PUBLIC WORKS DEPARTMENT
MEMORANDUM # 2010 - 64

DATE: November 18, 2010

TO: Honorable Mayor Joyce Downing and City Council Members

FROM: William A. Simmons, City Manager
David H. Willett, Director of Public Works

SUBJECT: Wastewater Utility Plan Update

BACKGROUND

On June 11, 2009, City Council approved CR- 67 that executed a Professional Service Agreement between the City of Northglenn and HDR Engineering, Inc. to update the Wastewater Treatment Plant Utility Plan (Utility Plan). City staff received the Utility Plan from HDR Engineering and has made a copy of the document which is available for review in the City Council Office. The Utility Plan is an essential document that incorporates all current information that directly impacts the wastewater treatment system. Northglenn staff will use the document for capital project planning as the Utility Plan will identify potential future discharge requirements and water usage projections. Utility Plans are typically updated every 5-10 years. The 2010 Wastewater Utility Plan Update builds upon the 2003 Wastewater Utility Plan.

Uniquely the Northglenn wastewater utility service area includes two separate geographical areas. The Southern Service Area (SSA) consists of the area within the corporate boundaries. The Northern Service Area (NSA) consists of Section 36 and adjacent land located in Weld County. This is an important factor in the Capital Improvement Program (CIP) as the primary growth occurs in the NSA, with potential full build-out by 2035. The current suggested CIP focuses on residential and commercial change within the SSA. Thus we suggest that the near term priorities be set on meeting water quality requirements and addressing operational efficiencies.

An Executive Summary from the Wastewater Utility Plan Update and the Wastewater Utility Plan Update Presentation are attached and will be used for the basis of discussion.

RECOMENDATION

Proposed Steps:

1. Staff will submit the Utility Plan to Denver Regional Council of Governments (DRCOG) and North Front Range Water Quality Planning Association (NFRWQPA) for planning jurisdiction review.
2. Staff will then submit the Utility Plan to Colorado Department of Public Health and Environment (CDPHE) for review.
3. Staff and HDR Engineering will address comments from the three organizations and make any necessary revisions for conditional approval of the Utility Plan.
4. Receive final approval from City Council of the Utility Plan.
5. Receive DRCOG, NFRWQPA and CDPHE final approval of the Utility Plan.

STAFF REFERENCE

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Attachments:

A. Wastewater Utility Plan Update Executive Summary
B. Wastewater Utility Plan Update Presentation

1.0 Executive Summary

1.1. Introduction

In 2009 the City of Northglenn undertook the task of updating the plan for the future of the City's wastewater collection and treatment facility. The goals of the planning effort were to define the conditions of the existing infrastructure, evaluate growth trends and estimate future impact, describe improvements necessary to meet discharge permit requirements, protect water resources, accommodate existing users and future growth, and develop a capital improvements plan and financial program that will ensure the goals of the utility are accomplished. This document builds upon and revises the information presented in the 2003 Wastewater Utility Plan (2003 Plan) included in Appendix A. As noted in the Table of Contents, some information required for review of this document did not change and is included in the original 2003 Plan. This executive summary briefly describes the chapter contents, conclusions and recommendations arising from this document.

1.2. Objectives and Purpose

The purpose of this chapter is to provide a summary of the key components contained in this Wastewater Utility Plan Update.

1.3. Basis of Planning

Determination of the demand on the wastewater collection and treatment system is dependent on land use, population density, the magnitude and type of commercial activity to be served, the condition of the existing system and regulatory requirements. The area studied in this document was established through meetings with City Staff and by examination of zoning, planning jurisdiction and environmental conditions. The Northglenn wastewater utility service area (WUSA) includes two separate geographical areas. The Southern Service Area (SSA) consists of the area within the Northglenn corporate boundaries and three Enclaves within the City of Thornton adjacent to the southern boundary of Northglenn. The Northern Service Area (NSA) consists of Section 36 and adjacent land located in Weld County east of the Northglenn WWTP.

Estimates of population were developed using three data sources; the NFRWQPA 2007 Water Quality Plan Update, the 2009 Northglenn Comprehensive Plan and the Denver Regional Council of Governments (DRCOG)'s Transportation Analysis Zone (TAZ) model results. The last large population increase occurred in the mid 90's with the addition of the Fox Run subdivision. The current (2007) population estimate within the city limits is approximately 35,827. It is expected the current economic slow down being experienced across the nation has also slowed growth rates within the City of Northglenn. Population growth trends have actually retreated in the last several years due to economic instability and aging residential properties. However, since redevelopment and densification in the SSA and development in the NSA is expected, population should increase until buildout (2035). Theoretical build-out of

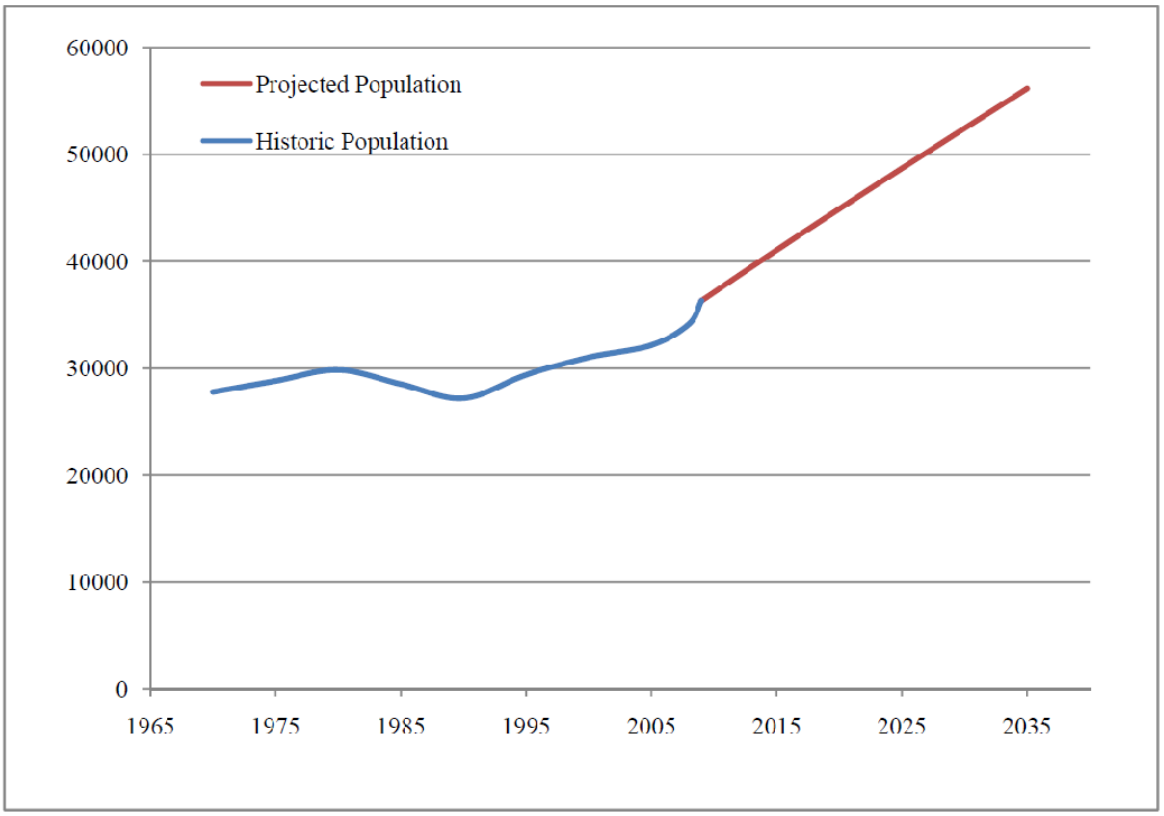
the study area was calculated and assumes that all developable land within the study area will be developed, giving a maximum density for the study area. Table 1-1 summarizes the current and predicted study area population.

Table 1-1: Northglenn Predicted Study Area Population-Unconstrained NSA

Year	Population	Added Population	Annual Percentage Growth	Employment
2010	36,304	-	-	11,529
2020	45,244	8,940	2.5%	17,757
2035	56,986	11,742	2.6%	25,754

Chart 1-1 below provides the total WUSA population and employment forecasts.

Chart 1-1: Study Area Projections within the WUSA with Unconstrained NSA



Source: Historical Population provided by the U.S. Census and DRCOG.
Note: The historic population is displayed as a running five year average.

To appropriately plan for necessary improvements to the wastewater collection and treatment systems and to adequately meet the demands of existing and future population, historical flow and loading data was first examined and unit loadings and peaking factors established. These factors were then used in conjunction with estimated population to arrive at projected flow and loading to the wastewater treatment plant. The per capita unit loadings are combined with population and peaking factors to generate projections of future loading

for the IGA unconstrained scenario. Table 1-2 summarizes existing and projected flow and loading.

Table 1-2: Unconstrained Scenario – Northglenn WWTP Existing and Projected Wastewater Loading

Criteria	Year 2010	Year 2020	Year 2035
Sewered Population	36,304	45,422	56,986
Average Daily Flow, MGD[1]	3.82	4.72	5.85
Peak Hour-Dry Weather Flow, MGD[2]	6.95	8.59	10.65
Peak Hour-Wet Weather Flow, MGD[3]	11.46	15.64	22.06
Influent BOD_5, lb/d	7,644	9,564	11,998
Influent TSS, lb/d	7,965	9,965	12,503
Influent Total Ammonia, lb/d	803	1,005	1,260

[1]Yearly average from 2008 flow data.
[2]Calculated from the average dry-weather flow multiplied by the established peak hour dry weather peaking factor (1.82).
[3]Calculated by adding the average dry-weather flow with peak hour wet-weather flow using I&I factor of 2,389 gpd/acre multiplied by the sewered area.

1.4. Discharge Permit Limits

Prior to selecting and sizing wastewater treatment facilities, a thorough understanding of current and future regulatory drivers is required. Chief among the potential permitting requirements is the 2006 draft PEL #200171, which set updated effluent discharge standards for Big Dry Creek (the PEL also set updated standards for the Thompson Ditch and Bull Canal discharges as well). Another significant action with implications for the Northglenn discharge is the recent reassessment of the South Platte River as a potential water supply. These permit issues govern effluent quality and have implications for the wastewater management choices available to the City.

Effluent from the Northglenn WWTP is discharged to a number of locations including Bull Reservoir, Bull Canal via Bull Reservoir, Thompson Ditch, and Big Dry Creek. The City of Northglenn WWTP discharge permit provides the same discharge limits for each outfall. Presently, the City discharges all effluent to Bull Canal, however in the future, discharge to Big Dry Creek is preferred. Flow in Big Dry Creek is dominated by irrigation diversions, storm water flows, reuse water, and wastewater effluent discharges and is designated as Use Protected, Warm Water Aquatic Life 2, Class P Recreation, Agriculture. Based on Preliminary Effluent Limits (PEL-200171) developed by CDPHE, the site specific in-stream water quality standards for this stretch of river are provided in Table 1-3.

Table 1-3. Water Quality Standards for Stream Segment COSPBD01 Based on PEL-200171

Parameter	Value	Units
Physical and Biological		
Dissolved Oxygen (DO)	5	mg/L
pH	6.5-9	s.u.
Fecal Coliform	325	Colonies/100mL
E. Coli	205	Colonies/100mL
Inorganic		
Un-Ionized Ammonia – Acute	TVS	
Un-Ionized Ammonia – Chronic	0.1	mg/L
Chlorine – Acute	0.019	mg/L
Chlorine – Chronic	0.011	mg/L
Free Cyanide – Acute	0.005	mg/L
Sulfide – Chronic	0.0002	mg/L
Boron – Chronic	0.75	mg/L
Nitrite	4.5	mg/L
Chloride – Chronic	250	mg/L
Sulfate – Chronic	Water Standard	mg/L
Metals		
Total Recoverable Arsenic – Acute	100	µg /L
Dissolved Beryllium - Chronic	100	µg /L
Dissolved Cadmium – Acute/Chronic	14.7/5.2	µg /L
Dissolved Trivalent Chromium – Acute/Chronic	1,451/189	µg /L
Dissolved Hexavalent Chromium – Acute/Chronic	16/11	µg /L
Dissolved Copper – Acute/Chronic	39.4/23.7	µg /L
Total Recoverable Iron – Chronic	1,000	µg /L
Dissolved Lead – Acute/Chronic	218/8.5	µg /L
Dissolved Manganese – Acute/Chronic	4,366/2,412	µg /L
Total Mercury – Chronic	0.01	µg /L
Dissolved Nickel – Acute/Chronic	1,229/136	µg /L
Dissolved Selenium – Acute/Chronic	19.1 (Nov 1 to March 31)/ 7.4 (Apr 1 to Oct 31), 15 (other periods)	µg /L
Dissolved Silver – Acute/Chronic	14.4/2.3	µg /L
Dissolved Zinc – Acute/Chronic	308/308	µg /L

Based on limits discussed in PEL-200171 and conversations with CDPHE permitting staff, the future effluent requirements are expected to include a limit on nitrate or total nitrogen. The following water quality targets will be used for the 5 to 10 year planning window:

Biochemical Oxygen Demand (BOD5)	30 mg/L
Total Suspended Solids (TSS)	30 mg/L
Ammonia Nitrogen	4 mg/L
Total Inorganic Nitrogen (TIN)	10 mg/L
Total Phosphorus	1 mg/L

1.5. Existing Wastewater Treatment & Conveyance

The City Northglenn's existing wastewater facilities include a sanitary sewer system, nine lift stations and a wastewater treatment plant. The demand on these wastewater facilities will continue to expand in the future.

Northglenn's existing wastewater collection system in the south service area consists of approximately 112 miles of pipeline and nine active pump stations. The collection system is divided into several service zones by the local terrain and physical barriers such as arterial roads and Interstate Highway 25 (I-25). I-25 divides the wastewater collection system into two major zones. Most of the flow from the area west of the I-25 corridor flows under the highway through an 18-inch diameter interceptor located just north of 105th Avenue. A small area south of 120th Avenue and west of I-25 is pumped under the highway through a 6-IN diameter force main. Almost all of the wastewater ultimately flows into Pump Station A located on Irma Drive at 105th Place. The remainder of the wastewater flows to the Bunker Hill Lift Station. From Pump Station A and the Bunker Hill Lift Station, the wastewater is conveyed to the Northglenn WWTP through the 8.7 mile, 27-IN diameter Forcemain A.

Two lift stations are expected to be affected by the flow increases include Lift Station A and Bunker Hill Lift Station. The increased flows between existing and buildout conditions are mostly due to redevelopment and are relatively spread out with the exception of the Bunker Hill area. For these reasons, the increased flows are assumed to not cause significant future problems within the gravity infrastructure after the existing conditions problem improvements are completed. Based on available firm pumping capacity of each lift station and the projected future flows, Lift Station A and Bunker Hill Lift Station appear to provide adequate capacity to meet future conditions.

The City of Northglenn operates a wastewater treatment plant (WWTP) that treats domestic and commercial wastewater collected within the sewer service area. The WWTP is located approximately 9 miles to the north in Weld County within the Big Dry Creek basin. The Northglenn WWTP was originally planned as a regional facility to serve new developments in the area north of 100th Avenue and east of I-25. The Northglenn WWTP was originally built as a Treatment Lagoon system and later upgraded with a three train BNR treatment facility in 2006. Due to funding limitations at the time, no headworks were constructed. Without a headworks facility, raw influent must be sent to the Treatment Lagoons to continue to remove grit and debris.

The WWTP includes the following components:

- Influent splitter box.
- Two stage Treatment Lagoon system each with a volume of 11.6 MG.
- Three activated sludge treatment trains (anaerobic, anoxic, and aerobic zones) each with a volume of 1 MG.
- Two 65 FT round Secondary Clarifiers.
- UV disinfection system.
- Two 20 MG sludge storage and stabilization lagoons.

The capacity of the existing treatment plant was evaluated against current and predicted flow and loading conditions. Table 1-4 summarizes the capacity of each process unit.

Table 1-4: Northglenn WWTP Capacity Rating Evaluation Summary

Unit Process	Capacity Criteria	Rated Capacity Ave/Peak	Current Condition Ave/Peak[1]	Year 2020 Ave/Peak	Year 2035 Ave/Peak	Comment
Influent Pipeline	Hydraulic	20.6 MGD/ 20.6 MGD	3.82 MGD/ 6.06 MGD	4.72 MGD/ 15.64 MGD	5.85 MGD/ 22.06 MGD	Adequate capacity for future
Influent Flow Control Box	Hydraulic	11.3 MGD/ 20 MGD	3.82 MGD/ 6.06 MGD	4.72 MGD/ 15.64 MGD	5.85 MGD/ 22.06 MGD	Adequate capacity for future
Secondary Clarifiers	Solids Loading	4.0 MGD/ 8 MGD	3.82 MGD/ 6.06 MGD	4.72 MGD/ 15.64 MGD	5.85 MGD/ 22.06 MGD	Capacity limited currently if lagoons are taken out of service
Return Activated Sludge Pumping	Hydraulic	2 MGD/ 4 MGD	3.82 MGD/ 6.06 MGD	4.72 MGD/ 15.64 MGD	5.85 MGD/ 22.06 MGD	Capacity limited for a RAS rate of 100% influent flow
Secondary Scum Pumping	Hydraulic	180 gpm	96 gpm	121 gpm	150 gpm	Adequate capacity for future
Waste Activated Sludge	Solids	280 gpm	60 gpm	76 gpm	95 gpm	Adequate capacity for future
UV Disinfection Equipment and Channels	Hydraulic	4 MGD/ 10 MGD	3.82 MGD/ 6.06 MGD	4.72 MGD/ 15.64 MGD	5.85 MGD/ 22.06 MGD	An additional UV channel will have to be added in 2020 to meet future demands
Sludge Storage	Storage Time	365 days	242 days	190 days	153 days	Adequate capacity for future
Sludge Land Application	Land Required	143 acres	203 acres	259 acres	321 acres	Assuming crops will be harvested only once a year

[1] Assumes aerated lagoons continue to provide flow equalization.

Evaluation of alternatives to improve and expand the existing treatment plant to accommodate current and predicted flow and loading was performed. Changing water quality regulations may dictate improvements to treated wastewater effluent quality. These

regulations were taken into consideration when evaluating treatment alternatives. Alternatives were identified and evaluated through an interactive process involving City and consultant staff. Driving forces considered in the evaluation process included permit revisions, age and condition of existing facilities, service area and population growth, process improvement, and impact to neighboring properties. Table 1-5 summarizes the processes evaluated, the alternatives considered, and the alternatives selected for detailed analysis.

Table 1-5: Northglenn WWTP – Alternative Development Ideas and Initial Screening Results

Idea		Initial Screening Result
Headworks:		
Alternative H1	No Action – Operate activated sludge process without Headworks Facility	Retain for evaluation. Existing system.
Alternative H2	Construct new Headworks Facility with fine screening, grit removal, and odor control	Retain for evaluation.
Primary Treatment:		
Alternative P1	No Action - Operate activated sludge process making use of existing Treatment Lagoon System (no Primary Clarification)	Retain for evaluation. Compatible with existing solids handling system.
Alternative P2	Operate activated sludge without existing Treatment Lagoon System and no Primary Clarification	Retain for evaluation. Compatible with existing solids handling system.
Alternative P3	Construct new Primary Clarifiers	Fail. Too expensive.
Biological Process:		
Alternative B1	Convert existing Anoxic Zone No.2 to swing anoxic/aerobic, convert existing Anaerobic Zone to swing anaerobic/anoxic	Retain for evaluation.
Alternative B2	Construct third Secondary Clarifier	Retain for evaluation.
Alternative B3	Convert Aerobic Zone to IFAS	Retain for evaluation.
Alternative B4	Construct fourth BNR Treatment Basin	Retain for evaluation.
Alternative B5	Effluent Filtration	Retain for evaluation in case effluent limits get tighter or reclaimed water is desired.
Solids Handling:		
Alternative S1	No Action - Maintain Solids Stabilization and Storage Lagoon	Retain for evaluation. Existing system.
Alternative S2	Construct Sludge Thickening, Digestion, and Dewatering Systems	Fail. Too expensive
Biosolids Management:		

Idea		Initial Screening Result
Alternative BM1	No Action - Maintain liquid application to agricultural land east of WWTP	Retain for evaluation. Existing system.
Alternative BM2	Dewater and create Class A product	Retain for evaluation.
Alternative BM3	Landfill	Fail. Too expensive and does not promote use of valuable product.
Support Facilities:		
Alternative SF1	Installation of standby power	Retain for evaluation.
Alternative SF2	Construction of new administration/operations building	Retain for evaluation.
Alternative SF3	Additional support facilities -Non-potable water system -Paving	Retain for evaluation.

Detailed analysis of retained alternatives for the Headworks, Primary Treatment, Biological Process, Solids Handling, Biosolids Management, and Support Facilities was performed. Recommendations for short term Phase 1 treatment plant expansion and improvements included:

- Construction of a new Headworks Facility with fine screening, grit removal, and odor control.
- Decommissioning of the existing Treatment Lagoon System.
- Improvements to the BNR Treatment System by:
    - Converting Anoxic Zone No. 2 to a swing anoxic/aerobic.
    - Converting Anaerobic Zone to a swing anaerobic/anoxic.
    - Remove baffle curtains and replace with concrete partition walls.
    - Remove geothermal heat loop piping from bioreactor.
- Construct third secondary clarifier to provide redundancy and additional capacity.
- Installation of standby power.
- Improvements to non-potable water system.
- Pave access roads.
- Miscellaneous operations and maintenance improvements.
    - Replacement of lagoon blower with high efficiency turbo style.
    - Replacement of existing UV equipment.

For the future, the following improvements should be considered:

- When necessary, expand biological process capacity through addition of IFAS media to existing basins (increases capacity to approximately 5 MGD) or the construction of a fourth BNR Treatment Basin (increases capacity to approximately 6.7 MGD).
- Installation of effluent filtration if City is able to obtain agreements for reuse.

- Develop alternatives for biosolids disposal including dewatering and generation of Class A product.
- Evaluate laboratory and operations space requirements.

1.6. Odor Control

Encroaching development in the vicinity of the once remote, Northglenn WWTP has brought odor emissions from the facility to the forefront of concern. Odorous emissions and corrosion along the pipeline to the WWTP are also of primary concern to the City. Northglenn has actively taken measures to reduce odor emissions from the WWTP and along the pipeline to the plant. Taking a proactive approach to odor control, Northglenn performed an odor evaluation on their wastewater system in 2007 (Odor Evaluation Report – 2007) and a follow-up evaluation in 2008 (Follow-up Odor Testing Report – 2008). The 2007 Evaluation measured the average H_2S concentration at the WWTP influent splitter box to be 300 ppm.

Odors are caused by several compounds, including H_2S. The generation of other odorous compounds occurs under similar reductive environmental conditions as H_2S; mitigation of those conditions for H_2S will logically mitigate other compounds as well. There are several odor production control options that may be used effectively to reduce or eliminate odors. Odor control options are categorized as liquid phase treatment, air phase treatment and as modifications to system operations that may reduce odors generated.

Conditions at Northglenn WWTP and in the pipeline leading to the WWTP are ideal for the generation of and release of H_2S and other odorous emissions. As shown in the 2007 and 2008 Odor Evaluations, the ORP at Lift Station A, which is a measure of oxidation reduction, was measured to be approximately -150 mV. Wastewater is conveyed to the WWTP at a velocity of 1.5 FT/s for more than 5.5 of the total 6.3 hours spent in conveyance. The average detention time in the pipeline is approximately 6.3 hours. This long detention time further facilitates the production of H_2S and other reduced sulfur compounds. Additionally, wastewater is retained in the Treatment Lagoons for an average of 6 days. The lagoons have a very large surface area that facilitates stripping of volatile hydrogen sulfide from the water surface by the prevailing winds.

The single most beneficial alternative for the reduction of odors emitted from the Northglenn WWTP is taking the Treatment Lagoons out of service. As illustrated in the 2007 and 2008 Odor Evaluations, the influent lagoons account for more than 90 percent of total odor emissions from the plant. Once the Headworks Facility is constructed, the Lagoon Treatment System can be taken out of service. Odor control will be provided for the Headworks Facility through the use of a biotower or biofilter. The proposed odor control facility should be designed to treat emissions from the Influent Box, Headworks Facility, and grit chamber. Additionally, chemical addition at Lift Station A must be continued to protect the pipeline from corrosion.

1.7. Bull Reservoir Effluent Pumping

The existing Northglenn WWTP has infrastructure in place to discharge treated effluent to Big Dry Creek, Thompson Ditch, Bull Canal, or Bull Reservoir. It is hydraulically possible to discharge by gravity to Big Dry Creek or Thompson Ditch from the UV disinfection building;

however, due to inorganic solids in the effluent stream these discharge points have not been utilized. For current operations, effluent is pumped from the UV disinfection effluent channel to Bull Reservoir. Effluent can then be pumped from Bull Reservoir to canals which intersect with Bull Canal to the west and Big Dry Creek to the southeast. However, the existing pump station is not adequately meeting the needs of the City of Northglenn due to a lack of operational flexibility and high energy costs. The current energy cost to operate the effluent pumps with one pump continuously in operation and the second pump in operation a quarter of the time to meet peak daily flows is approximately $6,000 a month ($72,000 annually).

The existing pump station provides some operational flexibility, but it comes at a cost. To meet future effluent discharge requirements while decreasing operational costs the existing effluent pumping system should be upgraded. Adding a second stage to the existing pumps will increase the range of the pumps enabling them to operate at the higher TDH and lower flow ranges that are required when the Reservoir is low. The reduction in flow will also decrease energy consumption, by reducing the need to pump the effluent several times before it is released. This modification will also require replacing the existing motors that can operate at 150 hp @ 900 rpm to ensure that the motors will not see an overload condition at the new operating points. The existing VFDs may be able to be reused, however they where include in the estimated cost to provide a conservative estimate of the total capital costs of these modifications. Cost for this alternative is approximately $284,000.

1.8. Bull Reservoir pH Control

Effluent which is currently pumped and stored in Bull Reservoir contains nutrients such as nitrogen and phosphorus. The presence of these nutrients in combination with the sunny climate of Colorado provides prime conditions for the promotion of algae growth. As the algal blooms expand, they consume CO_2 increasing pH in Bull Reservoir. Without an adequate buffering capacity, due to low alkalinity in the WWTP's effluent, the pH levels rise above the permitted limit of 9 (s.u.).

To ensure the City of Northglenn can meet their permitted effluent pH, and fit into the immediate operations plan, the following alternatives provided the highest benefit: effluent blending and chemical dosing. These two alternatives will be highly effective at circumventing high pH effluent from being released. However, with the capital cost of the alternatives being the driving factor, the alternative recommended for implementation is the Sulfuric Acid dosing system.

1.9. Recommendations & Capital Improvement Plan

The City of Northglenn has limited resources to invest in wastewater infrastructure, making prioritization of capital improvement projects a necessity. Multiple criteria govern the prioritization of capital improvement projects. The following list highlights the criteria that dictate capital improvements priorities for wastewater treatment and conveyance:

- Permit Changes
- Surface Water Protection
- Protection of Public Health
- Collection and Treatment System Reliability

- Growth
- Coordination and Compatibility With Other Capital Programs
- Renewal and Replacement
- Regulatory Compliance

1.9.1 Conveyance

Based on projected future flow rates for the southern service area, the existing conveyance system appears to have adequate capacity. However, as with all collections system, ongoing maintenance is required to keep the system in good working condition. All the wastewater from the SSA is conveyed to the WWTP through Forcemain A. Currently, no redundancy for this forcemain is provided. The City should continue to evaluate the need for a redundant pipeline during each utility plan update.

For the NSA, construction of infrastructure in the future will be needed to meet long term growth predictions. Chapter 5 provides a preliminary layout of the main system, however, a detailed preliminary evaluation of the collection is required.

1.9.2 Treatment

Processes at the WWTP are in need of improvement due to operations limitations, upcoming effluent permit requirements, and predicted service area growth. It is recommended that improvement of the Northglenn WWTP be accomplished utilizing a phased approach. For the purposes of this study, two phases will be considered. Phase 1 includes improvements recommended to improve operations or are required to meet regulatory or permit requirements in the near future (next five years). Phase 1 improvements will be designed, for the most part, for a capacity and service life to 2020. This approach will allow the City to spread the cost of this work over a longer period of time, and ensure that the cost of new capacity is covered by tap fees. Phase 2 includes improvements recommended to expand capacity of processes and equipment beyond 2020. Phase 2 improvements are designed for a capacity to meet 2035 requirements.

Phase 1 recommendations include the following:

- Construction of a new Headworks Facility with fine screening, grit removal, and odor control.
- Decommissioning of the existing Treatment Lagoon System.
- Improvements to the BNR Treatment System by:
    - Converting Anoxic Zone No. 2 to a swing anoxic/aerobic.
    - Converting Anaerobic Zone to a swing anaerobic/anoxic.
    - Remove baffle curtains and replace with concrete partition walls.
    - Remove geothermal heat loop piping from bioreactor.
- Construct third secondary clarifier to provide required redundancy and additional capacity.
- Installation of standby power.
- Construct improvements to Bull Reservoir effluent pumping
- Construct permanent Bull Reservoir effluent pH control system.

- Increase capacity of non-potable water system.
- Pave required access roads.
- Miscellaneous operations and maintenance improvements.
    - Replacement of lagoon blower with high efficiency turbo style.
    - Replacement of existing UV equipment.

The total estimated cost of the recommended Phase 1 project is approximately $10,344,000.

Phase 2 recommendations include the following:

- Expand biological process capacity through addition of IFAS media to existing basins or construction of a fourth BNR Treatment Basin bringing the capacity of the WWTP to approximately 5 MGD (cost assumes construction of a fourth basin).
- Construct administration and operations building.
- Construct effluent filtration to meet future effluent phosphorus limits and create reclaimed water.
- Construct alternatives for biosolids disposal including dewatering and generation of Class A product.

The total estimated cost of the Phase 2 project is $12,761,000.

1.9.3 Summary

Table 1-6 summarizes the recommended capital improvements by year.

Table 1-6. Capital Improvements Summary

Project Description	Trigger	Estimated Cost[1]				
		FY 11-12	FY 12-13	FY 13-14	FY 14-15	Future
Phase 1 Improvements						
Standby Generator	Required now to ensure un-interrupted operation	Design/Const-$224,000				
Construct New Headworks Facility	Required prior to de-commissioning of Lagoons	Design-$734,000	Construction-$3,669,000			
Decommission Existing Lagoon Treatment System	Capacity above 4 MGD or permit requires removal of nitrate		Design-$220,000	Construction-$1,101,000		
Construct BNR Treatment System Improvements	Decommissioning of Lagoons		Design-$121,000	Construction-$603,000		
Construct Third Secondary Clarifier	Required now to provide for redundancy	Design-$346,000	Construction-$1,728,000			
Improve Non-Potable Water System	BNR Treatment System Improvements			Design/Const-$15,000		
Pave Access Roads[2]	Construction of Headworks	Design/Const-$200,000			Design/Const-$365,000	
Construct Bull Reservoir Effluent Pumping Improvements	O&M Need	Design/Const-$284,000				
Construct Bull Reservoir pH Control	O&M Need	Design/Const-$84,000				
Miscellaneous O&M Improvements-Blower Replacement	O&M Need	Design/Const-$150,000				
Miscellaneous O&M Improvements-UV Replacement	O&M Need		Design/Const-$500,000			
Total Project Costs by Year		**$2,022,000**	**$6,238,000**	**$1,719,000**	**$365,000**	
Total Phase 1 Improvements	**$10,344,000**					

Project Description	Trigger	Estimated Cost[1]				
		FY 11-12	FY 12-13	FY 13-14	FY 14-15	Future
Phase 2 Improvements						
Expand BNR Treatment System Capacity	Capacity above 80 percent					Design/Const-$3,371,000
Construct New Administration/Operations Building	Permit requires nitrogen and phosphorus removal					Design/Const-$1,704,000
Construct Effluent Filtration to Meet Effluent Phosphorus Limits	Permit requires phosphorus removal below 1 mg/L					Design/Const-$4,733,000
Construct Biosolids Dewatering and Class A Generation	Regulations require Class A biosolids					Design/Const-$2,953,000
Total Phase 2 Improvements			**$12,761,000**			
Total All Phases			**$23,105,000**			

[1] All costs are in 2009 dollars. Estimates should be escalated to the mid-point of construction for budgeting purposes. Costs include allowances for construction contingency, engineering, legal, and fiscal costs.
[2] A portion of the access roads will be paved during the construction of the headworks facility.

Wastewater Utility Plan Update

City Council Study Session

November 18, 2010

What is a Wastewater Utility Plan?

- A Wastewater Utility Plan (Utility Plan) is a water quality planning document required by the Colorado Department of Public Health and Environment (CDPHE).

Why is a Utility Plan required?

- The Colorado Department of Public Health and Environment (CDPHE) is given the authority from the Environmental Protection Agency (EPA) to enforce the federal environmental programs including the 1972 Clean Water Act.
- CDPHE developed Regulation No. 23 in compliance with the Clean Water Act which requires regional water quality management plans (Utility Plans).

Who reviews and approves the Utility Plan?

1. Northglenn City Council
2. Endorsement from Planning Agencies (Regulation 23)
   - Denver Regional Council Of Governments (DRCOG)
   - North Front Range Water Quality Planning Association (NFRWQA)
3. Colorado Department of Public Health and Environment (CDPHE)

When should a Utility Plan be updated?

- Regulation 23 requires periodic updates to the Utility Plan as priorities and planning for the facility change (every 5-10 years).
- The City's last Wastewater Utility Plan was completed in 2003 prior to the 2006 plant expansion.

What does the Utility Plan accomplish?

- Identifies existing facility capacity thresholds.
- Prioritizes capital improvement projects based on:
  - Regulatory requirements
  - Operational efficiencies
  - Capacity thresholds
- Establishes planning level cost estimates for the recommended improvements.
- Identifies potential funding sources.

What is the current Wastewater Treatment system?

- Lagoon System constructed in 1980
- 2006 expansion
  - BNR (Biological Nutrient Reactor)
  - Secondary Clarifiers
  - Ultra-violet disinfection
  - Components not constructed
    - Headworks
    - Primary clarifier
    - Digester and solids handling

How are the Capital Improvements identified and prioritized?

- Drivers
  1. Regulatory requirements
  2. Operational costs
  3. Capacity thresholds
- Capital Improvement Project Planning
  - Available funding
  - Phasing priority projects

What are the recommendations from the Utility Plan Update?

- Major priorities
  - Headworks
  - 3rd Secondary Clarifier
  - Decommissioning the lagoons
- Description of the priority projects
  - Why these projects are priorities
  - Probable costs of these projects

What are some of the potential funding sources?

- Capital Reserves
- User Rates/ Fees
- Grants
  - State and Tribal Assistance Grants (STAG)
- Low Interest Loans
  - Colorado Water Pollution Control Revolving Fund
- Bonds
  - Revenue
  - General obligation

What are the next steps?

- Staff will submit the Utility Plan to (NFRWQPA) and (DRCOG) for planning jurisdiction review.
- Staff will submit the Utility Plan to (CDPHE) for review.
- Staff and HDR Engineering will address comments and make any necessary revisions to finalize the Utility Plan for final approval from the three organizations.
- Receive conditional NFRWQPA, DRCOG, and CDPHE approval of the Utility Plan.
- City Council approval
- Final approval NFRWQPA, DRCOG, and CDPHE.

Summary

- The Utility Plan is a guidance document that provides recommendations for improvements to the facility and the recommendations can be modified as processes and priorities change.