market. Composting and thermal drying can be operated around this limitation. Figure 3-11 shows the rankings of the five options.

Figure 3-11. Biosolids Technology Rankings

Technology	Cost	Regulatory compliance	Storage needs	Flexibility	Reliability	Operability	Safety	Odor potential	Viability at Newberg WWTP	Total score
Thermal drying	-	+	+	+	+	+	-	+	Yes	5
Lime pasteurization	+	+	-	-	0	0	0	-	No	0
TPAD	-	+	-	-	0	0	+	0	No	--1
Composting	-	+	-	0	+	+	+	+	Yes	3
Energy recovery	+	+	+	+	-	+	+	+	Yes	6

Note: A higher score is better.

Based on the scores in Figure 3-11, the three most feasible options—energy recovery, thermal drying, and composting—are evaluated in more detail. The cost evaluation is summarized in the following section.

Each of these technologies would be complemented by a dewatering upgrade. Even if solids are simply trucked offsite, a higher percent solids reduces material handling, hauling, and tipping fees. Applicable technologies in addition to the belt filter press include centrifuge, screw press (FKC), and rotary press (Fournier). From experience, we know that the screw press and rotary press work best on solids when primary sludge is in the mix. For biological or extended aeration sludge, the centrifuge will generate a consistently higher solids concentration than the BFP. Where the existing belt presses produce approximately 16 percent solids, we expect the centrifuge will produce 20 percent. Therefore, we recommend centrifuge dewatering as the most proven means of increasing solids concentration for the Newberg WWTP.

3.16.5 Comparative Cost Estimates

Order-of-magnitude costs for the solids improvements are summarized in Table 3-22. Costs for dewatering are based on providing capacity for 100 percent of solids generated while costs for Class A biosolids processes are only intended to accommodate future growth.

Table 3-22. Projected Costs for the Solids Processing Improvements

Description	Capital cost, dollars	O&M cost, dollars	Total present worth, dollars
Sawdust drying	500,000	TBD[1]	TBD[1]
Centrifuge dewatering	2,475,000	123,000	4,142,000
Class A process Alternative 1 (ASP composting)	3,284,000	178,000	5,705,000
Class A process Alternative 2 (thermal drying)	3,182,000	206,000	5,979,000
Class A process Alternative 3 (off-site energy recovery)	1,076,000	172,000	3,415,000

[1] Operating costs will be offset by energy and material (bulking agent) savings in the compost process, and labor savings for reduced materials handling.

Centrifuge dewatering is considered a fundamental improvement for the plant that will benefit existing and future process technologies. Upgraded dewatering will improve performance of the existing compost system and increase effective capacity by approximately 25 percent by increasing dewatered solids concentration. Higher solids content requires less bulking agent and reduces materials handling requirements. Based on the results of this analysis and the Liquids Solids Workshop No. 2, centrifuge dewatering improvements are recommended.

As an immediate improvement to increase compost system capacity, the sawdust dryer equipment procurement and installation appears promising. Capital costs are substantially lower than mechanical dewatering, and operation can provide the maximum immediate benefit in terms of compost system capacity. An investigation is in progress to determine potential grant funding (28 percent) to reduce required capital investment. Potential energy and labor savings as a result of providing drier compost feedstock are also being evaluated.

For the alternative Class A process technologies, composting and thermal drying are nearly equal in cost, while off-site energy recovery is much less. Costs for energy recovery need to be confirmed. An evaluation of Class A process upgrades is presented in Figure 3-12.

Figure 3-12. Biosolids Technology Rankings

Technology/Description	Evaluation criteria: Relative Present Worth Cost	Energy conservation	Regulatory compliance	Flexibility	Reliability	Operation and Maintenance	Safety	Viability at Newberg WWTP	Total score
Alternative 1 (ASP compost)	2	3	5	4	5	2	4	4	29
Alternative 2 (Thermal drying)	1	1	5	5	4	3	2	4	25
Alternative 3 (Off-site energy recovery)	5	5	5	5	1	5	5	3	34

Note: A higher score is better.

This analysis integrates the more detailed cost estimate with non-cost factors. Results favor offsite energy recovery. Plant staff have indicated that a back-up strategy using a simplified composting technology is desired until the offsite energy recovery has proven reliable for long-term service.

3.17 STAFFING

City water and wastewater utility operation and maintenance (O&M) responsibilities are handled by the Public Works Department Operations Division. Several staff members have assigned duties for both the WTP and the WWTP; others are predominantly performing daily activities in water or wastewater-related facilities. An assessment was made of specific duties identified in time sheets for December 2006 and April 2007. The purpose was to compare workloads during typical wet months and dry months. This information is summarized in Appendix F. Current staffing levels are documented to determine the existing deficiencies and deficiencies with the proposed WWTP improvements and upgrades

The City has 12 full-time employees plus one part-time administrative person (0.65 full-time equivalent) and a temporary labor man-hour pool of up to 2,000 hours annually for an hourly day laborer. The positions are described in Table 3-23.

Table 3-23. Current Positions and Responsibilities

Newberg Public Works Department–Operations Division Staffing		
Positions	No.	Responsibilities
Operations Superintendent	1	Supervise and manage WTP, WWTP, pump stations, wells, and springs
Environmental Supervisor	1	Supervise environmental activities (laboratory, pretreatment program, etc.)
Water Supervisor	1	Supervise WTP, wells, reservoirs, springs, and distribution water sampling
Wastewater Supervisor	1	Supervise wastewater operation including the WWTP and major pump stations
Wastewater Maintenance Sr. Mechanic	1	Maintain wastewater system facilities
Water Operations Sr. Operator and Operator I	2	Provide WTP operation and sampling
Water/Wastewater Maintenance Plant Mechanic	1	Provide maintenance—25 percent to WTP, 75 to percent wastewater system
Wastewater Operations Two Operator II and one Operator I	3	Operate WWTP liquids and solids systems
Laboratory Operations Lab Technician II	1	Collect samples and process lab tests
Administrative Position	0.65	Provide office support
Temporary Laborer	1[1]	Provide temporary assistance for a variety of jobs in both the water and wastewater systems.

[1]The amount of hours for this position varies with each budget cycle generally averaging 2,000 man-hours annually.

In reviewing the distribution of manpower between several areas, the following observations were made based on a review of data for a typical month, April 2007.

- WWTP and pumping stations account for 50 percent of the workforce time.
- The level of effort to operate and maintain the composter requires an additional 16 percent of available labor.
- The water treatment and distribution pumping system requires approximately 20 percent of the available labor.
- A commendable level of effort (6.7 percent) is devoted to safety and training. This percentage may decrease as staff experience increases, and may also fluctuate as current senior staff become eligible for retirement in the next 5 plus years.
- Earned time off (holidays, sick leave, vacation, etc.) averages 8.1 percent of the time, equivalent to one man month.

A more comprehensive summary of work allocations for specific work areas is presented in Appendix F. This information was summarized from time sheets for two monthly time periods: November 20 through December 21, 2006, and March 21 through April 20, 2007, representing a wet period and a relatively dry period.

CHAPTER 4
IMPLEMENTATION

4.1 INTRODUCTION

This chapter summarizes the wastewater treatment improvements recommendations and proposed implementation schedule based on the results of the analysis documented in Chapter 3 and both Liquids Solids Workshops conducted with City of Newberg (City) staff to address the future needs of the Newberg Wastewater Treatment Plant (WWTP).

There are three major factors that impact the wastewater service and the WWTP. These are:

- Ability to treat the City's wastewater to the required quality
- Ability to convey and treat the quantity of wastewater (hydraulic capacity)
- Ability to handle solids and compost, and deliver compost product to the public

The WWTP provides exceptional treatment to meet the required water quality requirements. However, the plant is currently limited based on hydraulic capacity and solids handling capacity. Modifications need to be made to provide immediate treatment capacity and future capacity in phases through 2025, and to define the land area needs for ultimate build-out in 2040 including:

- Phase 1: Immediate improvements to 2015 (2007-2025)
- Phase 2: Improvements to 2025 (2015-2025)
- Phase 3: Improvements for ultimate build-out (2025-2040)

The recommended Repair, Renovation, and Expansion Projects (RRE Projects) and phasing are summarized in Figure 4-1.

4.2 RECOMMENDED IMPROVEMENTS

The recommended improvements for the RRE projects are summarized below.

4.2.1 Influent Pump Station (IPS)

The IPS is an essential component of the WWTP. It pumps the wastewater approximately 100 feet between the lowest point in the collection system up to the headworks that provides screenings and grit removal. The pump station is currently under capacity. It cannot convey peak flows when one unit is out of service. Typical high influent flow events could cause permit violations. In addition, there are safety concerns with the existing pump station wet well. The wet well is inefficient and causes frequent problems from rags and debris clogging the pump impellers, which decreases the pumping capacity and requires frequent cleaning. The IPS upgrades and expansion are needed immediately.

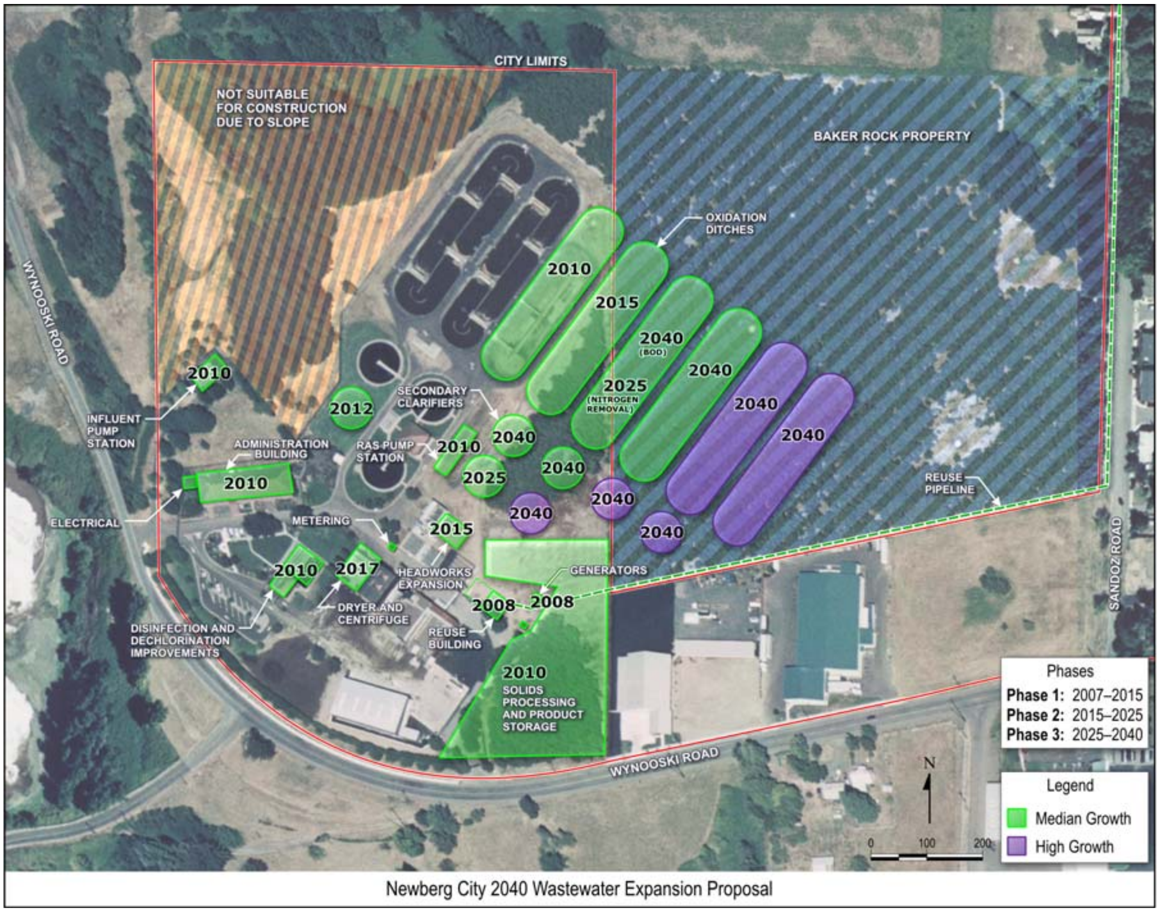


Figure 4-1. Newberg 3-Phased WWTP RRE Projects

The recommended improvements to the IPS, for safety and capacity reasons, include building additional capacity next to it for base flows and upgrading the existing wet well for overflow capacity pumping. The range of flows expected at the IPS is best accommodated by a dual pump station; low and moderate flows would be pumped by a station with a self-cleaning wet well, while higher wet weather flows would be pumped by the overflow pump station with confined inlet pumps. The recommended IPS improvements include modifying the inlet pipe slope, wet well, and related structure for 2040 flow conditions. The pumps selected and installed will be for 2025 flow conditions. The pump station will be able to pump flows in excess of 2015 flows because of the pump sizing constraints that more ideally fit the 2025 phasing. Variable-frequency drives for these pumps are included in the cost estimate. The expansion to Phase 3 will require only modifications or replacement of pumps. The IPS Electrical Room (being designed and constructed by others) is sized for future space requirements.

The proposed pump station layout is shown in Figure 4-2.

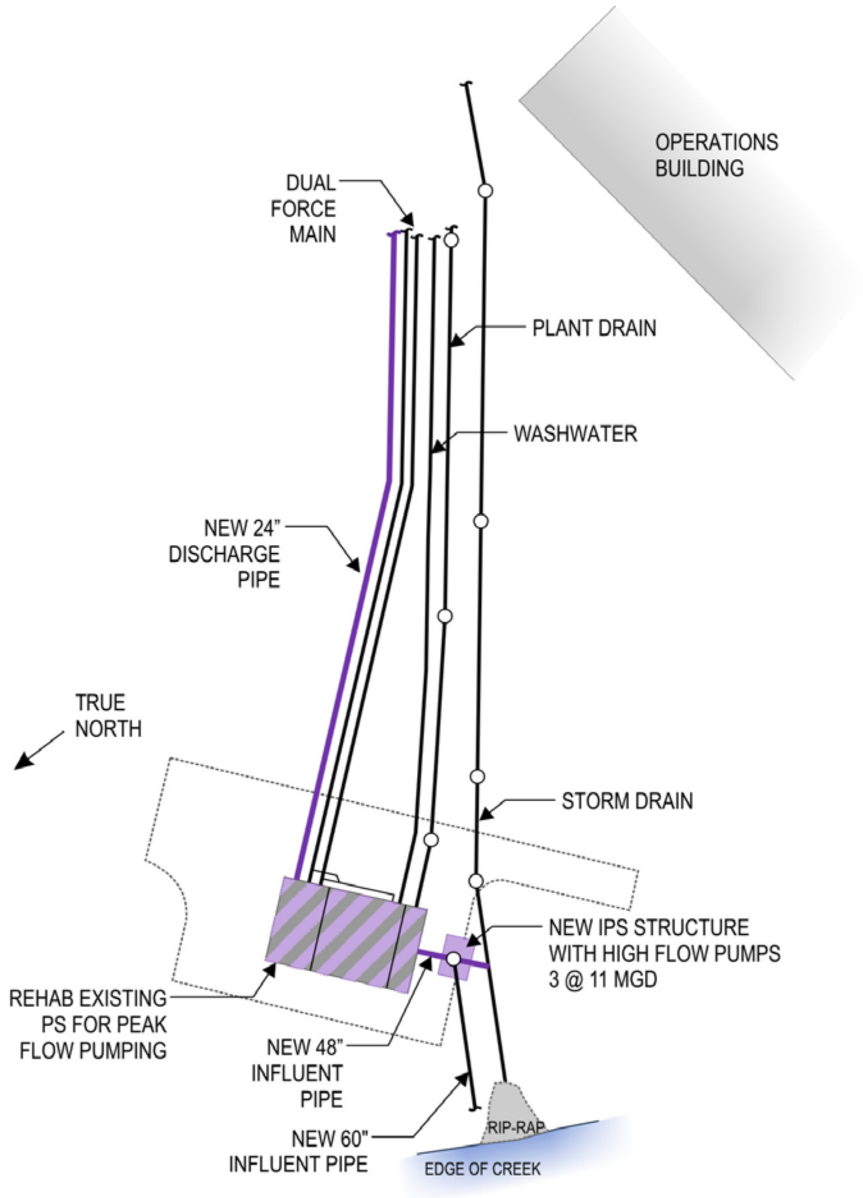


Figure 4-2. IPS Yard Piping Plan

It is also recommended that a section of the influent pipe be elevated sufficiently to remove the slope to the IPS that causes poor influent characteristics and high velocities at peak flows in the IPS. The influent pipe will be a new 60-inch-diameter pipe at a slope of 0.0007 foot per foot to limit inflow velocities to less than 4 feet per second from the first upstream manhole to the new IPS structure. This size pipe is satisfactory for both current and 2040 flow rates so that replacement in the future will not be necessary. When the influent pipe is re-laid, the slope into the wet well will be improved, and the new self-cleaning wet well will be located adjacent to the existing IPS but at a higher elevation.

During the facilities planning process, the Motor Control Center Building location for the IPS was discussed as part of the reuse design process. It was determined that a location to the west of the Administration Building would be optimum. This location avoids the influent piping at the east of the Administration Building, is adequately proximate to the IPS, and avoids the additional costs of construction on a steep slope and where the site is already constrained adjacent to the IPS.

The phased improvements, based on peak hour flow requirements, will provide the incremental IPS capacity, as shown in Figure 4-3.

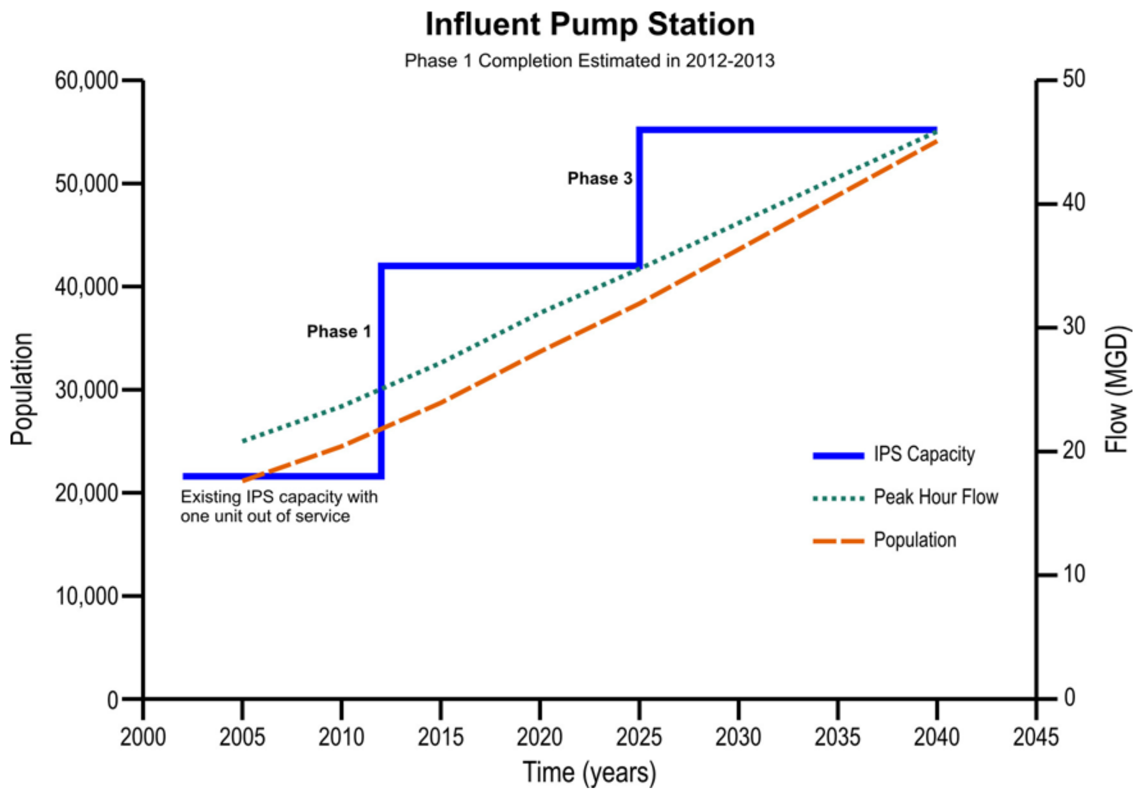


Figure 4-3. Incremental IPS Capacity

4.2.2 Headworks

The headworks processes include screening and aerated grit. The screens remove particles greater than 10 millimeters in diameter. The grit is removed with an aerated grit chamber. Although the screens were recently replaced with new, more reliable screens, the existing channel configuration does not allow conveyance and treatment of the total influent flow when one unit is out of service without bypassing around the process.

It is assumed that expansion will include the same type of screens as existing for ease of operations and maintenance and because they were determined to be cost-effective in 2002 during the Newberg Dump Station and Headworks Study conducted by Brown and Caldwell. The most cost-effective screen was chosen at that time. Plant staff have had positive experiences with these screens.

The screens will be installed in channels on the east side of the existing headworks, as shown in Figure 4-4. Emergency power should be added to ensure that critical headworks functions can continue in the event of a power outage. Odor control should be provided also as a good neighbor policy and to maintain compliance with Oregon Administrative Rules 208 that prohibits nuisance conditions such as odors.

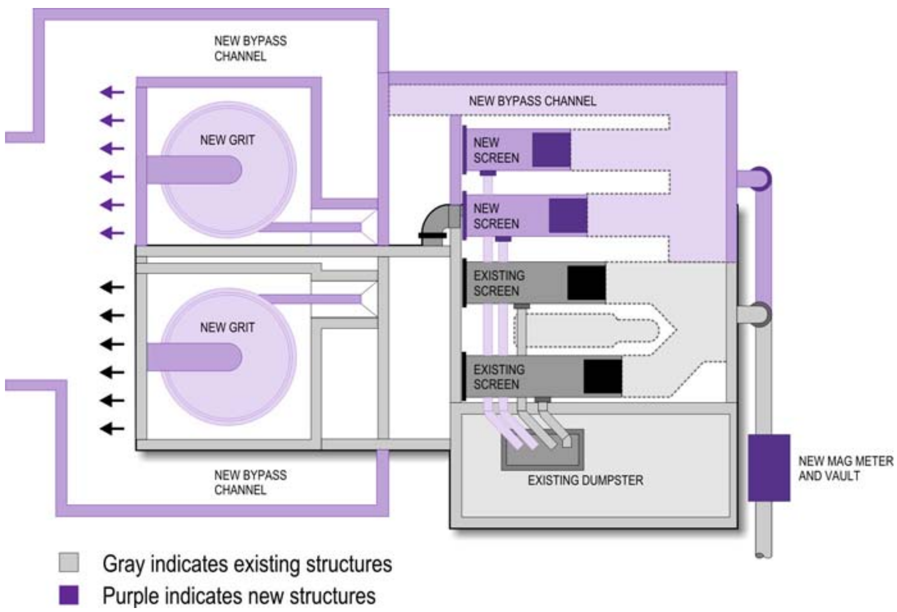


Figure 4-4. Headworks Improvements

The grit removal process is currently undersized, and the recommendation is to provide full grit removal for all flows. Therefore, additional grit removal capacity is needed immediately.
The tray separator system that removes grit using a series of stacked plates is the recommended grit removal system to provide the capacity.

New flow distribution and flow monitoring will need to be provided. The existing magmeters are not installed for accurate flow measurement. Magmeters will be installed approximately 10 to 20 feet upstream of the headworks to more accurately measure flow. The phased improvements, based on peak hour flow (PHF) requirements, will provide the incremental headworks capacity, as shown in Figure 4-5. The headworks will need to be expanded by 2015.

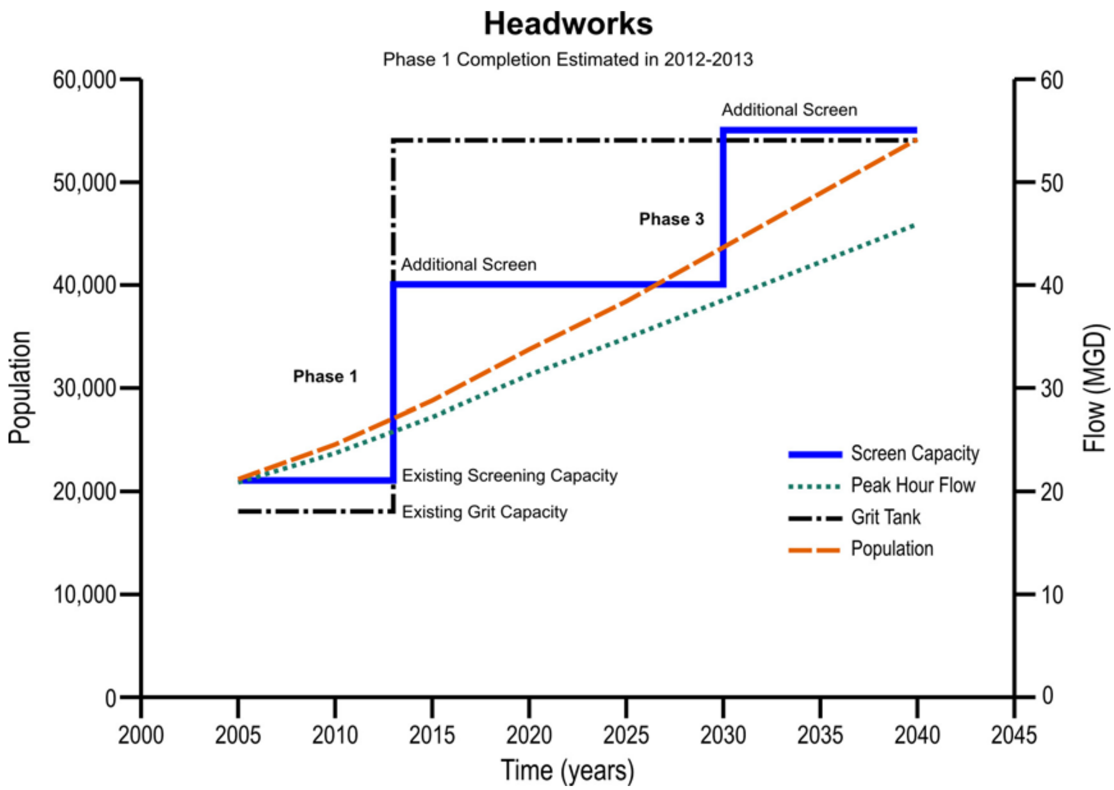


Figure 4-5. Phased Headworks Capacity

4.2.3 Secondary Treatment

The Newberg WWTP currently uses two oxidation ditches for secondary biological treatment to meet regulatory permit requirements. The secondary system is currently undersized for maximum month flow conditions.

4.2.4 Oxidation Ditches

The recommended expansion includes continuing to use the oxidation ditch process because of its low energy and maintenance costs and its ability to treat a wide variation in flows and loads. As shown in Figure 4-1, by 2010, a third oxidation ditch is needed to provide adequate treatment to meet effluent quality requirements. A fourth oxidation ditch is needed by 2015. The City has an interest in acquiring the adjacent Baker Rock property for expansion of the secondary system. However, in the event this land area expansion does not take place, additional processes were considered.

Expansion with the current oxidation ditch and secondary clarifier processes is the preferred alternative. Should site constraints or significantly more stringent effluent quality become an issue, membrane treatment could be added either in conjunction with the oxidation ditches or by replacing the oxidation ditches and secondary clarifiers with MBRs which would significantly reduce the footprint requirements. The phased capacity expansions for the oxidation ditch process, based on maximum month flow and no nitrogen reduction requirements until 2025, are shown in Figure 4-6.

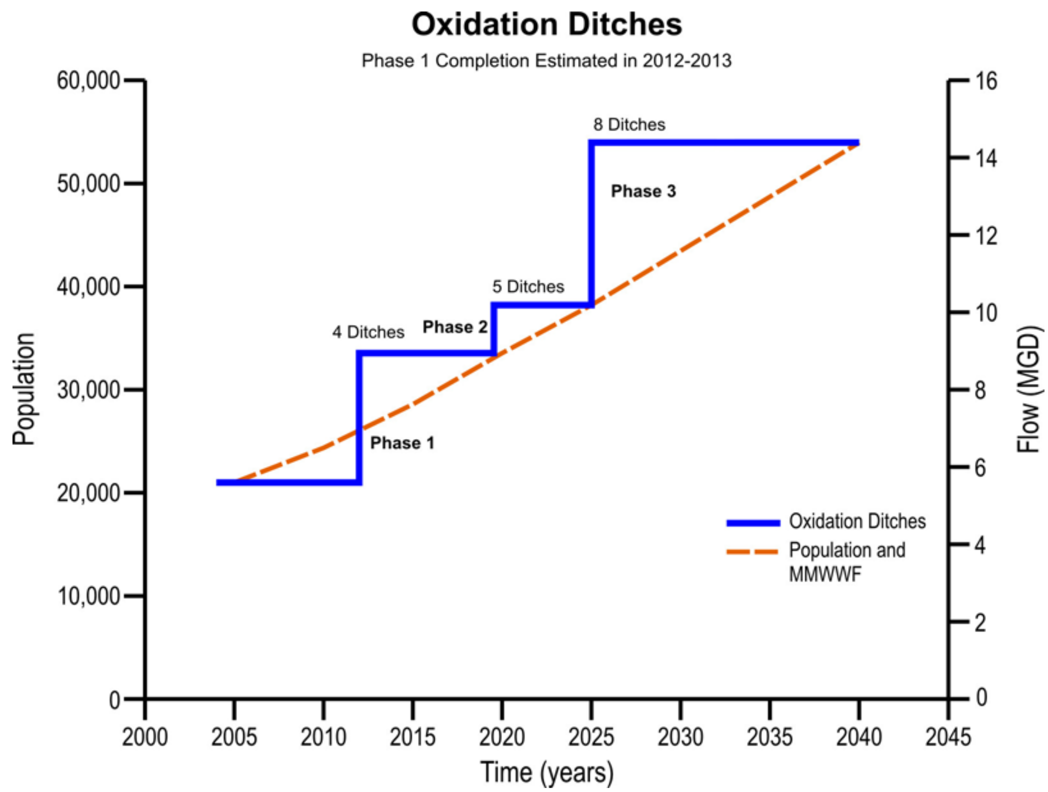


Figure 4-6. Phased Oxidation Ditch Capacity with Nitrogen Reduction Requirements

4.2.5 Secondary Clarification

Secondary clarifiers separate the biological organisms from the biologically treated wastewater prior to disinfection. The capacity of the secondary clarifiers is related to both hydraulic flow and the mass of biological solids from the oxidation ditches. As shown in Figure 4-1, the secondary clarifier process will need to be expanded with increased population and to match the additional oxidation ditch capacity. By 2012, a fourth secondary clarifier will be needed to meet effluent quality requirements. The phased capacity of the secondary clarifier system, based on maximum month flow requirements, is shown in Figure 4-7.

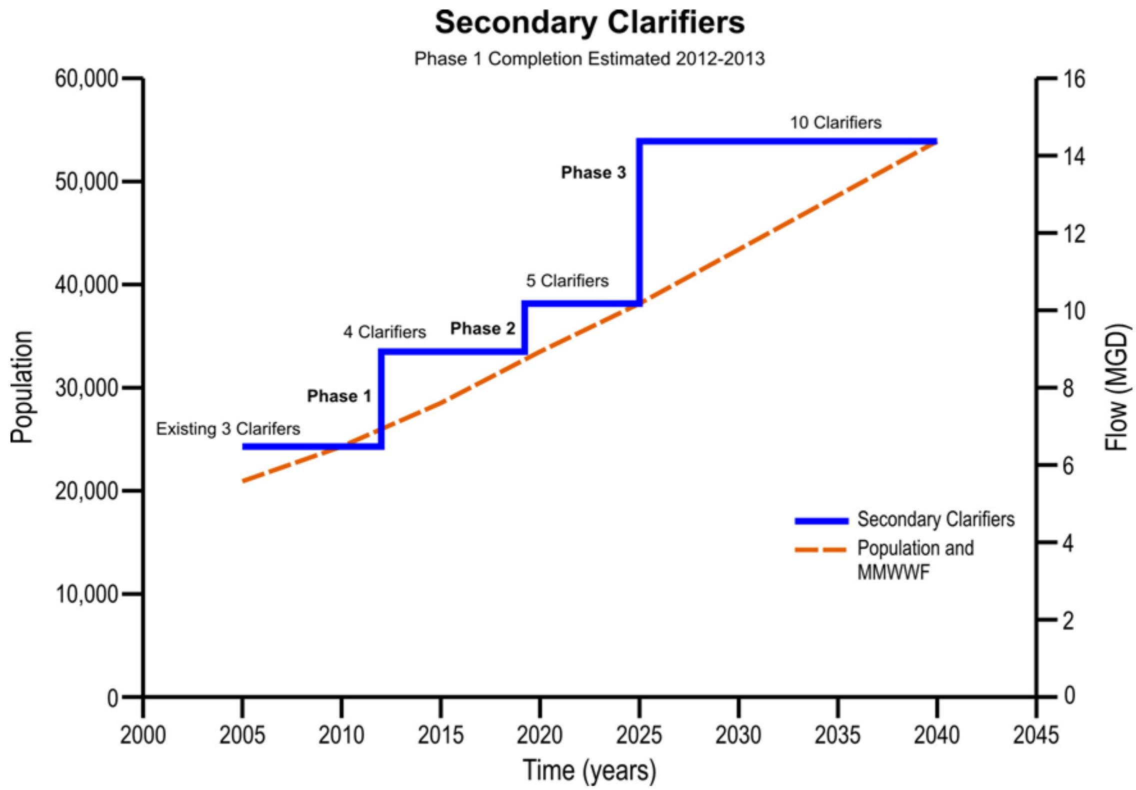


Figure 4-7. Phased Secondary Clarification Capacity with Nitrogen Reduction Requirements

4.2.6 Disinfection Process

Clarified effluent must be disinfected prior to discharge or reuse. Currently, the disinfection process consists of a chlorination system that uses ton cylinders of chlorine gas. Immediate changes are needed to improve the reliability of the effluent quality to continue to meet disinfection permit requirements. These include chemical induction mixer(s) at the chlorine injection point, scum removal, improved effluent flow monitoring, and automatic disinfection control strategy. Roof drainage needs to be re-routed out of the contact basin.

The City will continue with gas chlorine for the first 5-year permit cycle as well as the existing contact basins. The City is considering phasing in hypochlorite when the Newberg WTP is constructed in closer proximity to the WWTP, which is not expected until 2017. High-rate disinfection can be used to increase the effectiveness of the disinfection to accommodate the limited contact time in the existing contact chamber. The City is also investigating the applicability of phasing in ultraviolet (UV) treatment at a later date. UV disinfection may not be feasible at the WWTP since the effluent has iron which can inhibit the effectiveness of the process.

Disinfected wastewater is currently dechlorinated at the outlet of the chlorine contact basins. The dechlorination system requires complete replacement to be more effective, but currently capacity is limited by the configuration of the equipment. A new 1,050-gallon high-density polyethylene storage tank, two new feed mechanical diaphragm pumps, and a new control system are recommended for immediate implementation. The phased disinfection capacity, based on PHF requirements, is shown in Figure 4-8.

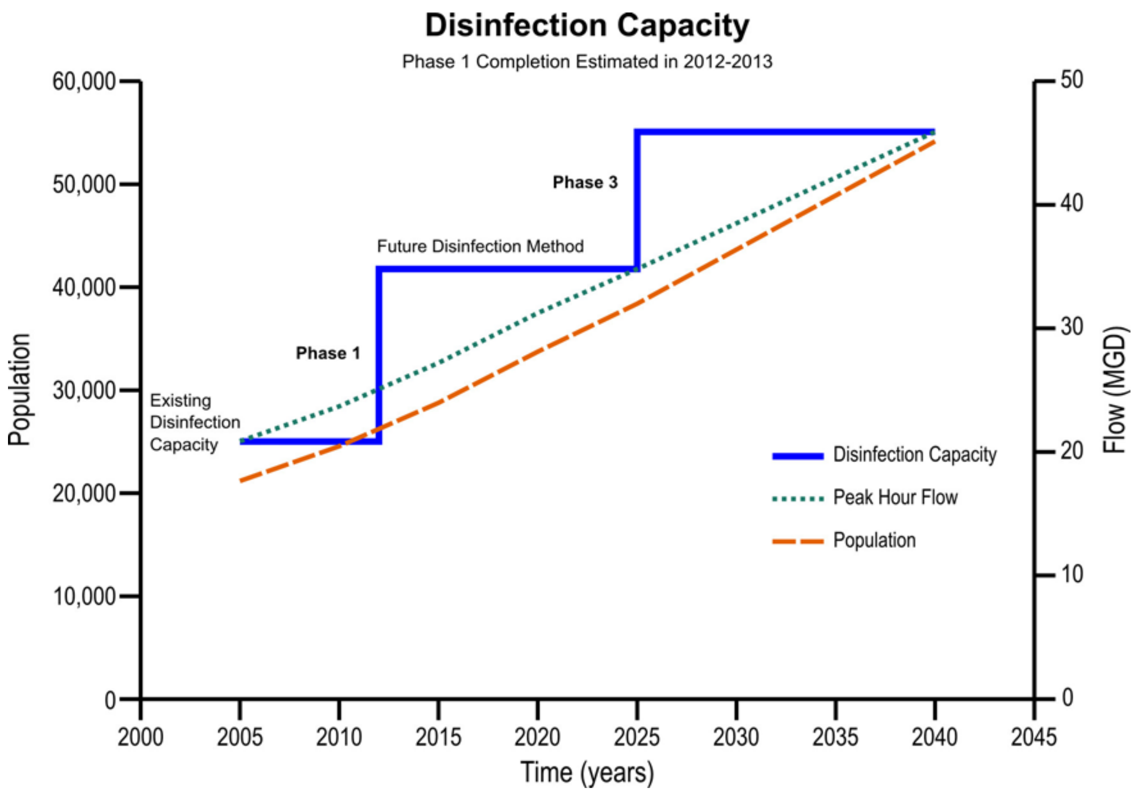


Figure 4-8. Disinfection Capacity

4.2.7 Outfall

The outfall is primarily a conveyance unit process and the capacity is needed to convey peak flows to the river discharge point. Due to hydraulic conditions caused by air entrainment at high flows that are called a hydraulic cannon, the outfall has experienced structural damage to the uphill manhole. In order to alleviate the hydraulic cannon effects, a parallel outfall down the slope is recommended to be implemented immediately for safety reasons. This will prevent the air entrapment and alleviate the hydraulic effects. The phased outfall capacity increase, based on PHF requirements, is shown in Figure 4-9.

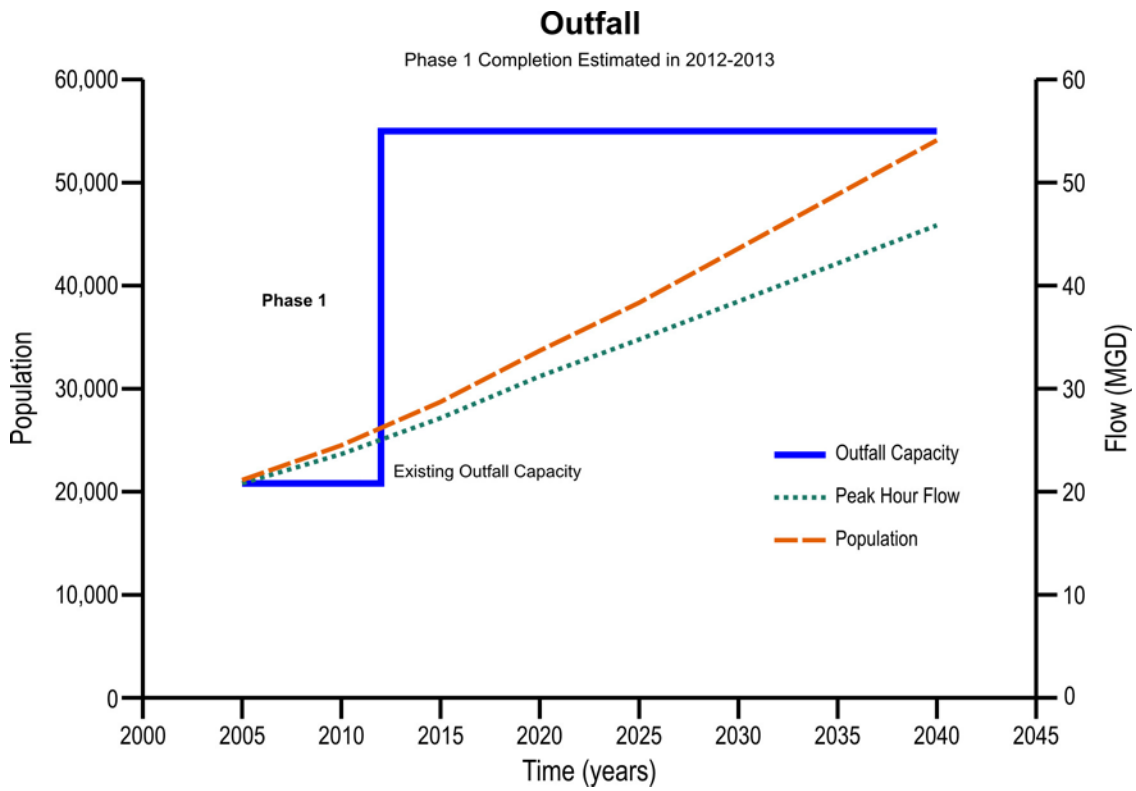


Figure 4-9. Phased Outfall Capacity

4.3 REUSE

The City is implementing plans to use treated effluent for irrigation of a local golf course.

4.3.1 Irrigation

Tertiary treatment using membranes has been selected by the City after a predesign evaluation and recommendation documented in the *Reuse Water System Predesign Study* (CH2M Hill, October 2005). Membranes will be assumed to be the preferred technology for future tertiary treatment for reuse at local golf courses (by others). The City is currently planning to provide variable reuse water from April through October, with the lowest demand expected in April. The peak delivery capacity for the hottest summer months is 1 mgd.

4.3.2 Temperature Compliance

DEQ will be implementing the Willamette total maximum daily load (TMDL) waste load allocations (WLAs) in the City's open National Pollutant Discharge Elimination System permit. The City has the opportunity to track river temperature, and effluent temperature, and flow on a 7-day running average to comply. The City conducted preliminary analyses showing that it will be able to add approximately 40 to 44 million kilocalories of heat energy per day to the Willamette River without violating the WLA. The WLA is based on a 7-day average. In 2005, the summer the maximum 7-day temperature was 23.5 degrees Celsius. According to the City's analysis, this would result in a maximum allowable discharge of approximately 3.0 to 3.5 mgd, though this could vary slightly depending on the temperature of the Willamette River. The maximum 7-day summer flow (May to October) was 4.1 mgd. The City is implementing a reuse program to irrigate local golf courses that will decrease its effluent discharge by 1 mgd.

The City plans to add additional reuse to address the temperature WLA in the future. Depending on the final temperature management plan, some storage may need to be provided. The golf course that will use the treated water for irrigation has 3 million gallons of storage capacity.

4.4 SOLIDS HANDLING AND TREATMENT

The compost process has reached capacity because the compost feed mix has a high moisture content. Compost capacity is based on peak week solids production, solids, and feed sawdust moisture content. Recent market demands for sawdust has resulted in smaller buyers (including the City) receiving wetter sawdust product. This has resulted in an immediate need to provide static compost piles in addition to the mechanized composting operation. Decreasing the moisture in the sawdust with a sawdust dryer would result in a capacity increase and is recommended for immediate implementation. Capital costs are substantially lower than that of mechanical dewatering, and the operation can provide the maximum immediate benefit in terms of compost system capacity. An investigation is in progress to determine potential grant funding (up to 40 percent) to reduce required capital investment. Potential energy and labor savings as a result of providing drier compost feedstock are also being evaluated.

After the sawdust dryer capacity is realized, upgrading the dewatering system is recommended for Phase 2 implementation to provide an additional increase in capacity for solids composting, to improve operational performance, and to reduce required bulking agent cost and material (recycle) handling. Centrifuge dewatering is considered a fundamental dewatering system that will benefit existing and future process technologies. Centrifuge dewatering, the only technology that achieves the highest solids content, will improve performance of the existing compost system and increase effective capacity by approximately 30 percent by increasing dewatered solids concentration. The higher solids content that results from centrifuge dewatering requires less bulking agent and reduces materials handling requirements. City staff indicate that the system can handle current solids flow of 3,750 wet tons (600 dry tons at 16 percent solids concentration). The City will experience a 30 percent reduction in solids volume, and effectively, a 30 percent increase in available compost capacity (on a dry ton basis) when the centrifuge is added.

For Class A process technologies, composting and thermal drying are nearly equal in cost, while offsite energy recovery is much less. Initial evaluations favor offsite energy recovery. Plant staff have indicated that a backup strategy using a simplified composting technology (aerated static pile [ASP]) is desired until offsite energy recovery has been implemented locally and has been proven reliable for long-term service.

4.5 ADMINISTRATION BUILDING

As part of the Facilities Planning process, an evaluation of the Administration Building at the WWTP was conducted. The purpose of the Administration Building evaluation was to develop a concept for a functional, secure, and energy-efficient facility that will improve operations. Built in 1987 and in operation since then, the Administration Building has undergone a number of significant changes in its programmatic functions over the past 20 years. Few design changes and upgrades have occurred over this period leading to a building that is highly inefficient in the use of its available space. For example, major functions such as the maintenance workshop have been moved out of the building into more appropriate locations on the plant site leaving underutilized voids of space; while remaining critical functions, such as the laboratory, administrative areas, and staff support areas, have developed increasing needs for space and technical updating. Most critically, emergency generator exhaust entered the buildings' ventilation system, creating worker safety considerations. The recommendation to move the engine generator out of the existing building is already being implemented.

The planning considered the needs for 2025 and the potential to house the City's Water Treatment Plant (WTP) administrative personnel and certain water treatment plant functions (shop, laboratory, etc.). The Administration Building improvements are recommended to be implemented immediately.

The proposed layout for the Administration Building is shown in Figure 4-10. When complete, the remodeled building will be a much improved facility with increased flexibility for growth, greater efficiency, and expanded functionality; and it will be a more productive environment for the WWTP staff and potentially the WTP staff to carry out its mission to the community.

4.6 WASTEWATER TREATMENT SUPPORT SYSTEMS

Improvements to the wastewater treatment support systems are summarized below.

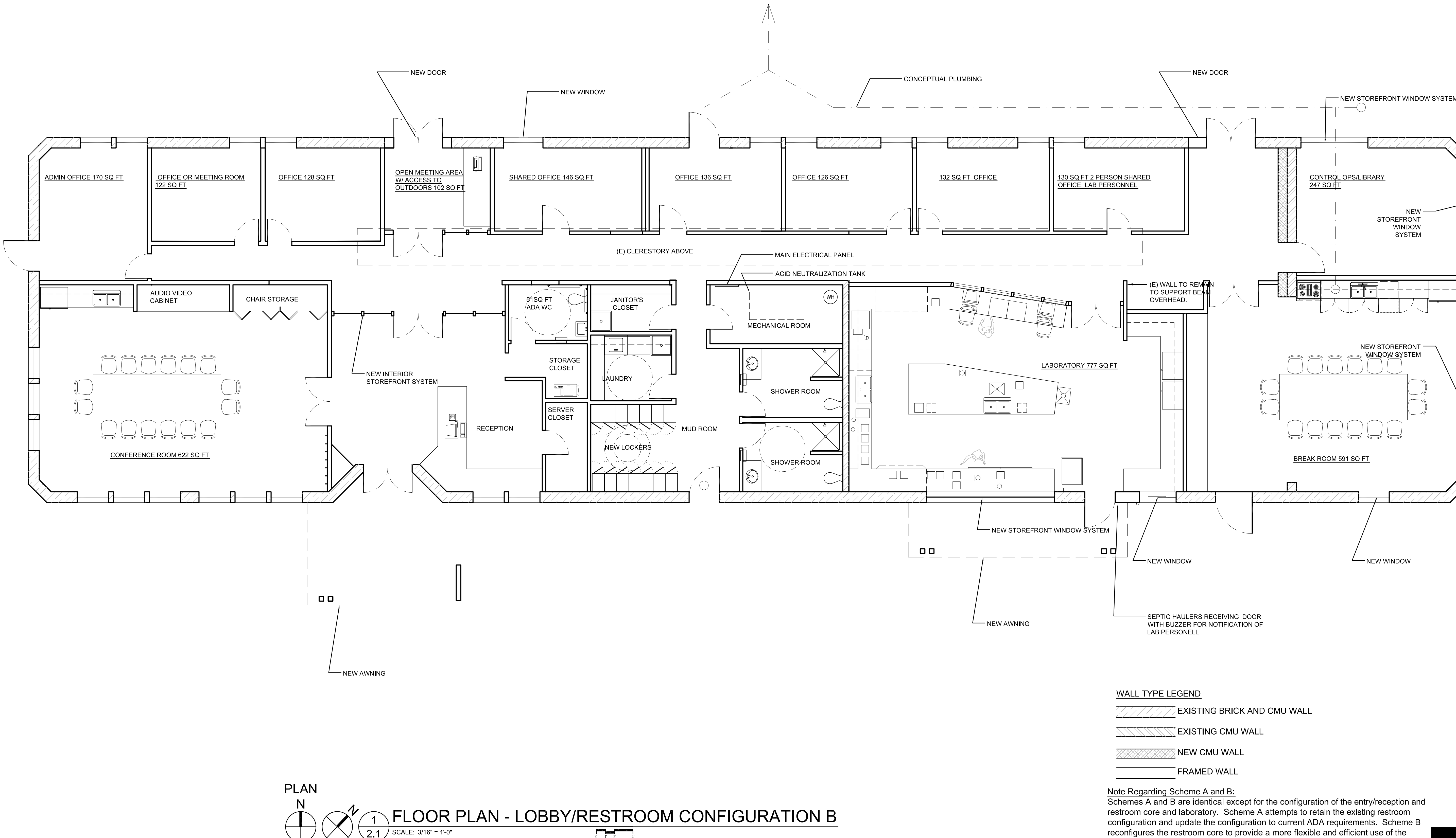
4.6.1 Emergency generator

The emergency generator needs were established as part of the Administration Building Predesign Report. The emergency generator project is being completed by others as part of the reuse improvements.

4.6.2 Building Improvements

Based on several meetings and a site walk-through on September 29, 2006, miscellaneous improvements were recommended to the following buildings:

- Chlorine Building, chlorine scrubber, and duct
- Secondary Return Activated Sludge/Waste Activated Sludge (WAS) Pump Building
- Solids Building
- Compost Building



Note Regarding Scheme A and B:
Schemes A and B are identical except for the configuration of the entry/reception and restroom core and laboratory. Scheme A attempts to retain the existing restroom configuration and update the configuration to current ADA requirements. Scheme B reconfigures the restroom core to provide a more flexible and efficient use of the required spaces and meeting current ADA requirements.

Project Client: City of Newberg

Newberg Waste Water Treatment
Administration Building Renovation
2301 Wynooski Rd
Newberg, OR 97132

SCHEME B PLANS

Date:

Project No: 0505_

Sheet No: A2.2

BROWN AND CALDWELL

Burgee architecture LLC

20% Schematic Design - Draft 11/16/2005

Newberg Waste Water Treatment
Administration Building Renovation
2301 Wynooski Rd
Newberg, OR 97132

Figure 4-10. Proposed Layout for the Administration Building

4.6.3 Stormwater

Stormwater generated onsite is conveyed by gravity to the IPS along with recycle streams. In-plant stormwater handling alternatives were studied and documented in a previous report entitled *Final Report for the Recommended Plan City of Newberg Dump Station/Headwork Studies* (*Final Dump Station/Headworks Studies* report) (Brown and Caldwell, June, 2002).

The design is based 60,000 gallons of runoff per 1 inch of rain for the current plant site. This value was based upon plant staff observation. Applying this amount to a 5-year rainfall amount of 3.10 inches resulted in a total volume of 186,000 gallons. This volume was applied over a 24-hour period, which resulted in a peak runoff rate of 510 gallons per minute (gpm).

During the facility planning process, plant staff requested that the in-plant pump station be sized for the recommended plant expansion. Scaling up to the plant site for 2025 results in approximately 850 to 900 gpm for a runoff rate. This could be decreased if the plant decreased its impermeable area during new construction. The 50,000 gallons per day (gpd) of recycle water was converted to gpm, assuming 6 hours of flow per day. This rate totaled 140 gpm over a 6-hour period. The analysis also included an allowance for pumping 50,000 gpd of recycled water from plant operations. This rate was added to the peak stormwater runoff rate to arrive at a peak flow rate of 650 gpm. Scaling up is based on increased land area and sizing the wet well for 2025.

The pumps will be installed in a circular 5-foot-diameter wet well consisting of precast manhole sections 8 feet deep. The pump station will be located in the vicinity of Stormwater Manhole No. 1 and will be connected to the stormwater and recycle water systems through new gravity sewers. Flow will be conveyed from the new station to the headworks via approximately 320 feet of 4-inch ductile iron pipe. An overflow pipe will allow flows exceeding the capacity of the pumping station to re-enter the existing stormwater system via a new manhole constructed over the stormwater pipe discharging to the IPS. We have made the following assumptions:

- Pump station is located in a 5-foot-diameter manhole, 8 feet deep
- Two submersible pumps
  - one duty
  - one standby
- Pumps are 10 horsepower
- Outdoor control panel is mounted on a pole next to the manhole

4.6.4 In-plant Reclaimed Water

The current reclaimed water system filters for in-plant use are inadequate and the screening size is too large to be effective. A looped plant water system is recommended that includes adding a source of plant water at the headworks and providing more hose bibs for cleaning at the aeration basins.

4.6.5 Septage Receiving

New septage receiving is recommended. Septage receiving was studied in *Final Dump Station/Headworks Studies* report. The recommended improvements include modifications to the road southeast of the headworks (including a trench drain and catch basin), a Lakeside 31SAP-type septage receiving station, a buried septage receiving tank, duplex pumps in the septage receiving tank, piping to transfer the septage to the screening channel of the headworks, and a new access road around the north side of the headworks. The screenings from the station will be bagged, so no roof over the septage screenings dumpster will be required. Vactor trucks can discharge on the ramp leading to the septage receiving station. Rocks and debris will be manually removed.

4.6.6 Miscellaneous Facility Review Recommended Improvements

Miscellaneous needed improvements were identified in the facility review process. These are summarized in Appendix E. These improvements are being implemented by plant staff or have been identified as a capital improvement project included in the RRE projects.

4.7 PHASING OF RECOMMENDED IMPROVEMENTS

The phasing of the RRE projects is shown in Figures 4-1 and 4-11. Phasing is planned in three increments. Phase 1 is to be completed as soon as funding is available. Figure 4-11 shows the estimated population projections for low, median, and high growth scenarios, year that the estimated growth is expected to occur, and the planned capacity phasing.

The impacts of the Newberg infiltration/inflow (I/I) elimination program will affect the capacity of the WWTP RRE projects. However, these impacts will not immediately reduce the first planned RRE project scope, but will delay, reduce, and/or, postpone future project expansions. The first phase RRE is needed to convey and treat the I/I flows until collection system improvements result in decreased I/I. Reductions in I/I are not expected to occur until after the first phase RRE is implemented. An effective I/I elimination program in the sewer system - after implementation - could potentially postpone future WWTP RRE project construction related to hydraulic expansion.

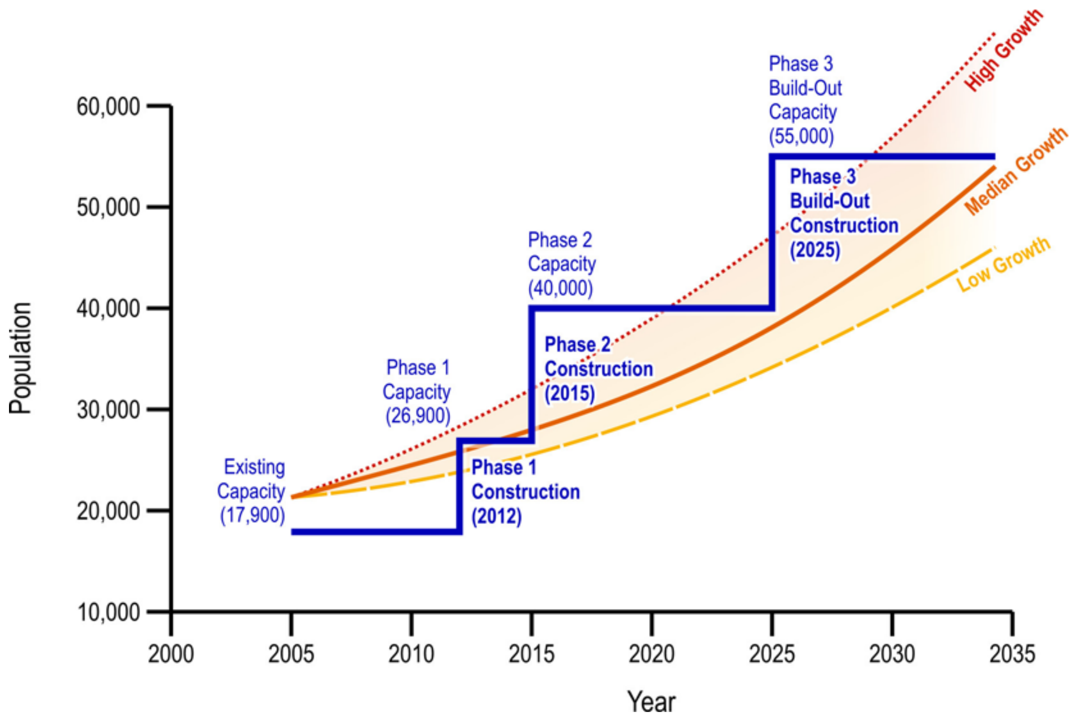


Figure 4-11. Planned Phased Construction Assuming no I/I Removal

4.7.1 Phase 1 RRE Projects, 2007 to 2015

The RRE projects that need to be completed immediately to provide service through 2015 are shown in Figure 4-12 and the order-of-magnitude costs or Capital Improvements Program projects are summarized in Table 4-1. The Phase 1 improvements will be implemented immediately and will meet the needs through 2015 based on median growth projections. Actual phasing implementation may vary depending on the City's priorities. The proposed modifications (shown in green) are needed by the date shown on the site plan. The IPS, disinfection and dechlorination improvements, miscellaneous facilities, outfall, and sawdust drying are needed immediately.

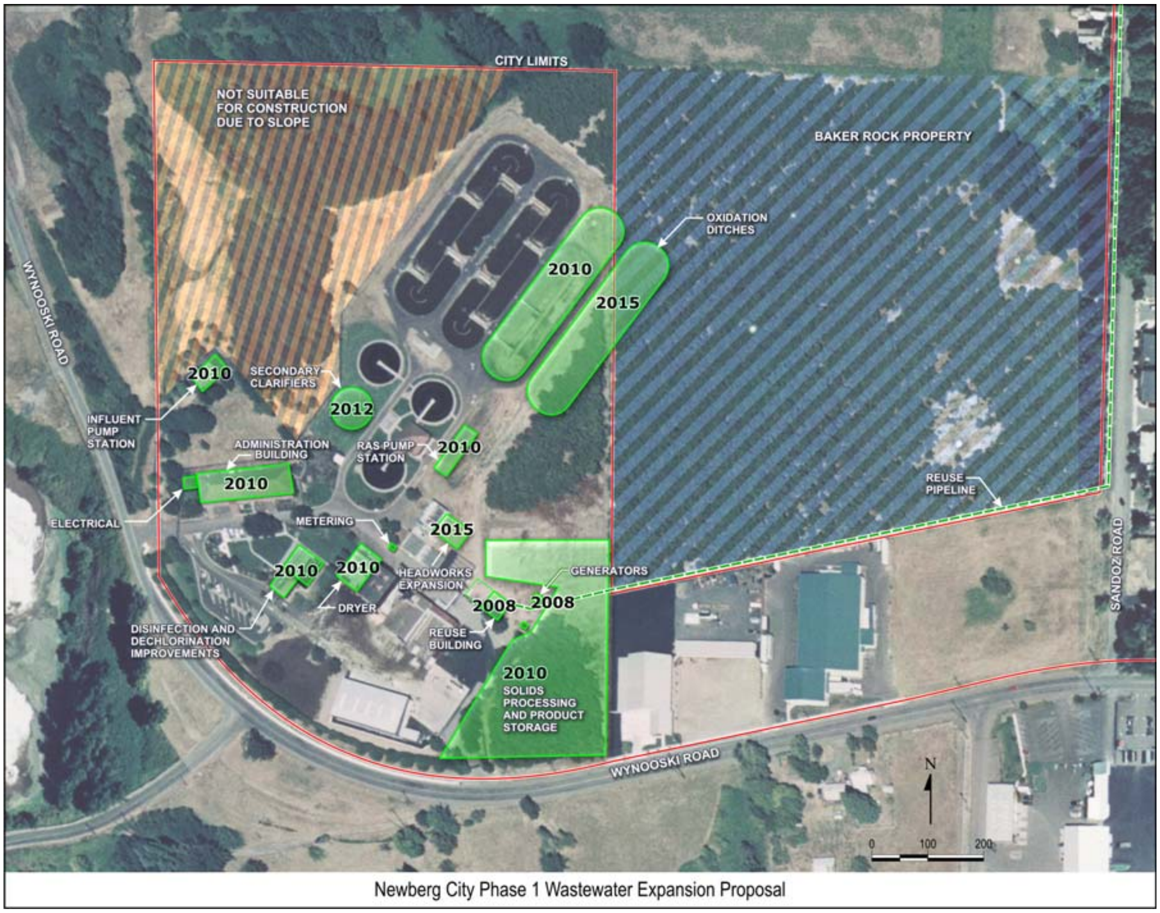


Figure 4-12. Recommended Improvements for Phase 1

Table 4-1. Capital Costs for Phase 1 RRE Projects 2007 to 2015

WWTP improvements	Cost, dollars	Comments
IPS and parallel discharge pipe	3,124,700	Needed immediately
Influent pipeline improvements	287,000	Needed with IPS.
Influent metering	250,000	
Headworks improvements	4,145,700	
Headworks odor control first phase	70,000	
Septage receiving	395,500	
Third and fourth oxidation ditch	6,565,000	
Existing oxidation ditch repairs	573,500	
Fourth secondary clarifier	3,251,200	
Splitter structures	650,000	
Disinfection	425,300	Needed immediately
Dechlorination	339,000	Needed immediately
Outfall	367,900	Needed immediately
In-plant reuse water	85,000	
In-plant stormwater pump station	474,300	
Building upgrades		
Chlorine Building	77,200	
Chlorine scrubber and duct	833,300	
Secondary Building	346,300	
Solids Handling Building	348,100	
Compost Building	468,400	
Sawdust dryer	533,000	2007 dollars; Needed immediately; Energy funding available
Level IV reuse facilities (by others) and storage		Provided by others
Administration Building	1,496,100	
Subtotal, construction cost	25,106,500	
Administration/engineering costs at 25 percent	6,276,600	
Total capital cost	**31,383,100**	**Escalated to 2011 mid-point of construction except as noted**

The upgrades to the IPS in Phase 1 and all ancillary equipment will be able to handle peak flows up to 2040 projected flow rates. The pumps included in Phase 1 will have the capacity to handle peak flows up to 2025 projected flow rates. In 2025, the pumps will be nearing the end of their useful life and will need to be replaced. A third screen will be needed to meet the flow requirements in 2015. Two grit basins will be needed by 2015.

To serve the needs for the 2015 median growth scenario, the plant will need to add two oxidation ditches and one clarifier assuming no additional nitrogen reduction is needed. One of the oxidation ditches will be built in the location of the existing equalization basin. The existing oxidation ditches will be rehabilitated.

The City will continue with gas chlorine for the first 5-year permit cycle as well as the existing contact basins. The immediate disinfection improvements that need to be made include chemical induction mixer(s) at the chlorine injection point, scum removal, improved effluent flow monitoring, and automatic disinfection control strategy. Roof drainage needs to be re-routed out of the contact basin.

The parallel outfall is included as needed improvements in phase 1.

No improvements other than the planned reuse is needed for temperature compliance in Phase 1.

A sawdust dryer is needed immediately to increase capacity of the compost system.

4.7.2 Phase 2, RRE Projects for 2015 to 2025

The RRE projects that need to be completed to meet the Phase 2 needs from 2015 to 2025 are shown in Figure 4-13 and the order-of-magnitude costs are summarized in Table 4-2. The fifth oxidation ditch will be required in 2025 if nitrogen reduction becomes a regulatory requirement. If nitrogen reduction is not required, the fifth oxidation ditch will not be needed until 2040. For the purposes of cost estimating, it was assumed that nitrogen reduction was required to meet National Pollutant Discharge Elimination System (NPDES) discharge requirements. This is a conservative estimate. Actual Phase 2 implementation will be based on the NPDES requirements at that time.

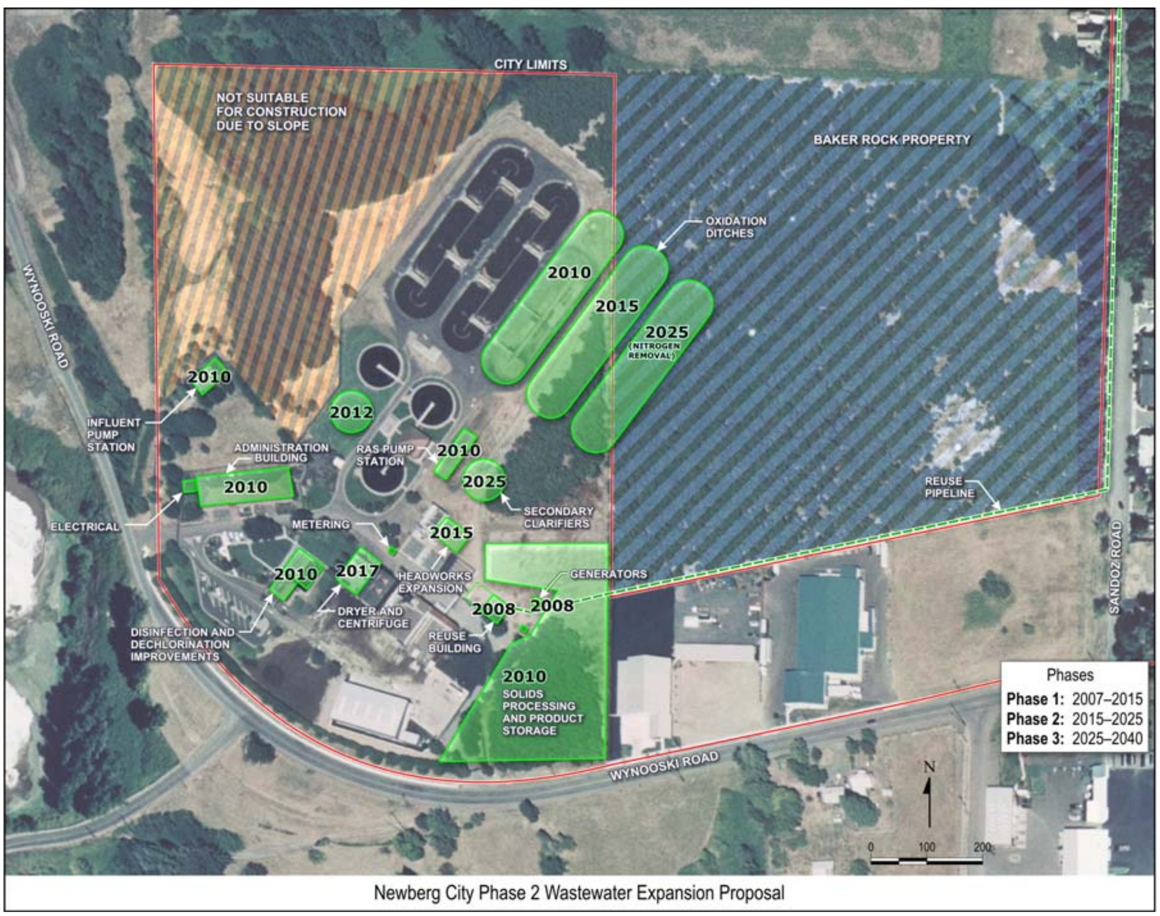


Figure 4-13. Newberg WWTP Phase 2 Improvements 2015 to 2025

Table 4-2. Capital Costs for Phase 2 Improvements 2015 to 2025

WWTP improvements	Cost, dollars	Comments
IPS and parallel discharge pipe	N/A	
Influent pipeline improvements	N/A	
Influent metering	N/A	
Headworks (screenings and grit) improvements	N/A	
Headworks odor control first phase	300,000	Potential for more odor control
Septage receiving	N/A	
Fifth oxidation ditch	4,363,000	Assumes nitrogen reduction requirements
Fifth secondary clarifier	3,251,000	
Splitter structure	600,000	
Electrical building	500,000	
Disinfection	3,065,000	Assumes conversion to UV
Dechlorination	N/A	
Outfall	N/A	
In-plant reuse water	N/A	
In-plant stormwater pump station	N/A	
Building upgrades	N/A	
Composting expansion	3,283,500	
Centrifuge Dewatering	3,508,500	
Level IV reuse facilities and storage	N/A	Level IV reuse by others
Administration Building	N/A	
Subtotal, construction cost	18,871,000	
Administration/engineering costs at 25 percent	4,717,800	
Total capital cost	**23,588,800**	**(in March 2007 dollars)**

No IPS improvements are needed in Phase 2.

If the recommended headworks expansion is conducted in Phase 1, no improvements are needed to meet 2025 conditions.

The phased expansion to 2025 will require another clarifier. A fifth oxidation ditch will be needed if nutrient reduction is required. The clarifier and oxidation ditch will be required by 2025.

The City is considering phasing in hypochlorite when the Newberg WTP is constructed in closer proximity to the WWTP. The City is also investigating the applicability of UV treatment since its effluent has iron which can inhibit UV effectiveness. The immediate improvements that are being made may be adequate through 2025. The detention time at the currently projected PHF for the median growth projection is 11 minutes. Operating history with the high-rate disinfection will provide input into when to expand the disinfection contact time. The City will have to build additional chlorine contact basins for additional contact time or switch to UV disinfection.

The outfall improvements in Phase 1 were sized to provide capacity through 2040. No additional outfalls are required for capacity. However, diffuser modifications may be required for future regulatory compliance.

When the biosolids system nears capacity, the City should evaluate the current state of composting technology. Current recommendation is based on aerated static pile (ASP) composting process. Brown and Caldwell has become familiar with a new and improved tunnel system that should be considered in future analysis. Presumably, compost upgrade would be based on the failure of the less expensive BacGen/Polaris facility being implemented.

To maintain compliance with the temperature TMDL, the peak week flows will need to be stored. Storage for the peak week flows is recommended in addition to expanding reuse.

4.7.3 Phase 3, RRE Projects for 2025 to 2040

The RRE projects to meet the ultimate buildout needs, as previously discussed, are shown in Figure 4-1. The ultimate build-out is assumed to occur by 2040. Phase 3 was identified to define the potential land requirements to serve the population at ultimate build-out of the urban reserve area. Ultimate build-out is assumed to occur by 2040. The scenarios shown on Figure 4-1 include improvements needed to serve median growth estimates as well as improvements needed if high population growth estimates are realized. Costs for the RRE projects for ultimate buildout are not included in the planning effort. The ultimate buildout was included to define the potential land requirements only.

The upgrades to the IPS have been sized such that the facility and all ancillary equipment will be able to handle peak flows up to 2040 projected flow rates. However, the pumps included in the previous cost estimate have been sized to handle peak flows up to 2025 projected flow rates. In 2025, the pumps will be nearing the end of their useful life and will need to be replaced. The City should re-evaluate its flow rates then and will need to replace the pumps with larger pumps.

A fourth screen will be needed to meet the flow requirements in 2040.

To serve the needs for the 2040 median growth scenario, the plant will need to add one more oxidation ditch and two more clarifiers. To meet the high growth estimate needs, three new oxidation ditches and five new clarifiers will be required.

The immediate improvements that are being made may be adequate until the 2025 population projection. At that time the plant will need to re-evaluate its disinfection needs based on revised population and flow predictions. Most likely the City will have to build additional chlorine contact basins or switch to UV disinfection.

The new composting system can be expanded gradually as the population increases. No additional major expenditures are expected except equipment replacement.

The outfall improvements in Phase 1 were sized to provide capacity through 2040. No additional outfalls are required for capacity. However, diffuser modifications may be required for future regulatory compliance.

For temperature compliance, the peak week flows (PWFs) will need to be stored. Storage for the PWFs is recommended in addition to expanding reuse. This analysis needs to be conducted with the reuse project, so it is not included in the recommended CIP.

4.8 STAFFING

A review of the current staffing level was conducted as part of the Facilities Planning process, and recommendations were developed for three future time periods relating to modifications and additions to the WWTP. Staffing needs will increase with the improvements and upgrades associated with the RRE projects. The staffing assessment findings from Appendix F were used to make projections for staffing levels for Phases 1 through 3.

It is recognized that many factors will have an impact on staffing recommendations, and they will need to be updated as more of the elements of the plan become firm.

4.8.1 Estimated Staffing 2007 to 2015

The recommended added personnel are one Senior Laboratory Technician/Environmental Specialist and one Operator II. Both should have cross-training for water and wastewater treatment, in order to provide flexibility in allocating manpower as needed within the operations division. Personnel might be also added at the Utility Worker level with emphasis on moving the person to an operation or maintenance role in the future. These recommendations are based on an analysis that shows a need for 2.9 full time equivalents (FTEs) for the Phase 1 time period.

The proposed facility plan calls for additions to the WWTP that will require increased manpower. Specific planned alternatives for additions to the WWTP include:

- Influent pumping
- Headworks
- Septage receiving
- Oxidation ditches
- Secondary clarification/solids separation
- Disinfection
- Outfall
- Reuse (by others)
- In-plant drains
- Solids handling
- Class A biosolids treatment
- Laboratory/Environmental

The manpower requirements for the above WWTP additions and unit processes have been reviewed and estimates are based on the following conclusions:

- Additional influent pumping station (IPS) capacity. With the new station parallel to the existing facility, more surveillance will be required.

- Two new screens will be added to the headworks. This addition will ease challenges during wet weather and consequently increase O&M attention.
- A Eutek Headcell grit removal system will be installed, increasing O&M attention.
- A new septage receiving station is planned to handle septic tank pump truck discharges that will require added maintenance.
- Expansion of the current oxidation ditch process is the preferred alternative for the future. Workload allocations will be expanded when the addition is completed.
- High-rate disinfection is recommended for the immediate improvements with ultraviolet (UV) disinfection phased in for incremental expansion when needed in the future. An upgraded system and potentially different technology will require more O&M personnel attention.
- Immediate improvements of the sodium bisulfite feed system, including a more advanced control system with updated and larger pumps, will require added O&M attention.
- The reuse tertiary treatment system will be added under a separate contract but will require operator attention for surveillance and periodic membrane maintenance and cleaning. It will also require daily sampling and testing for turbidity, total coliform and chlorine residual to meet Oregon Administrative Rules Division 55. O&M personnel will be required.
- The addition of a rotary dryer for drying sawdust will gain more capacity for the existing composter system. The sawdust dryer requires attendance during operation. Manpower impacts of the sawdust dryer are assumed to be neutral at this time, per discussions with plant personnel.
- The installation of a centrifuge dewatering system will gain additional capacity for the existing composter system. The requirement for this system may be delayed depending on future decisions (by others) dealing with treatment solids energy recovery options. This unit process will add O&M requirements.
- Increased laboratory and regulatory sampling, testing, and reporting for both the treatment plants and collection system with emphasis on the pretreatment program will require additional staffing. As noted above, several key staff members will be eligible for retirement within the next 5 years making it imperative to hire and train qualified staff.

Based on the above summaries of areas requiring more attention by plant staff, the following FTE estimates are presented in Table 4-3.

Table 4-3. Estimated staffing required 2007 to 2015

Function	Hours per week	FTEs per year
IPS	10.3	0.26
Headworks	5.8	0.14
Odor control	3.8	0.09
Septage receiving	6.4	0.16
Third oxidation ditch	5.2	0.12
Fourth oxidation ditch	5.2	0.12
Disinfection	4.2	0.10
Dechlorination	2.7	0.07
In-plant reuse	3.8	0.09
Solids dewatering/Onix system	11.0	0.28
Other processes	3.0	0.08
Laboratory/Environmental	40.0	1.0
Subtotal of Direct Labor	101.4	2.6
Safety and training (6.7 percent)	2.7	0.07
Paid time off sick/holiday/vacation (12.8 percent)	14.2	0.13
Total	118.3	2.71

Table 4-3 presents the estimated level of effort for facilities to be added over the initial phase of the plant additions. The largest single category requiring additional staffing will be the laboratory and environmental activities, with one FTE. Other unit processes will require smaller increments of attention as noted in Table 4-2. A more detailed spreadsheet is provided in Appendix F that shows the anticipated staff additions for each year. Year 1 is scheduled for 2.2 FTEs which includes the laboratory/environmental person.

Using existing job titles, the recommended added personnel should be one Senior Laboratory Technician/Environmental Specialist and one Operator II. Both should have cross-training for water and wastewater treatment. Personnel should also be added at the Utility Worker level with emphasis on moving the person to an operation or maintenance role in the future.

4.8.2 Estimated Staffing 2015 to 2025

The recommended staffing addition is a minimum of three people (3 FTEs) over the span of 10 years. These positions recommend to be filled by an additional Plant Mechanic, a Senior Environmental Technician, and an Operator II.

The facilities plan identifies increased unit process additions in the period between 2015 and 2025 as outlined in the following areas:

- Some improvements to the headworks odor control system are projected that require additional manpower.
- By 2025, a fifth oxidation ditch and a fifth secondary clarifier are scheduled to be added to the flow pattern with consequent manpower needs.
- Although there is a potential for an offsite energy process that would use dewatered biosolids, this estimate is based on the possible addition of an aerated static pile (ASP) to augment the existing tunnel composting process. This would require additional O&M personnel.
- As the plant equipment ages, maintenance needs increase. It is projected that one more full-time maintenance person will be required.
- Increased coverage for laboratory testing and regulatory reporting will also be needed, requiring additional personnel for these activities.

Table 4-4 summarizes additional FTE requirements for the Phase 2 time period.

Table 4-4. Estimated staffing required 2015 to 2025

Function	Hours per week	FTEs per year
Odor control	2.2	0.06
Fifth oxidation ditch	5.2	0.13
Fifth secondary clarifier	5.7	0.14
ASP composting process	27.0	0.68
Added maintenance needs	40.0	1.0
Laboratory/Environmental	40.0	1.0
Subtotal	120.1	3.0
Safety and training (6.7 percent)	8.0	0.2
Paid time off sick/holiday/vacation (12.8 percent)	15.4	0.38
Total	133.5	3.35

A review of the above information shows the need for the addition of a minimum of three people over the span of 10 years. These positions are recommended to be filled by an additional Plant Mechanic, a Senior Environmental Technician, and an Operator II. Specific details relating to Table 4-4 are presented in Appendix F.

These projections do not reflect potential additional personnel needs for the WTP which is proposed to be constructed during this timeframe. Staffing projections will be addressed in the design of the new facility.

4.8.3 Estimated Staffing 2025 to 2040

It is estimated that a total of three more FTEs will be required during this time period and the recommended job titles are an additional Operator I, a Utility Worker, and an Environmental Technician.

In Phase 3, unit process modifications and additions are projected to include the following items:

- IPS pumps are scheduled to be replaced in this time span. This should not entail adding more personnel.
- A fourth screen will be added to the headworks requiring some added O&M attention.
- An additional oxidation ditch and two secondary clarifiers will be added requiring added O&M attention.
- The facilities plan assumes that a new disinfection system will be required by 2025, and a UV system is used to project labor needs.
- Several considerations for biosolids handling are being considered during earlier years of the study period, and systems installed should be adequate though 2040. Labor needs should not be affected during the 2025 to 2040 span of years.
- Temperature regulations may require expansion of the reuse system as well as facilities for effluent storage. Increased labor and monitoring will require additional personnel.

Table 4-5 summarizes additional FTE requirements for the Phase 3 time period.

Table 4-5. Estimated staffing required 2025 to 2040

Function	Hours per week	FTEs per year
IPS added pumps	3.1	0.08
Fourth headworks screen	3.6	0.09
Sixth oxidation ditch	4.9	0.12
Sixth and seventh secondary clarifiers	6.5	0.16
UV process	7.4	0.19
Reuse expansion and storage	6.0	0.15
Added utility worker	40.0	1.0

Table 4-5. Estimated staffing required 2025 to 2040 (continued)

Function	Hours per week	FTEs per year
Laboratory/Environmental	40.0	1.0
Safety and training (6.7 percent)	6.4	0.16
Paid time off		
sick/holiday/vacation (12.8 percent)	14.8	0.36
Total	126.2	3.2

It is estimated that a total of three more people will be required during this time period, and the recommended job titles are an additional Operator I, a Utility Worker, and an Environmental Technician. Specific details relating to Table 4-5 are presented in Appendix F.

4.8.4 Relevant Staffing Considerations

Relevant staffing considerations include sharing personnel and documenting standard operating procedures (SOPs).

4.8.4.1 Cooperative Use of Personnel for Water and Wastewater Systems

The current use of personnel in both the treatment of wastewater and the treatment of potable water is a valid use of the staff for both utilities. Personnel are routinely shifted between the facilities, allowing cross-training and backup for emergencies. This practice is particularly valuable seasonally when more emphasis is needed in the water system during summer months, and in winter when excessive flows and loading require additional wastewater system attention. It is recommended that this practice be continued and maximized as more staff members reach retirement age.

4.8.4.2 Recommended Modifications to SOP

Many utilities are facing a "brain-drain" caused by an increasing number of experienced personnel retiring, taking with them valuable knowledge on O&M of facilities. It is recommended that some formalized method be used to capture and codify this knowledge in SOP. This can be done through electronic O&M manuals, videos, and other systems. Note the City Public Works Department is currently addressing this issue by developing a department-wide Standard Operating Procedure Initiative in accordance with APWA standards. This can then be further refined into a more detailed electronic O&M procedure.

4.9 PUBLIC INVOLVEMENT

The City held an open house for the public at the City Library on October 17, 2006, to provide outreach on the public works projects including the Newberg WWTP Facilities Plan Update. The handout to explain the WWTP Facilities Plan Update is provided in Appendix C.

APPENDICES

A	PERMIT
B	BIOSOLIDS MANAGEMENT PLAN
C	HIDDEN ASSETS
D	TUNNEL COMPOSTER CAPACITY ANALYSIS TM
E	FACILITIES REVIEW
F	STAFFING
G	IPS SKETCHES

APPENDIX A

Permit

file → Oregon DEQ

Oregon

Theodore R. Kulongoski, Governor

Department of Environmental Quality
Western Region - Salem Office
750 Front St. NE, Ste. 120
Salem, OR 97301-1039
(503) 378-8240
(503) 378-3684 TTY

June 22, 2004

Certified Mail

RECEIVED
JUN 24 2004
By________

Michael Soderquist
City of Newberg
PO Box 970
Newberg OR 97132

RE: **NPDES Permit 100988 Issuance**
File Number: 102894
Facility: Newberg Wynooski Street STP, 2301 Wynooski St, Newberg
Yamhill County

Dear Mr. Soderquist:

The Department has completed its review of your application for a National Pollutant Discharge Elimination System (NPDES) permit, and the comments received regarding the preliminary draft permit. Your NPDES permit has been issued and is enclosed.

This permit will be considered the final action on permit application number 992393.

You are urged to carefully read the permit and take all possible steps to comply with conditions established to help protect Oregon's environment against pollution.

If you are dissatisfied with the conditions or limitations of this permit, you have 20 days to request a hearing before the Environmental Quality Commission or its authorized representative. Any such request shall be made in writing to the Director and shall clearly state the grounds for the request.

Questions regarding Discharge Monitoring Reports, inspections and other technical questions may be addressed to Raghu Namburi in the Salem Office, at 503-378-8240 ext. 233. Questions regarding the permit may be addressed to Mark Hamlin, Salem Office, 503-378-8240 ext. 239.

Sincerely,

Mark E Hamlin

for Michael H. Kortenhof
Western Region Water Quality Manager
Salem Office

MHK:der

enclosure
cc: Mark Hamlin, Salem Office
Raghu Namburi, Salem Office
EPA, Region X
James Nusrala, WQ

C: Jim Bennett
Howard Hamilton
Don Danicic

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:

Newberg, City of
P.O. Box 970
Newberg, OR 97132

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 49.7
Emergency Overflows:		
Dayton Avenue PS	002	Chehalem Creek
Andrew Street PS	004	Chehalem Creek
Charles Street PS	005	Chehalem Creek
Chehalem Street PS	006	Chehalem Creek
Creekside Lane PS	007	Chehalem Creek
Sheridan Street PS	008	Chehalem Creek
Fernwood Road PS	009	Sprinbrook Creek

FACILITY TYPE AND LOCATION:

Activated Sludge
Newberg - Wynooski Street STP
2301 Wynooski Street
Newberg, Oregon
Treatment System Class: Level IV
Collection System Class: Level III

RECEIVING STREAM INFORMATION:

Basin: Willamette
Sub-Basin: Middle Willamette
Receiving Stream: Willamette River
LLID: 1227618456580 - 49.7 - D
County: Yamhill

EPA REFERENCE NO: OR003235-2

Issued in response to Application No. 992393 received April 3, 1997.

This permit is issued based on the land use findings in the permit record.

Mark E Hamlin (signature) for
Michael H. Kortenhof, Western Region Water Quality Manager

June 22, 2004
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge to waters of the state is prohibited, including discharge to an underground injection control system.

SCHEDULE A

1. Waste Discharge Limitations not to be exceeded after permit issuance.

a. Treated Effluent Outfall 001

(1) May 1 - October 31:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
$CBOD_5$ (See Note 1)	10 mg/L	15 mg/L	330	500	660
TSS	10 mg/L	15 mg/L	330	500	660

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
$CBOD_5$ (See Note 1)	25 mg/L	40 mg/L	1400	2000	2700
TSS	30 mg/L	45 mg/L	1600	2400	3200

* Average dry weather design flow to the facility equals 4.0 MGD. Summer mass load limits based upon average dry weather design flow to the facility. Winter mass load limits based upon average wet weather design flow to the facility equaling 6.5 MGD. The daily mass load limit is suspended on any day in which the daily flow to the treatment facility exceeds 8 MGD (twice the design average dry weather flow).

(3)

Other parameters (year-round)	Limitations
E. coli Bacteria	Shall not exceed 126 organisms per 100 mL monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL. (See Note 3)
pH	Shall be within the range of 6.0 - 9.0
$CBOD_5$ and TSS Removal Efficiency	Shall not be less than 85% monthly average for $CBOD_5$ and 85% monthly for TSS.
Total Residual Chlorine	Shall not exceed a monthly average concentration of 0.02 mg/L and a daily maximum concentration of 0.05 mg/L. (See Note 4)

(4) Except as provided for in OAR 340-045-0080, no wastes shall be discharged and no activities shall be conducted which violate Water Quality Standards as adopted in OAR 340-041 except in the following defined mixing zone:

The allowable mixing zone is that portion of the Willamette River contained within a band extending out seventy five (75) feet from the west bank of the river and extending from a point fifteen (15) feet upstream of the outfall to a point one hundred fifty (150) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within fifteen (15) feet of the point of discharge.

b. Emergency Overflow Outfalls 002 and 004 through 009

(1) No wastes shall be discharged from these outfalls, unless the cause of the discharge is due to storm events as allowed under OAR 340-041-0120 (13) or (14) as follows:

(2) Raw sewage discharges are prohibited to waters of the State from November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm, and from May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm. If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

c. No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals shall be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

NOTES:

1. The $CBOD_5$ concentration limits are considered equivalent to the minimum design criteria for BOD_5 specified in Oregon Administrative Rules (OAR) 340-041. These limits and $CBOD_5$ mass limits may be adjusted (up or down) by permit action if more accurate information regarding $CBOD_5/BOD_5$ becomes available.

2. At the point of discharge, the Willamette River is water quality limited for temperature (summer), fecal coliform (fall, winter and spring), several toxic parameters (PCB, aldrin, dieldrin, DDT, DDE, iron and mercury) year around and biological criteria (due to skeletal deformities in juvenile squawfish). A Total Maximum Daily Load (TMDL) has not been issued for any of these parameters at the time of permit issuance. Upon EPA approval of a TMDL addressing any of these pollutants, this permit may be reopened to include any Waste Load Allocation (WLA), best management practice or any other condition required by the TMDL.

3. If a single sample exceeds 406 organisms per 100 mL, then five consecutive re-samples may be taken at four-hour intervals beginning within 28 hours after the original sample was taken. If the log mean of the five re-samples is less than or equal to 126 organisms per 100 mL, a violation shall not be triggered.

4. When the total residual chlorine limitation is lower than 0.10 mg/L, the Department will use 0.10 mg/L as the compliance evaluation level (i.e. daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitation).

SCHEDULE B

1. **<u>Minimum Monitoring and Reporting Requirements</u>** (unless otherwise approved in writing by the Department).

The permittee shall monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples shall have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results shall be included in the report, but not used in calculations required by this permit. When possible, the permittee shall re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

The facility influent cyanide and grab samples and all measurements are taken at the entrance to grit chamber. Composite and metals samples are taken just after the grit chamber. The composite sampler is located in the grit pump room.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Semi-Annual	Verification
$CBOD_5$	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
Toxics:		
Metals (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Zn) & Cyanide, measured as total is mg/L (See Note 1)	Semi-annually using 3 consecutive days between Monday and Friday, inclusive	24-hour daily composite (See Note 2)

b. Treated Effluent Outfall 001

The facility effluent cyanide, bacteria, pH and chlorine residual grab samples and all measurements are taken from the Cipolletti weir discharge. Composite and metals samples are taken just prior to the Cipolletti weir. The composite sampler is located in reclaimed water pump room.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Calculation (see Note 3)
Flow Meter Calibration (see Note 3)	Semi-Annual	Verification
$CBOD_5$	2/Week	Composite
Ammonia (NH3-N)	2/Week	Composite
TSS	2/Week (see Note 4)	Composite
Hardness (mg/L $CaCO_3$)	See Note 4	Grab
pH	3/Week	Grab
Effluent Temperature, Daily Max (See Note 5)	Daily	Continuous
E. coli	2/Week	Grab (See Note 6)
Quantity Chlorine Used	Daily	Measurement
Total Chlorine Residual	Daily	Grab
Pounds Discharged ($CBOD_5$ and TSS)	2/Week	Calculation

b. Treated Effluent Outfall 001 (continued)

Item or Parameter	Minimum Frequency	Type of Sample
Average Percent Removed ($CBOD_5$ and TSS)	Monthly	Calculation
Nutrients		
TKN, NO2+NO3-N, Total Phosphorus	1/Week (May-Oct)	24-hour Composite
Toxics:		
Metals (Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se, Zn) & Cyanide, measured as total is mg/L (See Notes 1 and 4)	Semi-annually using 3 consecutive days between Monday and Friday, inclusive	24-hour daily composite (See Note 2)
Iron	Monthly (see Note 7)	24-hour daily composite
Priority Pollutants (see Note 8)	(see Note 8)	24-hour daily composite
Whole Effluent Toxicity (See Note 9)	Annually	Acute & chronic

c. Biosolids Management (see Note 10)

Item or Parameter	Minimum Frequency	Type of Sample
Sludge analysis including: Total Solids (% dry wt.) Volatile solids (% dry wt.) Biosolids nitrogen for: NH_3-N; NO_3-N; & TKN (% dry wt.) Phosphorus (% dry wt.) Potassium (% dry wt.) pH (standard units)	Quarterly	Composite sample to be representative of the product prior to being sold or given away (See Note 11)
Sludge metals content for: Ag, As, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Se & Zn, measured as total in mg/kg	Quarterly	Composite sample to be representative of the product prior to being sold or given away (See Note 11)
Record of amount of Class A biosolids derived material sold or given away.	Each Occurrence	Record of date and volume of compost sold or given away.
Record of locations where Class B biosolids are applied on each DEQ approved site. (Site location maps to be maintained at treatment facility for review upon request by DEQ)	Each Occurrence	Record of date, volume & locations where biosolids were applied recorded on site location map.
Class A PFRP maintain 55C or higher for 3 days or longer.	Daily	Record of temperatures at 55°C or higher
Class B PSRP maintain 40C or higher for 5 days, during which 4 hours must exceed 55C.	Daily	Record of temperatures at 40°C or higher and at 55°C or higher
Vector Attraction Reduction Option #5 at least 14 days at over 40C (104F) with the average temperature of over 45C.	Daily	Record of temperatures at 45°C or higher and at 40°C or higher
Record of compost process time	Quarterly	Record of compost process time by tracking a marker or other known method

c. Biosolids Management (continued)

Item or Parameter	Minimum Frequency	Type of Sample
Fecal coliform bacteria per gram total solids (dry weight basis) or Salmonella sp. bacteria per four grams total solids (dry weight basis)	Quarterly	At least seven (7) individual samples representative of the product to be beneficially used (See Note 11)

d. Emergency Overflow Outfalls 002 and 004 through 009

Item or Parameter	Minimum Frequency	Type of Sample
Flow	Daily (during each occurrence)	Estimate duration and volume

e. Willamette River

Item or Parameter	Minimum Frequency	Type of Sample
Metals (Ag, Cd, Cu, Pb) measured as total in mg/L	Semi-annually during one of the 3 consecutive days of effluent monitoring (See Note 12)	Grab
TSS	See Note 12	Grab
Hardness (mg/L $CaCO_3$)	See Note 12	Grab

2. **Reporting Procedures**

a. Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the appropriate Department office by the 15th day of the following month.

b. State monitoring reports shall 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 shall also identify each system classification as found on page one of this permit.

c. Monitoring reports shall also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

3. **Report Submittals**

a. The permittee shall have in place a program to identify and reduce inflow and infiltration into the sewage collection system. An annual report shall be submitted to the Department by February 15 each year, which details sewer collection maintenance activities that reduce inflow and infiltration. The report shall state those activities that have been done in the previous year and those activities planned for the following year.

b. For any year in which biosolids are land applied, a report shall be submitted to the Department by February 19 of the following year that describes solids handling activities for the previous year and includes, but is not limited to, the required information outlined in OAR 340-050-0035(6)(a)-(e).

c. An annual report covering temperature monitoring done in the calendar year is due by February 15th of the following year. The report shall include results of any temperature monitoring conducted on the influent, sidestreams or the Willamette River. The report shall include calculations of the weekly averages of the daily maximum temperatures of the effluent.

NOTES:

1. For influent and effluent cyanide samples, at least six (6) discrete grab samples shall be collected over the operating day. Each aliquot shall not be less than 100 mL and shall be collected and composited into a larger container, which has been preserved with sodium hydroxide for cyanide samples to insure sample integrity.

2. Daily 24-hour composite samples shall be analyzed and reported separately. Toxic monitoring results and toxics removal efficiency calculations shall be tabulated and submitted with the Pretreatment Program Annual Report as required in Schedule E. Submittal of toxic monitoring results with the monthly Discharge Monitoring Report is not required.

3. The effluent flow is to be calculated based on the influent flow and adjusted by measure and/or estimated side stream flows. Where possible, calibration of side stream flow meters shall be performed at the frequency specified.

4. During the first two years after permit issuance, special monitoring for cadmium, copper, lead, mercury and silver shall be conducted on the effluent during at least one of the three consecutive days of monitoring. TSS and hardness shall be monitored simultaneously. The special monitoring for cadmium, copper, lead and silver shall be conducted using a "clean" sampling method, an "ultra-clean" sampling method, EPA method 1669 or any other test method approved by the Department. The special monitoring for mercury shall be conducted in accordance with EPA Method 1631. At the permittee's option, the results of the special monitoring may be used for one or more of the three consecutive days monitoring that is required on a semi-annual basis. After the first two years, special monitoring of the effluent for cadmium, copper, lead, mercury and silver may be eliminated unless otherwise notified in writing by the Department. For all tests, the method detection limit shall be reported along with the sample result.

5. When continuous monitors are used, record the time between temperature readings, and results are to be tabulated and submitted in an annual report. Continuous temperature monitors must be audited in June and December, following procedures described in DEQ Procedural Guidance for Water Temperature Monitoring. Continuous temperature monitors are to be checked visually monthly to insure that the devices are still in place and submerged.

6. *E. coli* monitoring must be conducted according to any of the following test procedures as specified in **Standard Methods for the Examination of Water and Wastewater, 19th Edition**, or according to any test procedure that has been authorized and approved in writing by the Director or an authorized representative:

Method	Reference	Page	Method Number
mTEC agar, MF	Standard Methods, 18th Edition	9-29	9213 D
NA-MUG, MF	Standard Methods, 19th Edition	9-63	9222 G
Chromogenic Substrate, MPN	Standard Methods, 19th Edition	9-65	9223 B
Colilert QT	Idexx Laboratories, Inc.		

7. During the first year after permit issuance, monitoring for iron shall be conducted on the effluent at the frequency specified. The method detection limit must be lower than 0.3 mg/L. After the first year, iron monitoring of the effluent may be eliminated unless otherwise notified in writing by the Department. For all tests, the method detection limit shall be reported along with the sample result.

8. The permittee shall perform all testing required in Part D of EPA Form 2A. The testing includes all metals (total recoverable), cyanide, phenols, hardness and the 85 pollutants included under volatile organic, acid extractable and base-neutral compounds. In addition, the permittee shall monitor for the pesticide pollutants listed in Table II of Appendix D of 40 CFR Part 122. Three scans are required during the 4 ½ years after

permit issuance. Two of the three scans must be performed no fewer than 4 months and no more than 8 months apart. The effluent samples shall be 24-hour daily composites, except where sampling volatile compounds. In this case, six (6) discrete samples (not less than 100 mL) collected over the operating day are acceptable. The permittee shall take special precautions in compositing the individual grab samples for the volatile organics to insure sample integrity (i.e. no exposure to the outside air). Alternately, the discrete samples collected for volatiles may be analyzed separately and averaged.

9. Beginning no later than calendar year 2004, the permittee shall conduct Whole Effluent Toxicity testing for a period of four (4) years in accordance with the frequency specified above. If the Whole Effluent Toxicity tests show that the effluent samples are not toxic at the dilutions determined to occur at the Zone of Immediate Dilution and the Mixing Zone, no further Whole Effluent Toxicity testing will be required during this permit cycle. Note that four Whole Effluent Toxicity test results will be required along with the next NPDES permit renewal application.

10. If alternative methods of demonstrating compliance with federal pathogen reduction and/or vector attraction reduction requirements are used, the monitoring and sampling frequency shall be based on 40 CFR Part 503 and shall conform to the approved Biosolids Management Plan.

11. Composite samples from the Compost pile shall be taken from reference areas in the Compost pile pursuant to Test Methods for Evaluating Solid Waste, Volume 2; Field Manual, Physical/Chemical Methods, November 1986, Third Edition, Chapter 9.

    Inorganic pollutant monitoring must be conducted according to Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Second Edition (1982) with Updates I and II and third Edition (1986) with Revision I.

12. During the first two years after permit issuance, the Willamette River shall be monitored for cadmium, copper, lead, silver, TSS and hardness when special monitoring of the effluent is conducted (see Note 5). The Willamette River monitoring for cadmium, copper, lead and silver shall be conducted using a "clean" sampling method, an "ultra-clean" sampling method, EPA method 1669 or any other test method approved by the Department. After the first two years, Willamette River monitoring for cadmium, copper, lead and silver may be eliminated. For all tests, the method detection limit shall be reported along with the sample result. The Willamette River shall be sampled for hardness at the same time the river is sampled for metals.

SCHEDULE C

Compliance Schedules and Conditions

1. Within 180 days of permit issuance, the permittee shall submit to the Department for review and approval a proposed program and time schedule for identifying and reducing inflow. Within 60 days of receiving written Department comments, the permittee shall submit a final approvable program and time schedule. The program shall consist of the following:

   a. Identification of all overflow points and verification that sewer system overflows are not occurring up to a 24-hour, 5-year storm event or equivalent;

   b. Monitoring of all pump station overflow points;

   c. A program for identifying and removing all inflow sources into the permittee's sewer system over which the permittee has legal control; and

   d. If the permittee does not have the necessary legal authority for all portions of the sewer system or treatment facility, a program and schedule for gaining legal authority to require inflow reduction and a program and schedule for removing inflow sources.

2. By no later than ninety (90) days after permit issuance, the permittee shall submit to the Department a report which either identifies known sewage overflow locations and a plan for estimating the frequency, duration and quantity of sewage overflowing, or confirms that there are no overflow points. The report shall also provide a schedule to eliminate the overflow(s), if any.

3. By no later than June 30, 2005, the permittee shall submit to the Department for approval Sewer Use Ordinance revisions. The permittee shall conduct a comprehensive review of the City's sewer use ordinance to ensure consistency with 40 CFR § 403 pretreatment regulations and USEPA Region 10 Model Sewer Use Ordinance and revise as necessary to provide the legal authorities to fully implement the federal industrial pretreatment program. (See Note 1)

4. By no later than June 30, 2006, the permittee shall submit to DEQ for approval local limits developed with an emphasis on maximum allowable headworks loading (MAHL) and in accordance with 40 CFR § 403.5(c)(1). (See Note 1)

5. By no later than June 30, 2006, the permittee shall submit to the Department for approval pretreatment program implementation procedures. The procedures must include but not be limited to, industrial user survey, permit application procedure, permit process, IU notification procedures, self monitoring report, inspection procedures, sampling requirements, investigations, budget requirements, data base management, sewer use charges and enforcement response plan. (See Note 1)

6. The permittee is expected to meet the compliance dates, which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he/she determines good and valid cause resulting from events over which the permittee has little or no control.

NOTE:

1. In the event the City of Newberg or the Department determine the City has acquired a categorical or significant industrial user as defined in 40 CFR § 403.3, the City must submit a revised schedule of

compliance to condense the time allowed to develop a fully functional pretreatment program. The amount of time will be dependent on the circumstances at the time including the City's progress toward developing the pretreatment program and timing of the industry connecting to the sewer but in no case shall exceed one hundred eighty (180) days. Any revised time schedule must be approved by the Department.

SCHEDULE D

Special Conditions

1. All biosolids shall be managed in accordance with the current, DEQ approved biosolids management plan. Any changes in solids management activities that significantly differ from operations specified under the approved plan require the prior written approval of the DEQ. Land application of Class B biosolids is allowed only after site authorization approval is issued by the Department in accordance with the biosolids management plan.

2. This permit may be modified to incorporate any applicable standard for biosolids use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for biosolids use or disposal is more stringent than any requirements for biosolids use or disposal in the permit, or controls a pollutant or practice not limited in this permit.

   Biosolids that do not meet Class A pathogen and vector attraction reduction requirements of 40 CFR Part 503 or that contain metal concentrations greater than the concentration specified in 40 CRF 503.13 Table 3 shall not be sold or given away.

3. **Whole Effluent Toxicity Testing**

   a. The permittee shall conduct whole effluent toxicity tests as specified in Schedule B of this permit.

   b. Bioassay tests may be dual end-point tests, only for the fish tests, in which both acute and chronic end-points can be determined from the results of a single chronic test (the acute end-point shall be based upon a 48-hour time period).

   c. Acute Toxicity Testing - Organisms and Protocols

      (1) The permittee shall conduct 48-hour static renewal tests with the *Ceriodaphnia dubia* (water flea) and the *Pimephales promelas* (fathead minnow).

      (2) The presence of acute toxicity will be determined as specified in **Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms**, Fourth Edition, EPA/600/4-90/027F, August 1993.

      (3) An acute bioassay test shall be considered to show toxicity if there is a statistically significant difference in survival between the control and 100 percent effluent, unless the permit specifically provides for a Zone of Immediate Dilution (ZID) for toxicity. If the permit specifies such a ZID, acute toxicity shall be indicated when a statistically significant difference in survival occurs at dilutions greater than that which is found to occur at the edge of the ZID.

   d. Chronic Toxicity Testing - Organisms and Protocols

      (1) The permittee shall conduct tests with: *Ceriodaphnia dubia* (water flea) for reproduction and survival test endpoint, *Pimephales promelas* (fathead minnow) for growth and survival test endpoint, and *Raphidocelis subcapitata* (green alga formerly known as *Selanastrum capricornutum*) for growth test endpoint.

      (2) The presence of chronic toxicity shall be estimated as specified in **Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms**, Third Edition, EPA/600/4-91/002, July 1994.

(3) A chronic bioassay test shall be considered to show toxicity if a statistically significant difference in survival, growth, or reproduction occurs at dilutions greater than that which is known to occur at the edge of the mixing zone. If there is no dilution data for the edge of the mixing zone, any chronic bioassay test that shows a statistically significant effect in 100 percent effluent as compared to the control shall be considered to show toxicity.

e. Quality Assurance

(1) Quality assurance criteria, statistical analyses and data reporting for the bioassays shall be in accordance with the EPA documents stated in this condition and the Department's **Whole Effluent Toxicity Testing Guidance Document**, January 1993.

f. Evaluation of Causes and Exceedances

(1) If toxicity is shown, as defined in sections c.(3) or d.(3) of this permit condition, another toxicity test using the same species and Department approved methodology shall be conducted within two weeks, unless otherwise approved by the Department. If the second test also indicates toxicity, the permittee shall follow the procedure described in section f.(2) of this permit condition.

(2) If two consecutive bioassay test results indicate acute and/or chronic toxicity, as defined in sections c.(3) or d.(3) of this permit condition, the permittee shall evaluate the source of the toxicity and submit a plan and time schedule for demonstrating compliance with water quality standards. Upon approval by the Department, the permittee shall implement the plan until compliance has been achieved. Evaluations shall be completed and plans submitted to the Department within 6 months unless otherwise approved in writing by the Department.

g. Reporting

(1) Along with the test results, the permittee shall include: 1. the dates of sample collection and initiation of each toxicity test; 2. the type of production; and 3. the flow rate at the time of sample collection. Effluent at the time of sampling for bioassay testing should include samples of required parameters stated under Schedule B, condition 1. of this permit.

(2) The permittee shall make available to the Department, on request, the written standard operating procedures they, or the laboratory performing the bioassays, are using for all toxicity tests required by the Department.

h. Reopener

(1) If bioassay testing indicates acute and/or chronic toxicity, the Department may reopen and modify this permit to include new limitations and/or conditions as determined by the Department to be appropriate, and in accordance with procedures outlined in Oregon Administrative Rules, Chapter 340, Division 45.

4. The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

a. The permittee shall have its wastewater system supervised by one or more operators who are certified in a classification <u>and</u> grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

b. The permittee's wastewater system may not be without supervision (as required by Special Condition 4.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified at no less than one grade lower then the system classification.

c. If the wastewater system has more than one daily shift, the permittee shall have the shift supervisor, if any, certified at no less than one grade lower than the system classification.

d. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

e. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program, 811 SW 6th Ave, Portland, OR 97204. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

f. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 4.b. above.

5. The permittee shall notify the appropriate DEQ Office in accordance with the response times noted in the General Conditions of this permit, of any malfunction that could result in a permit violation or endanger public health or the environment so that corrective action can be coordinated between the permittee and the Department.

6. Unless otherwise approved in writing by the Department, all inflow sources are to be permanently disconnected from the sanitary sewer system in accordance with the approved inflow removal plan required by Schedule C, Condition 1.

7. The permittee shall not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

a. The facilities are operated in accordance with the permit conditions, and;

b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

If warranted, at permit renewal the Department may evaluate the need for a full assessment of the facilities impact on groundwater quality.

SCHEDULE E

Pretreatment Activities

Upon Permit issuance, the permittee shall implement the following pretreatment activities:

1. The permittee shall update its inventory of industrial users at a frequency and diligence adequate to ensure proper identification of industrial users subject to pretreatment standards, but no less than once per year. The permittee shall notify these industrial users of applicable pretreatment standards in accordance with 40 CFR § 403.8(f)(2)(iii).

2. The permittee must develop and maintain a data management system designed to track the status of the industrial user inventory, discharge characteristics, and compliance. In accordance with 40 CFR § 403.12(o), the permittee shall retain all records relating to pretreatment program activities for a minimum of three years, and shall make such records available to the Department and USEPA upon request. The permittee shall also provide public access to information considered effluent data under 40 CFR Part 2.

3. The permittee shall submit by March 1 of each year, a report that describes the permittee's pretreatment program during the previous calendar year. The content and format of this report shall be as established by the Department.

4. The permittee shall submit in writing to the Department a statement of the basis for any proposed modification of its approved program and a description of the proposed modification in accordance with 40 CFR § 403.18. No substantial program modifications may be implemented by the permittee prior to receiving written authorization from the Department.

Upon Department approval of the revised pretreatment program procedures (required by Schedule C, Conditions 3, 4 and 5), the permittee shall implement the following pretreatment activities:

5. The permittee shall conduct and enforce its Pretreatment Program, as approved by the Department, and comply with the General Pretreatment Regulations (40 CFR Part 403). The permittee shall secure and maintain sufficient resources and qualified personnel to carry out the program implementation procedures described in this permit.

6. The permittee shall adopt all legal authority necessary to fully implement its approved pretreatment program and to comply with all applicable State and Federal pretreatment regulations. The permittee must also establish, where necessary, contracts or agreements with contributing jurisdictions to ensure compliance with pretreatment requirements by industrial users within these jurisdictions. These contracts or agreements shall identify the agency responsible for all implementation and enforcement activities to be performed in the contributing jurisdictions. Regardless of jurisdictional situation, the permittee is responsible for ensuring that all aspects of the pretreatment program are fully implemented and enforced.

7. The permittee shall enforce categorical pretreatment standards promulgated pursuant to Section 307(b) and (c) of the Act, prohibited discharge standards as set forth in 40 CFR § 403.5(a) and (b), or local limitations developed by the permittee in accordance with 40 CFR § 403.5(c), whichever are more stringent, or are applicable to nondomestic users discharging wastewater to the collection system. Locally derived discharge limitations shall be defined as pretreatment standards under Section 307(d) of the Act.

   A technical evaluation of the need to revise local limits shall be performed at least once during the term of this permit and must be submitted to the Department as part of the permittee's NPDES permit application, unless the Department requires in writing that it be submitted sooner. Limits development will be in accordance with the procedures established by the Department.

8. The permittee shall issue individual discharge permits to all Significant Industrial Users in a timely manner. The permittee shall also reissue and/or modify permits, where necessary, in a timely manner. Discharge permits must contain, at a minimum, the conditions identified in 40 CFR § 403.8(f)(1)(iii). Unless a more stringent definition has been adopted by the permittee, the definition of Significant Industrial User shall be as stated in 40 CFR § 403.3(t).

9. The permittee shall randomly sample and analyze industrial user effluents at a frequency commensurate with the character, consistency, and volume of the discharge. At a minimum, the permittee shall sample all Significant Industrial Users for all regulated pollutants twice per year. Alternatively, at a minimum, the permittee shall sample all Significant Industrial Users for all regulated pollutants once per year, if the permittee has pretreatment program criteria in its approved procedures for determining appropriate sampling levels for industrial users, and provided the sampling criteria indicate once per year sampling is adequate. At a minimum, the permittee shall conduct a complete facility inspection once per year. Additionally, at least once every two years the permittee shall evaluate the need for each Significant Industrial User to develop a slug control plan. Where a plan is deemed necessary, it shall conform to the requirements of 40 CFR § 403.8(f)(2)(v).

   Where the permittee elects to conduct all industrial user monitoring in lieu of requiring self-monitoring by the user, the permittee shall gather all information which would otherwise have been submitted by the user. The permittee shall also perform the sampling and analyses in accordance with the protocols established for the user.

   Sample collection and analysis, and the gathering of other compliance data, shall be performed with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Unless specified otherwise by the Director in writing, all sampling and analyses shall be performed in accordance with 40 CFR Part 136.

10. The permittee shall review reports submitted by industrial users and identify all violations of the user's permit or the permittee's local ordinance.

11. The permittee shall investigate all instances of industrial user noncompliance and shall take all necessary steps to return users to compliance. The permittee's enforcement actions shall track its approved Enforcement Response Plan, developed in accordance with 40 CFR § 403.8(f)(5). If the permittee has not developed an approved Enforcement Response Plan, it shall develop and submit a draft to the Department for review within 90 days of the issuance of this permit.

12. The permittee shall publish, at least annually in the largest daily newspaper published in the permittee's service area, a list of all industrial users which, at any time in the previous 12 months, were in Significant Noncompliance with applicable pretreatment requirements. For the purposes of this requirement, an industrial user is in Significant Noncompliance if it meets one or more of the criteria listed in 40 CFR 403.8(f)(2)(vii).

NPDES GENERAL CONDITIONS
(SCHEDULE F)

SECTION A. STANDARD CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Oregon Revised Statutes (ORS) 468B.025 and is grounds for enforcement action; for permit termination, suspension, or modification; or for denial of a permit renewal application.

2. Penalties for Water Pollution and Permit Condition Violations

Oregon Law (ORS 468.140) allows the Director to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit.

In addition, a person who unlawfully pollutes water as specified in ORS 468.943 or ORS 468.946 is subject to criminal prosecution.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee shall correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application shall be submitted at least 180 days before the expiration date of this permit.

The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions

This permit may be modified, suspended, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute;

b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants

The permittee shall comply with any applicable effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

7. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege.

8. Permit References

Except for effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls, and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The term "bypass" does not include nonuse of singular or multiple units or processes of a treatment works when the nonuse is insignificant to the quality and/or quantity of the effluent produced by the treatment works. The term "bypass" does not apply if the diversion does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities or treatment processes which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.

(1) Bypass is prohibited unless:

(a) Bypass was necessary to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The permittee submitted notices and requests as required under General Condition B.3.c.

(2) The Director may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when the Director determines that it will meet the three conditions listed above in General Condition B.3.b.(1).

c. Notice and request for bypass.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in General Condition D.5.

4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of General Condition B.4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the causes(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in General Condition D.5, hereof (24-hour notice); and

(4) The permittee complied with any remedial measures required under General Condition A.3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Event

For purposes of this permit, A Single Operational Event which leads to simultaneous violations of more than one pollutant parameter shall be treated as a single violation. A single operational event is an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational event does not include Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational event is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definitions

(1) "Overflow" means the diversion and discharge of waste streams from any portion of the wastewater conveyance system including pump stations, through a designed overflow device or structure, other than discharges to the wastewater treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the conveyance system or pump station which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an overflow.

(3) "Uncontrolled overflow" means the diversion of waste streams other than through a designed overflow device or structure, for example to overflowing manholes or overflowing into residences, commercial establishments, or industries that may be connected to a conveyance system.

b. Prohibition of overflows. Overflows are prohibited unless:

(1) Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance system storage; and

(3) The overflows are the result of an upset as defined in General Condition B.4. and meeting all requirements of this condition.

c. Uncontrolled overflows are prohibited where wastewater is likely to escape or be carried into the waters of the State by any means.

d. Reporting required. Unless otherwise specified in writing by the Department, all overflows and uncontrolled overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D.5.

7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs, upon request by the Department, the permittee shall take such steps as are necessary to alert the public about the extent and nature of the discharge. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in such a manner as to prevent any pollutant from such materials from entering public waters, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Sampling and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

4. Penalties of Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years, or by both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years or both.

5. Reporting of Monitoring Results

Monitoring results shall be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports shall be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value shall be recorded unless otherwise specified in this permit.

7. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean, except for bacteria which shall be averaged as specified in this permit.

8. Retention of Records

Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records of all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

9. Records Contents

Records of monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and

d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

SECTION D. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall comply with Oregon Administrative Rules (OAR) 340, Division 52, "Review of Plans and Specifications". Except where exempted under OAR 340-52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers shall be commenced until the plans and specifications are submitted to and approved by the Department. The permittee shall give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit shall be transferred to a third party without prior written approval from the Director. The permittee shall notify the Department when a transfer of property interest takes place.

4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting

The permittee shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally (by telephone) within 24 hours, unless otherwise specified in this permit, from the time the permittee becomes aware of the circumstances. During normal business hours, the Department's Regional office shall be called. Outside of normal business hours, the Department shall be contacted at 1-800-452-0311 (Oregon Emergency Response System).

A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. If the permittee is establishing an affirmative defense of upset or bypass to any offense under ORS 468.922 to 468.946, and in which case if the original reporting notice was oral, delivered written notice must be made to the Department or other agency with regulatory jurisdiction within 4 (four) calendar days. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected;

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and

e. Public notification steps taken, pursuant to General Condition B.7.

The following shall be included as information that must be reported within 24 hours under this paragraph:

a. Any unanticipated bypass which exceeds any effluent limitation in this permit.

b. Any upset which exceeds any effluent limitation in this permit.

c. Violation of maximum daily discharge limitation for any of the pollutants listed by the Director in this permit.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under General Condition D.4 or D.5, at the time monitoring reports are submitted. The reports shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information that the Department may request to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

8. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified in accordance with 40 CFR 122.22.

9. Falsification of Information

A person who supplies the Department with false information, or omits material or required information, as specified in ORS 468.953 is subject to criminal prosecution.

10. Changes to Indirect Dischargers - **[Applicable to Publicly Owned Treatment Works (POTW) only]**

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;

b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

11. Changes to Discharges of Toxic Pollutant - **[Applicable to existing manufacturing, commercial, mining, and silvicultural dischargers only]**

The permittee must notify the Department as soon as they know or have reason to believe of the following:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels:

(1) One hundred micrograms per liter (100 µg/L);

(2) Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

(3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) Five hundred micrograms per liter (500 µg/L);

(2) One milligram per liter (1 mg/L) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

(4) The level established by the Department in accordance with 40 CFR 122.44(f).

SECTION E. DEFINITIONS

1. BOD means five-day biochemical oxygen demand.
2. TSS means total suspended solids.
3. mg/L means milligrams per liter.
4. kg means kilograms.
5. m^3/d means cubic meters per day.
6. MGD means million gallons per day.
7. Composite sample means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.
8. FC means fecal coliform bacteria.
9. Technology based permit effluent limitations means technology-based treatment requirements as defined in 40 CFR 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-41.
10. CBOD means five day carbonaceous biochemical oxygen demand.
11. Grab sample means an individual discrete sample collected over a period of time not to exceed 15 minutes.
12. Quarter means January through March, April through June, July through September, or October through December.
13. Month means calendar month.
14. Week means a calendar week of Sunday through Saturday.
15. Total residual chlorine means combined chlorine forms plus free residual chlorine.
16. The term "bacteria" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
17. POTW means a publicly owned treatment works.

State of Oregon
Department of Environmental Quality

National Pollutant Discharge Elimination System
PERMIT EVALUATION AND FACT SHEET
March 29, 2004

Oregon Department of Environmental Quality
Western Region
750 Front St NE, Suite 120
Salem OR 97301
(503) 378-8240

ISSUED

Permittee:	City of Newberg P.O. Box 970 Newberg, OR 97132 File Number: 102894
Current Permit:	NPDES Permit Number: 100988 EPA Reference Number: OR003235-2 Issue Date: September 30, 1992 Expiration Date: September 30, 1997
Source Information:	Newberg Wastewater Treatment Facilities 2301 Wynooski Road Newberg, Oregon Latitude 45° 17' 9" North, Longitude 122° 57' 14" West
Source Contact:	Howard Hamilton, Operations Superintendent Phone: 503-537-1211
Proposed Action:	NPDES Major Domestic Permit Renewal Application Number: 992393 Date Received: April 3, 1997
Permit Writer:	Mark E. Hamlin Phone: 503-378-8240, extension 239

INTRODUCTION

The City of Newberg owns and operates a secondary wastewater treatment facility located in Newberg, Oregon **(see Figure 1)**. Municipal wastewater is treated and discharged to the Willamette River in accordance with National Pollutant Discharge Elimination System (NPDES) Permit number 100988. The Permit for the facility was issued on September 30, 1992 and expired on September 30, 1997.

The Department received a renewal application on April 3, 1997. The permit shall not be deemed to expire until final action has been taken on the renewal application as per Oregon Administrative Rules (OAR) 340-045-0040. A renewal permit is necessary to discharge to state waters pursuant to provisions of Oregon Revised Statutes (ORS) 468B.050 and the Federal Clean Water Act. The Department proposes to renew the permit. This permit evaluation report describes the basis and methodology used in developing the permit.

This permit is a joint federal and state permit and subject to federal and state regulations. The Clean Water Act, the Code of Federal Regulations, and numerous guidelines of the Environmental Protection Agency provide the federal permit requirements. The Oregon Revised Statutes, Oregon Administrative Rules, and policies and guidelines of the Department of Environmental Quality provide the state permitting requirements.

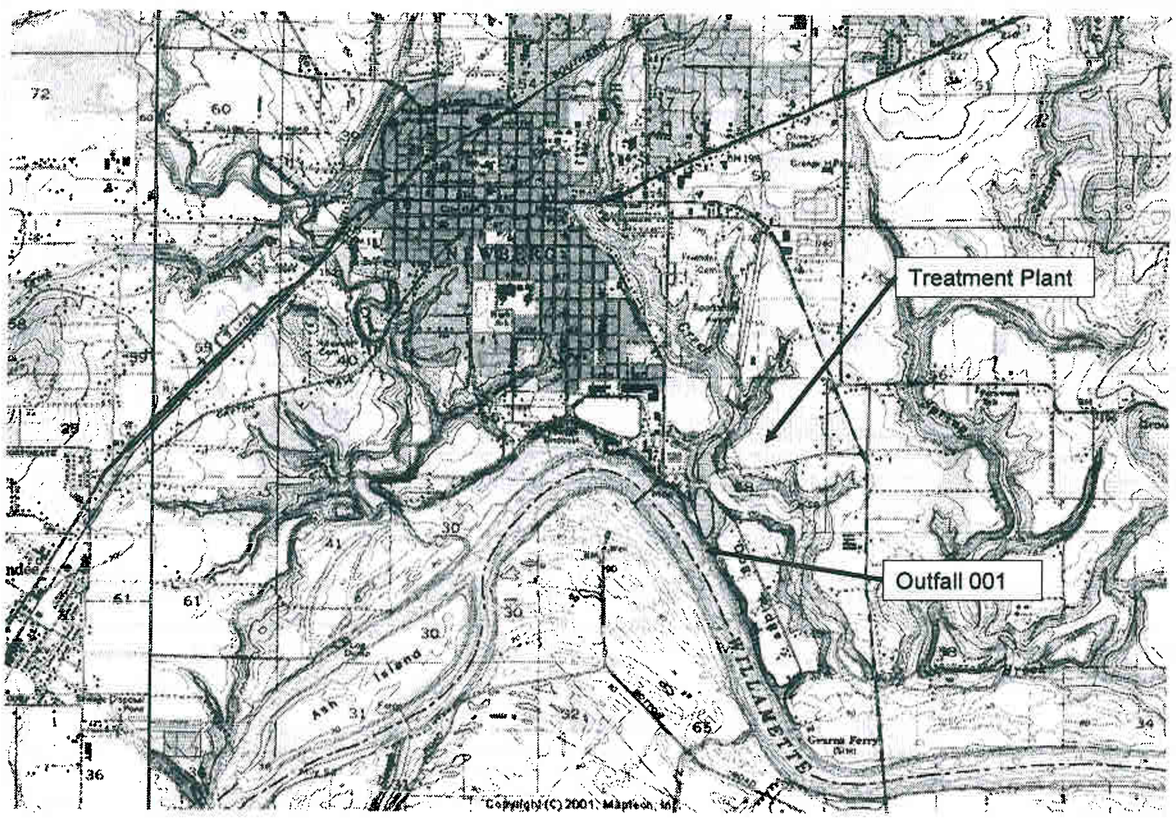


Figure 1

FACILITY DESCRIPTION

The treatment facility serves the entire City of Newberg. No service is currently provided outside the City limits. The facilities **(see Attachment #1)** consist of a raw influent pump station, headworks, activated sludge oxidation ditches, secondary clarifiers, chlorine disinfection, dechlorination, effluent outfall and biosolids composting. The facility was placed into operation in 1987. The facility accepts septage from local septic pumpers on a regular basis.

The raw sewage pump station contains 4 centrifugal pumps that pump all wastewater received to the headworks. The headworks currently consist of two influent channels with one mechanically cleaned bar screen and one bypass channel. The facility has an aerated grit removal system with one cyclone grit classifier. The headworks is being upgraded to three influent channels with two mechanically cleaned perforated plate screens with washer/compactors, one bypass channel and two cyclone grit classifiers.

Secondary treatment is provided by two oxidation ditches and three circular 80-foot diameter, center feed secondary clarifiers. Influent flows above 18 million gallons per day (MGD) are diverted to an equalization basin for peak flow storage. All flow is eventually treated in the secondary system except in extreme cases when the excess flow above 18 MGD cannot be contained in the equalization basin. In such cases, overflow from the equalization basin is blended with secondary effluent prior to disinfection.

Disinfection is performed with chlorine gas. Treated and disinfected effluent is dechlorinated with sodium bisulfite prior to flow measurement and discharge. The outfall is a single port diffuser in the Willamette River at river mile 49.7.

The facility is unmanned at night, but has 24 hour monitoring of alarms through telemetry through the treatment plant. The facility also has redundant power and some standby electric generation at the treatment plant. Some lift stations have standby power generators while others are served by a mobile generator.

Only minor modifications were made to the facility during the last permit cycle. The facility was originally designed to compost biosolids but was unable to, due to a structural failure. The facility used lime stabilization to process biosolids until the composting facilities were repaired. Lime stabilization of biosolids was discontinued in 1994. In addition, dechlorination of the effluent was instituted toward the end of 1998.

The existing permit identifies the treatment facility design average dry weather flow (ADWF) capacity as 4.0 MGD. During the last three dry seasons (2001, 2002 and 2003 from May 1 through October 31), the plant received an average of 1.78 MGD or 45 percent of its hydraulic capacity. The plant's design organic capacity is 7,200 pounds of BOD (approximately 5040 pounds of CBOD) per day and 5,000 pounds per day of TSS. Summer plant loading averaged approximately 57 percent of the CBOD organic capacity and 78 percent of the TSS capacity. The maximum CBOD loading (approximately 69 percent) occurred during October 2001 while the maximum TSS loading (98 percent) occurred during May 2003.

The plant's design AWWF is 6.5 MGD. Monthly average plant flows during the winter are weather dependant. During the last two wet weather periods (2001/02 and 2002/2003 from November 1 though April 30), the plant received an average of 4.16 MGD or 64 percent of its winter hydraulic capacity. Winter plant loading averaged approximately 57 percent of the CBOD organic capacity and 84 percent of the TSS capacity. The maximum CBOD loading (77 percent) and the maximum TSS loading (119 percent) occurred during November 2001. (The 2000/01 wet weather period occurred during a severe drought and plant flow is not considered representative.)

With the new headworks, peak instantaneous hydraulic capacity will be rated at 27 MGD.

Biosolids Management and Utilization

All waste sludge must be managed in accordance with the Department approved Biosolids Management Plan to ensure compliance with the federal biosolids regulations (40 CFR Part 503) and the state rules (OAR 340-050). The permittee's biosolids management plan was originally approved June 22, 1989. An updated management plan is proposed to be approved with this permit action.

The biosolids consistently meet the vector attraction and Class A pathogen reduction requirements in 40 CFR Part 503. After treatment necessary to comply with vector attraction and pathogen reduction requirements, the Class A biosolids can be sold, given away or beneficially land applied with few additional restrictions. The updated plan also allows land application of Class B biosolids (should it become necessary or desirable in the future). The site selection criteria for land application include all of Oregon. The Department is proposing to approve the plan **(see Attachment #2).**

Sludge from the secondary clarifiers and dredging from the oxidation ditches (when necessary) are pumped through the solid treatment processes. Sludge can be stored in two 80,000-gallon sludge storage tanks or directly thickened with dissolved air floatation and a pair of two-meter belt filter presses. Dewatered sludge cake is mixed with sawdust recycled compost and enters one of two compost reactor vessels to produce Class A biosolids. Each reactor tunnel is 18 feet wide, 12 feet high and 66 feet long.

At maximum loading each tunnel has a detention time of approximately 14 days. All batches must meet the minimum vector attraction reduction requirement of aerobic treatment of the sludge for at least 14 days at over 40 degrees C with the average temperature of over 45 degrees C.

The City uses Option 5 (composting time and temperature) to demonstrate compliance with vector attraction requirements. The compost pile must be over 40 degrees C for at least 14 days with the average temperature of over 45 degrees C.

The City uses Salmonella sp. and/or fecal coliform monitoring of the compost and Alternative 5 of Processes to Further Reduce Pathogens (PFRP) to demonstrate compliance with Class A pathogen reduction requirements. The compost pile must be at a minimum pile temperature of 55 degrees C for three consecutive days. The compost (Class A biosolids) is sold to interested parties for private and commercial use. The City produces approximately 570 metric dry tons of composted biosolids per year.

If Class B biosolids are produced, the biosolids may be land applied. However, the City no longer has authorized land application sites. Any future land application sites must conform to the site selection criteria in the Biosolids Management Plan and must be located in Oregon.

The City conducts quarterly chemical testing of the composted sludge (see Table 1). Testing includes analyses for nutrients and 11 metals. Based on the analyses, there are no known potential impacts from the compost distribution program.

Table 1 – Biosolids Metals Results for December 2003

Parameter	Mg/dry Kg	§503.13 Table 3 Limit	Parameter	Mg/dry Kg	§503.13 Table 3 Limit
Arsenic	5.7	41 mg/kg	Molybdenum	3.2	No limit
Cadmium	1.5	39 mg/kg	Nickel	13.7	420 mg/kg
Chromium	15.6	No limit	Selenium	4.4	100 mg/kg
Copper	150	1500 mg/kg	Silver	8.92	No limit
Lead	21.2	300 mg/kg	Zinc	442	2800 mg/kg

Mercury	0.77	17 mg/kg			

Inflow and Infiltration (I/I)

The plant received an average of 1.78 MGD during the last three dry seasons while it received an average of 4.16 MGD during the last two wet weather periods. The wet period average flow is about 2.3 times the dry period average flow. The maximum daily flow of 14.9 MGD occurred in January 2003. The plant experiences significant but not extreme levels of I/I.

Collection system overflows can result from catastrophic failure of the treatment plant or pump stations or high flows due to storm events. According to the rules (OAR 340-041-0009(6) and (7)), the City is prohibited from discharging raw sewage during the period of November 1 through May 21, except during a storm event greater than the one-in-five-year, 24-hour duration storm. In addition, they cannot discharge raw sewage during the period of May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm. The City of Newberg can comply with these rules.

The current permit contains Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) and total suspended solids (TSS) removal efficiency limits of 85 percent. The City has had no violations of the removal efficiency limits. The Department is proposing to retain the existing limits.

Industrial Pretreatment

The City of Newberg has a Department approved industrial pretreatment program. Federal and state pretreatment requirements were included in the previous NPDES permit for this facility. However, the City's industrial pretreatment program has been inactive since the last significant industry closed. The requirement to implement an industrial pretreatment program could be deleted from the permit but the City wishes to retain their program in order to attract new significant or categorical industries. The City currently does not permit any industrial users.

A technical assistance inspection of the City's Industrial Pretreatment Program was conducted on October 2, 2003 by DEQ. The primary focus of the visit was to evaluate the status of the City's inactive program. As a result of the technical assistance visit, the Department determined that the City did not have the procedures necessary to adequately implement a pretreatment program.

The proposed permit contains Schedule C compliance conditions for developing the necessary program procedures. The industrial pretreatment program would have to be complete and reactivated prior to the connection of a new significant or categorical industry. Schedule B of the proposed permit contains the monitoring requirements normally included with a pretreatment program. Schedule E includes the requirements for implementation of an industrial pretreatment program. However, full implementation of the program is delayed until after Department approval of the program procedures required by the Schedule C compliance conditions.

Groundwater Issues

The treatment plant is constructed entirely of impervious structures. It is not anticipated that the treatment process and discharge to surface waters will cause groundwater impacts. Schedule A of the proposed permit prohibits adverse impacts to groundwater. A condition in Schedule D states that no groundwater evaluations will be required during this permit cycle.

Stormwater Issues

General NPDES permits for stormwater are required for wastewater treatment facilities with a design flow of greater than 1 MGD if stormwater is collected and discharge from the plant site. This facility does not discharge stormwater. Stormwater from the plant site is collected and drains to the influent pump station wetwell for full secondary treatment.

Outfalls

The proposed NPDES Permit allows the treatment facility to discharge treated effluent into the Willamette River approximately one-third mile southwest of the plant at River Mile 49.7. Treated, disinfected and dechlorinated effluent is discharged through an outfall pipe to an outfall in the Willamette River.

Two emergency overflow points are identified in the current permit. The proposed permit deletes the now non-existent River Road overflow point (003), retains emergency overflow point 002 and adds six new overflow points. Their use is restricted to storm events as allowed under OAR 340-041-0009(6) and (7) and instances of upset as defined in the General Conditions. During the current permit period, the collection system has overflowed on rare occasions.

Mixing Zone Analysis

Federal regulations (40 CFR 131.13) allow for the use of mixing zones, also known as "allocated impact zones". When using mixing zones, acute toxicity to drifting organisms must be prevented and the integrity of the waterbody as a whole may not be impaired. Mixing zones allow the initial mixing of waste and receiving water, but are not designed to allow for treatment. EPA does not have specific regulations pertaining to mixing zones. Each state must adopt its own mixing zone regulations that are subject to review and approval by EPA. In States that lack approved mixing zone regulations, ambient water quality standards must be met at the end of the pipe.

The Department has adopted the two-number aquatic life criteria and developed mixing zone regulations with respect to that. The regulations are primarily narrative and essentially require the permit writer to use best professional judgment in establishing the size of the mixing zone. Based on EPA guidance and the Department's mixing zone regulations, two mixing zones may be developed for each discharge that reflect acute and chronic effects: 1) The acute mixing zone, also known as the "zone of initial dilution" (ZID), and 2) the chronic mixing zone, usually referred to as "the mixing zone". The acute mixing zone is designed to prevent lethality to organisms passing through the ZID. The chronic mixing zone is designed to protect the integrity of the entire water body as a whole. The allowable size of the mixing zone should be based upon the relative size of the discharge to the receiving stream, the beneficial uses of the receiving stream, location of other discharges to the same water body, location of drinking water intakes, and other considerations. More specific guidance is available from EPA regarding criteria used in appropriately sizing a ZID. Primarily the ZID must be designed to prevent lethality to drifting organisms.

The Department's mixing zone regulations state the mixing zone must be less than the total stream width as necessary to allow passage of fish and other aquatic organisms. Early recommendations regarding the size of the zone of passage originated from the Department of Interior (1968). They recommended a zone of passage of 75 percent of the cross-sectional area and/or volume of flow of the receiving stream. Based on this recommendation, the Department's standard practice is to allow no more than 25 percent of the stream flow for mixing zones.

The current permit provides for a mixing zone that consists of that portion of the Willamette River contained within a band extending out seventy five (75) feet from the west bank of the river and extending from a point fifteen (15) feet upstream of the outfall to a point one hundred fifty (150) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) is defined as that portion of the allowable mixing zone that is within fifteen (15) feet of the point of discharge.

The defined mixing zone overlaps with the defined mixing zone for the SP Newsprint Company's discharge. However, the effluent plumes do not mix until they are outside the defined mixing zones. For the facility, outfall, and mixing zone as presently configured, the mixing zone study determined that the dilution factor at the edge of the ZID is 2.4 during critical low stream flow conditions while the dilution factor at the edge of the mixing zone is 28.5 during critical low flow conditions.

The Department proposes to retain the existing mixing zone.

Receiving Stream Water Quality

The City's discharge is to the Willamette River at River Mile 49.7. The discharge is within the Willamette basin and Middle Willamette sub-basin. The designated beneficial uses of the receiving stream are: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life (including salmon and steelhead migration corridor), wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality and hydro Power. The water quality standards for the Willamette Basin (OAR 340-041) were developed to protect the beneficial uses of the basin.

The Willamette River is included on the Department's List of Water Quality Limited Water Bodies (also called the 303(d) List) as water quality limited for the following parameters:

Record	Waterbody	R.M.	Parameter	Season	Criteria
6038	Willamette River	24.8 to 54.8	Fecal Coliform	Winter/Spring/Fall	Geometric Mean of 200, No more than 10%>400
9220	Willamette River	24.8 to 54.8	PCB	Year Around	public health advisories
9221	Willamette River	24.8 to 54.8	Aldrin	Year Around	public health advisories
9223	Willamette River	24.8 to 54.8	Dieldrin	Year Around	public health advisories
9224	Willamette River	24.8 to 54.8	DDT	Year Around	public health advisories
9225	Willamette River	24.8 to 54.8	DDT Metabolite (DDE)	Year Around	public health advisories
8381	Willamette River	24.8 to 54.8	Iron	Year Around	Table 20
5864	Willamette River	24.8 to 54.8	Temperature	Summer	Rearing: 17.8 C
7087	Willamette River	24.8 to 54.8	Mercury	Year Around	public health advisories
6125	Willamette River	24.8 to 54.8	Biological Criteria		Waters of the state shall be of sufficient quality

A Total Maximum Daily Load (TMDL) addressing temperature, mercury, and fecal bacteria is scheduled to be issued in 2004. The TMDL will likely assign Waste Load Allocations (WLA) to this source. The WLA may be incorporated into the permit by modification or during the next permit renewal.

Fecal Coliform Issues
As stated, fecal bacterial levels exceed the standard during fall, winter and spring but no TMDL has been developed. The NPDES Permit represents the Bacteria Control Management Plan for the City of Newberg. As long as the discharge remains in compliance with the permit's bacteria limits, the treated effluent discharge will not have a negative impact on the water quality of the Willamette River with respect to bacteria. The sewage collection system has experienced minimal raw sewage overflows during the last several years. Those overflows may have contributed slightly to the ambient fecal bacteria violations.

Temperature Issues

Water temperature affects the biological cycles of aquatic species and is a critical factor in maintaining and restoring healthy salmonid populations throughout the state. It is the policy of the Environmental Quality Commission (EQC) to protect aquatic ecosystems from adverse temperature changes caused by anthropogenic activities. The purpose of the temperature criteria listed in OAR 340-041-0028 is to protect designated beneficial uses that are temperature sensitive, including salmonids in waters of the State.

The Department utilizes Fish Use Designation and Salmon and Steelhead Spawning Use Designations maps to identify applicable temperature criteria for each basin. The Willamette Basin maps are contained in OAR 340-041, Figures 340A and 340B, respectively. According to the approved use designation maps, the Willamette River is designated as a migration corridor at this location. Salmon and steelhead spawning is not a designated use. Therefore, the applicable numeric temperature criterion is 20 °C during the entire year.

The Department's List of Water Quality Limited Water Bodies (also called the 303(d) List) for 2002 indicates the Willamette River is water quality limited for temperature during the summer. However, the basis of that listing was violation of the old 64 °F numeric criteria. This evaluation assumes the Willamette River will continue to be included on future 303(d) lists for violation of the 20 °C during the summer.

Prior to the completion of a temperature TMDL, each NPDES point source that discharges into a temperature water quality limited water is allowed a "Human Use Allowance". Each point source may cause the temperature of the water body to increase up to 0.3 degrees Celsius above the applicable criteria after mixing with either twenty five (25) percent of the stream flow, or at the edge of the mixing zone, whichever is more restrictive.

Based on the existing discharge, the Department calculated in-stream temperature increases (using the existing facility design flow and maximum effluent temperatures) by two separate methods as required by rule (OAR 340-041-0028(12)(b)):

- Based on 25 percent of the 7Q10 stream flow **(see Attachment 3a)**
- Based on the estimated dilution achieved in the mixing zone at 7Q10 stream flow **(see Attachment 3b)**

Because the in-stream temperature increase is significantly smaller than the allowable increase, this facility has no reasonable potential to violate the temperature standard. Therefore, a summer period Excess Thermal Load limit has not been included in this permit.

A similar evaluation was performed for the winter period **(see Attachments 4a and 4b)**. There was no reasonable potential for this facility to violate the temperature standard and no winter period Excess Thermal Load limit was included in this permit.

The permit may be reopened and a maximum allowable thermal load limit included when more accurate temperature data becomes available. If the Total Maximum Daily Load (TMDL) for temperature for this sub-basin assigns a Waste Load Allocation (WLA) to this source, this permit may be re-opened to establish new thermal load limits and/or new temperature conditions or requirements.

Mercury Issues

The Department has no information about potential discharges of mercury by the permittee. As stated, a TMDL addressing mercury should be issued in 2004. The TMDL will likely require many sources to obtain a General NPDES Permit addressing mercury issues. The General Permit may require monitoring and implementation of Best Management Practices (BMP). In this permit, the Department proposes to require semi-annual monitoring for mercury during the first two years after permit issuance. Monitoring for mercury must be performed in accordance with EPA Method 1631. If the Department determines that there is an impact from the effluent for mercury, the permit may be modified to include limitations, additional monitoring or other requirements.

Iron Issues

The TMDL to be issued in 2004 will not address iron. The Department does not have any information concerning the discharge of iron from this source. The proposed permit requires the City to monitor the effluent for iron monthly for one year after permit issuance. This monitoring will allow the Department to determine if iron in the discharge has a reasonable potential for causing or contributing to water quality standard violations. The Department may require additional monitoring or reopen the permit to include new limits, conditions or requirements if it is determined that this discharge causes or contributes to the violations of the instream iron criteria.

Other Toxics (PCB, Aldrin, Dieldrin, DDT, DDE)

The TMDL to be issued in 2004 will not address these pollutants but it is not likely this discharge is a significant source of these pollutants. However, the Department does not have any information concerning the discharge of these pollutants under this permit. Therefore, the proposed permit includes the pesticide fraction in the annual monitoring of priority pollutants in Schedule B.

The Department is not aware of any other water quality violations that may be attributable to this source. The Department is scheduled to develop a TMDL by 2004 that will determine the corrective actions necessary to bring the Willamette River back into compliance. The TMDL may assign one or more pollutant WLA to this point source discharge. This permit may be reopened to incorporate any WLA.

PERMIT HISTORY

Previous Permit Actions

The Department issued NPDES Permit #100988 on September 30, 1992. Because this was a new facility, this is the only NPDES Permit for this facility. (The City's previous treatment facility was at a different location and had a separate NPDES permit.) The Permit was issued for discharge to the Willamette River at river mile 49.7. The plant has a design dry weather average flow of 4.0 MGD.

The $CBOD_5$ and TSS concentration and mass limits vary depending upon season. Limits were also established for $CBOD_5$ and TSS removal efficiency, pH, fecal coliform and total chlorine residual. A mixing zone and Zone of Immediate Dilution (ZID) were established. Two emergency discharge points were identified.

The permit was modified on March 24, 1997 to revise the total chlorine residual limitation and the mixing zone definition. The Department received renewal application number 991591 on April 3, 1997. The permit expired on September 30, 1997. The permit shall not be deemed to expire until final action has been taken on the renewal application.

An Antidegradation Review was completed with a recommendation to proceed with this permit action **(see Attachment #5).**

Existing Permit Limits

Schedule A contains the effluent limits for the treatment facility. Some limits are dependent upon the season (summer and winter) while others are year-round. The current permit limits are as follows:

Outfall 001 – Treated Effluent

(1) May 1 - October 31:

Parameter	Average Effluent Concentrations		Monthly Average lb/day	Weekly Average lb/day	Daily Maximum lbs
	Monthly	Weekly			
$CBOD_5$	10 mg/L	15 mg/L	330	500	660
TSS	10 mg/L	15 mg/L	330	500	660

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations		Monthly Average lb/day	Weekly Average lb/day	Daily Maximum lbs
	Monthly	Weekly			
$CBOD_5$	25 mg/L	40 mg/L	1400	2200	2800
TSS	30 mg/L	45 mg/L	1600	2400	3200

(3) Other Parameters:

Other parameters (year-round)	Limitations
Fecal Coliform	Shall not exceed 200 per 100 mL monthly geometric mean nor 400 per 100 mL weekly geometric mean
pH	Shall be within the range of 6.0 - 9.0
$CBOD_5$ and TSS Removal Efficiency	Shall not be less than 85% monthly average.
Total Residual Chlorine	Shall not exceed a daily average of 0.05 mg/L

Schedule A also defines a mixing zone for Outfall 001 and includes restrictions on discharges from the emergency overflow outfalls.

Compliance History

This facility was last inspected June 26, 2003 and was found to be operating in compliance with the permit. The following Notices of Noncompliance (NON) have been issued for violations documented at this facility since 1994:

Date of Enforcement Action	Type of Enforcement Action	Description
3/17/1998	Class 2 NON	Exceeding Permit Discharge Limits & Failure To Obtain Departmental Approval Of Plans

On October 2, 1992, the City of Newberg was issued a Stipulation and Final Order (SFO) that required the City to provide upgraded facilities to comply with the permit limit on total residual chlorine (TRC). The SFO also contained an interim TRC limit based on the capabilities of the wastewater facilities at that time. The SFO was modified to extend the compliance deadline for providing upgraded facilities. However, the interim limit was not extended and expired on December 31, 1995. At that time, the City could consistently comply with the interim TRC limit contained in the NPDES Permit.

On March 24, 1997, the NPDES Permit was modified to include a much lower, final TRC limit of 0.05 mg/L. Through a Department oversight, the expiration of the SFO interim limit was not corrected at the same time. The City regularly violated this new, lower TRC permit limit until June 5, 1997, when the Department again modified the SFO so that it would include an interim discharge limit on TRC.

In the same NON, the Department noted a violation of Oregon Administrative Rule (OAR) 340-52. A forcemain extension to the City's sanitary sewage collection system was completed without approval by the Department. While the City of Newberg is exempt from Department plan review for gravity sewers, the exemption does not include forcemains.

NON's are informal enforcement actions. Formal enforcement actions include Notice of Permit Violation (NPV), Civil Penalties (CP) and administrative orders (such as the SFO). No formal enforcement action were taken during this permit cycle. The previously mentioned SFO was issued on October 2, 1992. In addition, civil penalties were assessed in November 1992 for deficiencies in the City's pretreatment program. Finally, a NPV was issued on June 30, 1993 for historical violations of permits limits.

The violations have been corrected. Therefore, the Department considers this facility to be in substantial compliance with the terms of the current permit. There is no record of any complaints about this facility.

PERMIT LIMITATIONS

Two categories of effluent limitations exist for NPDES permits: 1) Technology based effluent limits, and 2) Water quality based effluent limits. Technology based effluent limits have been established by EPA rules. Technology based effluent limits were established to require a minimum level of treatment for industrial or municipal sources using available technology. Water quality based effluent limits are designed to be protective of the beneficial uses of the receiving water and are independent of the available treatment technology.

In addition, when performing a permit renewal, there are existing permit limits (discussed above). These may be technology-based limits, water quality-based limits, or limits based on best professional judgment. When renewing a permit, the most stringent of technology-based, water quality-based, and existing effluent limits must be applied.

Technology-Based Effluent Limits

EPA has established secondary treatment standards for domestic wastewater treatment facilities. The standards are found in 40 CFR Part 133. This facility must achieve a biochemical oxygen demand (BOD_5) monthly average of 30 mg/L and a weekly average of 45 mg/L or a carbonaceous biochemical oxygen demand ($CBOD_5$) monthly average of 25 mg/L and a weekly average of 40 mg/L. The facility must also achieve a suspended solids (TSS) monthly average of 30 mg/L and a weekly average of 45 mg/L. The pH must be between 6.0 and 9.0. In addition, the facility must remove at least 85% of the influent $CBOD_5$ and TSS.

Oregon Administrative Rules establish minimum design criteria for domestic treatment facilities. In the Willamette Basin, the $CBOD_5$ and TSS minimum design criteria is 10 mg/L as a monthly average in the summer period and secondary treatment (as described above) in the winter period. In addition, there are requirements for disinfection and dilution of oxygen demanding pollutants.

Water Quality-Based Effluent Limits

Pollutant parameters should be limited if there is a reasonable potential for the discharge to cause or contribute to an excursion above any state water quality criteria or standard. The future TMDLs may assign additional WLAs to this source to address in-stream violations of water quality criteria.

The Department is required to determine whether the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality criterion. EPA has developed a method to make this determination for toxic pollutants called a reasonable potential analysis (RPA). An RPA relies on statistical probability to determine the likelihood that a discharge will violate an instream criterion based on the effluent data, its variability, available dilution, and the receiving water background concentration. The Department has developed an RPA spreadsheet that employs EPA's methodology.

A reasonable potential analysis (RPA) for ammonia, cyanide and metals was performed by evaluating effluent data in DEQ spreadsheets. The spreadsheet uses acute and chronic water quality criteria, background concentrations and the available dilution. The RPA **(see Attachment #6)** for ammonia indicated that there is no reasonable potential for the discharge to cause or contribute to an excursion above the water quality criteria for ammonia. The RPA for the other toxics indicated that concentrations of cadmium, copper, lead, mercury and silver in the effluent could have a reasonable potential to cause an excursion above the state water quality criteria.

However, in each case, the effluent and/or ambient results were near or below the minimum detection level for that parameter. In some cases, the upstream background concentrations were actually above the water quality criteria. Therefore, the Department proposes to include a permit requirement for special monitoring of the effluent and receiving stream for cadmium, copper, lead and silver using a "clean" sampling method, an "ultra-clean" sampling method, EPA method 1669 or any other method approved by the Department. Monitoring for mercury shall be conducted in accordance with EPA Method 1631. The special monitoring must be conducted semi-annually on one day of the three consecutive days of toxics monitoring. After 2 years, the permittee may discontinue special monitoring of the receiving stream. At that time, special monitoring of the effluent may be discontinued unless otherwise notified in writing by the Department.

After special monitoring is complete, the Department will perform a RPA to determine if the discharge has a potential to cause or contribute to an excursion above the state water quality criteria. If there is a reasonable potential, the Department may modify the permit as necessary.

PERMIT DRAFT DISCUSSION

The proposed permit limits and conditions are described below. Refer to the proposed permit and the discussion above when reviewing this section.

Face Page

The face page provides information about the permittee, description of the wastewater, outfall locations, receiving stream information, permit approval authority, and a description of permitted activities. The permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system. Permits discharge of treated effluent to the Willamette River within limits set by Schedule A and the following schedules. All other discharges are prohibited.

In accordance with OAR 340, Division 49 all permitted municipal wastewater collection and treatment facilities are to receive a classification based on the size and complexity of the systems. The Department has incorporated the classification of the collection and treatment systems into the NPDES discharge permit. Currently, the treatment plant is considered a Class IV system while the collection system is considered Class III. Both systems were reevaluated to determine the appropriateness of the current classification for operator certification requirements **(see Attachment #7)**. The Department proposes to retain the current system classifications.

Schedule A, Waste Discharge limitations

Schedule A contains the effluent limitations proposed for each Outfall. In addition, there is a condition prohibiting adverse impacts on existing or potential beneficial uses of groundwater.

Outfall 001 - Treated Effluent

The Department is generally proposing to retain the existing limits shown above with one exception. The fecal coliform limit will be based on the *E. coli* bacteria standard.

CBOD and TSS concentration and mass limits

Based on the Willamette Basin minimum design criteria, wastewater treatment resulting in a monthly average effluent concentration of 10 mg/L for $CBOD_5$ and TSS must be provided from May 1 through October 31. From November 1 through April 30, a minimum of secondary treatment is required. Secondary treatment in Oregon is defined as monthly average concentration limit of 30 mg/L for BOD_5 or 25 mg/L for Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) and 30 mg/L for TSS.

The Department is proposing concentration limits at least as stringent as the basin minimum design criteria. The proposed monthly average summer $CBOD_5$ and TSS concentration limits are 10 mg/L with a weekly average limit of 15 mg/L. The proposed monthly average winter $CBOD_5$ concentration limits are 25 mg/L with a weekly average limit of 40 mg/L. The proposed monthly average winter TSS concentration limits are 30 mg/L with a weekly average limit of 45 mg/L.

The facility's summer mass limits (monthly and weekly average and daily maximum) for $CBOD_5$ and TSS are based on the design average dry weather flow (ADWF) of 4.0 MGD and the monthly average $CBOD_5$ and TSS concentration limit of 10 mg/L. The summer calculations are:

a) 4.0 MGD x 8.34 lbs/gal x 10 mg/L = 333 (330) lbs/day monthly avg.
b) 333 lbs/day monthly avg x 1.5 = 500 lbs/day weekly avg.
c) 333 lbs/day monthly avg x 2 = 666 (670) lbs daily maximum

The daily maximum mass limit could be as high as 670 pounds per day. However, the current permit limits are 660 pounds per day. The limits cannot be increased without approval of the Environmental Quality Commission (EQC). No changes are proposed for the summer mass limits.

The winter mass load limits (monthly and weekly average and daily maximum) for $CBOD_5$ are based on the design average wet weather flow (AWWF) of 6.5 MGD and the monthly average $CBOD_5$ concentration limit. The weekly average and daily maximum $CBOD_5$ limits in the prior permit were incorrectly calculated. The proposed permit corrects these errors. The weekly average limit is reduced from 2200 lbs/day to 2000 lbs/day and the daily maximum limit is reduced from 2800 lbs/day to 2700 lbs/day. The new limits are in accordance with OAR 340-041-041-120(9)(a). The winter $CBOD_5$ calculations are:

a) 6.5 MGD x 8.34 lbs/gal x 25 mg/L = 1355 (1400) lbs/day monthly avg.
b) 1355 lbs/day monthly avg x 1.5 = 2033 (2000) lbs/day weekly avg.
c) 1355 lbs/day monthly avg x 2 = 2710 (2700) lbs daily maximum

The winter mass load limits (monthly and weekly average and daily maximum) for TSS are based on the design average wet weather flow (AWWF) of 6.5 MGD and the monthly average TSS concentration limit. The winter TSS calculations are:

a) 6.5 MGD x 8.34 lbs/gal x 30 mg/L = 1626 (1600) lbs/day monthly avg.
b) 1626 lbs/day monthly avg x 1.5 = 2439 (2400) lbs/day weekly avg.
c) 1626 lbs/day monthly avg x 2 = 3253 (3300) lbs daily maximum

The daily maximum mass limit could be as high as 3300 pounds per day. However, the current permit limits are 3200 pounds per day. The limits cannot be increased without approval of the Environmental Quality Commission (EQC). No changes are proposed for the winter TSS mass limits.

On any day that the daily flow exceeds 8.0 MGD (twice the design ADWF), the daily mass load limits shall not apply. In accordance with OAR 340-041-0061(10)(a)(G), the permittee is required to remove all inflow sources from the collection system because the winter mass limits are based on the design average wet weather flow (AWWF). The proposed permit includes a Schedule C condition requiring submittal of a program and time schedule for identifying and removing inflow.

No other changes are proposed for the winter mass limits. The mass load limitations are rounded to two significant figures. A review of monitoring data **(see Attachment #8)** for the last three years indicate the City is generally able to comply with the permit limits.

BOD and TSS Percent Removal Efficiency
A minimum level of percent removal for BOD5 and TSS for municipal dischargers is required by the Code of Federal Regulations (CFR) secondary treatment standards (40 CFR, Part 133). An 85 percent removal efficiency limit is included in the proposed permit to comply with federal requirements. A review of monitoring data indicates the City should generally be able to comply with the BOD and TSS removal efficiency limits.

pH
The proposed effluent limits for pH remain unchanged at 6.0 to 9.0 for the facility. The Willamette Basin water quality standards for pH are established in OAR 340-041-0345. The allowed ambient range is 6.5 to 8.5. The proposed permit limits pH to the range 6.0 to 9.0. This limit is in accordance with Federal wastewater treatment guidelines for sewage treatment facilities (in 40 CFR 133.102(c)) and is applied to the majority of NPDES permittees in the state. Within the permittee's mixing zone, the water quality standard for pH does not have to be met. The Department evaluated the pH of the effluent mixed with ambient water within the mixing zone to ensure that the pH at the edge of the mixing zone meets the standard **(see Attachment #9)**. The Department considers the proposed permit limits to be protective of the water quality standard.

Fecal Bacteria
The current permit contains limits on fecal coliform bacteria. The limits are 400 organisms/100 ml weekly geometric mean (or log mean) and 200 organisms/100 ml. monthly geometric mean. In January 1996, the fecal bacteria water quality standard was changed and is now based on *E. coli* bacteria.

The proposed limits are a monthly geometric mean of 126 *E. coli* per 100 mL, with no single sample exceeding 406 *E. coli* per 100 mL. The new bacteria standard allows that if a single sample exceeds 406 *E coli* per 100 mL, then the permittee may take five consecutive re-samples. If the log mean of the five re-samples is less than or equal to 126, a violation is not triggered. The re-sampling must be taken at four-hour intervals beginning within 28 hours after the original sample was taken. The *E. coli* effluent limitations are achievable through proper operation and maintenance.

Total Chlorine Residual

Chlorine is added to the discharge to disinfect the plant effluent and comply with the waste discharge limitations for bacteria. The minimum design criteria (OAR 340-041-0007) for sewage wastes requires the City to provide disinfection facilities capable of achieving 1.0 mg/L total chlorine residual. This level could be considered a technology based minimum concentration.

Chlorine is a known toxic substance and as such is subject to limitation under Oregon Administrative Rules. The rule (OAR 340-041) states in part that toxic substances shall not be discharged to waters of the state at levels that adversely affect public health, aquatic life or other designated beneficial uses. In addition, levels of toxic substances shall not exceed the criteria listed in Table 20, which were based on criteria established by the EPA and published in Quality Criteria for Water (1986), unless otherwise noted.

However, OAR 340-041-0053 states that the Department may allow a designated portion of a receiving water to serve as a zone of dilution for wastewaters and receiving waters to mix thoroughly and this zone will be defined as a mixing zone. The Department may suspend all or part of the water quality standards, or set less restrictive standards, in the defined mixing zone, provided the water within the mixing zone is free of materials in concentrations that will cause acute toxicity to aquatic life as measured by the acute Whole Effluent Toxicity method and outside the boundary of the mixing zone is free of materials in concentrations that will cause chronic toxicity.

Furthermore, 40 CFR §122.44(d) states that permit limitations must control all pollutants or pollutant parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality. The fresh water criteria for chlorine were used to calculate permit limitations. According to OAR 340-041, Table 20, chlorine concentrations of 11 µg/L can result in chronic toxicity in fresh waters while 19 µg/L can result in acute chlorine toxicity in fresh waters.

Compliance with acute toxicity criteria is required at the edge of the Zone of Immediate Dilution (ZID) and compliance with chronic toxicity criteria is required at the edge of the mixing zone. For the facility, outfall, and mixing zone as presently configured, the dilution factor at the edge of the ZID is 2.4 during critical low stream flow conditions. The mixing zone study determined that the dilution factor at the edge of the mixing zone is 28.5 during critical low flow conditions.

Permit limits based on the acute and chronic criteria were calculated. Since the acute and chronic criteria are based on different durations, the durations have to be equalized using a DEQ spreadsheet program to determine the more restrictive criteria **(see Attachment #10).**

In this case, the acute criterion is the more stringent of the two. Thus, effluent limits based on that criteria were calculated. The calculated limits are 0.02 mg/L monthly average and a daily maximum of 0.05 mg/L.

The current permit limits total residual chlorine to a daily average of 0.05 mg/L. The water quality based limit is more restrictive than the technology based minimum and is essentially equal to the existing permit limit. The Department is proposing to include total residual chlorine limits of 0.02 mg/L monthly average and a daily maximum of 0.05 mg/L.

The permittee has the ability to dechlorinate the discharge to reduce potential toxic effects on the receiving stream. A file review of recent effluent monitoring data shows that the chlorine residual does not exceed this limit and the City should generally be able to comply with the limit.

The water quality based effluent limits for total residual chlorine proposed in this permit are lower than the Minimum Level (ML) for chlorine of 0.1 mg/L published by EPA. In accordance with EPA Region X Guidance for WQBELs Below Analytical Detection Limits issued in 1996, the permit should include the ML as a "compliance evaluation level". The Department is proposing to include a note in Schedule A establishing 0.10 mg/L as a compliance evaluation level for total residual chlorine.

Mixing Zone

The current permit provides for a mixing zone that consists of that portion of the Willamette River contained within a band extending out seventy five (75) feet from the west bank of the river and extending from a point fifteen (15) feet upstream of the outfall to a point one hundred fifty (150) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within fifteen (15) feet of the point of discharge. The Department proposes to retain the existing mixing zone.

Emergency Overflow Outfalls 002 and 004 through 009

The City has experienced occasional raw sewage overflows from the sewage collection system. Schedule A contains a condition prohibiting discharges from these outfalls unless the cause of the overflow is in accordance with the rules.

Groundwater

Based on the Department's current information, this facility has a low potential for adversely impacting groundwater quality. Therefore, the permit includes a condition in Schedule A that prohibits any adverse impact on groundwater quality. In addition, Schedule D of the proposed permit states that no groundwater evaluations will be required during this permit cycle.

Schedule B - Minimum Monitoring and Reporting Requirements

Schedule B describes the minimum monitoring and reporting necessary to demonstrate compliance with the conditions of this permit. The authority to require periodic reporting by permittees is included in ORS 468.065(5). Self-monitoring requirements are the primary means of ensuring that permit limitations are being met. However, other parameters need to be monitored to collect information when insufficient information exists to establish a limit, but where there is a potential for a water quality concern.

In 1988, the Department developed a monitoring matrix for commonly monitored parameters. Proposed monitoring frequencies for all parameters are based on this matrix and, in some cases, may have changed from the current permit. The proposed monitoring frequencies for all parameters correspond to those of facilities of similar size and complexity in the state.

The permittee is required to have a laboratory Quality Assurance/Quality Control program. The Department recognizes that some tests do not accurately reflect the performance of a treatment facility due to quality assurance/quality control problems. These tests should not be considered when evaluating the compliance of the facility with the permit limitations. Thus, the Department is also proposing to include in the opening paragraph of Schedule B a statement recognizing that some test results may be inaccurate, invalid, do not adequately represent the facility's performance and should not be used in calculations required by the permit.

Below is a discussion of some of the minimum monitoring requirements contained in the proposed permit that have not been previously discussed.

Influent and Outfall 001 (Treated Effluent)

Daily monitoring of influent and effluent flow is required in this permit. Both flow meters must be calibrated every six months. Monitoring of the influent and effluent for $CBOD_5$ and TSS is retained at twice per week. Pounds of effluent $CBOD_5$ and TSS must be calculated at the same frequency.

Federal secondary treatment standards require municipal sources to achieve a specific $CBOD_5$ and TSS removal efficiency as a monthly average. Reporting of the removal efficiencies is required in the proposed permit.

The proposed permit requires monitoring of the quantity of chlorine used and the total chlorine residual on a daily basis to confirm consistent performance of the disinfection system. Bacteria monitoring on the discharge has been changed from fecal coliform to *E. coli* but the frequency has been retained at twice per week. Monitoring for *E. coli* must be performed in accordance with one of the methods approved by the Department. Monitoring of the influent and effluent for pH has been retained at three times per week. The effluent temperature must be monitored on a continuous basis year-round.

Ammonia monitoring is required because CBOD5 replaces BOD5. Monitoring must be performed on the same samples as CBOD5 so the frequency is proposed at twice per week.

In order to fully characterize the facility's contribution of nutrients to the receiving stream, the Department is proposing effluent monitoring for nutrients. Weekly monitoring of Total Kjeldahl Nitrogen (TKN), nitrate plus nitrite and phosphorus is proposed for the period from May through October each year.

The City previously monitored the influent and effluent for 9 metals, cyanide and total phenols semi-annually for three consecutive days. The proposed permit requires monitoring the influent and effluent for 11 metals and cyanide semi-annually for three consecutive days. The total phenols monitoring requirement has been deleted. Monitoring results are to be submitted in the annual pretreatment report and are not required to be submitted with the monthly DMR.

For the first two years after permit issuance, the City must perform special toxics monitoring on the effluent for cadmium, copper, lead, mercury and silver during one of the three consecutive days of toxics monitoring. The special toxics monitoring shall be conducted using a "clean" sampling method, an "ultra-clean" sampling method, EPA method 1669 or any other test method approved by the Department with a detection limit of 0.1 µg/L or less. Monitoring for mercury shall be conducted in accordance with EPA Method 1631. The Willamette River shall be monitored for cadmium, copper, lead and silver at the same time. The Willamette River shall be sampled for hardness and TSS at the same time the river is sampled for metals. Monitoring for hardness and TSS is necessary to determine the appropriate criteria since the new toxic standards will likely be based on dissolved metals.

After two years of this special toxics monitoring, the City may eliminate the special monitoring of the effluent unless otherwise notified by the Department. The Department will base its determination upon the ability of the permittee to consistently comply with the water quality criteria.

The permittee must perform "priority pollutant" scans in order to complete Part D of EPA Form 2A for the next renewal application. Three scans are required during the 4 ½ years after permit issuance. Two of the three scans must be performed no fewer than 4 months and no more than 8 months apart. As stated above, the proposed permit requires that the pesticide fraction be included in the monitoring of priority pollutants.

The Department has required annual whole effluent toxicity (WET) tests using three species in the proposed permit. If the results of the first four tests show that the effluent is not toxic, no further WET testing will be required during this permit. WET tests are to be conducted in accordance with EPA test methods and procedural requirements as defined in Schedule D.

Biosolids
OAR 340, Division 50, "Land Application of Domestic Wastewater Treatment Facility Biosolids, Biosolids Derived Products, and Domestic Septage" requires monitoring and reporting of specific sludge parameters under Section 35. These parameters are identified in Schedule B under "Biosolids Management" and include: Total solids, Volatile solids, Nitrogen, eleven metals (Ag, As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Se & Zn), Phosphorus, Potassium and pH.

In order to demonstrate compliance with vector attraction requirements, the proposed permit requires monitoring the composting time and temperature. Monitoring the fecal coliform or Salmonella sp. content and composting time and temperature is the method used to demonstrate compliance with federal biosolids pathogen reduction requirements. The City must also record of amount of biosolids derived material sold or given away. Many of these are new requirements.

Outfalls 002 and 004 through 009 (Emergency Overflows)
The estimated duration and volume of each overflow from the emergency outfalls must be recorded. There is no change in this requirement except for the deletion of one overflow point and the addition of six new overflow points.

Receiving Stream
The Department does not have adequate information on the background concentration of certain metals in the Willamette River and cannot perform a complete reasonable potential analysis. For the first two years after permit issuance, the City must perform special toxics monitoring on the Willamette River during one of the three consecutive days of effluent toxics monitoring. The special toxics monitoring shall be conducted using a "clean" sampling method, an "ultra-clean" sampling method, EPA method 1669 or any other test method approved by the Department with a detection limit of 0.1 µg/L or less. Monitoring for mercury shall be conducted in accordance with EPA Method 1631. The Willamette River shall be sampled for hardness and TSS at the same time the river is sampled for metals. After two years of this special toxics monitoring, the City may eliminate the special monitoring of the receiving stream.

Reporting
The reporting period is the calendar month. Discharge monitoring reports must be submitted to the Department monthly by the 15th day of the following month. The monitoring reports need to identify the principal operators designated by the Permittee to supervise the treatment and collection systems. The reports must also include records concerning application of biosolids and all applicable equipment breakdowns and bypassing.

Schedule B of the permit includes the requirement for the submittal of annual reports. The conditions are standard language requirements concerning:

Annual report which details progress towards reducing overflow frequency

Annual report of solids handling activities if biosolids are land applied

Annual report on temperature monitoring results

Schedule C, Compliance Schedules and Conditions

The permit contains five compliance conditions with deadlines:

1. Within 180 days of permit issuance, the permittee must submit a proposed program and time schedule for identifying and reducing inflow.

2. Within 90 days after permit issuance, the permittee must submit a report, which identifies known sewage overflows.

3. By no later than June 30, 2005, the permittee must submit to the Department Sewer Use Ordinance revisions that are consistent with federal pretreatment regulations. The condition includes a note that provides for an accelerated time schedule should a categorical or significant industry connect to the City's collection system.

4. By no later than June 30, 2006, the permittee must submit to DEQ local pretreatment limits. The condition includes a note that provides for an accelerated time schedule should a categorical or significant industry connect to the City's collection system.

5. By no later than June 30, 2006, the permittee must submit to the Department pretreatment program implementation procedures. The condition includes a note that provides for an accelerated time schedule should a categorical or significant industry connect to the City's collection system.

The final condition requires the permittee to meet the compliance dates established in this schedule or notify the Department within 14 days following any lapsed compliance date.

Schedule D - Special Conditions

The permit contains seven special conditions. The requirements include:

1. Schedule D of this permit includes conditions requiring biosolids be managed in accordance with the approved biosolids management plan. Biosolids that do not meet the Class A criteria shall not be sold or given away.

2. The permit may be modified to incorporate changes in federal biosolids standards.

3. The requirements for Whole Effluent Toxicity (WET) testing are specified.

4. The permittee must have the facilities supervised by personnel certified by the Department in the operation of treatment and/or collection systems.

5. The permittee must notify the Department of malfunctions.

6. Unless otherwise approved in writing by the Department, all inflow sources are to be permanently disconnected from the sanitary sewer system.

7. The permittee shall not be required to perform a hydrogeologic characterization or groundwater monitoring due during the term of this permit.

Schedule E – Pretreatment Activities

The current permit contains a Schedule E, which requires the City to conduct and enforce an industrial waste pretreatment program as approved by the Department and the General Pretreatment Regulations (40 CFR Part 403). The Department is proposing to include similar conditions in the new permit with some minor changes. However, some of the condition will not become effective until the Department approves the pretreatment program improvements required in Schedule C.

Schedule F, NPDES General Conditions

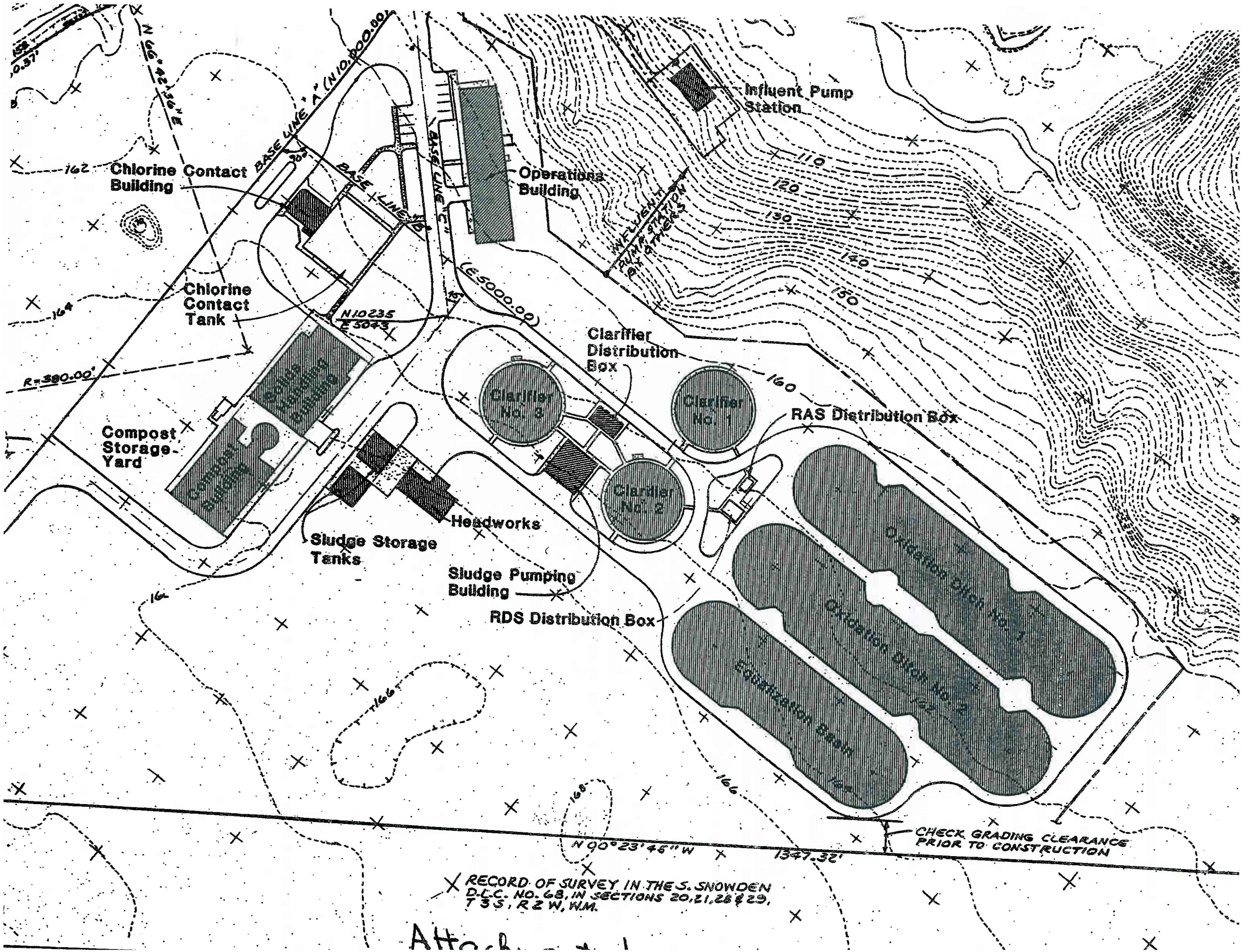
All NPDES permits issued in the State of Oregon contain certain conditions that remain the same regardless of the type of discharge and the activity causing the discharge. These conditions are called General Conditions. These conditions can be changed or modified only on a statewide basis. The latest edition of the NPDES General Conditions is December 1, 1995 and this edition is included as Schedule F of the draft permit.

Section A contains standard conditions which include compliance with the permit, assessment of penalties, mitigation of noncompliance, permit renewal application, enforcement actions, toxic discharges, property rights and referenced rules and statutes. Section B contains requirements for operation and maintenance of the pollution control facilities. This section includes conditions for proper operation and maintenance, duty to halt or reduce activity in order to maintain compliance, bypass of treatment facilities, upset conditions, treatment of single operational events, overflows from wastewater conveyance systems and associated pump stations, public notification of effluent violation or overflow, and disposal of removed substances. Section C contains requirements for monitoring and reporting. This section includes conditions for representative sampling, flow measurement, monitoring procedures, penalties of tampering, reporting of monitoring results, additional monitoring by the permittee, averaging of measurements, retention of records, contents of records, and inspection and entry. Section D contains reporting requirements and includes conditions for reporting planned changes, anticipated noncompliance, permit transfers, progress on compliance schedules, noncompliance which may endanger public health or the environment, other noncompliances, and other information. Section D also contains signatory requirements and the consequences of falsifying reports. Section E contains the definitions used throughout the permit.

PERMIT PROCESSING/PUBLIC COMMENT/APPEAL PROCESS

The beginning and end date of the public comment period to receive written comments regarding this permit, and the contact name and telephone number are included in the public notice. The permittee is the only party having standing to file a permit appeal. If the Permittee is dissatisfied with the conditions of the permit when issued, they may request a hearing before the EQC or its designated hearing officer, within 20 days of the final permit being mailed. The request for hearing must be sent to the Director of the Department. Any hearing held shall be conducted pursuant to regulations of the Department.

Updated 4-26-04 AR der
Updated 5-14-04 PN 199114 der



Influent Pump Station
Operations Building
Chlorine Contact Building
Chlorine Contact Tank
Compost Storage Yard
Clarifier Distribution Box
Clarifier No. 1
Clarifier No. 2
Clarifier No. 3
RAS Distribution Box
Headworks
Sludge Storage Tanks
Sludge Pumping Building
RDS Distribution Box
Oxidation Ditch No. 1
Oxidation Ditch No. 2
Equalization Basin
INFLUENT PUMP STATION BY OTHERS
BASE LINE "A" (N10,000.00)
BASE LINE "B"
BASE LINE "C"
(E5000.00)
N10235
E5043
R=380.00'
N 66°42'36"E
N 90°23'46"W
1347.32'
CHECK GRADING CLEARANCE PRIOR TO CONSTRUCTION
RECORD OF SURVEY IN THE S. SNOWDEN D.L.C. NO. 68, IN SECTIONS 20,21,28 & 29, T 3 S, R 2 W, W.M.
110
120
130
140
150
160
162
164
166
168

May 2004
Biosolid Management Plan **Attachment 2**
for
The City of Newberg (CN).

File Number: 102894

I. Treatment Facility

Introduction:

The City of Newberg (CN) owns and operates a municipal sewage collection and treatment system (built 1987) under National Discharge Elimination System (NPDES) permit. Wastewater processed by the sewage treatment works is principally of domestic origin. Septage is accepted at this wastewater treatment facility. The industrial discharges to the CN facility are minor and do not require regulation under a local pretreatment permit. Treated effluent from the treatment plant is discharged to the Willamette River, in Yamhill County, Oregon.

A) Wastewater Processing:

CN operates a 4.0-Million Gallon per Day (MGD) average dry weather design flow activated sludge plant. Secondary treatment is achieved in two oxidation ditches and three 80-foot diameter, center feed secondary clarifiers.

Influent passes through headworks, which consists of screening and grit removal. Influent passes through a mechanical bar screen, an aerated grit chamber, cyclone separator and grit classifier. All grit and debris are landfilled.

Influent from the head works is mixed with activated sludge into one of two oxidation ditches. Each oxidation ditch is 2 million gallons (gal.). The oxidation ditch effluent is transferred to one of three secondary clarifiers (XXX million gal. each) where solids are allowed to settle out. Solids are removed and routed to one of two (2) sludge storage tanks. Each storage tank has is 80,000 gal. capacity.

Clarifier effluent is directed to two (2) chlorine contact chambers (135,000 gal. each) for disinfection and then treated with sulfur dioxide to remove residual chlorine prior to being discharged to the Upper Willamette River (river mile 49). The City uses chlorine gas to disinfect their effluent.

B) Solids Processing:

Sludge from the secondary claifiers and dredging from the oxidation ditches (when necessary) are pumped through this series of solid treatment processes: the sludge storage tanks, dissolved air floatation (sludge thickening), and two (2) 2 meter belt filter press prior to entering one of two (2) compost reactor vessel process. Each reactor tunnel is 18 feet wide, 12 feet high and 66 feet long. At maximum loading each tunnel has a detention time of approximately 14 days. All batches must meet the minimum vector attraction reduction requirement of aerobic treatment of the sludge for at least 14 days at over 40C (104F) with the average temperature of over 45C (Compost).

There is primarily one end route for biosolids generated from this facility and that is Class A compost.

C) Solids Storage Structure:
There are two (2) 0.08 million gallons sludge storage tanks at the biosolids facility. In addition, a 1/2-acre lined compost yard, which is located at this facility.

D) Septage Receiving Facility:
This facility does not receive septage.

F) Pretreatment Program:

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 city of Newberg operates source control programs under a ordinance developed by the CN and adopted by the city. The CN ordinance directs the establishment of local limits to maintain biosolids quality at or below 50-percent of the "clean sludge" metal concentration criteria identified in EPA 40 CFR Part 503.13 and Oregon DEQ's Oregon Administrative Rules Chapter 340 Division 50.

Newberg administers the program within the urban growth boundary. The regulatory activities include developing pollutant limits for industrial discharges, responding to permit violations and conducting industrial site inspections.

II Solid Treatment Processes

The EPA's 40 CFR Part 503 and DEQ's OAR340-50 allow permittees to use EPA approved alternatives to satisfy Class A and B biosolids pathogen and vector attraction reduction criteria. The permittee must notify the Department in writing and get approval prior to any process change that would utilize pathogen reduction or vector attraction reduction alternatives other than their primary reduction alternatives contained in this management plan. The permittee must also certify that the alternatives used are EPA approved and that sampling and monitoring conforms to the 40 CFR 503 and OAR 340-050 regulations.

Pathogen Reduction
To meet the Part 503 regulatory requirements, pathogen reduction must be met before vector attraction reduction or at the same time vector attraction reduction is achieved.

Class A Biosolids
With all Class A alternatives microbial monitoring for fecal coliforms or *Salmonella* sp. is required (see section A and B below). This management plan lists the primary alternative and options employed by the permittee to meet Class A and B biosolids criteria.

A) Monitoring for Fecal Coliform or *Salmonella* sp.
Monitoring for Fecal Coliform or *Salmonella* sp. is required to detect growth of bacterial pathogens. Because Class A biosolids may be used without site restrictions, all Class A material must be tested to show that the microbial requirements are met at the time when it is ready to be used, disposed, sold or given away. In addition to meeting process requirements, Class A biosolids must meet one of the following requirements:

- Either the density of the fecal coliforms in the biosolids be less than 1,000 MPN per gram total solids (dry gram weight),
- *Or* the density of *Salmonella* sp. Bacteria in the biosolids be less than 3 MPN per 4 grams of total solids (dry weight basis).

Unlike Class B biosolids, Class A requirements are not based on an average value. Sampling for Class A biosolids consists of at least seven (7) discrete samples taken over a 2-week period. Test results are required before Class A material can be release for use or disposal. The microbial requirement that a Class A biosolids must meet is either:

- At the time of use or disposal, or
- At the time the biosolids are prepared for sale or given away in a bag or other container for land application, or
- At time the biosolid or material derived from the biosolid is prepared to meet the requirements in 503.10(b), 503.10 (c), 503.10 (e) or 503.10 (f).

B) Class A Pathogen Reduction Alternatives
Alt. 4) Sewage Sludge treated in Unknown Processes 503.32(a)(6)
This requirement relies on comprehensive monitoring of bacteria, enteric viruses and viable helmith ova to demonstrate adequate reduction of pathogens:

- Either the density of the fecal coliforms in the sewage sludge be less than 1,000 MPN per gram total solids (dry gram weight), *Or* the density of *Salmonella* sp. Bacteria in the sewage be less than 3 MPN per 4 grams of total solids (dry weight basis).
- The density of enteric viruses in the sewage sludge after pathogen treatment must be less than 1 PFU per 4 grams of total solids (dry weight basis).
- The density of viable helmith ova in the sewage sludge after pathogen treatment must be less than 1 per 4 grams of total solids (dry weight basis). (Alt. 4 is for an unknown process and must be approved by the EPA prior to its implementation. This should not be an alternative we use in Oregon.)

Alt. 5) Use of Processes to Further Reduce Pathogens (PFRP) 503.32(a)(7)

This requirement relies the process to demonstrate adequate reduction of pathogens to meet Class A biosolid criteria:

- Sludge has been treated in one of the PFRPs listed in Appendix B of the 503 regulation, and
- Either the density of the fecal coliforms in the sewage sludge be less than 1,000 MPN per gram total solids (dry gram weight), *Or* the density of *Salmonella* sp. Bacteria in the sewage be less than 3 MPN per 4 grams of total solids (dry weight basis).

Class B Biosolids

Class B biosolids can be met by using one of three alternatives, the two primary alternatives used by this facility are Alt. 1) Monitor sewage sludge for fecal coliform 503.32(b)(2), and Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32(b)(3).

Alt. 1) Monitor sewage sludge for fecal coliform 503.32(b)(2) requires that seven samples of treated sewage sludge (biosolids) be collected and that the geometric mean fecal coliform density of these samples be less than 2 million MPN per dry gram biosolid (dry weight basis).

Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32(b)(3) considers sludge treated in one of the PSRPs listed in Appendix B of the 40 CFR Part 503 to meet Class B biosolid criteria for pathogen reduction.
For this facility the following PSRP is primarily used:

- ##4 Composting, the temperature of the sewage sludge is raised to 40C (104F) or higher and remains at 40C or higher for 5 days. For 4 hours during the 5-day period, the temperature in the compost pile must exceed 55C (131F).

B) Vector Attraction

This facility primarily uses the following vector attraction reduction options:

Note: if the compost process is the biosolid treatment method then the pathogen reduction must be met at or prior to vector attraction; therefore the only vector attraction reduction available for the compost process is option 5 below.

Opt. 1) The % volatile solid reduction calculation to use for anaerobic digester that is decanted and that does not have appreciable grit accumulation would be the Van Kleeck or Approximate Mass balance (AMB) equation depending upon the percent solids in the decantante (**Attachment A**).

To meet the biosolid vector attraction reduction requirements an anaerobic digester must provide a 15 day detention time at 35C in a completely mixed high rate digester in order to achieve a volatile solids reduction of 38 % or more. There are alternative vector attraction reduction methods that are deemed equivalent to the 38% volatile solid reduction criteria under the EPA's and the DEQ's regulations.

Opt 4) The Specific Oxygen Uptake Rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a minimum temperature of 20 degrees Celsius. The range of total solids for the SOUR test is 2% or less.

Opt.5) Aerobic treatment of the sludge for at least 14 days at over 40C (104F) with the average temperature of over 45C (Compost).

Opt. 7) 75% solid by drying prior to mixing with other materials. Sewage sludge treated in aerobic or anaerobic process (i.e. Sewage sludge that do not contain unstabilized solids generated in primary wastewater treatment).

Opt 10) Sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land.

C) Batch Processes

Class A Biosolids

Alt. 5, PFRP Compost, compost pile must meet PFRP) of 3 consecutive days at a minimum pile temperature of 55C. (Note: Class A PFRP must be met within the Class B PSRP treatment parameter, EPA requirement).

Class B Biosolids

Alt. 3, # 4 PSRP) Compost, Process that Significantly Reduces Pathogens (PSRP) showing an average pile temperature of 45C and minimum temperature of 40C in the pile within 14 consecutive days.

Note: For solids to be composted which have already have achieved vector attraction criteria, i.e. compost solids that have been aerobically digested, lagoons stored and dewatered or air dried prior to composting; Pathogen reduction must be met at or before vector attraction reduction, therefore the composted biosolids must meet vector attraction through the compost process and have pathogen reduction and vector attraction reduction tested to meet the compost treatment criteria.

III Biosolid Characteristics

CN's treatment works utilizes an activated sludge process. The treatment facility wastes activated sludge form the secondary clarifiers through sludge storage, sludge belt filter press, and sludge composting treatment processes.

For the past five- (5) years the average volatile solids reduction criteria has been achieved by the (CN) wastewater treatment Class A compost process.

Annually, CN had generated approximately 500 dry tons of biosolids. For the year 2003 CN generated (573) dry metric tons of Class A compost biosolids. Under the 40

CFR Part 503, CN is required to sample biosolid every 90-days or four (4) times per year. Frequency of monitoring depends on the amount biosolid generated that is marketed to be sold or given away, land application and surface disposal. Frequency depends on the amount on bulk biosolid applied to the land, or the amount of sewage sludge received by a person who prepares biosolid that is sold or given away in a bag or other container for application to the land (dry weight basis), or the amount of biosolid (excluding domestic septage) placed on a surface disposal site.

Sampling

1) Sludge Belt Filter Press
Sample location: At discharge point to conveyor.

Number and type of sample taken per day: 1-2 grab samples per day, minimum 9 samples to make a representative composite sample.

Sample storage and transport: Samples are stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 hour of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods)

2) Compost
Sample location: Random depths and locations within the compost pile

Number and type of sample taken per batch: 7 discrete samples are mixed together to form a composite sample for metal analysis. For Class A Biosolid seven (7) discrete samples are required for pathogens.

Sample storage and transport: sample is stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 hour of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B;EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846 ; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods)

Biosolid Analysis:

Biosolid Chemical Analysis:

From the (CN)'s 2003 biosolids analysis the following is a representative sampling of the biosolid metal concentration.

Pounds(#)	Metal	lb./95 acre-yr.	site life
lb.	Arsenic (As)	0.053	683
lb.	Cadmium (Cd)	0.006	5783
lb.	Chromium (Cr)	0.155	6871
lb.	Copper (Cu)	2.22	603
lb.	Lead (PB)	0.21	1257
lb.	Mercury (Hg)	0.006	2334
lb.	Molybdenum (Mo)	0.022	2927
lb.	Nickel (Ni)	0.132	2837
lb.	Selenium (Se)	0.036	2474
lb.	Silver (Au)		
lb.	Zinc (Zn)	4.12	607

The site life would be limited to (607) years based on the Zinc loading CN's 2003-biosolid analysis **(Attachment B).**

Biosolid Nutrient Analysis:

For the year 2003, the composted biosolids contained about 9480 pounds (lb.) total nitrogen (N) of which about 572 lb. is in the nitrate form (NO3-NO2), 3280 lb. is in the ammonia form (NH3), and 5628 lb. Organic nitrogen. From the analysis the CN if were to land apply on to handle their annual biosolid nitrogen production they would need approximately (95) acres.

IV Biosolids Beneficial Reuse Program

Transportation and Land Application:

Biosolids are off loaded into city owned (XXXX gal.)-tanker trucks or XX-yard dump trailers at the Biosolids Management Facility. The biosolids loading areas are impounded in case of accidental spillage of biosolids during the truck loading process. These areas have drains that tie back into the on-site facultative lagoons. During the summer months CN's biosolids are land applied on a variable number of acres, depending on seasonal production from the facility.

For the year 2003, CN land applied to three DEQ authorized sites totaling 426 - acres. The biosolid land application sites are capable of assimilating CN 's annual total nitrogen production. The perennial agronomic biosolid land application rate for pastures and grass is 140 lb. available N per acre–yr. The agronomic land application rate for annual ryegrass, the predominate crop utilized by CN's land application program, is 140 lb. available N per acre–yr.

Land application: *CN owns land and land applies on other farmlands. All DEQ site authorizations for CN are part of CN's Biosolid Management Plan. The CN owns (XX) acres and has (XX) acres of additional farmlands to beneficially reuse their biosolids.*

Long term biosolid application rates and site restrictions are contained in the biosolid site authorization letter. References to the OAR 340-50, The 40 CFR Part 503, site setbacks, site agronomic loading rates, land application restrictions and site restrictions are also detailed out in the site authorization letter.

V Contingency Options

In the event Class B biosolids are spilled between the treatment facility and the land application site, CN's sewage treatment works shall contain the spill, lime, absorb (via sand) and remove spilled sludge solids spills with a front end loader or shovels and dispose of the spillage at a DEQ authorized application or disposal site. All spills into waters of the state or spills on the ground surface that are like to enter waters of the state shall be reported to immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and your regional biosolids coordinator at (541) 440-3338. All spills of 25 gallons or more on the ground surface shall be report to the regional biosolids coordinator at (541) 440-3338.

VI Reporting

Daily Reporting and Recordkeeping:

Each year prior to land application of biosolids the source operators shall check to see if contiguous property owners have changed. The operators shall keep a record of contact (date, and/or written log of phone call w/ name and number, and/or xerox of postcard w/ name and address, etc.,) with contiguous property owners, and which notifies new neighbors of the biosolid land application practice. Operator shall provide this documentation in the annual biosolid report.

Annual Reporting

The Annual Biosolid Report is due February 19, of each year for the previous years land applied biosolids. Part of this report is the submittal of the daily site logs, which have the date, time, and quantity gal-lb. N/acre land applied for each day-tank-batch land applied. Site logs shall have a scaled map showing the site and the land application location that coincides with the daily site loading methods (truck spreader bar, irrigation cannon). Daily records should clearly show the location of daily biosolid loading site log.

Annual Report shall have a signed copy of the certification statements for pathogen reduction, vector attraction reduction and biosolids has been land applied at approved agronomic loading. Person signing statements should be the operator of record at the treatment plant. The operator shall shown how the vector attraction reduction was met i.e., volatile solids reduction was achieved by time and temperature, the Van Kleeck equation filled out with digester records (MCRT), bench scale test, sour test or any other EPA approved alternative method appropriated for biosolid generated at your facility. Certification of pathogen reduction is required and is satisfied by submittal of test results in the Annual Biosolid Report. All the previous year's biosolids sampling and analysis that is required by the permit shall be included in CN's Annual Biosolid Report **(in each year's annual report appendix).**

VII Certification Statement

CN's facility is capable of meeting their primary alternatives for achieving Class A or B biosolid pathogen and vector attraction reduction criteria. Signed Class A and/or B biosolid and vector attraction certification statements shall accompany all biosolids that are land applied **(attachment C).** For Class A or B biosolid annual biosolid analysis must be provided upon request. Certification statements must also show conformance with nutrient and land application loading rates where applicable.

Attachment A:

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 (a weighted blend of the primary and secondary clarifier solids) and a representative composite sample of the solids existing the sludge holding tanks.

Typically in the past we've used the Van Kleeck equation for digesters. The assumption is that there is no grit accumulation in the digester. This volatile solids equation assumes the fixed solids input equals the fixed solids output. The Van Kleeck equation is appropriate if the digester decatante is low in total solids. The Van Kleeck equation can be used to calculate the volatile solids reduction for a digester that decants provided VSb equal VSd

FVSR: Fractional Volatile Solids Reduction

$$FVSR = 1 - VSb * (1-VSf) / VSf (1- VSb)$$

VSf Feed Sludge Fractional Volatile Solid, (kg/kg)
VSb Digested Sludge (digester bottom) Fractional Volatile Solids, (kg/kg)
VSd Decantate Fractional Volatile Solids

For this equation to be valid VSb must equal VSd.

For digesters with decant withdrawal (decant high in solids) and no grit accumulation, where the volatile and fixed concentrations are known for all streams as well as the volumetric flow rates for the decant and digester sludge then the Approximate Mass Balance equation should be used.

FVSR: Fractional Volatile Solids Reduction

$$FVSR = Fyb - Byb - Dyd / Fyb$$

Fyb	(F)	Feed Sludge Volumetric Flow Rate (m3/d)
	(yb)	Feed Sludge Volatile Solids Concentration (kg/ m3)
Byb	(B)	Digester Sludge (bottom) Volumetric Flow Rate (m3/d)
	(Bb)	Digester Sludge (bottom) Volatile Solids Concentration (kg/ m3)
Dyd	(D)	Decantate Volumetric Flow Rate (m3/d)
	(yd)	Decantate Volumetric Solids Concentration (kg/ m3)

Assumptions: Fixed Solids and Volatile Flows Streams.

Biosolid Analysis Year [redacted]

Source	Newberg	Lab analysis #	Alexin Analytical Labs	Date	Mar-03
File No.	102894		Alexin Analytical Labs		Jun-03
Phone No.	503-537-1252		Alexin Analytical Labs		Sep-03
Contact	Dale Eichel		Alexin Analytical Labs		Dec-03

Nutrient and metals analysis are an average of representative sampling events taken over the year biosolids are land applied.
Nutrient and metal concentrations are determined from the current year's representative solids analysis.
Site loading rates for nutrients and metal must be adjusted based on current analysis to meet authorized site loading rates.

COLOR KEY

requires entered value
calculated value
replace 1 with coefficient from selection

SOLIDS ANALYSIS

Cake Biosolid	1	0.85	Replace the 1 with the appropriate decimal
Liquid Biosolid	0.5	0.5	Dewater (10-50%) and Liquid
% Total Solids	40.5		
% Volatile Solids	68.6		

PATHOGEN REDUCTION

Class A Biosolid		X	Put X next to Class A if true
Class B Biosolid			Put X next to Class B if true
	5 PFRP	Compost	Cite 503.32 Alternative

Fecal Coliform 1794 <2,000,000 /dry gr. Total Solids
org.-100ml/1 dry gr.

VECTRO ATTRACTION REDUCTION (DIGESTION METHOD)

Volatile Solids Reduction Method 5 Cite 503. [redacted]
Compost

	2003
Source	Newberg
File No.	102894

VOLATILE SOLIDS REDUCTION (DIGESTION METHOD)

Volatile Solids Reduction Method: 1 Cfr 503.33 option

Anaerobic D.	1	0.2	Replace the 1 with the appropriate decimal
Aerobic D.	0.3	0.3	Replace the 1 with the appropriate decimal
Drying Bed	1	0.15	Replace the 1 with the appropriate decimal
Gal/yr.	[illegible]		

* Note If cake biosolids are generated then is total cubic yards instead of total gallons

Note biosolid cake conversion is 0.65 ton/ yd^3

Pounds Equation

lb. TS/yr. = %TS x 8.34 x gal/yr.

Dry TS US ton/yr.	[illegible]
lb. TS/yr.	1143993
Total US tons	572.00

0	Cubic yards hauled
0	Total US tons
0	
0	

Conversion
US-> Metric tons multiply by 1.11
Metric -> US tons multiply by 0.9

Total Metric tons: 514.7989459

NUTRIENT ANALYSIS

	%	mg/kg dry-wt.
Total Organic	1.64	16400
TKN	2.21	22100
NH4	0.57	5700
NO3	0.05	500
Phosphorus	1.04	10400
Potassium	0.16	1600

Organic N = (%TKN-%NH4)
Inorganic N = (%NH4 + %NO3)

	mg/kg dry-wt.	lb. / yr.	lb./ac-yr.	kg/ha
Phosphorus	10400	11897.5284	125.23715	140.28561
Potassium	1600	1830.3891	19.26725	21.57932

pH	7

	2003
Source	Newberg
File No.	102894

NITROGEN	mg/kg dry-wt.	lb. / yr.	lb./ac-yr.	kg/ha
Total Organic	1.64	5628.4456	59.2468	66.3564
TKN	2.21	7584.8758	258.1289	296.0644
NH4	0.57	3260.3807	34.3196	38.4382
NO3	0.05	571.9966	6.02102	6.74354
lb. mineralized organic N/dry ton			6.8400	
lb. inorganic N/dry ton			0.0705	
Total lb. available N/ ton			9.911	

NUTRIENT LOADING

Crop nitrogen loading rate N lb./acre	100.000	112	kg/ha
Total acres land applied for year.	95		
Number dry tons land applied per acre	6.02	13.49	metric ton/ha
lb. Nitrogen per dry ton	16.54		
Total lb. Org-N produced per year	5628.45		
Total lb. NH4 produced per year	3260.38		
Total lb. NO3 produced per year	572.00	#DIV/0!	lb. N / yd³
Total lb. Available N per year	9460.82	0.03	lb. N / gallon
Min. number of acres required per year (Nitrogen)	94.61		

	2003
Source	Newberg
File No.	102894

BIOSOLID METALS ANALYSIS AND CALCULATIONS

Sample calculation:

[([(5.0 mg As/1000000 mg TS X 140000 lb. Total Solids) = 0.07 lb. As/yr.

(((5.0 mg As/ 1000000 mg TS) x 140000 lb. TS) / 52 ac = 0.013 lb. As/ac-yr.

(EPA cumulative loading 41 total lb. As/ac / 0.013 lb. As/ac/yr.) = 2719.3 yr. site life for As

(0.013 lb. As/ac-yr.) x 1.12 conversion factor = 0.015 kg/ha-yr.
(2.6 tons biosolid is equivalent to a loading rate of 100 lb. total available N/ac) .

Metal Analysis	mg/kg dry-wt.	Mar-03	Jun-03	Sep-03	Dec-03
Arsenic	4.45	5.6	3.6	4.1	4.5
Cadmium	0.5	0.6	0.5	0.9	
Chromium	12.95	12.5	10	15.5	13.8
Copper	164.5	247	168	217	106
Lead	17.7	12	13	22	23.8
Mercury	0.54	0.78	0.85	0.53	
Molybdenum	1.9	1.6	3	2	1
Nickel	10.975	10	10	13.1	10.8
Selenium	2.9975	3.4	2	2.4	4.19
Silver	10.4	[illegible]	10	10	11
Zinc	342	338	259	362	409

	2003
Source	Newberg
File No.	102894

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Metals	Biosolid concentratior mg/kg	Ceiling Limits 503.13 Table 1 Conc mg/kg	Ceiling Limits 503.13 Table 1 metal lb./ton biosolid	Yearly lb. Metal per ton biosolids	Yearly Loading lb./ac-yr.	Yearly Loading kg/yr.
Arsenic	4.45	75	0.150	5.09077	0.05358	0.060
Cadmium	0.5	85	0.170	0.57200	0.00602	0.007
Chromium	12.95	1200	2.400	14.81471	0.15594	0.175
Copper	164.5	4300	8.600	211.06675	2.22176	2.488
Lead	17.7	840	1.680	20.24868	0.21314	0.239
Mercury	0.54	57	0.114	0.61776	0.00650	0.007
Molybdenum	1.9	75	0.150	2.17359	0.02288	0.026
Nickel	10.975	420	0.840	12.55533	0.13216	0.148
Selenium	2.9975	100	0.200	3.42912	0.03610	0.040
Silver	10.4					
Zinc	342	7500	15.000	391.24568	4.11838	4.613

There is no Ceiling limit for Chromium, table value is a past limit that is no longer valid, used here for loading calculations only.

Metals	Analysis Biosolid conc. mg/kg	Cumulative Pollutant Limits CFR 503.13 Table 2 mg/ha	40 CFR 503.13 Table 2 metal lb./ac biosolid	Yearly lb. Metal per ton biosolids	Biosolid Loading lb./ac-yr.	Biosolid Loading kg/ha-yr.
Arsenic	[redacted]	41	45.920	0.623	[redacted]	0.007
Cadmium	[redacted]	39	43.680	0.070	[redacted]	0.001
Chromium	[redacted]	1200	1344.000	1.813	[redacted]	0.021
Copper	[redacted]	1500	1680.000	25.830	[redacted]	0.305
Lead	[redacted]	300	336.000	2.478	[redacted]	0.029
Mercury	[redacted]	17	19.040	0.076	[redacted]	0.001
Molybdenum	[redacted]	75	84.000	0.266	[redacted]	0.003
Nickel	[redacted]	420	470.400	1.537	[redacted]	0.018
Selenium	[redacted]	100	112.000	0.420	[redacted]	0.005
Silver	[redacted]				[redacted]	
Zinc	[redacted]	2800	3136.000	47.880	[redacted]	0.564

There are no limits for Chromium or Molybdenum under Table 2, Mo concentration comes from Table 1. Ceiling Limit.

	2003
Source	[redacted]
File No.	[redacted]

Metals	Biosolid Analysis mg/kg	Pollutant Conc. Limits Table 3 mg/ha	Table 3 lb. Metal per /ac biosolid	Loading lb./ac-yr.	Loading kg/ha-yr.	Site Life in years
Arsenic	[redacted]	41	45.920	0.054	0.060	[redacted]
Cadmium	[redacted]	39	43.680	0.006	0.007	[redacted]
Chromium	[redacted]	1200	1344.000	0.156	0.175	[redacted]
Copper	[redacted]	1500	1680.000	2.222	2.488	[redacted]
Lead	[redacted]	300	336.000	0.213	0.239	[redacted]
Mercury	[redacted]	17	19.040	0.007	0.007	[redacted]
Molybdenum	[redacted]	75	84.000	0.023	0.026	[redacted]

Nickel	[redacted]	420	470.400	0.132	0.148	[redacted]
Selenium	[redacted]	100	112.000	0.036	0.040	[redacted]
Silver	[redacted]					[redacted]
Zinc	[redacted]	2800	3136.000	4.118	4.613	[redacted]

There are no limits for Chromium or Molybdenum under Table 3, Mo concentration comes from Table 1. Ceiling Limit.

40 CFR 503.13 Tables 1-4.

T1, Ceiling loading, bulk biosolids sold or given away, bag or container, can not exceed pollutant concentration Table 1.
T2, Cumulative Loading, has to meet Table 1 and 2 limits, no lawn/garden Class A no ability to tract.
T3, Pollutant Concentration , bulk biosolid land applied on agriculture land, forest, public contact site or reclamation site has to meet Tables 1 &3.
T4, Annual Pollutant loading Rate, for land application of Class A biosolid given away in bag or container, has to meet Table 1 & 4.

Attachment C:

"I certify, under penalty of law, that the pathogen requirements in [insert either 503.32(a) or 503.32(b)], the management practices in 503.14 and the vector attraction reduction requirements in [insert 503.33(b)(1) through 503.33(b)(10)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I also certify that all biosolids were land applied at the approved agronomic loading rate noted in the respective Department site authorization letter. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

Signature.. **Date**........................

Attachment 3a

Facility Name: Newberg STP Date: 3/18/2004

Enter data into white cells below:

7Q10 =	5200	cfs
Ambient Temperature or Criterion	20	°C
Effluent Flow =	4.0	mgd
Effluent Temperature	22.5	°C
Allowable increase =	0.3	°C

25% of 7Q10 = **1300.0** cfs

25% dilution = **211** dilution = (Qe+Qr)/Qe

ΔT at edge of MZ = 0.012 °C No Reasonable Potential

Thermal Load Limit = N/A Million Kcals

Attachment 3b

Facility Name: Newberg STP Date: 3/18/2004

Enter data into white cells below:

Dilution =	28.5	
Ambient Temperature or Criterion	20	°C
Effluent Temperature	22.5	°C
Allowable increase =	0.3	°C
Effluent Flow Rate =	4.0	mgd

ΔT at edge of MZ= 0.088 °C No Reasonable Potential

Thermal Load Limit = N/A Million Kcals

Attachment 4a

Facility Name: Newberg STP

Date: 3/18/2004

Enter data into white cells below:

7Q10 =	7180	cfs
Ambient Temperature or Criterion	20	°C
Effluent Flow =	4.0	mgd
Effluent Temperature	17	°C
Allowable increase =	0.3	°C

25% of 7Q10 = **1795.0** cfs

25% dilution = **291** dilution = (Qe+Qr)/Qe

ΔT at edge of MZ = -0.010 °C No Reasonable Potential

Thermal Load Limit = N/A Million Kcals

Attachment 4b

Facility Name: Newberg STP Date: 3/18/2004

Enter data into white cells below:

Dilution =	28.5	
Ambient Temperature or Criterion	20	°C
Effluent Temperature	17	°C
Allowable increase =	0.3	°C
Effluent Flow Rate =	4.0	mgd

ΔT at edge of MZ= -0.11 °C No Reasonable Potential

Thermal Load Limit = N/A Million Kcals

Antidegradation Review Sheet

Attachment 5

ANTIDEGRADATION REVIEW SHEET
FOR A PROPOSED INDIVIDUAL NPDES DISCHARGE

1. What is the name of Surface Water that receives the discharge? Willamette River

   Briefly describe the proposed activity: Municipal Wastewater Treatment

   Is this review for a renewal OR new (circle one) permit application?
   Go to Step 2.

---

2. Is this surface water an **Outstanding Resource Water** or **upstream** from an **Outstanding Resource Water**?
   Yes. Go to Step 5.
   No. Go to Step 3. [redacted]

3. Is this surface water a **High Quality Water**?
   Yes. Go to Step 8.
   No. Go to Step 4. [redacted]

4. Is this surface water a **Water Quality Limited Water**?
   Yes. Go to Step 13. [redacted]
   No. Go to Step 2. Note: The surface water must fall into one of three (3) categories: Outstanding Resource Water (Step 2), High Quality Water (Step 3), or Water Quality Limited Water (Step 4).

---

13. Will the proposed activity result in a Lowering of Water Quality in the **Water Quality Limited Water**?
    Yes. Go to Step 14.
    No. Proceed with Permit Application. Applicant should provide basis for conclusion. Go to Step 24. [redacted]

---

24. On the basis of the Antidegradation Review, the following is recommended:

_XX_ Proceed with Application to Interagency Coordination and Public Comment Phase.

____ Deny Application; return to applicant and provide public notice.

Action Approved

Section: ______________________________

Review Prepared By: ___Mark E. Hamlin______________

Phone: ___(503) 378-8240, ext. 239________

Date Prepared: ___March 19, 2004____________

Please provide the following information and submit with the completed application form to:

Department of Environmental Quality
Water Quality Division—Surface Water Management
811 SW Sixth Avenue
Portland, Oregon 97204-1390

Name: ______________________________
Name of Company: ______________________________
Address: ______________________________
____
____
____
Phone: ______________________________
Fax: ______________________________

Reasonable Potential Analysis - Chlorine and Ammonia

Facility Name: Newberg STP

Attachment #6

Date: 3/19/2004

Dilution Values? (Y/N)	Y	calculated
Low Flow Dilution @ ZID =	2.4	*
Low Flow Dilution @ MZ =	28.5	*
High Flow Dilution @ ZID =	2.4	*
High Flow Dilution @ MZ =	28.5	*
Enter data below if no dilution data is available		
Data to estimate dilution	Summer	Winter
7Q10 (CFS) =	*	*
1Q10 (CFS) =	*	*
% dilution at MZ =	25	25
% dilution at ZID =	10	10
Effluent Flow (mgd) =	*	*

Confidence Level =	99%
Probability Basis =	95%

Summer data	Effluent	Stream	Mixed		
			ZID	MZ	
pH * =	7.3	7.7	7.4	7.6	(6.5-9)
Temp * =	22.5	22	22.2	22.0	° C
Alkalinity =	75	25			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity (ppt)	0	20	11.7	19.3	
Winter data					
pH * =	7	7.6	7.1	7.5	(6.5-9)
Temp * =	16	12.8	14.1	12.9	° C
Alkalinity =	75	25			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity (ppt)	0	20	11.7	19.3	

PARAMETER	# of Samples	Highest Conc. mg/l	Coef. of Variance	Maximum Effluent Conc. mg/l	Background Conc. mg/l	Maximum Conc. at ZID mg/l	Maximum Conc. at MZ mg/l	WQ CRITERIA 1 Hour (CMC) mg/l	WQ CRITERIA 4 Day (CCC) mg/l	REASONABLE POTENTIAL ? ACUTE	REASONABLE POTENTIAL ? CHRONIC
Low Flow Season											
AMMONIA*	52	0.34	0.60	0.41	0.09	0.224	0.101	11.66	1.08	**NO**	**NO**
High Flow Season											
AMMONIA*	44	0.79	0.60	0.95	0.09	0.449	0.120	18.12	1.81	**NO**	**NO**

* -NOTES :

Temperature must be between 0 and 30 ° C
pH must be between 6.5 and 9
Ammonia is total ammonia as NH_3

Wastewater System Classification Worksheet for Operator Certification
OAR 340-049-0020

General Requirements (OAR 340-049-0015) - Each owner of a regulated wastewater system must have its system supervised by one or more operators who hold a valid certificate for the type of system, wastewater treatment or collection, and at a grade equal to or greater than the wastewater system classification as defined in OAR-340-049-0020 and 0025. DEQ will advise system owners of the classification of their systems as a permit action. **As the classification establishes the operator certificate type and grade required for compliance, it needs to be set <u>prior to</u> "start-up" of a new or upgraded and/or expanded facility.**

Wastewater treatment system classifications will be derived from the total points assigned based on criteria shown in OAR 340-049-0025 (see Classification Worksheet). Collection system classifications are based on <u>design</u> population or population equivalent to be served by a wastewater treatment system (see Worksheet).

Upon written notice to the wastewater system owner, DEQ may classify a wastewater treatment system higher than the classification based on accumulated points if the complexity of a treatment system is not reflected in the criteria(see Worksheet examples). If deemed appropriate, DEQ may classify a wastewater collection system higher than the classification based on population when a Class I by population will have significant pumping of sewage including STEP or other pumping that may warrant a Class II designation. In either case, designation must be consistent with the intent of the classification system (see OAR 340-049-0020(4) & (5)).

Classification of Wastewater Systems (OAR 340-049-0020) All wastewater systems regulated under OAR 340-049 will be classified by DEQ as wastewater treatment systems and/or wastewater collection systems, as appropriate, in accordance with the following classification system:

Wastewater Treatment Systems	Wastewater Collection Systems
Class I - 30 total points or less	**Class I - 1,500 or less design population**
Class II - 31-55 total points	**Class II - 1,501 to 15,000 design population**
Class III - 56-75 total points	**Class III - 15,001 to 50,000 design population**
Class IV - 76 or more points	**Class IV - 50,001 or more design population**

Definitions used in these regulations unless otherwise required by context (see OAR 340-049-0010):

"Average Dry Weather Flow" (ADWF) means the design average dry weather flow capacity of the wastewater treatment system in gallons per day or Million Gallons per Day (MGD), as approved by the Department.

"Industrial Waste" means liquid wastes from an industrial or commercial process discharged into a wastewater system for conveyance and treatment.

"NPDES Permit" means a waste discharge permit issued in accordance with requirements and procedures of the National Pollutant Discharge Elimination System authorized by Section 402 of the Federal Clean Water Act and OAR 340, Division 45.

"Population" means the design population of the wastewater system represented as the number of people or the population equivalent the system is designed to serve. Equivalent population ordinarily is determined based on 70 gallons per person per day average dry weather flow (ADWF) or 0.17 lbs. BOD5 per person per day, whichever is greater.

"Wastewater" or "sewage" means the water-carried human or animal waste from residences, buildings, industrial establishments or other places, together with such groundwater infiltration and surface water as may be present. The admixture of domestic and industrial waste or other by-products, such as sludge, is also considered wastewater or sewage.

"Wastewater Treatment System" or "Sewage Treatment System" means any structure, equipment or process for treating and disposing of, or recycling or reusing wastewater and sludge (including industrial waste) that is discharged to the wastewater system.

"Wastewater Collection System" or "Sewage Collection System" means the trunks, arterials, pumps, pump/lift stations, piping and other appurtenances necessary to collect and carry away wastewater or other liquid waste treatable in a community or private wastewater treatment facility.

"Wastewater System" means "Sewage Treatment Works" defined in ORS 448.405 as any structure, equipment or process required to collect, carry away and treat domestic waste and dispose of sewage as defined in ORS 454.010. Typically, components of a wastewater system include a wastewater collection system and a wastewater treatment system.

"WPCF Permit" means a Water Pollution Control Facilities permit to construct and operate a collection, treatment and/or disposal system with no discharge to navigable waters.

Wastewater System Classification Worksheet for Operator Certification
OAR 340-049-0020

WW System Common Name: City of Newberg STP

Facility ID: 102894 **Location:** 2301 Wynooski Street, Newberg

Total Points (from page 3): 107.5 **WWT Class (check):** ☐ I ☐ II ☐ III ☒ IV

Design Population[1]: 45000 **WWC Class (check):** ☐ I ☐ II ☒ III ☐ IV

Design ADWF load (Influent MGD) 4.0 **Design BOD load (Influent lbs./day)** 7200

Classified by: Mark E. Hamlin **Date:** April 26, 2004

Date this classification filed with the Operator Certification office: ______

System start-up date for this classification (new, upgrade or expansion): 1987

Is this a change from a prior classification? (check): ☐ Yes ☒ No

Criteria for Classifying Wastewater Treatment Systems (OAR 340-049-0025)

(1) Design Population or Population Equivalent Points (10 Points Maximum)

- ☐ Less than 750 — 0.5 points
- ☐ 751 to 2000 — 1 point
- ☐ 2001 to 5000 — 1.5 points
- ☐ 5001 to 10,000 — 2 points
- ☒ Greater than 10,000 — 3 points plus 1 per 10,000

Point subtotal 7.5

(2) Average Dry Weather Flow (Design Capacity) Points (10 points Maximum)

- ☐ Less than 0.075 MGD — 0.5 point
- ☐ Greater than 0.075 to 0.1 MGD — 1 point
- ☐ Greater than 0.1 to 0.5 MGD — 1.5 points
- ☐ Greater than 0.5 to 1.0 MGD — 2 points
- ☒ Greater than 1.0 MGD — 3 points plus 1 per 1 MGD

Point subtotal 7.0

(3) Unit Process Points (Check all that apply)

Preliminary Treatment and Plant Hydraulics:

- ☐ Comminution (includes shredders, grinders, etc.) — 1 point
- ☒ Grit Removal, gravity — 1 point
- ☒ Grit Removal, mechanical — 2 points
- ☒ Screen(s), in-situ or mechanical — 1 point
- ☒ Pump/Lift Station(s) (pumping of main flow) — 2 points
- ☒ Flow Equalization (any type) — 1 point

Point subtotal 7.0

Primary Treatment:

- ☐ Community Septic Tank(s) — 2 points
- ☐ Clarifier(s) — 5 points
- ☐ Flotation Clarifier(s) — 7 points
- ☐ Chemical Addition System — 2 points
- ☐ Imhoff Tank (or similar) — 3 points

Point subtotal 0

Total Points Page 1 21.5

[1] See "Population" definition. Use the design average daily per person load for Influent Flow or Influent BOD5, whichever is greater. This value is also used to determine the Collection System Classification.

Wastewater System Classification Worksheet

Unit Process Points – Continued (Check all that apply)

Secondary, Advanced, and Tertiary Treatment:

☐ Low Rate Trickling Filter(s) (no recirculation)	7 points
☐ High Rate Trickling Filter(s) (recirculation)	10 points
☐ Trickling Filter - Solids Contact System	12 points
☒ Activated Sludge (any type)	15 points
☐ Pure Oxygen Activated Sludge	20 points
☐ Activated Bio Filter Tower less than 0.1 MGD	6 points
☐ Activated Bio Filter Tower greater than 0.1 MGD	12 points
☐ Rotating Biological Contactors 1 to 4 shafts	7 points
☐ Rotating Biological Contactors, 5 or more shafts	12 points
☐ Stabilization Lagoons, 1 to 3 cells without aeration	5 points
☐ Stabilization Lagoons, 1 or more cells with primary aeration	7 points
☐ Stabilization Lagoons, 2 or more cells with full aeration	9 points
☐ Recirculating Gravel Filter	7 points
☐ Chemical Precipitation Unit(s)	3 points
☐ Gravity Filtration Unit(s)	2 points
☐ Pressure Filtration Unit(s)	4 points
☐ Nitrogen Removal, Biological or Chemical/Biological System	4 points
☐ Nitrogen Removal, Designed Extended Aeration Only	2 points
☐ Phosphorus Removal Unit(s)	4 points
☐ Effluent Microscreen(s)	2 points
☐ Chemical Flocculation Unit(s)	3 points
☐ Chemical Addition System(s) (6 points maximum)	@ 2 points
Point subtotal	15

Solids Handling:

☐ Anaerobic Primary Sludge Digester(s) w/o Mixing and Heating	5 points
☐ Anaerobic Primary Sludge Digester(s) with Mixing and Heating	7 points
☐ Anaerobic Primary and Secondary Sludge Digesters	10 points
☐ Sludge Digester Gas reuse	3 points
☐ Aerobic Sludge Digester(s)	8 points
☒ Sludge Storage Lagoon(s) (or tanks, basins etc.)	2 points
☐ Sludge Lagoon(s) with aeration	3 points
☐ Sludge Drying Bed(s)	1 point
☒ Sludge Air or Gravity Thickening	3 points
☒ Sludge Composting, In Vessel	12 points
☒ Sludge Belt(s) or Vacuum Press/Dewatering	5 points
☐ Sludge Centrifuge(s)	5 points
☐ Sludge Incineration	12 points
☐ Sludge Chemical Addition Unit(s) (alum, polymer, etc.)	2 points
☐ Non-Beneficial Sludge Disposal	1 point
☒ Beneficial Sludge Utilization	3 points
Point subtotal	25

Disinfection:

☐ Liquid Chlorine Disinfection	2 points
☒ Gas Chlorine Disinfection	5 points
☒ Dechlorination System	4 points
☐ Other disinfection systems incl. ultraviolet and ozonation	5 points
Point subtotal	9.0
Total Points Page 2	49

Wastewater System Classification Worksheet

(4) Effluent Permit Requirement Points (Check as applicable):

☐ Minimum of secondary effluent limitations for BOD and/or TSS	2 points
☐ Minimum of 20 mg/L BOD and/or Total Suspended Solids	3 points
☒ Minimum of 10 mg/L BOD and/or Total Suspended Solids	4 points
☐ Minimum of 5 mg/L BOD and/or Total Suspended Solids	5 points
☐ Effluent limitations for effluent oxygen	1 point
Point subtotal	4.0

(5) Variation in Raw Waste Points. (6 points maximum) Points in this category will be awarded only when conditions are extreme to the extent that operation and handling procedure changes are needed to adequately treat waste due to variation of raw waste

☐ Recurring deviations or excessive variations 100% to 200%	2 points
☒ Recurring deviations or excessive variations of more than 200% or conveyance and treatment of industrial wastes by Pretreatment program	4 points
☒ Septage or other hauled waste (control and/or preliminary treatment)	2 points
Point subtotal	6.0

(6) Sampling and Laboratory Testing Points (check as applicable - maximum 11 points)

☐ Sample for BOD, Total Suspended Solids performed by outside lab	2 points
☒ BOD or Total Suspended Solids analysis performed at treatment plant	4 points
☐ Bacteriological analysis performed by outside lab	1 point
☒ Bacteriological analysis performed at WWT plant lab	2 points
☐ Nutrient, Heavy Metals or Organics analysis performed by outside lab	3 points
☒ Nutrient, Heavy Metals or Organics analysis performed at WWT plant	5 points
Point subtotal	11

(7) Points For Other Complexities Not Reflected Above: (see OAR 340-049 0020(4) & (5))

☒ Odor Control (2 points maximum)	1 to 2 points
☒ Standby Power Units	@ 1 point
☒ Solids Composting or Land Application of Biosolids	10 points
☐ Alkaline Stabilization (3 points maximum)	2 to 3 points
☒ Other Effluent Limits [ammonia, Cl2, temp., etc. (list or attach list)]	@ 1 point
☐ Pond(s) (advanced treatment polishing or irrigation holding)	2 points
☐ Effluent Land Disposal - Evaporation (surface or subsurface)	2 to 4 points
☐ Effluent direct Reuse or Recycle	6 points
☒ SCADA or similar for data (limited to extensive total process operation)	2 to 6 points
☐ Chemical/Physical advanced waste treatment following secondary	10 points
☐ Chemical/Physical advanced waste treatment w/o secondary	15 points
☐ Biological or Chemical/Biological advanced waste treatment	12 points
☐ Reverse Osmosis, Electro-dialysis or Membrane Filtration techniques	15 points
☐ Other complexities (list or attach list): ______________________	______
Point subtotal	16
Total Points Page 3	37

Total Accumulated Points (3 pages) 107.5

A COPY OF THIS COMPLETED WORKSHEET IS TO BE FILED WITH THE OPERATOR CERTIFICATION PROGRAM, WATER QUALITY DIVISION, PRIOR TO SYSTEM START-UP

Attach #8 MONTH	INFLUENT										
	FLOW					CBOD			TSS		
	Total	AVER	%ADWF	%AWWF	Peak	mg/l	lbs	% cap	mg/l	lbs	% cap
Nov-00	56.6	1.89		29	2.8	168	2641	52	227	3569	71
Dec-00	84.4	2.72		42	5.1	124	2814	56	191	4334	87
Jan-01	67.5	2.18		33	2.7	123	2232	44	192	3484	70
Feb-01	65.2	2.33		36	3.4	131	2542	50	202	3920	78
Mar-01	72.1	2.32		36	3.9	150	2908	58	221	4285	86
Apr-01	67.7	2.26		35	2.9	125	2353	47	188	3540	71
May-01	65.6	2.12	53		3.8	123	2171	43	192	3388	68
Jun-01	57.4	1.91	48		3.3	188	3002	60	233	3721	74
Jul-01	53.2	1.71	43		1.9	208	2975	59	265	3790	76
Aug-01	54.6	1.76	44		3.6	198	2910	58	290	4263	85
Sep-01	53.4	1.78	45		2.2	217	3223	64	263	3907	78
Oct-01	60.5	1.95	49		4.3	214	3480	69	259	4212	84
Nov-01	115.4	3.85		59	11.1	121	3883	77	185	5937	119
Dec-01	173.1	5.58		86	11.2	79	3678	73	95	4423	88
Jan-02	176.4	5.69		88	12.1	67	3179	63	78	3701	74
Feb-02	114.9	4.10		63	8.1	102	3489	69	108	3695	74
Mar-02	124.1	4.00		62	10.6	71	2371	47	124	4141	83
Apr-02	75.3	2.51		39	3.6	127	2660	53	208	4356	87
May-02	62.8	2.03	51		2.6	141	2383	47	205	3465	69
Jun-02	56.7	1.89	47		3.1	172	2713	54	232	3659	73
Jul-02	54.8	1.77	44		2.0	190	2803	56	292	4308	86
Aug-02	48.6	1.57	39		1.8	230	3005	60	358	4678	94
Sep-02	50.4	1.68	42		2.4	221	3094	61	274	3836	77
Oct-02	52.4	1.69	42		2.2	204	2877	57	301	4245	85
Nov-02	57.7	1.92		30	3.2	160	2568	51	229	3676	74
Dec-02	129.0	4.16		64	10.3	82	2846	56	124	4303	86
Jan-03	159.4	5.14		79	14.9	57	2444	49	110	4717	94
Feb-03	117.0	4.18		64	10.9	84	2927	58	109	3799	76
Mar-03	147.8	4.77		73	8.5	55	2187	43	99	3936	79
Apr-03	121.8	4.06		62	6.5	84	2845	56	105	3557	71
May-03	71.2	2.30	57		3.1	165	3161	63	257	4924	98
Jun-03	51.8	1.73	43		1.9	164	2360	47	226	3253	65
Jul-03	48.9	1.58	39		1.7	214	2817	56	297	3909	78
Aug-03	46.2	1.49	37		1.6	208	2587	51	262	3259	65
Sep-03	46.0	1.53	38		1.9	220	2812	56	270	3451	69
Oct-03	50.3	1.62	41		2.0	204	2759	55	310	4192	84

Calculation of pH of a mixture of two flows.
Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

Attachment #9

INPUT	Lower pH
1. DILUTION FACTOR AT MZ BOUNDARY - (Qe+Qr)/Qe	29
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	22.0
pH:	7.0
Alkalinity (mg CaCO3/L):	25.0
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	22.5
pH:	6.0
Alkalinity (mg CaCO3/L):	75.0
OUTPUT	
1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.37
Effluent pKa:	6.37
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.81
Effluent Ionization Fraction:	0.30
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	30.84
Effluent Total Inorganic Carbon (mg CaCO3/L):	248.90
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	22.02
Alkalinity (mg CaCO3/L):	26.75
Total Inorganic Carbon (mg CaCO3/L):	38.49
pKa:	6.37
pH at Mixing Zone/ZID Boundary:	**6.7**

Permit Limits - Chlorine and Ammonia

Facility Name: **Newberg STP**

Attachment #10

Date: 3/19/2004

Dilution Values? (Y/N)	Y	calculated
Low Flow Dilution @ ZID =	2.4	*
Low Flow Dilution @ MZ =	28.5	*
High Flow Dilution @ ZID =	*	*
High Flow Dilution @ MZ =	*	*
	Summer	Winter
Effluent Flow (MGD) =	1	1
7Q10 (CFS) =	*	*
1Q10 (CFS) =	*	*
% dilution at MZ =	25	25
% dilution at ZID =	10	10

Summer data	Effluent	Stream	Mixed		
			ZID	MZ	
pH * =	7.3	7.7	7.4	7.6	(6.5-9)
Temp * =	22.5	22.0	22.2	22.0	° C
Alkalinity =	75	25			
Salmonids Present? (Y/N)		y			
Fresh Water ? (Y/N)		y			
Salinity	0	20	11.7	19.3	
Winter data					
pH * =	*	*	*	*	(6.5-9)
Temp * =	*	*	*	*	° C
Alkalinity =	*	*			
Salmonids Present? (Y/N)		*			
Fresh Water ? (Y/N)		*			
Salinity	*	*	*	*	

probability basis (for WLA multipliers)	99%

PARAMETER	WATER QUALITY CRITERIA 1 Hour (CMC) mg/l	WATER QUALITY CRITERIA 4 Day (CCC) mg/l	Back-ground mg/l	Allocations Acute mg/l	Allocations Chronic mg/l	CV	# Samples /Mo	Acute LTA mg/l	Chronic LTA mg/l	Min LTA mg/l	PERMIT LIMITS 95% Monthly mg/l	PERMIT LIMITS 99% Daily mg/l
Low Flow Season												
CHLORINE	0.019	0.011	0.00	0.05	0.31	0.6	30	0.01	0.17	0.01	0.02	0.05

APPENDIX B

Biosolids Management Plan

May 2007
Biosolid Management Plan
for
The City of Newberg (CN).

File Number: 102894

I. Treatment Facility

Introduction:

The City of Newberg (CN) owns and operates a municipal wastewater collection and treatment system (built in 1987) under a National Pollution Discharge Elimination System (NPDES) permit. Wastewater processed by the treatment works is principally of domestic origin. Septage is accepted at this wastewater treatment facility. The industrial discharges to the CN facility are minor and do not require regulation under a local pretreatment permit. Treated effluent from the treatment plant is discharged to the Willamette River, in Yamhill County, Oregon.

A) Wastewater Processing:

CN operates a 4.0-Million Gallon per Day (MGD) average dry weather design flow activated sludge plant. Secondary treatment is achieved in two oxidation ditches and three 80-foot diameter, center feed secondary clarifiers.

Influent passes through a headworks structure, which consists of screening and grit removal. Influent passes through one of two mechanically cleaned screens, and an aerated grit chamber. Grit is separated from the influent in two cyclone separators and grit classifiers. All grit and screenings are landfilled.

Influent from the headworks is mixed with activated sludge in one of two oxidation ditches. Each oxidation ditch has a volume of 2 million gallons (gal.). The oxidation ditch effluent is transferred to one of three secondary clarifiers (.605 million gal. each) where solids are allowed to settle out. Solids are removed and routed to one of two (2) sludge storage tanks. Each storage tank has is 80,000 gal. capacity.

Clarifier effluent is directed to two (2) chlorine contact chambers (135,000 gal. each) for disinfection by chlorine gas and then treated with sodium bisulfite to remove residual chlorine prior to being discharged to the Upper Willamette River (river mile 49).

B) Solids Processing:

Waste Activated Sludge (WAS) from the secondary clarifiers is pumped to the sludge storage tanks. From the storage tanks, WAS is pumped to two (2) 2 meter belt filter presses. Sludge cake from the belt filter presses is mixed with sawdust and recycled compost prior to entering one of two (2) compost reactor vessels. Each reactor tunnel is 18 feet wide, 12 feet high and 66 feet long. At maximum loading each tunnel has a detention time of approximately 14 days. All batches must meet the minimum vector attraction reduction requirement of aerobic treatment of the sludge for at least 14 days at over 40C (104F) with the average temperature of over 45C (Compost).

There is primarily one end route for biosolids generated from this facility and that is Class A compost.

C) Solids Storage Structure:

There are two (2) 0.08 million gallons sludge storage tanks at the biosolids facility. In addition, a 1/2-acre lined compost yard, which is located at this facility.

D) Septage Receiving Facility:

Septage haulers currently discharge into the treatment plant tank drain system via one of several catch basins adjacent to the sludge storage tanks and Solids Handling Building. Septage flows through the tank drains to the Influent Pump Station where it mixes with the wastewater from the collection system and is pumped to the Headworks. A septage receiving station at the WWTP is planned for the future.

F) Pretreatment Program:

The City's 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.

CN operates source control programs under an ordinance developed and adopted by the city. The CN's ordinance directs the establishment of local limits to maintain biosolids quality at or below 50-percent of the "clean sludge" metal concentration criteria identified in EPA 40 CFR Part 503.13 and Oregon DEQ's Oregon Administrative Rules Chapter 340 Division 50.

Newberg administers the program within the urban growth boundary. The regulatory activities include developing pollutant limits for industrial discharges, responding to permit violations and conducting industrial site inspections.

II Solid Treatment Processes

The EPA's 40 CFR Part 503 and DEQ's OAR340-50 allow permittees to use EPA approved alternatives to satisfy Class A and B biosolids pathogen and vector attraction reduction criteria. The permittee must notify the Department in writing and get approval prior to any process change that would utilize pathogen reduction or vector attraction reduction alternatives other than their primary reduction alternatives contained in this management plan. The permittee must also certify that the alternatives used are EPA approved and that sampling and monitoring conforms to the 40 CFR 503 and OAR 340-050 regulations.

Pathogen Reduction

To meet the Part 503 regulatory requirements, pathogen reduction must be met before vector attraction reduction or at the same time vector attraction reduction is achieved.

Class A Biosolids

With all Class A alternatives microbial monitoring for fecal coliform or *Salmonella* sp. is required (see section A and B below). This management plan lists the primary alternative and options employed by the permittee to meet Class A and B biosolids criteria.

A) Monitoring for Fecal Coliform or *Salmonella* sp.

Monitoring for Fecal Coliform or *Salmonella* sp. is required to detect growth of bacterial pathogens. Because Class A biosolids may be used without site restrictions, all Class A material must be tested to show that the microbial requirements are met at the time when it is ready to be used, disposed, sold or given away. In addition to meeting process requirements, Class A biosolids must meet one of the following requirements:

- Either the density of the fecal coliform in the biosolids be less than 1,000 MPN per gram total solids (dry gram weight),
- *Or* the density of *Salmonella* sp. Bacteria in the biosolids be less than 3 MPN per 4 grams of total solids (dry weight basis).

Unlike Class B biosolids, Class A requirements are not based on an average value. Sampling for Class A biosolids consists of at least seven (7) discrete samples taken over a 2-week period. Test results are required before Class A material can be release for use or disposal. The microbial requirement that a Class A biosolids must meet is either:

- At the time of use or disposal, or
- At the time the biosolids are prepared for sale or given away in a bag or other container for land application, or
- At time the biosolid or material derived from the biosolid is prepared to meet the requirements in 503.10(b), 503.10 (c), 503.10 (e) or 503.10 (f).

B) Class A Pathogen Reduction Alternatives

Alt. 5) Use of Processes to Further Reduce Pathogens (PFRP) 503.32(a)(7)
This requirement relies on the process to demonstrate adequate reduction of pathogens to meet Class A biosolid criteria:

- Sludge has been treated by composting or in one of the six other PFRPs listed in Appendix B of the 503 regulation, and
- Either the density of the fecal coliform in the sewage sludge be less than 1,000 MPN per gram total solids (dry gram weight), *or* the density of *Salmonella* sp. bacteria in the sewage be less than 3 MPN per 4 grams of total solids (dry weight basis).

Class B Biosolids

Class B biosolids can be met by using one of three alternatives. The two primary alternatives used by this facility are Alt. 1) Monitor sewage sludge for fecal coliform 503.32(b)(2), and Alt. 2) Use Process to Significantly Reduce Pathogen (PSRP) 503.32(b)(3).

Alt. 1) Monitoring sewage sludge for fecal coliform, 503.32(b)(2), requires that seven samples of treated sewage sludge (biosolids) be collected and that the geometric mean fecal coliform density of these samples be less than 2 million MPN per dry gram biosolid (dry weight basis).

Alt. 2) Use of a Process to Significantly Reduce Pathogen (PSRP), 503.32(b)(3), considers sludge treated in one of the PSRPs listed in Appendix B of the 40 CFR Part 503 to meet Class B biosolid criteria for pathogen reduction.
For this facility the following PSRP is primarily used:

- #4 Composting. The temperature of the sewage sludge is raised to 40C (104F) or higher and remains at 40C or higher for 5 days. For 4 hours during the 5-day period, the temperature in the compost pile must exceed 55C (131F).

B) Vector Attraction

This facility primarily uses the following vector attraction reduction option:

Opt 4) The Specific Oxygen Uptake Rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a minimum temperature of 20 degrees Celsius. The range of total solids for the SOUR test is 2% or less.

Opt.5) Aerobic treatment of the sludge for at least 14 days at over 40C (104F) with the average temperature of over 45C (Compost).

Note: if the compost process is the biosolid treatment method then the pathogen reduction must be met at or prior to vector attraction; therefore the only vector attraction reduction available for the compost process is option 5 below.
Other vector attraction reduction options:

Opt. 7) 75% solid by drying prior to mixing with other materials. Sewage sludge treated in aerobic or anaerobic process (i.e. Sewage sludge that do not contain unstabilized solids generated in primary wastewater treatment).

Opt 10) Sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land.

C) Batch Processes

Class A Biosolids

Alt. 5, PFRP Compost, compost pile must meet PFRP) of 3 consecutive days at a minimum pile temperature of 55C. (Note: Class A PFRP must be met within the Class B PSRP treatment parameter, EPA requirement).

Class B Biosolids
Alt. 3, # 4 PSRP) Compost, Process that Significantly Reduces Pathogens (PSRP) showing an average pile temperature of 45C and minimum temperature of 40C in the pile within 14 consecutive days.

Note: For solids to be composted which have already have achieved vector attraction criteria, i.e. compost solids that have been aerobically digested, lagoons stored and dewatered or air dried prior to composting; Pathogen reduction must be met at or before vector attraction reduction, therefore the composted biosolids must meet vector attraction through the compost process and have pathogen reduction and vector attraction reduction tested to meet the compost treatment criteria.

III Biosolid Characteristics

CN's treatment works utilizes an activated sludge process. The treatment facility wastes activated sludge form the secondary clarifiers through sludge storage, sludge belt filter press, and sludge composting treatment processes.

For the past ten- (10) years the 40 CFR Part 503 requirements have been met by the CN wastewater treatment Class A compost process.

Annually, CN had generated approximately 500 dry tons of biosolids. For the year 2003 CN generated (573) dry metric tons of Class A compost biosolids. Under the 40 CFR Part 503, CN is required to sample biosolid every 90-days or four (4) times per year. Frequency of monitoring depends on the amount biosolid generated that is marketed to be sold or given away, land application and surface disposal. Frequency depends on the amount on bulk biosolid applied to the land, or the amount of sewage sludge received by a person who prepares biosolid that is sold or given away in a bag or other container for application to the land (dry weight basis), or the amount of biosolid (excluding domestic septage) placed on a surface disposal site.

Sampling

1) Sludge Belt Filter Press
Sample location: At discharge point to conveyor.

Number and type of sample taken per day: 1-2 grab samples per day, minimum 9 samples to make a representative composite sample.

Sample storage and transport: Samples are stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 hour of sample collection.

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B; EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods)

2) Compost

Sample location: Random depths and locations within the compost pile

Number and type of sample taken per batch: 7 discrete samples are mixed together to form a composite sample for metal analysis. For Class A Biosolid seven (7) discrete samples are required for pathogens.

Sample storage and transport: sample is stored at 4 degrees C in ice chest or refrigerator. Samples are transported in ice chest to maintain temperature during delivery to laboratory. Pathogen samples are delivered to lab within 6 hour of sample collection. *(Comment: this conflicts with a statement earlier in this document that composite samples are to be collected over a two week period.)*

Sample analysis method: EPA 9045; EPA 160.3;EPA 160.4; SM 4500-NH3B;EPA 353.2; EPA 365.3; EPA 351.3; SW-846 7060; SW-846 6010; SW-846 ; SW-846 7481; SW-847 7471; SW-846 7740; SM 18th, 9221E.1; SM 18:9260D.1; ASTM D 4994-89; EPA 600/1-87/014; EPA 8240; EPA 1613; EPA 8270; EPA 1613B; EPA 1668 (may include one or more of the referenced methods)

Biosolid Analysis:

Biosolid Chemical Analysis:

From the (CN)'s 2003 biosolids analysis the following is a representative sampling of the biosolid metal concentration.

Pounds(#)	Metal	lb./95 acre-yr.	site life
lb.	Arsenic (As)	0.053	683
lb.	Cadmium (Cd)	0.006	5783
lb.	Chromium (Cr)	0.155	6871
lb.	Copper (Cu)	2.22	603
lb.	Lead (PB)	0.21	1257
lb.	Mercury (Hg)	0.006	2334
lb.	Molybdenum (Mo)	0.022	2927
lb.	Nickel (Ni)	0.132	2837
lb.	Selenium (Se)	0.036	2474
lb.	Silver (Ag)	n/a	n/a
lb.	Zinc (Zn)	4.12	607

The site life would be limited to (607) years based on the Zinc loading CN's 2003-biosolid analysis **(Attachment B)**.

Biosolid Nutrient Analysis:
For the year 2003, the composted biosolids contained about 9480 pounds (lb.) total nitrogen (N) of which about 572 lb. is in the nitrate form (NO3-NO2), 3280 lb. is in the ammonia form (NH3), and 5628 lb. Organic nitrogen. From the analysis, if CN were to land apply their annual biosolid nitrogen production, they would need approximately (95) acres.

IV Biosolids Beneficial Reuse Program

Under normal circumstances, the City of Newberg treats all solids removed in the wastewater treatment process by composting, and all compost produced meets requirements for Class A designation. As such, the compost has no restrictions on its use. The compost produced is sold or given away in bulk at the WWTP. All off-site transportation is done by the purchasers.

In the event that the City cannot meet Class A requirements, Class B biosolids will be beneficially reused through the following procedures.

Transportation :
Biosolids will be off loaded into city owned, leased, or rented-tanker trucks or dump trucks at the WWTP. The biosolids loading areas are impounded in case of accidental spillage of biosolids during the truck loading process. These areas have drains that tie back into the wastewater treatment process.

Land application:
CN does not own land and currently does not have site authorization for land application on other farmlands. Prior to any land application the City will acquire the required site authorizations from DEQ, and all DEQ site authorizations for CN will be included in CN's Biosolids Management Plan. .

Long term biosolid application rates and site restrictions are contained in the biosolid site authorization letter. References to the OAR 340-50, The 40 CFR Part 503, site setbacks, site agronomic loading rates, land application restrictions and site restrictions are also detailed out in the site authorization letter.

V Contingency Options

In the event Class B biosolids are spilled between the treatment facility and the land application site, CN's wastewater treatment works shall contain the spill, lime, absorb (via sand) and remove spilled sludge solids spills with a front end loader or shovels and dispose of the spillage at a DEQ authorized application or disposal site. All spills into waters of the state or spills on the ground surface that are like to enter waters of the state shall be reported to immediately to Oregon Emergency Response System (OERS) at 1-800-452-0311 and your regional biosolids coordinator at (541)

440-3338. All spills of 25 gallons or more on the ground surface shall be report to the regional biosolids coordinator at (541) 440-3338.

VI Reporting

Daily Reporting and Recordkeeping:

Each year prior to land application of biosolids the source operators shall check to see if contiguous property owners have changed. The operators shall keep a record of contact (date, and/or written log of phone call w/ name and number, and/or xerox of postcard w/ name and address, etc.,) with contiguous property owners, and which notifies new neighbors of the biosolid land application practice. Operator shall provide this documentation in the annual biosolid report.

Annual Reporting

The Annual Biosolid Report is due February 19 of each year for the previous year's biosolids treatment and land application activities . Part of this report is the submittal of the daily land application site logs, which have the date, time, and quantity gal-lb. N/acre land applied for each day-tank-batch land applied. Site logs shall have a scaled map showing the site and the land application location that coincides with the daily site loading methods (truck spreader bar, irrigation cannon). Daily records should clearly show the location of daily biosolid loading site log.

Annual Report shall have a signed copy of the certification statements for pathogen reduction, vector attraction reduction and biosolids land application at approved agronomic loading. The person signing the statements should be the operator of record at the treatment plant. The operator shall shown how the vector attraction reduction was met i.e., volatile solids reduction was achieved by time and temperature, the Van Kleeck equation filled out with digester records (MCRT), bench scale test, sour test or any other EPA approved alternative method appropriated for biosolid generated at your facility. Certification of pathogen reduction is required and is satisfied by submittal of test results in the Annual Biosolid Report. All the previous year's biosolids sampling and analysis that is required by the permit shall be included in CN's Annual Biosolid Report **(in each year's annual report appendix).**

VII Certification Statement

CN's facility is capable of meeting their primary alternatives for achieving Class A or B biosolid pathogen and vector attraction reduction criteria. Signed Class A and/or B biosolid and vector attraction certification statements shall accompany all biosolids that are land applied **(Attachment A).** For Class A or B biosolid annual biosolid analysis must be provided upon request. Certification statements must also show conformance with nutrient and land application loading rates where applicable.

Attachment A:

Certification Statement

"I certify, under penalty of law, that the pathogen requirements in [insert either 503.32(a) or 503.32(b)], the management practices in 503.14 and the vector attraction reduction requirements in [insert 503.33(b)(1) through 503.33(b)(10)] have been met. This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that the pathogen requirements and vector attraction reduction requirements have been met. I also certify that all biosolids were land applied at the approved agronomic loading rate noted in the respective Department site authorization letter. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

Signature………………………………………. **Date…………………….**

APPENDIX C

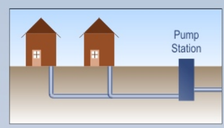
Hidden Assets

Newberg's Hidden Assets

Newberg is home to over 20,000 people and is growing rapidly. The City has undertaken planning efforts to ensure that the community's hidden assets which include the wastewater collection and pumping infrastructure and the Wastewater Treatment Facility are prepared for the future growth and meet regulatory requirements. The Newberg Wastewater Treatment Facility Plan Update and Sewerage System Master Plan will ensure that the maintenance and development of their valuable local infrastructure and assets will enhance the area's quality of life for the citizen's of today and the generations to come.

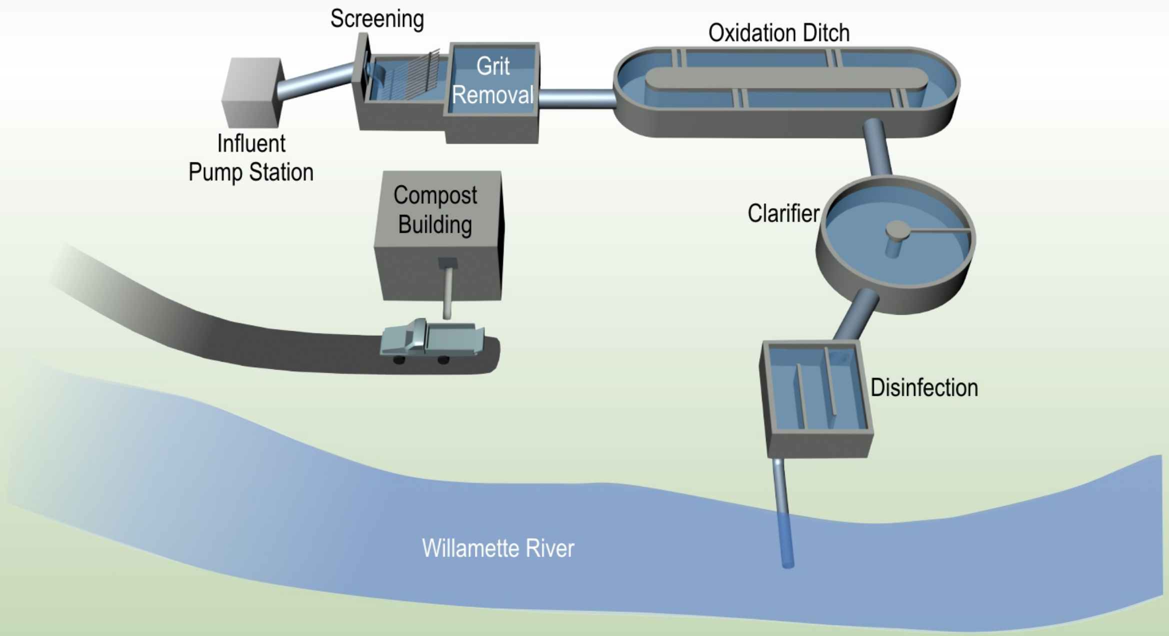
Wastewater Collection System

The City of Newberg has over 73 miles of sanitary sewer and seven pump stations. The current capacities of the trunks and interceptors are unknown since the last master plan and hydraulic model were developed over 20 years ago. Growth is occurring at a rapid rate and continued growth is anticipated for decades to come. Portions of the sewer system are 80 to 90 years old. The Sewerage Master Plan Update will provide the City with a blueprint for efficiently managing this important asset to deliver desired service levels.



Wastewater Treatment Facility

The City's Wastewater Treatment Facility was placed into service in 1987, so it is nearing 20 years of service. The facility is an oxidation-ditch type, activated sludge plant with class A in-vessel bio-solids composting. The treatment train is comprised of influent pumping, screening and grit removal, oxidation ditch activated sludge, clarification, solids dewatering, composting, odor control, chlorination, de-chlorination and discharge to the Willamette River. Key improvements include the 1997 instrumentation and controls (I&C) improvements, 2004 Headworks project and the 2004 Composter Odor Control project.



BROWN AND CALDWELL

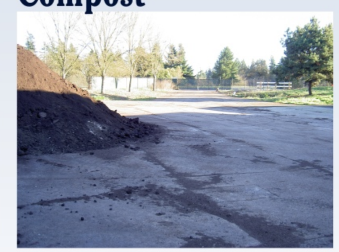
Wastewater Treatment Products

The two main products that result from the City's wastewater treatment are water and compost.

Water

The City discharges the water to the Willamette River and plans to irrigate local golf courses in the future with some of the treated product.

Compost



The City sells the Compost product to the public.

APPENDIX D

Tunnel Composter Capacity Analysis TM

TO: Lawrence Fain, City of Newberg

COPIES: File

FROM: Daria Wightman, Brown and Caldwell

PREPARED BY: Larry Sasser, LARK Environmental Consultants, LLC

REVIEWED BY: Steve Wilson, Brown and Caldwell

DATE: May 2, 2006

PROJECT NO.: BC Project No. 128414 Task 500

SUBJECT: Tunnel Composter Capacity Analysis

CONTENTS

Objective

The objective of this analysis is to evaluate the capacity of the tunnel reactor for composting dewatered biosolids using sawdust and recycle from the composting process to provide the moisture content of the initial mix required for mixing and tunnel operation. A previous evaluation concluded that the system capacity ranged from 1.5 to 2 dry tons of solids/day (DT/day) in the dry season and 1 DT/day in the wet season (CH2M, 1996). The original design specification was 3.5 DT/day (PWT, 1995). Operating experience has shown that the compost system has already been exceeded.

Generally, the capacity of a biosolids composting facility is determined by one or more of three limiting factors:

1. The ability to remove heat. Mechanical aeration provides this capability if properly designed. The heat is removed by evaporating water from the composting mix. Heat removal also provides drying of the mix. Heat removal requires more air than is needed to maintain aerobic conditions in the compost pile.

2. The moisture content of each of the feedstock materials. The empirically derived target moisture content for the Newberg facility is 41.5 percent total solids (TS), based on mixing and tunnel reactor operational needs. A change in the moisture content of any of the three components will change the desired mix ratios.

3. The material detention time that is determined by the physical capacity of the composting area to provide composting. The minimum detention time to comply with both the PFRP and VAR time and temperature requirements contained in 40 CFR 503 would be about 16 days. First stage aerated static pile composting facilities are typically designed to provide 21 to 28 days of composting. If the first stage is designed to handle only the PFRP and high rate composting phase it might be designed for 5 to 10 days of detention. Additional composting time is required in all cases to provide a stable/mature compost (cured) product.

Material detention time for a tunnel reactor is complicated by the compaction that occurs and the reintroduction of biosolids with the recycle stream. In this composting system the degradation of the feedstocks also impacts detention time. All three factors tend to increase the time that any particle of biosolids spends in the tunnel compared to the single pass of a non-compressible, non-degradable material. Detention time can be defined in three ways:

- *Volumetric detention time*–The volume of the reactor divided by the feed rate of the mixed material at uncompressed density This is the most useful definition for defining capacity because it requires no assumptions regarding compression, degradation or recycle rate.

- *Single-pass detention time*–The time it takes for a particle that is fed to the tunnel reactor to pass through is determined by feed rate, compaction and degradation. This can be measured by placing a marker in the material and observing the time to pass through.

- *Total recycle detention time*–This would be the total amount of time that any particle of biosolids actually spends in the reactor through the potential numerous recycle loops. This would be a statistical distribution since some particles (or remains thereof) will pass through only once while others will be recycled through many times. This statistical value will change with the mix of feedstocks and the degradability and moisture content of the feedstocks.

Known Information

The information that we are using for a basis of the analysis is:

1. The dewatering equipment currently produces an average annual solid content of approximately 16 percent TS.

2. The sawdust currently being purchased for the composting facility has a typical moisture content of 52 percent TS.

3. The optimum mix of sawdust to biosolids is 1.5:1 empirically derived by operations staff. This ratio is based on the current dewatering equipment, bulking material and mixing system and will likely be subject to change if any of these conditions change.

4. The target moisture content for the mix of feedstocks based on the needs of the mixer and tunnel operation is 41.5 percent TS.

Capacity Defining Variables

Since composting is a biological process, the primary objective of the facility design and operation is to provide conditions in the reactor that are suitable (and optimized if possible) for the activity of the organisms that do the desired work. For composting organisms it is a warm, moist and oxygenated condition. To facilitate the availability of nutrition for the organisms it has been observed that mixing the material during composting also facilitates the composting process.

1. *Compaction*–The degree of compaction associated with this style of tunnel composting is unusual. Some other composting methods, e.g., vertical silos also have to work with compacted materials but the pressures required to push the pile through the tunnel are greater. This process requires a unique aeration method designed to lift the pile to reduce friction when moving the pile as well as to help permeate oxygen throughout the composting mass.

2. *Moisture content*–defines the quantity of sawdust and recycle needed to provide suitable conditions in the reactor for composting. The moisture content of the resulting mix is important for mixer function with the current mixer and for the composting function in the tunnel. The mix moisture content is affected by the moisture content of the biosolids, sawdust and recycle.

Assumptions

1. The desired reactor Volumetric Detention Time is assumed to be 16 days for this analysis. This assures that sufficient time is provided for VAR compliance. For the tunnel volume, the feed rate to produce this 16 day detention time is 65 cubic yards per day. The corresponding actual single pass detention time is likely in the range of 18 to 24 days. Additional biosolids feed capacity would be available if the actual single pass detention time were determined and set at 16 days. A better correlation between volumetric and actual detention time could be developed by adding a marker to the tunnel feed on a daily basis to track detention times and compare to volumetric loading data.

2. The 41.5 percent TS mix target is generally applicable through a range of mix combinations that can be used to produce the target condition.

Impact of Recycle Drying on Tunnel Capacity

The capacity of the tunnel can theoretically be increased by reducing the water content of any of the three components. Improved dewatering, use of dried sawdust or producing a drier recycle will provide an increase in capacity. As an example of the potential effect on capacity, the following analysis considers the potential benefit of obtaining all or a part of the recycled material from the curing area product. The curing area is designed with adequate aeration capacity and a robust control system that should allow the use of residual heat from the curing process to further dry the material (per discussion with Tim O'Neill).

Figure 1 illustrates the potential capacity for composting biosolids on a DT/day basis (assuming 16 percent TS) for a range of possible recycle solids contents. As shown, an increase in recycle moisture content from 50 to 55 percent TS increases the potential capacity by 30 percent from 1.35 to 1.75 DT/day. Since the analysis assumes that the sawdust to biosolids ratio is 1.5, the sawdust requirement would increase at the same rate as the biosolids.

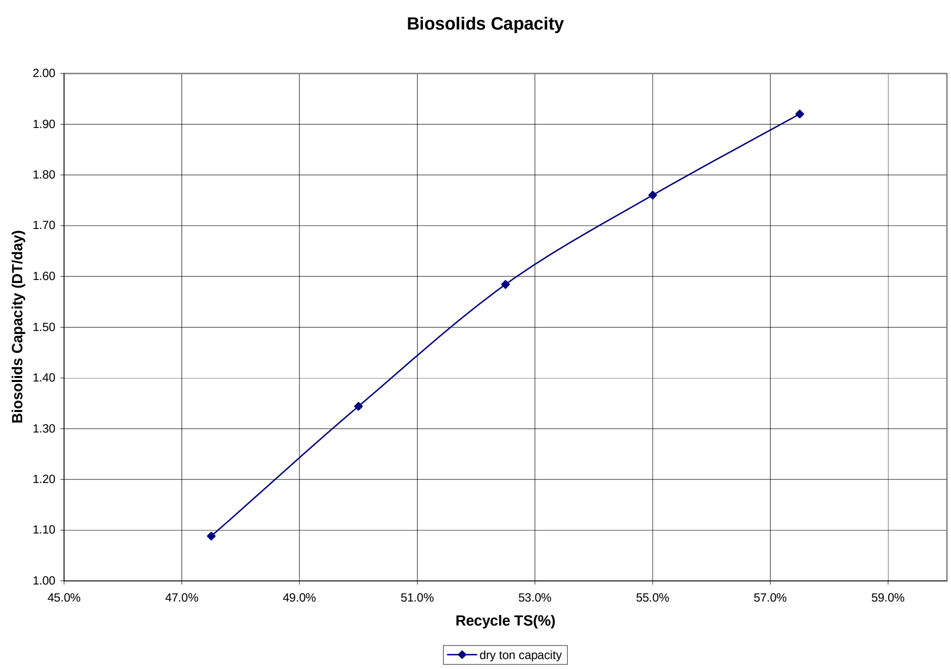


Figure 1.

Figure 2 shows the impact of recycle solids content on the amount of recycle required per day. The same increase in recycle solids content (from 50 to 55 percent TS) reduces the required recycle from 43 to 35 cubic yards per day or a decrease of 19 percent.

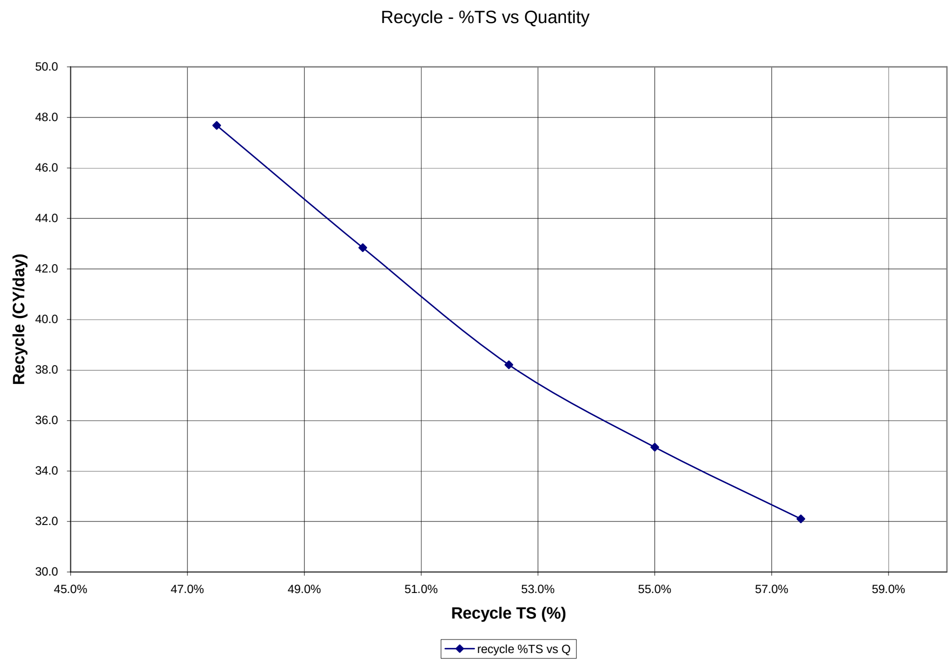


Figure 2.

The analysis assumes that the ratio of new sawdust to biosolids remains constant. However, it may be possible to replace a portion of the sawdust with the drier recycle. This reduction in sawdust could produce a significant cost savings. On the other hand, if insufficient recycle from the curing area is available to meet the recycle demand, additional sawdust would have to be used to adjust the feed moisture content.

Heat Removal Capacity

Over the range of biosolids loading considered in the above analysis and the aeration capacity of 3,000 cubic feet per minute, it appears that the available aeration capacity varies from 4,700 to 6,700 cubic feet per hour (cfh) per DT. Typical design values for the aerated static pile process range between 3,000 and 5,000 cfh per DT. The aeration capacity appears to be adequate over this loading range. Heat removal capacity should be revisited when evaluating the impact of providing drier feedstock to the tunnel. Since heat removal is accomplished by evaporating water from the mix, the potential for over-drying must also be considered as the feedstock moisture content is reduced.

Determination of Tunnel Capacity

The capacity of the tunnel reactors will vary with the feedstocks used and the initial mix moisture content required for mixer and tunnel operation. The current capacity is estimated to vary seasonally between 1.1 and 1.4 DT per calendar day.

APPENDIX E

Facilities Review

ESTIMATED REMAINING LIFE ANALYSIS

	Expanded procedure 2-28-06	1	2	3	4	5
	Newberg Equipment Remaining Life Assessment	Exp	%	%	Cond.	Est.
	Based on Comments - 2/9/06 Meeting	Life	Base	Util.	Grd.	Rem.
			Life			Life
WWTP						
Influent Pump Station						
Influent Wetwell	Leaks reported into wet well when drained. Also needs better design for grease removal					2
RSP 1 w/ VFD		25	1.2	1.05	0.8	5.2
RSP 2 W/ VFD		25	1.2	1.05	0.8	5.2
RSP 3 W/ VFD		25	1.2	1.05	0.8	5.2
RSP 4 W/ VFD	Pump rated at 9mgd, only pumping less than 5mgd	25	1.2	1	0.62	1.4
Yale 2 ton hoist	Failed 2/06, will be replaced					20
Wet Well Level Transmitters (2)						10
Preliminary Treatment						
Influent Flowmeter 1	Need to be relocated, possibly replaced.	15	1.2	1.05	0.8	0.12
Influent Flowmeter 2	Need to be relocated, possibly replaced.	15	1.2	1.05	0.8	0.12
Grit Pump 1		25	1.2	1.05	0.8	5.2
Grit Pump 2	Pump has bad bearings	25	1.2	1.05	0.62	-0.47
pH Meter	Not functional					0
Equalization Basin	Basin has cracks and leaks when filled with storm flows. Return flows go to inf. PS	50	1	1	0.5	5
Oxidation Ditch						
Inf. Splitter Box		50	1	1	0.8	20
RAS Splitter Box		50	1	1	0.8	20
Oxidation Ditch 1	Concrete needs repair. Assessment done by Larry O. [BC]	50	1	1	0.62	11
Oxidation Ditch 2	Concrete needs repair. Assessment to be done next summer when drained.	50	1	1	0.62	11
Oxidation Ditch 1 Aerators (4)	Adj. weirs installed 2005, aerators are functional but 20 year old technology, both ditches	20	1.2	1.05	0.9	2.7
Oxidation Ditch 2 Aerators (4)	Variable speed arrangements installed, both ditches 2004-05.	20	1.2	1.05	0.9	2.7
DO Meters Ditch 1 (2)	Prefer new technology - foul easily	10				1
DO Meters Ditch 2 (2)	Prefer new technology - foul easily	10				1
Secondary Clarifiers						
Secondary building HVAC	Need new system	20	1	1	0.62	-7.6
SC Splitter Box		50	1	1	0.8	20
CL2 Injection Site	Need new system	10	1	1	0.5	-5
Secondary Clarifier 1	Works well, need to evaluate structural walls and floor	20	1.2	1.1	0.9	3.8
Secondary Clarifier 2	Works well, need to evaluate structural walls and floor	20	1.2	1.1	0.9	3.8
Secondary Clarifier 3	Works well, need to evaluate structural walls and floor	20	1.2	1.1	0.9	3.8
RAS Pumping						
RAS Pump 1 W/ VFD	All pumps oversized, inefficient use of too large pump	25	1.2	1.1	0.7	3.1
RAS Pump 2 W/ VFD	All pumps oversized, inefficient use of too large pump	25	1.2	1.1	0.7	3.1
RAS Pump 3 W/ VFD	All pumps oversized, inefficient use of too large pump	25	1.2	1.1	0.7	3.1
RAS Pump 4 W/VFD	#4 available for future clarifier	25	1.2	1.2	0.9	12.4
WAS Pumping						
WAS Pump 1 W/ VFD		25	1.2	1.1	0.7	3.1
WAS Pump 2 W/ VFD		25	1.2	1.1	0.7	3.1
WAS Pump 3 W/ VFD	Pump has a cracked housing, needs to be replaced	25	1	1	0.7	-2.5

	Expanded procedure 2-28-06	1	2	3	4	5
	Newberg Equipment Remaining Life Assessment	Exp	%	%	Cond.	Est.
	Based on Comments - 2/9/06 Meeting	Life	Base	Util.	Grd.	Rem.
			Life			Life
WWTP						
Chlorination / Dechlor						
CL2 Contact Chamber 1 & 2		50	1	1.2	0.9	34.0
Surface Skimmer 1 & 2	"Morning glory" type skimmers not efficient	10	1	1	0.8	-12.0
Chlorine Storage Area	No emergency scrubber, exhaust system inadequate, heater not functional	50	1	1.2	0.9	34.0
CL2 Cradle / Scale 1		40	1.2	1.2	0.9	31.8
CL2 Cradle / Scale 2		40	1.2	1.2	0.9	31.8
Sodium Bisulfite Tank	Head is insufficient to feed by gravity	25	1	1.2	0.9	7.0
Sodium Bisulfite Pump 1	Needs total review for entire system	25	1	1.1	0.8	2.0
Upstream ORP	Not working well as a means of control	10	1	1.2	0.9	-9.2
Sodium Bisulfite Pump 2	Needs total review for entire system	25	1	1.1	0.8	2.0
Downstream ORP		10	1	1.2	0.9	-9.2
Effluent Flowmeter	Will require complete redesign to meet DEQ requirements	15	1	1.2	0.9	-3.8
Reclaimed Water System						
Reclaimed Water Pump 1		25	1.2	1.2	1	16.0
Reclaimed Water Pump 2		25	1.1	1.1	0.9	7.2
Reclaimed Water Pump 3		25	1.1	1.1	0.9	7.2
Reclaimed Water Pump 4		25	1.2	1.2	1	16.0
Plant Water Strainer	Needs replacement, system inadequate					
Sludge Storage Tanks						
WAS Transfer Pump 1 W/ VFD	Mixer is not efficient, polymer not adequately prepared when mixed with sludge	25	1.1	1.1	0.9	7.2
WAS Flowmeter 1	Recently replaced	15	1.2	1.1	1	17.8
WAS Transfer Pump 2 W/ VFD	Mixer is not efficient, polymer not adequately prepared when mixed with sludge	25	1.1	1.1	0.9	7.2
WAS Flowmeter 2	Recently replaced	15	1.2	1.1	1	17.8
DAFT						
Service Air Compressor 1		20	1.1	1.1	0.9	1.8
Service Air Compressor 2		20	1.1	1.1	0.9	1.8
Dewatering						
Coeffing 2 Ton Crane		20	1.2	1.2	1	8.8
Belt Filter Press 1 W/ VFD	Belt control could be improved, solids in range of 17-18%, operated ~50 hrs/week	20	1.1	1.2	0.9	3.8
Belt Filter Press 2 W/ VFD	Belt control could be improved, solids in range of 17-18%, operated ~50 hrs/week	20	1.1	1.2	0.9	3.8
Conveyor 8-01		20	1.1	1.2	0.9	3.8
Conveyor 8-02		20	1.1	1.2	0.9	3.8
Truck Cake Conveyor		20	1.1	1.2	0.9	3.8
Composting Facility						
HVAC Sys	System is inadequate, summer time operation - heat in building a problem	20	1.1	1.2	0.6	-4.2
Sludge Bin W/ (2) VFD's		20	1.1	1.2	0.9	3.8
Recycle Bin W/ VFD	*General comments: Composter system is at capacity particularly in high flow periods*	20	1.1	1.2	0.9	3.8
Mixer	*General comments, cont.: No redundancy, requires 2 full time operators, costly to operate.*	20	1.1	1.2	0.9	3.8
Temp. Probe 1		10	1	1.2	0.9	-9.2
Temp. Probe 2		10	1	1.2	0.9	-9.2
Emergency Generator						
Genset		50	1.1	1.2	0.9	39.4
	((Exp. Life x %Base Life x %Utiliz. X Cond. Grade) - Age) = Est. Remaining Life					

EQUIPMENT REPLACEMENT DECISION SUPPORT TOOL

RATING GRAPHS

Newberg WWTP Equipment - Possible CIP Ratings 0 - 3 Physical and/or Functional - Page 1/2																							
	Physical Condition Rating					Functionality Rating					Remaining Life - Years				Reliable		Performance		Structual		Costly to Operate		Year Installed
WWTP	0	1	2	3	4	0	1	2	3	4	1	5	10	20	Yes	No	Yes	No	Yes	No	Yes	No	Year
Influent Pump Station																							
RSP 1 w/ VFD				X					X														
RSP 2 W/ VFD				X					X														
RSP 3 W/ VFD				X					X														
RSP 4 W/ VFD				X					X														
Wet Well Level Transmitters (2)					X				X														
Preliminary Treatment																							
Influent Flowmeter 1				X				X															
Influent Flowmeter 2				X				X															
Grit Pump 1			X						X														
Grit Pump 2				X					X														
PH Meter	X					X																	
Equalization Basin			X					X															
Oxidation Ditch																							
Inf. Splitter Box				X					X														
RAS Splitter Box				X					X														
Oxidation Ditch 1				X					X														
Oxidation Ditch 2				X					X														
Oxidation Ditch 1 Aerators (4)				X					X														
Oxidation Ditch 2 Aerators (4)				X					X														
DO Meters Ditch 1 (2)					X				X														
DO Meters Ditch 2 (2)					X				X														
Secondary Clarifiers																							
SC Splitter Box					X				X														
CL2 Injection Site			X					X															
Secondary Clarifier 1				X					X														
Secondary Clarifier 2				X					X														
Secondary Clarifier 3				X					X														
RAS Pumping																							
RAS Pump 1 W/ VFD				X					X														
RAS Pump 2 W/ VFD				X					X														
RAS Pump 3 W/ VFD				X					X														
RAS Pump 4 W/VFD				X					X														
WAS Pumping																							
WAS Pump 1 W/ VFD				X					X														
WAS Pump 2 W/ VFD				X					X														
WAS Pump 3 W/ VFD		X					X																

Newberg WWTP Equipment - Possible CIP Ratings 0 - 3 Physical and/or Functional - Page 2/2

	Physical Condition Rating					Functionality Rating					Remaining Life - Years				Reliable		Performance		Structual		Costly to Operate		Year Installed
	Condition and Functionality Rating																						
WWTP	**0**	**1**	**2**	**3**	**4**	**0**	**1**	**2**	**3**	**4**	**1**	**5**	**10**	**20**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Year**
Chlorination / Dechlor																							
CL2 Contact Chamber 1 & 2				X					X														
Surface Skimmer 1 & 2			X					X															
Chlorine Storage Area					X				X														
CL2 Cradle / Scale 1				X					X														
CL2 Cradle / Scale 2				X					X														
Sodium Bisulfite Tank			X					X															
Sodium Bisulfite Pump 1			X					X															
Upstream ORP				X			X																
Sodium Bisulfite Pump 2			X					X															
Downstream ORP				X					X														
Effluent Flowmeter				X				X															
Reclaimed Water System																							
Reclaimed Water Pump 1					X				X														
Reclaimed Water Pump 2				X					X														
Reclaimed Water Pump 3				X					X														
Reclaimed Water Pump 4					X				X														
Plant Water Strainer			X					X															
Sludge Storage Tanks																							
WAS Transfer Pump 1 W/ VFD					X			X															
WAS Flowmeter 1					X				X														
WAS Transfer Pump 2 W/ VFD					X			X															
WAS Flowmeter 2					X				X														
DAFT																							
Service Air Compressor 1				X					X														
Service Air Compressor 2				X					X														
Dewatering																							
Coeffing 2 Ton Crane					X				X														
Belt Filter Press 1 W/ VFD				X					X														
Belt Filter Press 2 W/ VFD				X					X														
Conveyor 8-01				X						X													
Conveyor 8-02				X						X													
Truck Cake Conveyor				X					X														
Composting Facility																							
HVAC Sys			X					X															
Sludge Bin W/ (2) VFD's				X					X														
Recycle Bin W/ VFD				X					X														
Mixer				X					X														
Temp. Probe 1				X					X														
Temp. Probe 2				X					X														
Emergency Generator																							
Genset			X					X															

APPENDIX F

Staffing

Attachment 1

060407-2:30

City of Newberg
W & WW System - Labor Summary
Nov. 20 - Dec. 21

PROJECT / ACTIVITY	CA	ET	JM	KT	RR	SR	AL	DE	DW	PS	TS	DR	HH	TOT.	FTEs	%	Comments
														173.75			
Administrative WasteW													79.5	79.5	0.5	3.7%	
Administrative Water				9	6								79	94	0.5	4%	
Training / Safety			25	1	9		2.5		1			3		41.5	0.2	1.9%	
Computer Support					9									9	0.1	0.4%	
Paid Time Off	37	20	25	23	36	16	57	39	30	18	23	65.5	22	411.5	**2.4**	**18.9%**	Highest ranked due to holidays
Miscellaneous				12										12	0.1	0.6%	
Meetings	3	6	1	2	20	3	11	31	6	1.5	3	1		88.5	0.5	4.1%	Meetings & Training/Safety ~ 5.8%
Monthly Reports				4					5					9	0.1	0.4%	
Purchasing				14										14	0.1	0.6%	
Personnel				4			3.5							7.5	0.0	0.3%	
Water Quality Sampling														0	0.0	0.0%	
Backflow Prevention				11										11	0.1	0.5%	
Distribution System Op.														0	0.0	0.0%	
WTP Operation		1	2		64	8			72	66.5				213.5	**1.2**	**9.8%**	Water treatment ranks #4
Spring Operation					1				16	28				45	0.3	2.1%	
Well Field Operation					1				12	1				14	0.1	0.6%	
WWTP Operation	41.5	1	68.5		25	32		73	1	9				251	**1.4**	**11.5%**	WW liquid treatment ranks #3
Composter Operation	101		58			123		36						318	**1.8**	**14.6%**	Composter is second only to Time Off
Call Back														0	0.0	0.0%	
Industrial Pretreatment				5			4							9	0.1	0.4%	
Lab Analysis									6			104.5		110.5	0.6	5.1%	
Pump Station Operation	3							6						9	0.1	0.4%	
Routine Maintenance		60									57	3		120	0.7	5.5%	
Equipment Repair		94									97			191	1.1	8.8%	
WW Tech Support							37.5							37.5	0.2	1.7%	
WW Samling/Lab Anal.							29							29	0.2	1.3%	
WW Reg Compliance							6							6	0.0	0.3%	
Field Instrumentation							6							6	0.0	0.3%	
Composter Report				2										2	0.0	0.1%	
WWTP Facilties Plan							6.5							6.5	0.0	0.3%	
Misc/Other							2			13.5		1		16.5	0.1	0.8%	
Safety Activities														0	0.0	0.0%	
Professional Societies														0	0.0	0.0%	
Collections Master Plan							1							1	0.0	0.0%	
Effluent Reuse							10							10	0.1	0.5%	
Water Lab Analysis										19				19	0.1	0.9%	
Reservoir Operations									3					3	0.0	0.1%	
Routine Bac-T Samples					6				20	18				44	0.3	2.0%	
Special Bac-T Samples					1				1	3.5				5.5	0.0	0.3%	
Reg. Compliance Samp.														0	0.0	0.0%	
BFP - Clerical									5					5	0.0	0.2%	
Water Quality Report				3										3	0.0	0.1%	
Water Call Back									2					2	0.0	0.1%	
Total	**185.5**	**182.0**	**179.5**	**90.0**	**178.0**	**182.0**	**176.0**	**185.0**	**180.0**	**178.0**	**180.0**	**178.0**	**101.0**	**2175.0**	**12.5**	**100%**	

	TOT.	FTEs	%
Water System	**466.5**	**2.7**	**21%**
Wastewater System	**924**	**5.3**	**42%**
Paid Time Off	**411.5**	**2.4**	**19%**
Meetings & Training	**130**	**0.7**	**6%**
Other	**68**	**0.4**	**3%**

Attachment 2

060407-2:40

City of Newberg
W & WW System - Draft Labor Summary
Mar. 21 - Apr. 20, 2007

PROJECT / ACTIVITY	CA	ET	JM	KT	RR	SR	AL	DE	DW	PS	TS	DR	HH	TOT.	FTEs	%	Comments
														193.5			
Administrative - WWater				4									85	89	0.5	3.8%	
Administrative - Water					4								85	89	0.5	3.8%	Does not include Plant Supt.
Training / Safety	24	10	13.5		1	9	0.5	32	1	9	42.5	1		143.5	0.7	6.2%	This is a commendable percentage
Computer Support					14									14	0.1	0.6%	
Paid Time Off	18.5	10	25	6	9	3	55.5	4.5	21	9	4	7	22	194.5	1.0	8.4%	May be justification for more staff
Miscellaneous				5	1									6	0.0	0.3%	
Meetings	4	4	3	3	28	4	13	26	12	13.5	3	9.5		123	0.6	5.3%	Added to Training & Safety = ~12.5%
Monthly Reports				5					7					12	0.1	0.5%	
Purchasing				16										16	0.1	0.7%	
Personnel				8			5.5							13.5	0.1	0.6%	
Water Quality Sampling				12										12	0.1	0.5%	
Backflow Prevention				12	1									13	0.1	0.6%	
Distribution System Op.					4									4	0.0	0.2%	
WTP Operation					97	8			88	88	6			287	**1.5**	**12.4%**	Ranks #2 for labor effort
Spring Operation					8				4	24				36	0.2	1.6%	
Well Field Operation					9				12					21	0.1	0.9%	
WWTP Operation	36		69.5			35		87.5		12	2			242	**1.3**	**10.4%**	Ranks #3 for labor effort
Composter Operation	101.5		77.5			128		35						342	**1.8**	**14.7%**	Ranks #1 for labor effort
Call Back						2								2	0.0	0.1%	
Industrial Pretreatment				19			18							37	0.2	1.6%	
Lab Analysis									4	19.5		165		188	1.0	8.1%	
Pump Station Operation											4			4	0.0	0.2%	
Routine Maintenance		62									49.5			111.5	0.6	4.8%	
Equipment Repair		104									77			181	0.9	7.8%	
WW Tech Support							50.5							50.5	0.3	2.2%	
WW Samling/Lab Anal.							1							1	0.0	0.0%	
WW Reg Compliance							6							6	0.0	0.3%	
Field Instrumentation							3.5							3.5	0.0	0.2%	
WWTP Facilties Plan							4.5							4.5	0.0	0.2%	
Misc/Other							23							23	0.1	1.0%	
Safety Activities							1							1	0.0	0.0%	
Professional Societies							1							1	0.0	0.0%	
Collections Master Plan							1							1	0.0	0.0%	
Reservoir Operations					2				3	1				6	0.0	0.3%	
Routine Bac-T Samples					5				12	3				20	0.1	0.9%	
Special Bac-T Samples					1				1					2	0.0	0.1%	
Reg. Compliance Samp.									17					17	0.1	0.7%	
BFP - Clerical									2					2	0.0	0.1%	
Water Call Back										2				2	0.0	0.1%	
Total	**184**	**190**	**188.5**	**90**	**184**	**189**	**184**	**185**	**184**	**181**	**188**	**182**	**192**	**2322**	**12**	**100.0%**	

Water System	**511**	**2.6**	**22%**
Wastewater System	**1262**	**6.5**	**54%**
Paid Time Off	**195**	**1.0**	**8%**
Meetings & Training	**267**	**1.4**	**11%**
Admin. & Other	**104**	**0.5**	**4%**

Attachment 3

Phase 1 - 2007-2015

Newberg est. added man-days

6/22/07-3:45

	Man Hours					FTEs by Year									
		Note [1]	Note [2]	Note [3]										0.025	
		5.5	52	10		1	2	3	4	5	6	7	8		
	Op/day	Op/wk	Maint/wk	Wet w/wk Op	Wet w/wk Maint									FTEs	HRs
IPS and parallel discharge pipe	1.0	5.5	4.0	0.4	0.4	0.26								0.26	10.3
Influent metering			0.25			0.01								0.01	0.3
Headworks improvements	0.5	2.8	2.1	0.4	0.4	0.14								0.14	5.7
Headworks odor control first phase	0.5	2.8	1.0						0.09					0.09	3.8
Septage receiving	0.8	4.4	2.0			0.16								0.16	6.4
Third oxidation ditch	0.5	3.0	1.0	1.0	0.2			0.13						0.13	5.2
Fourth oxidation ditch	0.5	3.0	1.0	1.0	0.2								0.13	0.13	5.2
Fourth secondary clarifier	0.5	2.8	1.5	1.0	0.2					0.15				0.15	5.4
Splitter structures	0.2	1.1	0.5							0.04				0.04	1.6
Disinfection	0.3	1.7	1.0	1.0	0.5	0.10								0.10	4.2
Dechlorination	0.3	1.7	1.0			0.07								0.07	2.7
Outfall	0.0	0.0	0.0			0.00								0.00	0.0
In-plant reuse water	0.5	2.8	1.0				0.09							0.09	3.8
Solids dewatering	1.5	8.3	3.0			0.28								0.28	11.3
Stormwater P.S.	0.1	0.6	0.1			0.02								0.02	0.7
Laboratory/Environmental	8.0	40.0				1.0								1.00	40.0
Hours-Op./Maint./Lab		**80.0**	**19.5**												
Training/Safety Meetings (6.7%)		5.4	1.3			0.17								0.17	6.7
Holiday/Sick/Vacation (12.8%)		10.2	2.5			0.32								0.32	12.7
	15.3	**85.4**	**23.2**	**4.8**	**1.9**	**2.52**	**0.09**	**0.13**	**0.09**	**0.19**	**0.00**	**0.00**	**0.13**	3.15	
Man-hours per year	2080														
						Hours	**FTEs**								
Year 1						5235.2	2.52								
Year 2						195.0	0.09								
Year 3						268.4	0.13								
Year 4						195.0	0.09								
Year 5						392.2	0.19								
Year 6						0.0	0.00								
Year 7						0.0	0.00								
Year 8						268.4	0.13								
Total-O&M/Lab						**6554.3**									
Total man-days/year-O&M/Lab							**3.15**								

Note [1]: Assume 5.5 day week

Note [2]: 52 wk/year

Note [3]: Assume 10 weeks - wet weather

Attachment 4

Phase 2 - 2015-2025

Newberg est. added man-days

		Man Hours						
6/22/07-10:15			Note [1]	Note [2]	Note [3]			0.025
			5.5	52	10			
		Op/day	Op/wk	Maint/wk	Wet w/wk Op	Wet w/wk Maint	FTEs	HRs
	Headworks odor control Phase 2	0.2	1.1	1.0			0.05	2.1
	Fifth oxidation ditch	0.5	2.8	1.0	1.0	0.2	0.12	4.9
	Fifth secondary clarifier	0.5	2.8	1.5	1.0	0.2	0.14	5.4
	New ASP process	4.0	22.0	3.0			0.63	25.0
	Incr. maint. due to plant aging	8.0		40.0			1.00	40.0
	Laboratory/Environmental		8.0	40.0			1.00	40.0
	Hours-Op./Maint./Lab	**13.2**	**36.6**	**86.5**	**2.0**	**0.4**	**2.94**	**77.48**
	Training/Safety Meetings (6.7%)		**2.5**	**5.8**			0.21	8.2
	Holiday/Sick/Vacation (12.8%)		**4.7**	**11.1**			0.39	15.8
	Totals		**43.7**	**103.4**			**3.5**	**101.5**
	One man year total hours	2080						
							Hours	**FTEs**
							7357.4	3.54
	Total-O&M/Lab						**7357.4**	
	Total man-days/year-O&M/Lab							**3.54**

Note [1] Assume 5.5 day week

Note [2] 52 wk/year

Note [3] Assume 10 weeks - wet weather

Attachment 5

Phase 3 - 2025-2040

Newberg est. added man-days

6/22/07-3:40

	Man Hours							
		Note [1]	Note [2]	Note [3]				0.025
		5.5	52	10				
	Op/day	Op/wk	Maint/wk	Wet w/wk Op	Wet w/wk Maint	FTEs	HRs	
IPS pump replacement	0.2	1.1	1.0	0.5	0.5	0.08	3.1	
Fourth headworks screen	0.2	1.1	1.0	1.0	0.5	0.09	3.6	
Sixth oxidation ditch	0.5	2.8	1.0	1.0	0.2	0.12	4.9	
Sixth and seventh sec. clarifiers	0.7	3.9	1.5	1.0	0.2	0.16	6.5	
New UV disinfection process	0.8	4.4	3.0			0.19	7.4	
Reuse expansion & storage	0.5	2.8	3.0			0.14	5.8	
Incr. utility labor needs	8.0		40.0			1.00	40.0	
Laboratory/Environmental	8.0	40.0				1.00	40.0	
Hours-Op./Maint./Lab	**18.9**	**56.0**	**49.5**	**3.0**	**0.9**	**2.78**	**111.33**	
Training/Safety Meetings (6.7%)		**3.7**	**3.3**			0.18	7.1	
Holiday/Sick/Vacation (12.8%)		**7.2**	**6.3**			0.34	13.5	
Totals		**66.9**	**59.2**			**3.3**	**131.9**	
One man year total hours	**2080**							
						Hours	**FTEs**	
						6858.7	3.30	
Total-O&M/Lab						**6858.7**		
Total man-days/year-O&M/Lab							**3.30**	

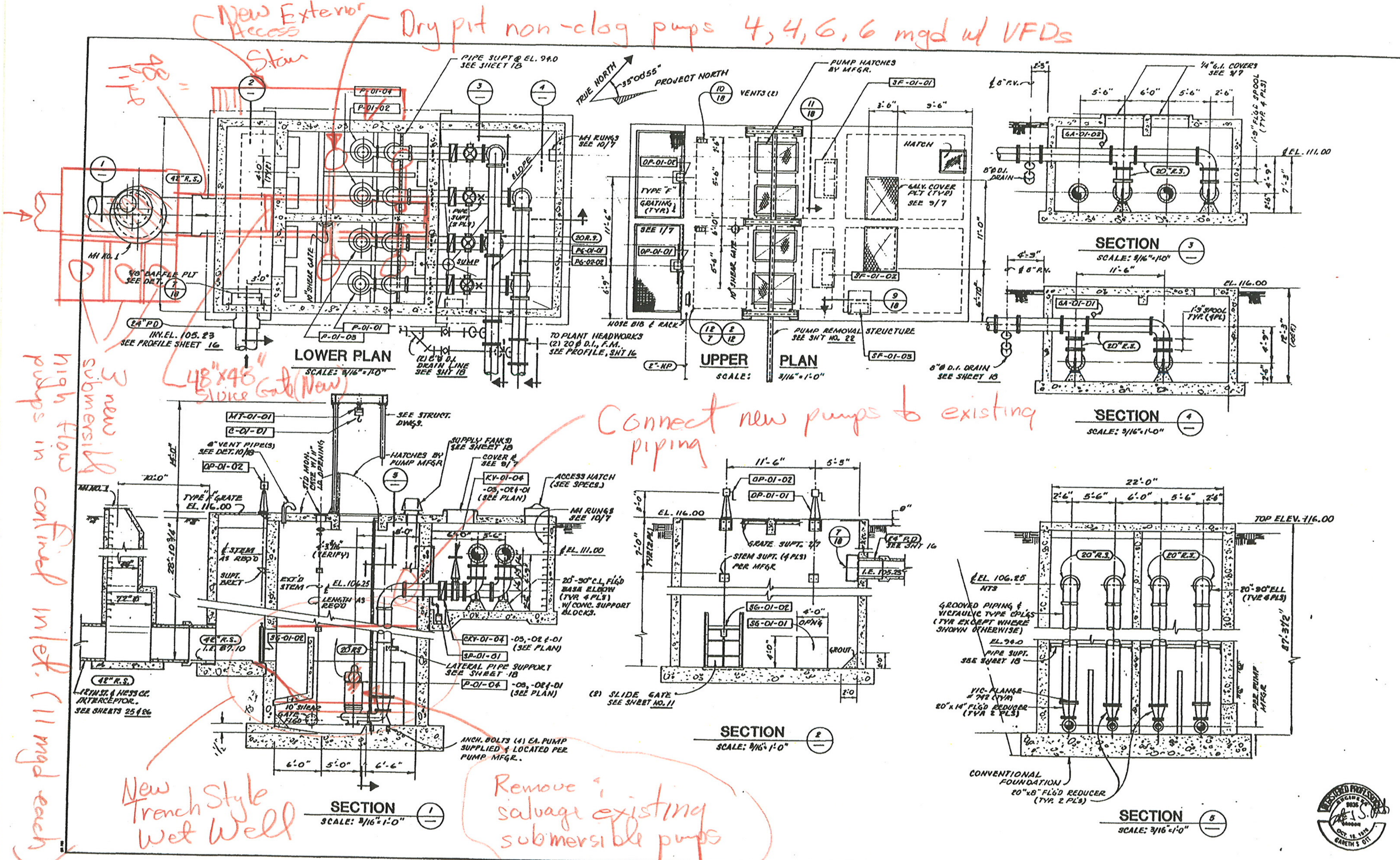
Note [1] Assume 6 day week

Note [2] 52 wk/year

Note [3] Assume 10 weeks - wet weather

APPENDIX G

IPS Sketches



KCM

Kramer, Chin & Mayo, Inc.
10 SW Ash Street
Portland, Oregon 97204

date	designed by J. G.
1/26/85	drawn by R.R.E.
scale	checked by
3/16" = 1'-0"	approved by

revisions

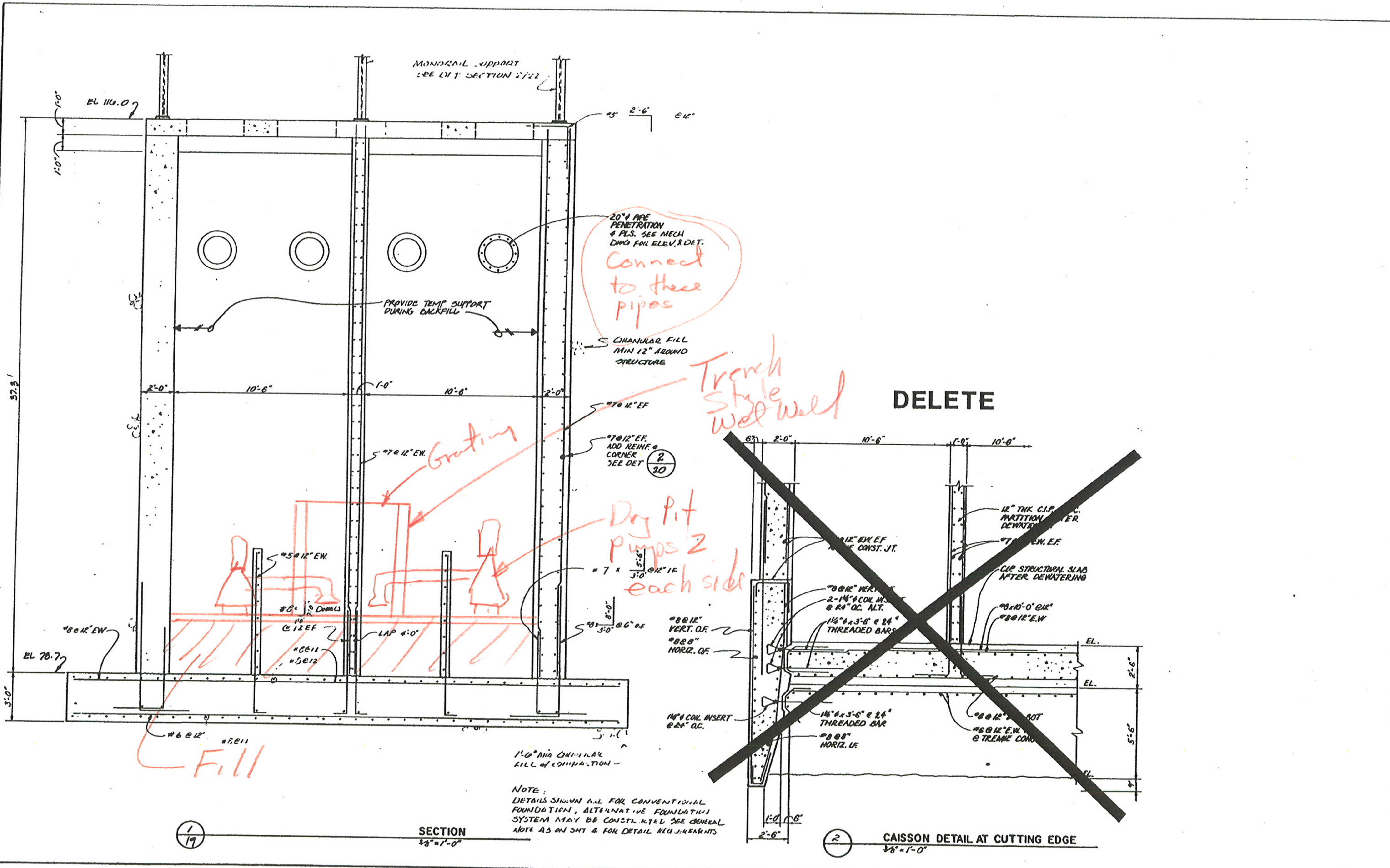
City of Newberg — Newberg Sewerage System Improvements

SCHEDULE "A" HESS CREEK INFLUENT WASTEWATER PUMPING STATION

PLAN & SECTIONS
INFLUENT PUMP STATION

drawing number A - 104
sheet number 17 of 43

This drawing is full size when 22" x 34" or is reduced to half size when 11" x 17"



KCM

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10 SW Ash Street
Portland, Oregon 97204-3589

date	designed by D.E.
1/26/85	drawn by D.M.
scale	checked by
SHOWN	approved by M.S.

revisions

City of Newberg — Newberg Sewerage System Improvements

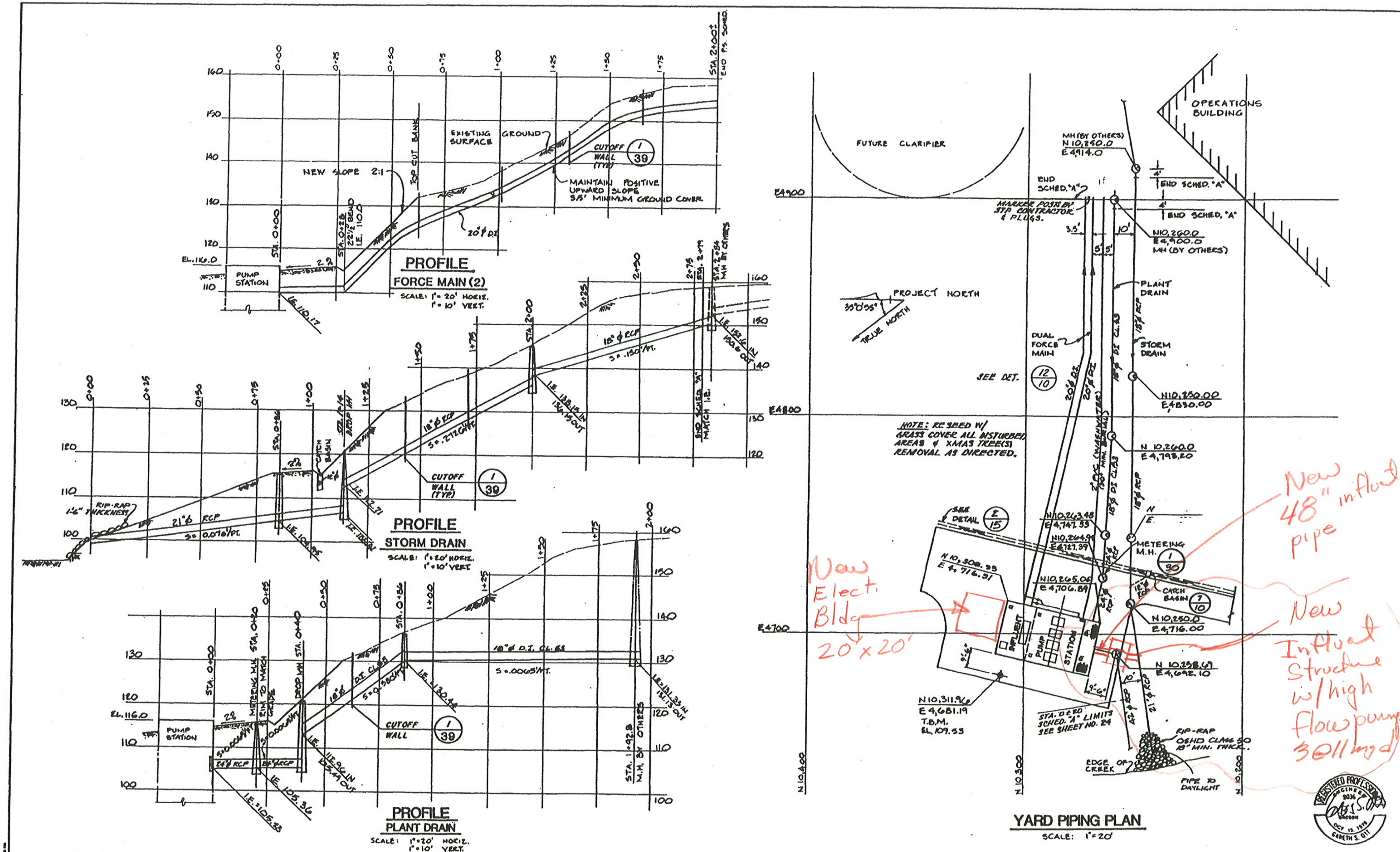
INFLUENT PUMP STATION

SECTIONS

drawing number A - 108

sheet number 21 of 43

This drawing is full size when 22" x 34" or is reduced to half size when 11" x 17"



KCM

Kramer, Chin & Mayo, Inc.
10 SW Ash Street
Portland, Oregon 97204

date	designed by
1/26/95	MDW
	drawn by MDW
scale NOTED	checked by
	approved by M.S.

revisions

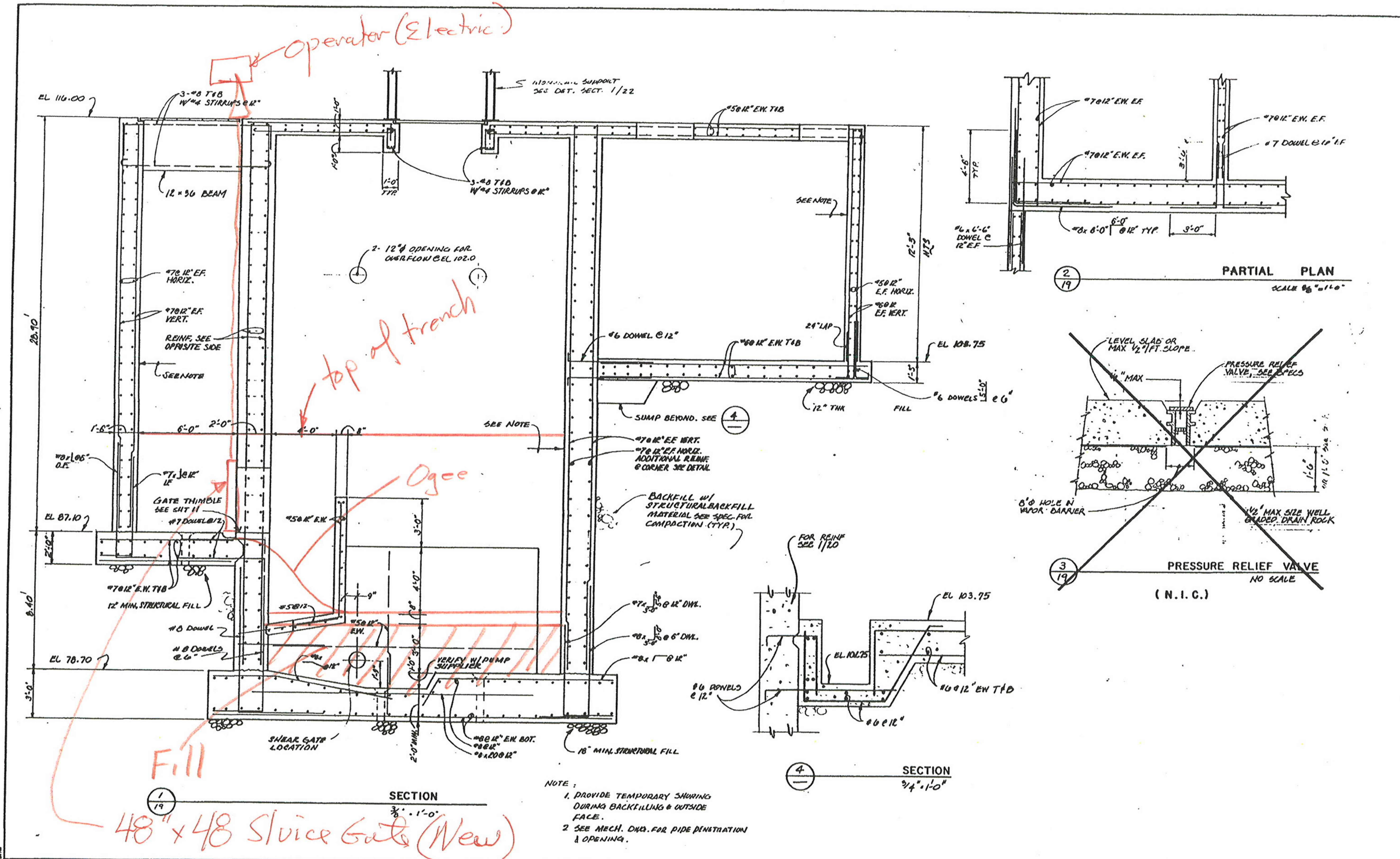
Newberg Sewerage System Improvements

SCHEDULE "A" HESS CREEK INFLUENT WASTEWATER PUMPING STATION

PUMP STATION YARD PIPING

drawing number A - 103

sheet number 16 of 43



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City of Newberg — Newberg Sewerage System Improvements

INFLUENT PUMP STATION

SECTIONS

drawing number A - 107

sheet number 20 of 43

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