May 22, 2020

Mr. Matt Mardesen
City Administrator
City of Nevada
1209 6th Street
Nevada, IA 50201

RE: **City of Nevada Wastewater Treatment facility Improvements**
DNR Project #2019-0233A
Subject: **Facilities Plan Review and Approval Letter**

Dear Mr. Mardesen:

The Iowa Department of Natural Resources (DNR) has reviewed the facilities plan for the City of Nevada wastewater treatment facility improvements and all subsequent correspondence for the above-referenced project. The department is in agreement with the project as currently proposed. The proposed facility plan and the concept are officially approved. The City of Nevada conducted an alternative analysis in accordance with the Iowa Anti-degradation Implementation Procedure (567 IAC 61.2(2)) and department approved the final report on October 23, 2019.

Project Background:
The City of Nevada, Iowa has proposed to replace their existing wastewater treatment system to accommodate industrial and population growth that will exceed the current design capacity. The existing wastewater treatment facility has two significant industrial wastewater contributors, Burke Corporation and Du Pont. The approved project has addressed the required nutrient reduction strategy. The approved project also included construction of a new outfall structure that discharges the treated effluent directly into West Indian Creek few miles downstream of the existing outfall.

The following is a brief summary of the approved facilities plan:

Facility Design Flows and Loads

Design Flows MGD			30 day max average lbs/day		Daily Max lbs/day	
ADW	1.64	MGD	BOD	6,692	BOD	12,130
AWW	3.02	MGD	TSS	4,300	TSS	7,987
MWW	6.13	MGD	TKN	869	TKN	1,491
PHWW	8.23	MGD				

The approved facilities plan is for the process of an activated sludge, three stage oxidation ditch, with enhanced biological phosphorus removal system. From the existing wastewater collection system a new raw influent lift station will pump water to the new preliminary treatment system at the new facility through a 30 inch interceptor sewer. The preliminary treatment system will have parshall flume for flow measurement and automatic composite sampler at the head-works building. The influent screening will have two mechanical fine screens followed by two vortex grit removal units with three grit pumps and with two grit washing and dewatering units.

The splitter box will guide wastewater flow from the primary treatment system to the two oxidation ditches, three stage- anaerobic, anoxic and aeration stages. From the oxidation ditches for settling and solids removal water will be transferred to three circular, center feed, and peripheral draw secondary clarifiers. The clarifiers will have six centrifugal return sludge pumps and two centrifugal waste sludge pumps.

Waste sludge will be transferred to two aerobic digesters which operates in series flow and will receive adequate aeration from three blowers. The digested, thickened sludge will be transferred to the sludge storage tank for final disposal.

The approved project also includes a UV disinfection system installed in a single open channel that has the capability to treat 8.5 mgd peak flow and an emergency stand-by diesel power generator. The UV system will have 65% minimum UV transmittance to meet the required 126 E.coli per 100 ml treated effluent. The UV system will have two banks and each with six modules and eight lamps per module thus bringing total number of 96 UV lamps and associated electrical control system.

The treated effluent will be discharged to West Indian Creek, designated as Class B(WW-2) A2, through a new outfall structure approximately three miles south of the existing outfall. The wasteload allocation calculated Water Quality Based Effluent discharge criteria for the approved project that has been included in the facilities plan.

On November 12, 2019 the IDNR Field Office in Des Moines, Iowa, conducted a preliminary site investigation for the above-referenced project. The site survey was done in accordance with the Sub rule 567 IAC Chapter 64.2(3) for the proposed wastewater treatment facilities improvements including the construction of the new plant at a new location in Story County, Iowa. The preliminary site approval was done by the department on November 27, 2019.

The City has opted to utilize State Revolving Loan Funds (SRF) for financing the proposed project. Therefore, an environmental review (ER) is necessary to assess the environmental impacts of the project in accordance with procedures in 40 CFR Part 6, and is required for all loan recipient s. A decision will be made by the department to determine if the project qualifies for a categorical exclusion (CX) or if a finding of no significant impact (FNSI) is required. Please contact Mike Sullivan, Environmental Review Staff, at 515-725-8304 or michael.sullivan@dnr.iowa.gov for questions about the ER status.

Our approval is limited to the treatment and disposal alternatives as described in the analysis under the approved flows and loads. Our approval does not constitute an agreement with the proposed treatment processes that will be further reviewed and evaluated. However, if the design conditions or selected alternatives are modified subsequent to this approval a new or revised alternatives analysis may be required.

You may proceed with the plans and specification preparation and submittal of associated construction permit application for our review to obtain the required construction permit for your project.

If you have any further questions, please feel free to call me at 515-725-8429 or email me at Suresh.Kumar@dnr.iowa.gov.

Sincerely,

Suresh Kumar, Environmental Engineer/Industrial Coordinator

C: Iowa DNR Field Office 5
City of Nevada Wastewater File 6856200101
Nevada SRF File # CS192094501
HR Green engineering, consultant

FACILITY PLAN

WWTF Improvements – FACILITY PLAN

City of Nevada, Iowa

August 2019

Prepared By:

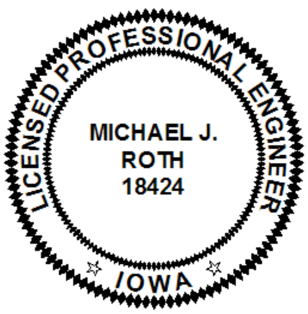
HRGreen

CERTIFICATION

PRELIMINARY ENGINEERNIG
FOR
WWTF Improvements – Facility Plan

CITY OF NEVADA, IOWA

August 2019



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

______________________________ Date:__________

MICHAEL J. ROTH, P.E.

License No. **18424**

My renewal date is **December 31**, **2020**

Pages or sheets covered by this seal:

Entire Document

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(1) Table 3-12, *Wastewater Engineering Treatment and Reuse,* Metcalf & Eddy, 4th Ed

1. EXECUTIVE SUMMARY

1.1. SCOPE AND BACKGROUND

This Facility Plan is required by the Iowa Department of Natural Resources (IDNR) as the official document to evaluate and recommend improvements to Nevada's wastewater treatment system infrastructure. The report projects the wastewater produced by the City's residential, commercial and industrial wastewater contributors and presents a wastewater treatment plan to meet the treatment needs and environmental protection for the 20 year planning period and beyond.

The City's Wastewater Treatment Facility (WWTF) has served the community for approximately 60 years. The WWTF has undergone many modifications over its lifetime in order to increase capacity to a continually growing population. Some of the facility's improvements include the addition of a peak flow clarifier in 1992, a mechanical screen and a vortex grit removal system that was installed in 1995, replacement of a primary clarifier in 2004, addition of a 960,000 gallon biosolids storage tank in 2004, and most recently a roughing filter upgrade in 2010. The roughing filter upgrade in 2010 was the basis for a capacity re-rating by the City of Nevada in 2013.

The 2013 facility plan and Antidegradation Analysis evaluated whether the City of Nevada would need further modifications in order to treat increased loadings from industry and population growth. The approved facility plan concluded no improvements were needed to the facility at that time with a re-rated capacity. The facility plan did conclude that disinfection would be required for the plant during the next permitting cycle; the solids treatment process was very close to capacity; and the facility would not meet future limits that will be implemented for Total Nitrogen and Total Phosphorous removal from Iowa's Nutrient Reduction Strategy. The facility's re-rated capacity was projected for a design year of 2027 based on population growth.

Since the approval of the 2013 Facility Plan, Significant Industrial User (SIU) Burke Corporation has recently informed the City of planned process expansions. These process expansions will produce loadings to the wastewater treatment facility that will exceed the re-rated WWTF organic loading capacity. Burke's expansion is expected to be completed and fully operational in 2021. In order to help expedite the implementation of a new waste water treatment facility the City of Nevada has already purchased a new site approximately three miles south of the current facility. Review of the current facility has shown a new facility is necessary for the following reasons:

- **Limited Space on Current Site.** In order to accommodate the increased loadings from Burke, major upgrades and additions will be needed at the existing facility. The current facility already has limited space available for expansion and new processes.
- **The Iowa Nutrient Strategy Applies.** In addition to capacity increases for Burke's expansion, the existing facility will eventually need major and costly modifications in order to meet more stringent effluent requirements for Total Nitrogen and Phosphorus Removal. A new facility will address these requirements simultaneously while addressing other requirements.

- **Encroachment on the Existing WWTF Site.** The current facility already resides within 1000 feet of multiple inhabitable residences. A new facility will relieve pressure and scrutiny of the current facility's location.
- **Disinfection Still Needed.** The existing facility's new discharge permit requires addition of effluent disinfection process to meet new permit limits. A new facility will address this need simultaneously while addressing other requirements.

1.2. EVALUATIONS

The Facility Plan was developed based on the requirements of the IDNR Design Standards. The existing loads and flows were reviewed and design flows and loads were established for the future residential projected population; non-Burke industrial loading limits; and the SIU Burke design loadings from their expansion.

A Waste Load Allocation (WLA) was developed for West Indian Creek as the proposed receiving stream adjacent to the new site. This new outfall will be downstream of the existing outfall that goes into an unnamed creek before discharging to West Indian Creek. The WLA limits along with the Iowa Nutrient Strategy goals were used to evaluate wastewater treatment technologies considered in this report.

Two interceptor sewer alternatives and two WWTF alternatives were evaluated in detail in this report. No evaluations of the existing collection system were included in this report. The City of Nevada is currently implementing improvements to the existing collection system to reduce I&I flows.

The interceptor sewer alternatives propose to either follow West Indian Creek with a gravity sewer before being pumped with a lift station to the headworks of the proposed WWTF or to use a force main to pump flow from the existing WWTF site to Country Road S14 and subsequently conveyed via a gravity interceptor sewer to the new site.

The main objective of the WWTF alternatives evaluation was to find an economical solution (capital and life-cycle costs) that best met the City's qualitative criteria of:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically Enhanced Biological Phosphorus Removal (EBPR)

The evaluations for preliminary, primary, secondary, solids treatment, solids processing, biosolids storage, and effluent disinfection treatment processes were focused during a conceptual design workshop with the City at the beginning of this planning effort. Since the Antidegradation Analysis found the less degrading alternative to be practical, reasonable, and economical, secondary treatment systems with nutrient removal capability were the only alternatives evaluated herein. Evaluated alternatives were Five-stage Bardenpho (P1) and Three-stage Oxidation Ditch (P2).

The same preliminary treatment and disinfection processes were used for both alternatives' (P1 and P2) overall cost development as these processes are not influenced by the secondary treatment system. Final design and equipment selections for preliminary treatment will be determined in final design. Several options were available for disinfection. Use of ultraviolet (UV) disinfection was ultimately chosen for both alternatives based on the City's preferences from the design workshop.

Primary treatment was eliminated from both alternatives due to the negative impact on secondary treatment to achieve EBPR. Neither alternative includes primary treatment.

Solids treatment is most influenced by the type(s) of sludge produced. Due to no primary treatment processes, only waste activated sludge (WAS) from the secondary treatment system was anticipated. This resulted in evaluation of aerobic digestion processes for solids treatment. Solids thickening processes were also evaluated in lieu of aerobic digestion and the City's continued preference for liquid biosolids disposal. Continued land application of biosolids was anticipated, influencing biosolids storage requirements for a minimum of 180 days of storage.

1.3. RECOMMENDATIONS

The recommended interceptor sewer between the existing and new WWTF sites is Alternative S2 which locates the lift station at the existing WWTF site; force main along US Highway 30 to the intersection of County Road S14; and gravity interceptor sewer along County Road S14 to the new WWTF site.

The recommended WWTF alternative is Alternative P2. Alternative P2 is recommended for the WWTF design because of the best relative ability for:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically EBPR

The opinion of probable construction cost for the recommended WWTF and interceptor sewer is **$41,741,100.00.**

2. INTRODUCTION

2.1. BACKGROUND

The City of Nevada's Wastewater Treatment Facility (WWTF) does not have sufficient capacity for planned industry expansion (Burke Corporation) and projected population growth within the design period. The existing WWTF configuration is readily amenable for the additional effluent disinfection and nutrient removal requirements currently required by the Iowa Department of Natural Resources (IDNR). Additionally, the facility is near the end of its life due to infrastructure age. The facility treats the residential, commercial and industrial wastewater flows that are collected and conveyed through the City's sanitary sewer collection system.

The City of Nevada purchased a123.5-acre parcel of farmland approximately three miles south of the existing Wastewater Treatment Facility along West Indian Creek. The new wastewater treatment plant will be located on this property.

The existing collection system consists of approximately 30 miles of sanitary sewer, 550 manholes, one lift station, and one equalization basin. The City's two permitted SIUs discharge to the City's collection system. The City continues to improve and rehabilitate the collection system and reduce wet weather flows received at the WWTF.

Due to the design capacity of the current WWTF (> 1.0 million gallons per day (mgd) AWW), the City is required as part of the Iowa Nutrient Reduction Strategy to evaluate the feasibility to reduce nutrients discharged from the WWTF. If the current facility were to remain in operation, the ability to provide nutrient reduction would require major upgrades to the WWTF. This Facility Plan includes an alternative treatment scenario for nutrient removal at the proposed WWTF to achieve effluent discharge levels of 10 mg/l Total Nitrogen (TN) and 1 mg/l Total Phosphorus (TP). A brief nutrient reduction feasibility analysis is included in **Appendix I**.

2.2. PURPOSE AND SCOPE

The purpose of the Facility Plan is two-fold: First, the City of Nevada will use it as a guide to planning and designing the new wastewater treatment facility to meet the City's wastewater treatment needs for industry expansion and population growth; second, the Facility Plan will be used by IDNR to review the proposed technologies with respect to discharge limits and wastewater design standards.

Due to an aggressive expansion plan/timeline by Burke Corporation, the replacement of the existing WWTF has an accelerated implementation schedule. The increased loadings will exceed the current WWTF capacity earlier than previously planned. Burke's expansion expected to be fully operational in 2021. The City hopes to begin construction on the new WWTF by July 2021. Burke is planning to transport "excess" pretreated wastewater above its permitted discharge capacity from its facility to the Ames WWTF until the new WWTF is operational. This will allow the current WWTF to operate at or below its design capacity after Burke's expansion is operational during the interim period.

This Facility Plan was developed to provide a reliable wastewater treatment system to meet projected NPDES discharge limits in the most cost effective manner. The Facility Plan was developed around a reliable and flexible secondary treatment system and the necessary preliminary treatment and solids processing systems to support plant operation. Due to high organic loadings from industry, it is possible to design a secondary treatment process that incorporates biological nutrient removal to meet Iowa Nutrient Reduction Strategy targets.

A sewer rate analysis was not part of this report's scope, though project construction cost estimates will help the City of Nevada to define future sewer rates and industry contribution to fund recommended improvements. Evaluation of the existing collection system was not part of this report's scope.

3. EXISTING CONDITIONS AND PROJECTIONS

3.1. PLANNING PERIOD

Per IDNR requirements, the planning period for this project with respect to design flows and loads is 20 years from completion of construction activities. Construction activities are anticipated to be completed by 2024; therefore, the design year is 2044. Per IDNR Design Standards, a 50-year design life for the interceptor sewer infrastructure is used.

3.2. LAND USE

Land use within the City of Nevada's corporate limits is a mix of residential, commercial, industrial, and civic (schools, parks, etc.) land use/zoning. Residential, commercial, industrial, and civic proportions are approximately 35-, 4-, 6-, and 20-percent of developed land, respectively. Road ROW within corporate limits accounts for approximately 33-percent. There is approximately 1,250 acres total of "undeveloped" land area within the corporate limits designated as "Agriculture and Open Space" and "Vacant Urban Land".

The main industrial corridors are in the northwest (along old Highway 30), west, and southwest (along U.S. Highway 30) areas of town. Commercial districts are found primarily in the "downtown" along 8th Street and south of U.S. Highway 30 along G Avenue.

Future residential development may occur south of the current corporate limits along Country Club Road. This area(s) would either tie into to the City's existing collection system or new interceptor sewer to the new WWTF.

3.3. DEMOGRAPHIC AND ECONOMIC DATA

The population serviced by the WWTF is assumed based on census information and projected population growth.

According to the U.S. Bureau of the Census, in 2010 the total population of Nevada was 6,798. Since 1920, Nevada has experienced an annual average population growth of 1.25%, with growth slowing from 2000 – 2010. In the 2013 Facility Plan submitted by HR Green, an average annual growth rate of 0.75% was determined to be a reasonable estimation of 20-year growth for design purposes. City staff have affirmed the validity of this assumption. Applying this growth rate will result in a 2044 population of 8,764 which is used as the reference population for flow and loading projections. Census population data for the past 100 years as well as projections to 2044 are shown in **Figure 3-1**, below.

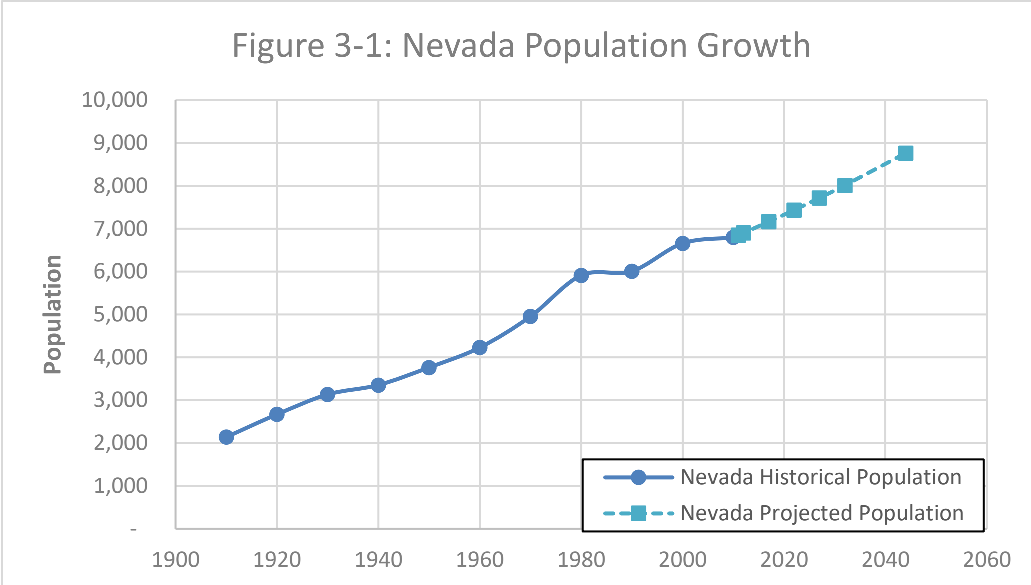

Figure 3-1: Nevada Population Growth

The Median Household Income (MHI) in Nevada, Iowa is estimated to be $61,876. This value was determined during the Antidegredation Analysis based on the 1999 census's MHI being $42,527 and the Consumer Price Index ratio from 1999 to 2019 being 1.455. In 2013 HR Green completed a sewer rate study for the City of Nevada with proposed increases in sewer rates through 2018. The City of Nevada has used this study to define rates. Currently the City has standard rates for basic monthly charges, quantity use charges, connection fees, and sewer construction fees. In addition to these standard fees, the City of Nevada has a treatment agreement with Significant Industrial User (SIU) Burke Corporation for pretreatment of its process wastewater to defined limits prior to discharge to the City's collection system with industry surcharge fees for cBOD, TSS, TKN, and Oil and Grease exceeding those defined limits. If Burke exceeds the loading agreements, additional penalty fees (surcharges) may be applied. Using 12-month service charges from March 2019 and prior, SIU Burke currently accounts for approximately 34-percent of all sewer charges. With no outstanding wastewater-related loans, the City of Nevada currently gains an annual net revenue of approximately $650,000 from sewer service charges. **Appendix B** provides the City of Nevada's existing ordinance for service charges. See **Section 5.7: Project Financing** for more information regarding future sewer rates and funding for the recommended alternatives.

4. EXISTING FACILITIES EVALUATION

4.1. EXISTING COLLECTION SYSTEM

The existing collection system consists of approximately 30 miles of sanitary sewer, 550 manholes, one lift station, and one equalization basin. The sanitary sewer piping ranges from 6- to 24-inch diameter of varying material types. All flow is directed to the wastewater treatment plant located on the south side of town at the north west corner of U.S. Highway 30 and West Indian Creek.

A map of the system is shown in **Figure 4-1**. The map also shows the location of Burke Corporation, as they are a beneficiary to this project.

The one existing lift station within the collection system is located near the Nevada high school/middle school complex (H Avenue and 15th Street.) This lift station serves the area around the high school/middle school complex.

The one equalization basin is located in the central area of town (southwest of E Avenue and 4th Street.) The basin is a concrete tank with a storage capacity of 1.0 million gallons. The basin is filled by gravity flow during wet weather events. Submersible pumps are used to return stored flow to the collection system after wet weather events. There are no flow measurement devices at the equalization basin.

The scope of this facility plan does not include an evaluation to the existing collection system. All existing flows and loadings contributed by the existing collection system can be found in **Section 4.4. Existing Wastewater Flows and Characteristics**. These historic flows will be used as the basis of design for the future facility's capacity.

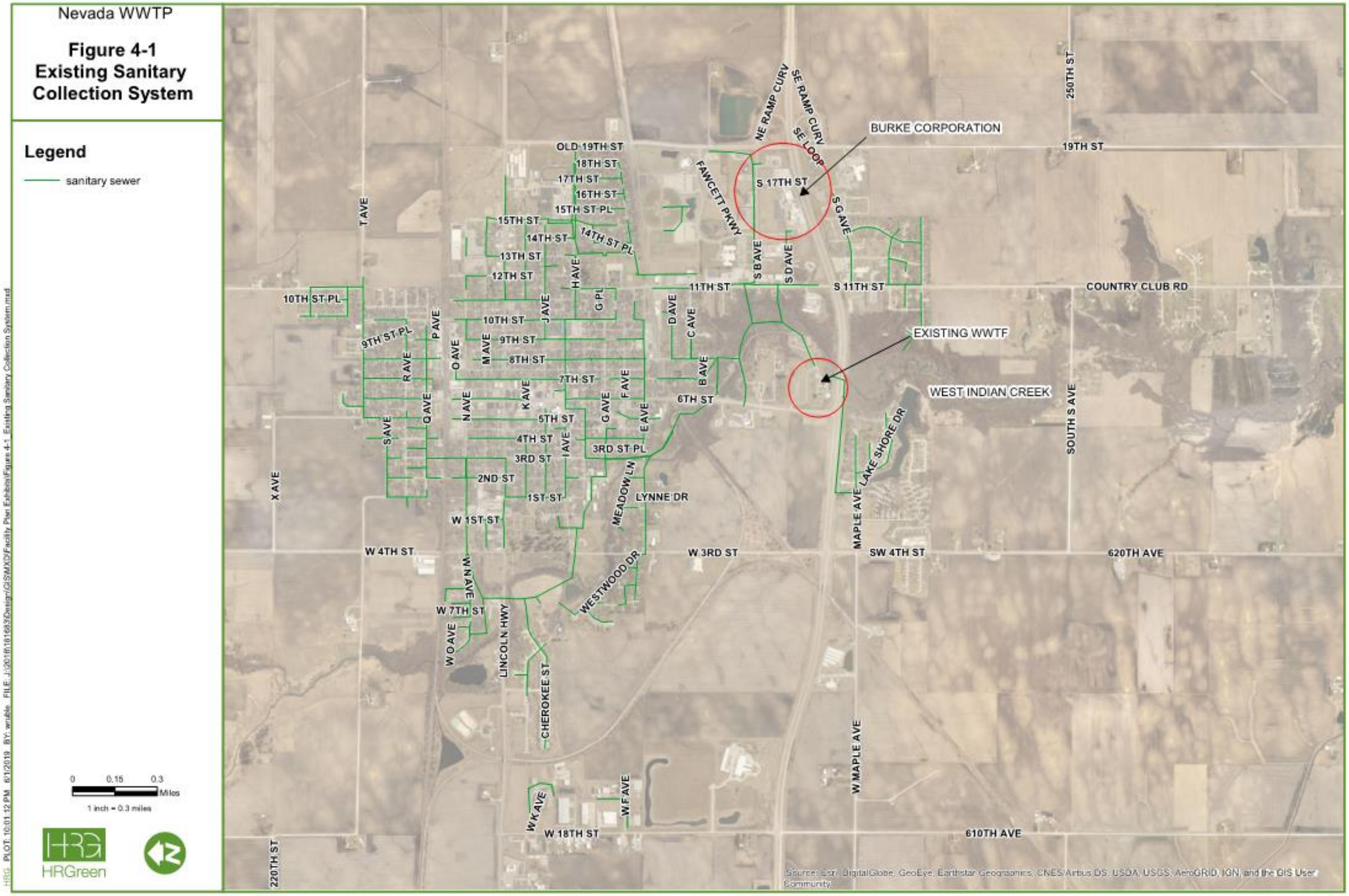

Figure 4-1: Existing Sanitary Collection System

4.2. EXISTING TREATMENT PLANT SITE

The City of Nevada WWTF's current site is located northeast of the US Highway 30 and 6th Street intersection. The WWTF site currently does not meet the IDNR 1000-foot site separation requirements between inhabitable structures and treatment processes. There is very little space for the WWTF to expand on the existing site and maintain the required 90% of existing separation distance.

The lowest portion of the treatment plant is located at approximately 950.00 feet above sea level in the southern part of the city near the West Branch of Indian Creek. According to Federal Emergency Management Association (FEMA), the National Flood Protection Insurance Program has established the 100-year flood elevation to be 948.00. **Figure 4-2** Below shows an aerial image of the existing site.

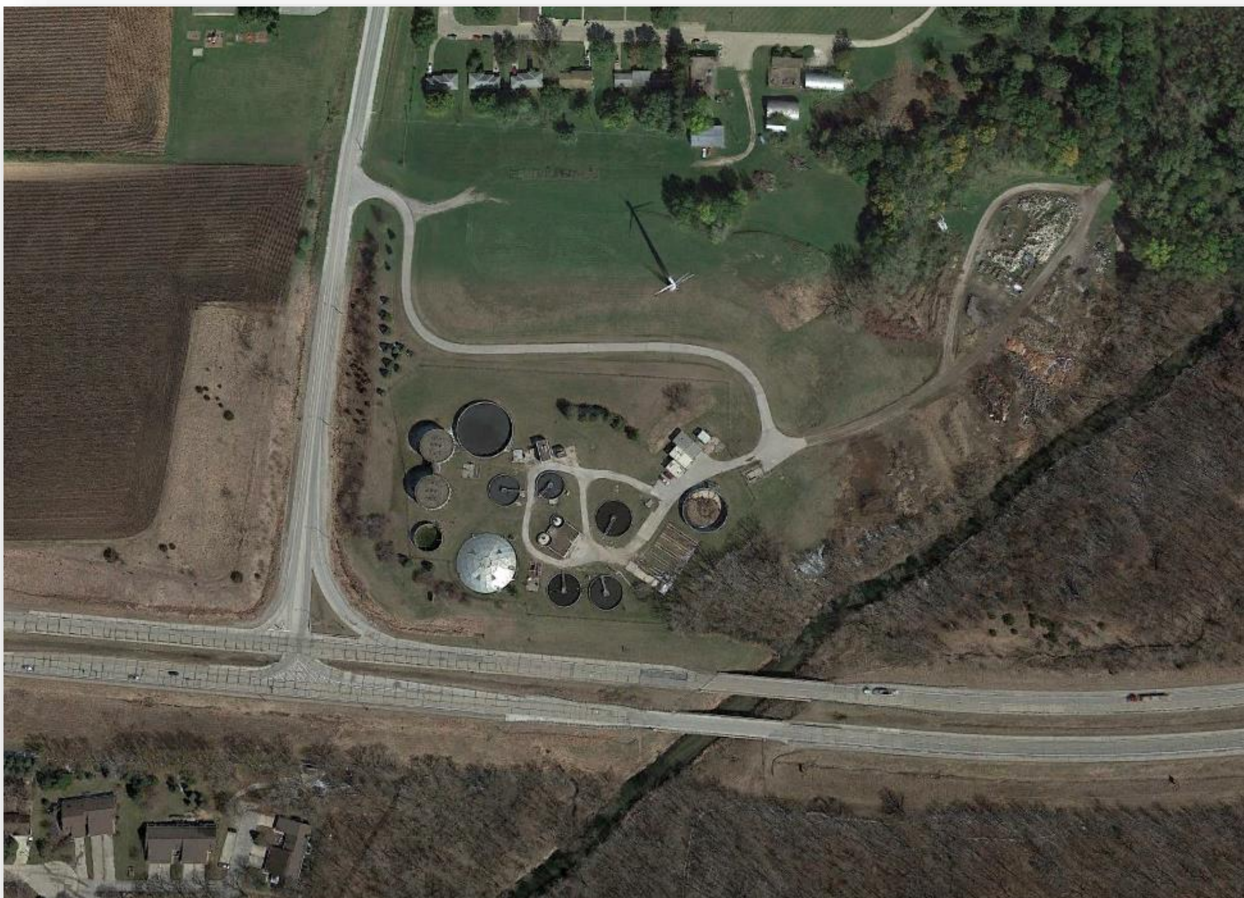

Figure 4-2: Exiting WWTF Site Plan

4.3. EXISTING TREATMENT FACILITIES

The City of Nevada, Iowa utilizes a fixed film treatment facility to treat the wastewater generated by the community. Preliminary treatment includes screening and grit removal. Primary treatment is provided by two primary clarifiers; one of which was replaced in 2004. Secondary treatment is completed by a two-stage trickling filter process with an intermediate clarifier, and two final clarifiers. The two stage trickling filter system consists of a roughing filer for removal of biochemical oxygen demand (BOD) and second-stage trickling filter towers for nitrification (removal of ammonia –N). The second-stage trickling filters have been converted to operate in series. Solids treatment includes two anaerobic digesters and two large liquid sludge storage tanks. The existing drying beds are not currently in use for sludge drying but are available for emergency use if needed.

In 2013 the City of Nevada requested a re-rate of the plant's capacity due to previous improvements from a roughing filter upgrade and the conversion of the second-stage trickling filters to operate in series. **Table 4-1** shows the current plant's permitted capacity.

Table 4-1: Existing Permitted Capacity

FLOWS (mgd)	Organic Loading (lbs/day)
ADW = 1.6580	BOD = 4,871
AWW = 3.7100	TKN = 1004.00
MWW = 6.2180	

4.3.1. Influent Pump Station

Collection system flows enter the plant and are pumped by the raw influent pumps (capacity of 3.75 mgd) to preliminary treatment. Flows in excess of this amount are pumped by the excess flow pumps (5.2 mgd) to the peak flow clarifier. All flows entering the Influent Pump Station are measured using a Parshall Flume; bypass flows are also measured with a Parshall flume. Peak flow pumping capacity of the plant is 8.95 mgd.

4.3.2. Flow Equalization

A peak flow clarifier was constructed in 1992. This clarifier is 80-feet in diameter and has a 13 feet sidewater depth (SWD). Volume of the clarifier is 490,000 gallons. Any flow in excess of the raw wastewater pumping capacity (3.75 mgd) overflows and is pumped to this clarifier. Wastewater is returned by gravity from the peak flow clarifier to the raw wastewater pumping station. If the clarifier fills completely, wastewater is able to overflow to the second-stage trickling filter wet well, where it is pumped up to the second-stage trickling filter towers for treatment, prior to being discharged. The second-stage towers would be operated in parallel under this condition.

4.3.3. Preliminary Treatment

Wastewater enters the raw wastewater pump station and is pumped to the Headworks Building for preliminary treatment. Preliminary treatment consists of a mechanical screen and a vortex grit removal system that was installed in 1995. The mechanical screen can be bypassed through a manually raked bar rack.

The mechanical screen has 5/8-inch openings and is sized to handle the current pumping capacity of 3.75 mgd. Grit removal consists of a forced vortex (Pista-Grit) grit system. Grit is pumped out and dewatered before final disposal. A 12-inch Parshall flume and ultrasonic transducer are used for influent flow measurement.

4.3.4. Primary Treatment

There are two primary clarifiers that receive an equal split of flows. Both are 50-feet in diameter with a 12-foot SWD. One is original and the other was constructed in 2004 to a replace a shallower clarifier. Additional work included splitter modifications to evenly divide the flow between the two clarifiers. The clarifiers are in good condition.

Table 4-2: Existing Clarifier Capacity

Primary Clarifiers	
Items	**Value**
Qty	2
Diameter, ft	50
Depth, ft	12
Area, sf, ea	1,963
Volume, gal, ea	176,256
AWW flow capacity per IDNR, mgd	3.92
Overflow Rate @3.75 mgd, gpd/sf	956

It is expected that the primary clarifiers remove 30% of incoming BOD and 65-70% of incoming TSS.

4.3.5. Secondary Treatment

Secondary treatment is a two-stage trickling filter process with intermediate and final clarifiers.

<u>Roughing Filter</u>
The roughing filter is designed to remove BOD. The roughing filter is 105 feet in diameter with a media depth of 8.25 feet. In 2010, the original rock media was replaced with higher specific surface area plastic media. Also in 2010, the underdrains, ventilation fan, and distributor arm were replaced. The roughing filter components are in good condition. These upgrades were the basis for a capacity re-rating requested by the City of Nevada in 2013.

Effluent BOD concentration from the roughing filter should be 20 milligrams per liter (mg/L) in order for the nitrifying towers to provide full capacity for ammonia removal. When BOD levels in the roughing filter effluent exceed 20 mg/L, the nitrifying towers must first remove this additional BOD, prior to ammonia removal taking place, which ultimately reduces the plant's ammonia capacity. The sizing of the roughing filter was reviewed with respect to the Germain and Schultz equation to give an organic loading capacity for the packed plastic media roughing filter. The evaluation was completed for winter (12 deg-C) and summer (20 deg-C) wastewater temperatures. A reduction of flows was also considered for the winter condition; however, this reduction has little effect on the capacity. The installation and capacity specifics are presented in the **Table 4-3** below.

Table 4-3: Roughing Filter Capacity

Items	Value
Qty	1
Diameter, ft	105
Depth, ft	8.25
Area, sf	8,659
Volume, cf	71,436
Media specific surface area, sf	2,143,106
Hydraulic Loading @ AWW, gpd/sf	391
Winter BOD Removal capacity, ppd	**4,270**
BOD Loading Rate, ppd/sf	493

The IDNR roughing filter hydraulic loading rate is 700-4,200 gpd/sf and organic loading rate is 100-500 ppd/1,000 sf. The winter condition with high BOD loading and low flow will control and should be used for design. Based on the primary clarifier BOD removal being 30%, the influent max day BOD capacity of the plant is 6,100 ppd.

Intermediate Clarifier

After the roughing filter, flow goes through the intermediate clarifier which is 60-feet in diameter and 10-feet deep. Intermediate clarifier capacity is given in **Table 4-4** below.

Table 4-4: Intermediate Clarifier Capacity

Items	Value
Qty	1
Diameter, ft	60
Depth, ft	10
Area, sf	2,830
Volume, gal	211,700
PHWW flow capacity per IDNR, MGD	4.25
Overflow Rate @ AWW, gpd/sf	1,195

The IDNR max overflow rate for intermediate clarifiers is 1,500 gpd/sf. The intermediate clarifier capacity is acceptable for flows through the plant. The clarifier's purpose is to remove any TSS that would be associated with the roughing filter sloughed solids.

Secondary Trickling Filters

Flow from the intermediate clarifier goes to a wet well to be pumped up through two second-stage trickling filter towers. The towers are each 60 feet in diameter with a 24-foot depth of plastic cross-flow media. The media has a specific surface area of 30 sf/cf. Each tower uses a two-arm distributor to apply the wastewater to the media. The trickling filter towers can be run in series or parallel mode. Current operation is in series for additional ammonia- nitrogen removal. Parallel operation would allow higher flows. The installation specifics are presented below in **Table 4-5**.

Table 4-5: Second Stage Trickling Filter Specifics

Items	Value
Qty	2
Diameter, ft	60
Depth, ft	24
Area, sf	2,830
Volume, cf, ea	67,600
Media specific surface area, sf, ea	2,028,000

The effluent flow from the intermediate clarifier is designed to target a maximum BOD of 20 mg/L. This allows the second-stage tricking filter system to remove ammonia-nitrogen at the greatest efficiency. However, as mentioned above, when BOD levels in the roughing filter effluent exceed 20 mg/L, the second-stage towers must first remove this additional BOD, prior to ammonia removal taking place, which lowers the ammonia removal capacity of the trickling filter towers.

The capacity of the second-stage trickling filters depends on the target effluent Ammonia-N and temperature. See **Table 4-6** below for design capacity.

Table 4-6: Second Stage Trickling Filter Capacity

Parameter	Summer[1] (Max Day) (6 mg/L)	Winter [2] (Max Day) (7 mg/L)	Summer [1] (Max Month) (1.0 mg/L)	Winter [2] (Max Month) (3.0 mg/L)
Ammonia-N, ppd	1,168	851	1,113	847
TKN, ppd [3]	1,946	1,418	1,854	1,412

(1) Summer wastewater temps = 20 deg-C.
(2) Winter wastewater temps = 12 deg-C.
(3) TKN was assumed to be 1.66 of Ammonia-N. This is based on typical domestic flows.

The controlling scenario for second-stage trickling filter capacity is during winter months with low flows and high loading. Assuming a 10% removal in the primary clarifier and roughing filter, the ammonia capacity is 941 ppd and TKN capacity is 1,569 ppd. This assumes adequate airflow can be provided to the second-stage trickling filters to remain at 75% of oxygen saturation in the wastewater.

Final Clarifiers

Following the trickling filter towers, flow continues to two final clarifiers. Both of the final clarifiers are 60 feet in diameter with a 10 foot SWD. The second clarifier was constructed in 2004 and replaced a shallow final clarifier. **Table 4-7** below shows final clarifier capacity. After final clarification, plant effluent flows by gravity to an isolated channel and beyond to the creek.

Table 4-7: Final Clarifier Capacity

Items	Value
Qty	2
Diameter, ft	60
Depth, ft	10
Area, sf, ea	2,830
Volume, gal, ea	211,700
PHWW flow capacity per IDNR, mgd	6.8
Overflow Rate @ AWW, gpd/sf	598

4.3.6. Solids Treatment

Solids from the primary, intermediate, and final clarifiers are pumped to two anaerobic digesters using air-operated diaphragm pumps. The digesters are 24 feet in diameter with a 26 feet SWD. The digesters are operated in the mesophilic temperature range to stabilize biosolids through the consumption of organic matter in the absence of oxygen. In 2008, the floating digester cover was replaced in-kind due to corrosion of the original covers and damage to piping in the tank due to a tipped cover. Additionally, the WWTF also operates a 200,000 gallon aerobic storage tank which provides additional solids treatment.

Originally, the anaerobic digesters operated in primary-secondary arrangement. Currently, they both are operated in parallel as primary anaerobic digesters since the 2004 addition of a large liquid sludge storage tank. This additional storage capacity was increased to match the overall solids digestion capacity of the WWTF as discussed below. The capacity of the solids treatment system is 5,520 dry pounds per day, which assumes a minimum 15-day solids retention time in the primary digesters, 60-days in the aerobic tank, and a solids concentration of 4.28-percent. Treatment was assumed in the aerobic storage tank with the aeration equipment installed.

4.3.7. Solids Storage and Digester Gas Equipment

Stabilized biosolids storage was expanded in 2004 with the addition of a 960,000 gallon storage tank. The tank is a cast-in-place, open top storage tank with pumped recirculation and jet nozzle system provided for mixing. The tank is 100 feet in diameter with a 16.5 foot SWD. The WWTF also uses an existing 200,000 gallon aerated storage tank. Total available storage is approximately 136 days at the projected solids digestion capacity of 5,520 dry pounds per day and a sludge concentration of 4.28-percent.

The current sludge drying beds at the plant are not in use for sludge drying at this time, but can be used in emergency situations.

The digester waste gas burner system and gas safety equipment were upgraded in approximately 2007. A new waste gas burner, piping, condensate traps and other digester gas safety equipment were installed. The WWTF currently burns all their biogas produced by the anaerobic digesters through the waste gas burner. The WWTF does not recover biogas for reuse at this time.

4.3.8. Disinfection

The existing facility does not currently operate any disinfection process. The City of Nevada planned on incorporating UV disinfection to the existing facility before knowledge of the proposed industry expansion and subsequent decision to construct a new treatment facility.

4.3.9. Existing Facilities Summary

In summary, the existing facility for the City of Nevada has had many upgrades and process changes over the past 20-plus years in order to increase the existing facility's capacity and efficiency. In 2013, the facility was able to request a rerated capacity from the Iowa DNR due to previous process improvements with the roughing filter upgrade and extend the expected life of the treatment plant to 2027 when projected loadings from population growth were expected to exceed the re-rated capacity. Due to recent expansion plans by Burke Corporation, the capacity of the treatment plant will be exceeded in 2021 instead of 2027. With the existing treatment plant already upgraded to maximize capacities there is little room on the site for additional capacity upgrades to account for the new loads. In addition, the existing WWTF will require major modifications in order to achieve targeted effluent TN and TP reduction as outlined in the Iowa Nutrient Reduction Strategy. Required disinfection upgrades will also be challenging and costly to incorporate into the existing WWTF layout.

Given the proposed new WWTF is located at a different site, the entire existing WWTF will be decommissioned. The potential exception is to repurpose the existing influent pump station as all existing influent sewers will still route flow to the existing WWTF site. There is a need to convey flows from the existing WWTF site to the beginning of the proposed gravity interceptor sewer to new WWTF site. Further evaluation is planned during detailed design phase to determine if this repurposing is practicable and economically efficient compared to construction of a new influent pump station at the existing WWTF site.

4.4. EXISTING WASTEWATER FLOWS AND CHARCTERISTICS

4.4.1. Hydraulic Loading

Table 4-8 is a summary of the total influent wastewater flows discharged to the WWTF for the period from October 2015 through October 2018. Per IDNR Design Standards, the Average Dry Weather (ADW), Average Wet Weather (AWW), and Maximum Wet Weather (MWW) flows identified. The average of the three years will be used as the basis for the existing ADW and AWW flows when determining the design ADW and AWW flows. The maximum of the MWW flows will be used as the basis for the existing MWW when determining the design MWW flows.

Table 4-8: Influent Total Flows Summary

	2015–2016	2016–2017	2017–2018	Average	Current NPDES Permit Limit
ADW, mgd	1.164	0.963	0.862	0.996	1.658
AWW, mgd	2.389(1)	1.973	2.785	2.382	3.710
MWW, mgd	4.776(1)	3.720	5.219	4.572	6.218

(1) Flow meter was submerged on 12/14/15. Data point excluded.

Historical flows and current WWTF NPDES permit limits are plotted in **Figure 4-3** (12/14/15 data point excluded). Industrial flow is the combined daily total of the City's two permitted SIUs (Du Pont and Burke Corporation.)

Precipitation data for Nevada, Iowa from the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service databases and is also shown in Figure 3-2 to determine correlation of influent flow peaks. Figure 3-2 shows that Nevada's sanitary collection system is subject to significant inflow and infiltration (I&I) loading as the major peaks in influent flow to the WWTF are highly correlated with heavy precipitation events.

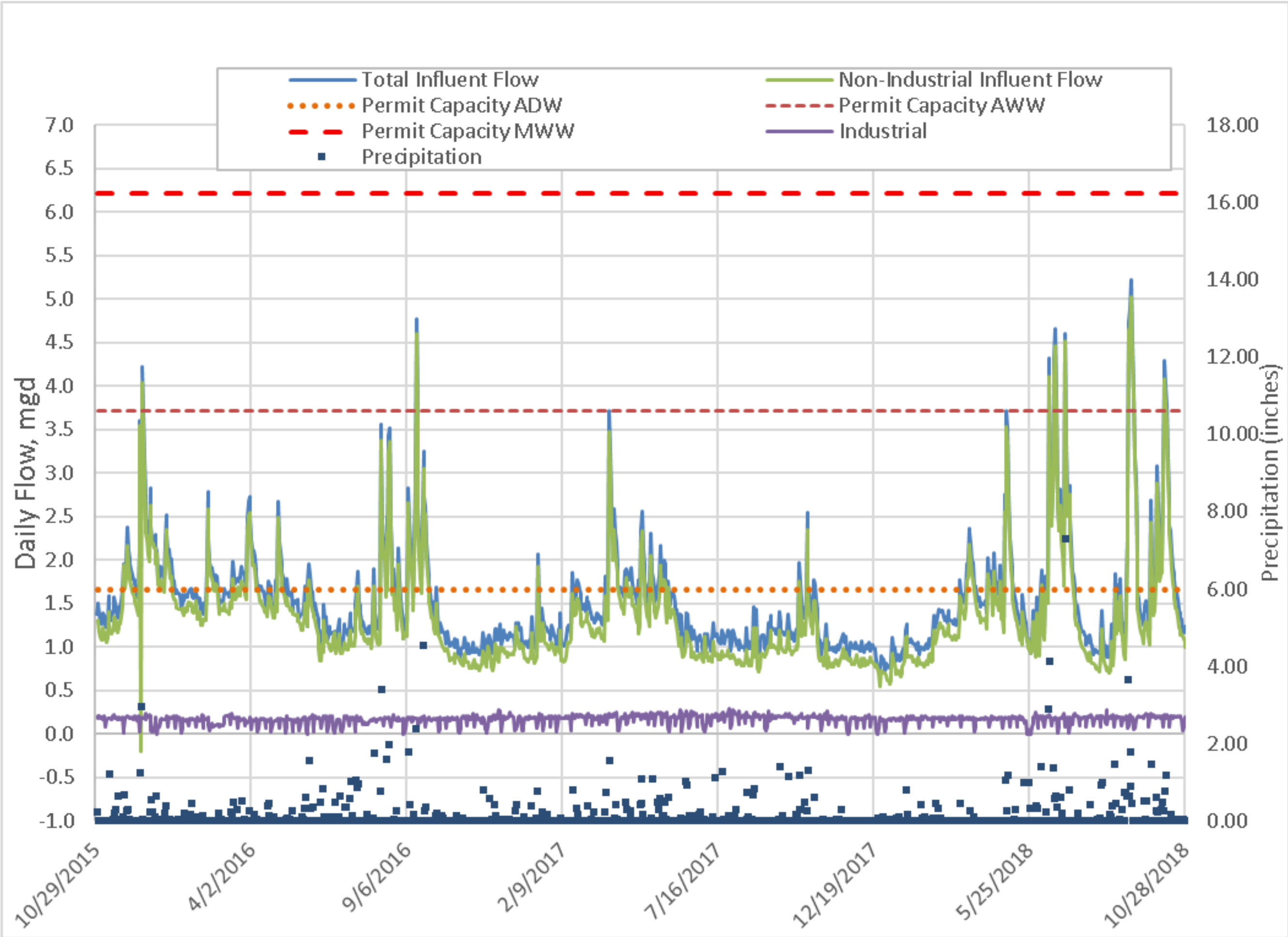

Figure 4-3: Historical Flows (2015-2018) – Nevada, IA

4.4.2. Organic Loading

Historic Influent organic loadings into the City's WWTF are derived from domestic, commercial, and the two SIU's (Burke and Du Pont). The Du Pont facility was recently purchased by Verbio and after the period of data review. Verbio has not gone into operation since acquiring the Du Pont facility. Historical data references Du Pont instead of Verbio for clarity.

Historical per capita loadings for the non-industrial component of influent loading was calculated by subtracting the historical total industrial maximum 30-day average load (SIU-1 maximum 30-day average + SIU-2 maximum 30-day average) from the historical total influent maximum 30-day average load, divided by the most recent (2010) census population estimate for Nevada. Equation 1 is the generic equation for the per capita non-industrial load calculation.

$$Non-Industrial\ Load, lb/cap \cdot d = \frac{(Total\ Infl\ Load)-(SIU-1\ Infl\ Load+SIU-2\ Infl\ Load), lb/d}{2010\ population} \quad \text{(Eqn 1)}$$

For several of the organic loading constituents, loadings from Burke exceeded the total influent load to the WWTF. Loading from any input to the WWTF should not exceed the total influent load measured at the WWTF. Reasons for these inconsistencies where Burke's loadings exceeded the WWTF loadings could be:

1. WWTF sample not collected on the same day as the SIU sample (e.g. WWTF samples on Monday and Wednesday; SIU sample on Tuesday)
2. Delay of SIU loading reaching the WWTF due to collection system residence time
3. Unrepresentative sample event/sampling error

In an effort to eliminate these anomalies, an outlier analysis was performed on Burke's historical data. Data points found to be outside of 1.5 times the interquartile range (middle 2 parts of the data distribution, Q1-Q3) were eliminated from the data set and analysis.

<u>Biochemical Oxygen Demand & Carbonaceous Biological Oxygen Demand</u>
Total influent Carbonaceous Biochemical Oxygen Demand (cBOD) data was reviewed from October 2015-October 2016. Total influent Biological Oxygen Demand (BOD) was reviewed from November 2016-October 2018. Due to the City's renewed NPDES permit in 2016, influent WWTF constituent measurement was changed from cBOD to BOD per IDNR requirements. Burke Corporation provided both cBOD and BOD data for the entire period. Du Pont's historical BOD data is from November 2016 to October 2018. Du Pont historically discharged only a fraction of the allowable loading to the WWTF. It is assumed that the new Verbio facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Figures 4-4 and 4-5 below show the trends of the 30-day average loading for BOD and cBOD, respectively. The trends indicate that Du Pont's loadings have a negligible effect on the overall loading of BOD observed at the WWTF.

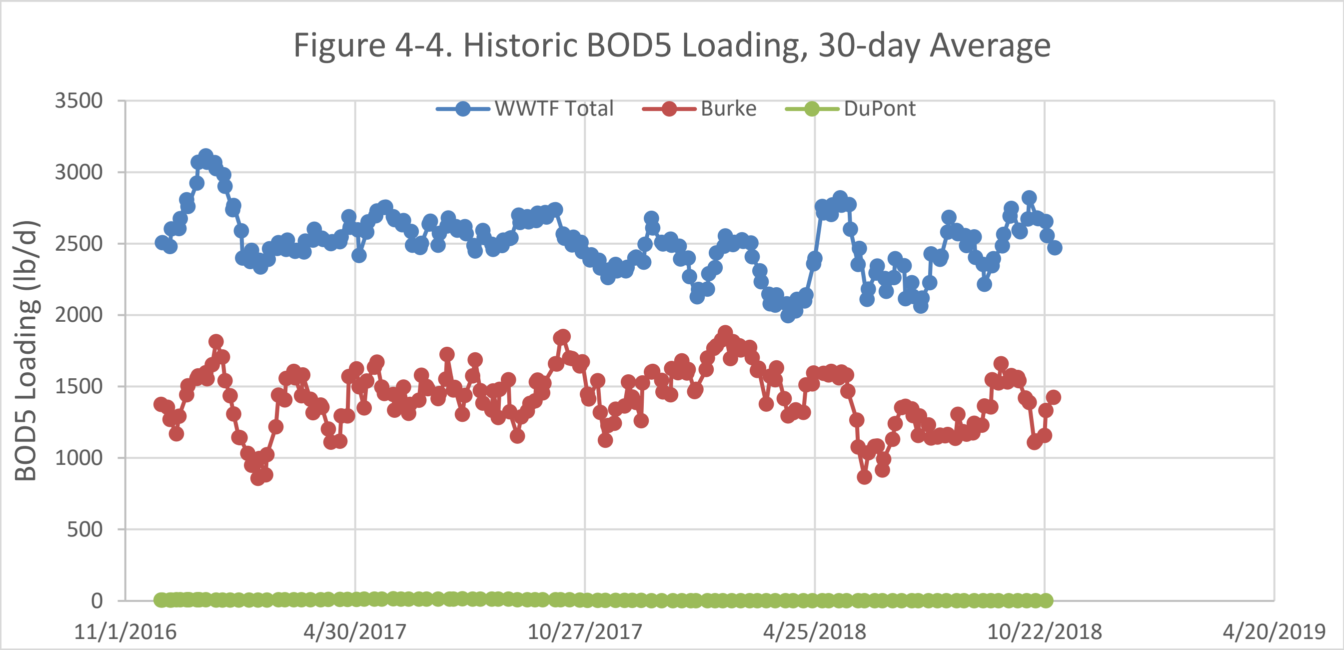

Figure 4-4: Historic BOD5 Loading, 30-day Average

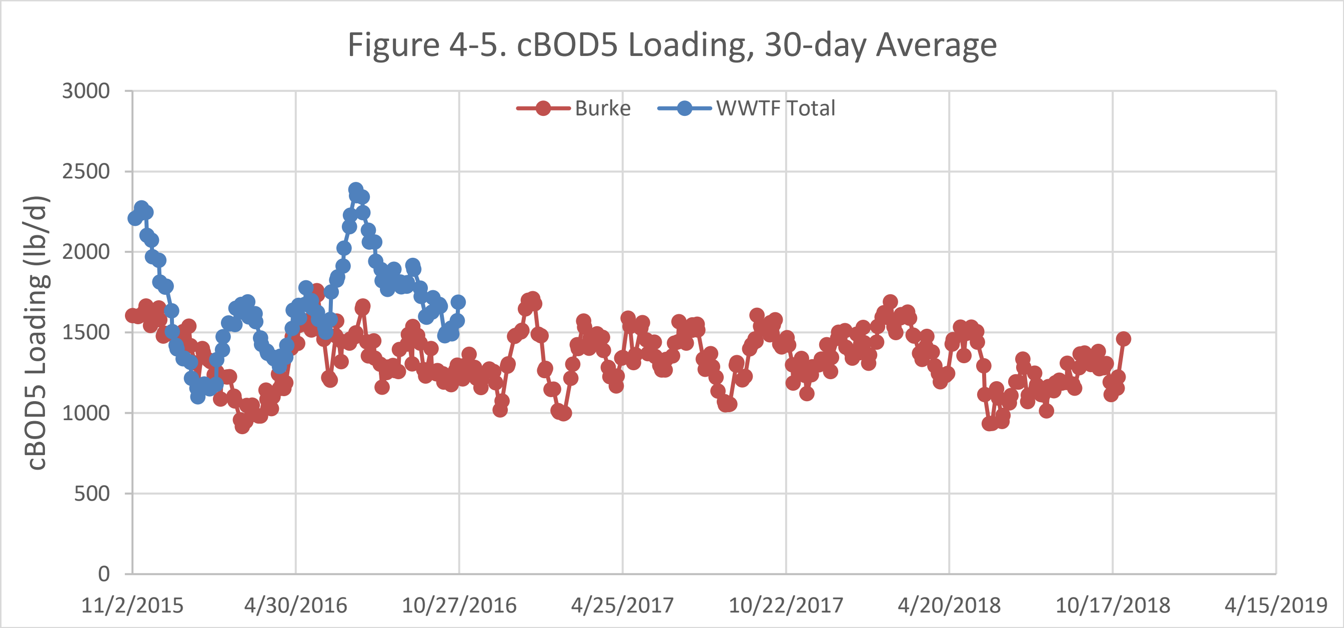

Figure 4-5: cBOD5 Loading, 30-day Average

Tables 4-9 and 4-10 below show the tabulated results of the data. Table 4-9 shows the historical industrial loadings and Table 4-10 shows the historical total influent loading. Burke contributes a significant fraction of the total cBOD/BOD to the Nevada WWTF. From November 1, 2016 through October 21, 2018, Burke's BOD input accounted for an average of 57% or the total BOD.

Table 4-9: Historical Industrial BOD Loading

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
cBOD, mg/L	1323	1900	-	-
cBOD, lb/d	1762	2694	3073	3750
BOD, mg/L	1284	1900	-	-
BOD, lb/d	1877	3439	-	-
Du Pont de Nemour Corp (SIU-2)				
BOD, mg/L(1)	116	170	-	-
BOD, lb/d(1)	15	41	76	114

(1) MOR data from 11/1/16 - 10/30/18

Table 4-10: Historical Total Influent BOD Loading

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
cBOD, mg/L(1)	227	320		-	-
cBOD, lb/d(1)	2388	3366		0.09	0.09
BOD, mg/L(2)	327	440		-	-
BOD, lb/d(2)	3114	5287	4871	0.18	0.27

(1) Measured from 10/1/2015 - 10/31/2016

(2) Measured from 11/1/2016 - 10/30/2018

As seen in **Table 4-10**, the calculated historic 30-day average non-industrial loading per capita for BOD is 0.18 lb/day. This is within typical values for municipal wastewater[1].

(1)Table 3-12, Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, 4TH Ed.

<u>Total Suspended Solids</u>
Total Suspended Solids (TSS) data was obtained for the entire design period from October 2015 to October 2018.

Figure 4-6 below show the trends of the 30-day average loading for TSS. The trends indicate that Du Pont's and Burke's loadings have a negligible effect on the overall loading of TSS observed at the WWTF.

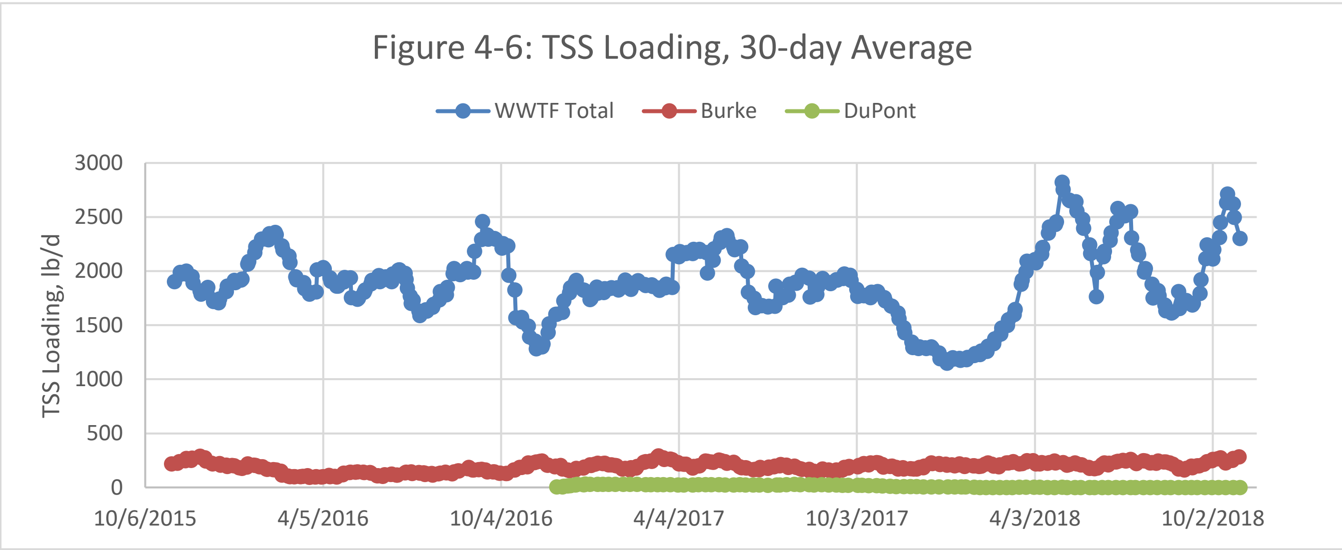

Figure 4-6: TSS Loading, 30 day Average

Tables 4-11 and 4-12 below show the tabulated results of the data. Table 4-11 shows the historical industrial loadings and Table 4-12 shows the historical total influent loading.

Table 4-11: Historical Industrial TSS Loadings

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
TSS, mg/L	205	330	-	-
TSS, lb/d	293	548	646	750
Du Pont de Nemour Corp (SIU-2)				
TSS, mg/L(1)	119	180	-	-
TSS, lb/d(1)	31	77	129	194

(1) MOR data from 11/1/16 - 10/30/18

Table 4-12: Historical Total Influent TSS Loadings

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
TSS, mg/L	210	320		-	-
TSS, lb/d	2822	5976		0.37	0.79

As seen in **Table 4-12**, the calculated historic 30-day average non-industrial loading per capita for TSS is 0.37 lb/day. This is at the upper range for typical loadings for municipal wastewater[1].

<u>Nutrient Loadings</u>
Nutrient loading data was obtained for Total Kjedahl Nitrogen (TKN), Total Nitrogen (TN), and Total Phosphorous (TP). There was no TN or TP data from Du Pont to review. TKN data was reviewed for the entire design period of October 2015-October 2018. TN and TP data was reviewed from November 2016-November 2018.

Figures 4-7, 4-8, and 4-9 below show the trends of the 30-day average loading for TKN, TN, and TP, respectively. The trends indicate that Du Pont's TKN loadings have a negligible effect on the overall TKN loading observed at the WWTF. The trends indicate Burke's loading of TKN, TN, and TP have a significant effect on the overall loadings for these parameters at the WWTF

(1)Table 3-12, Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, 4TH Ed.

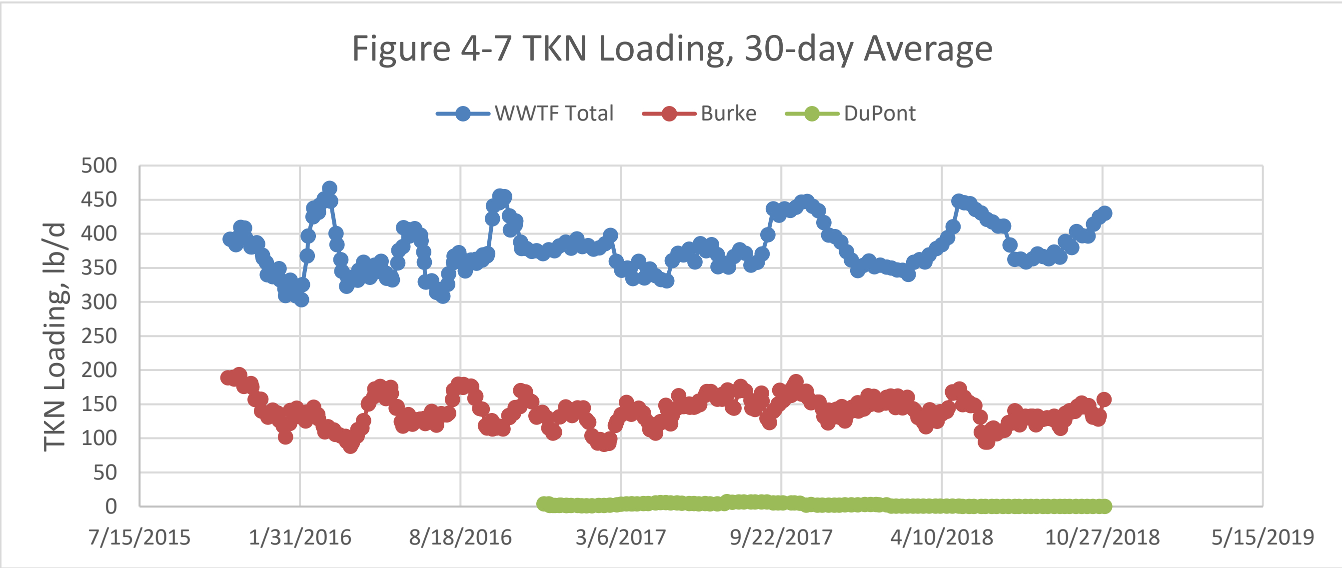

Figure 4-7: TKN Loading, 30-day Average

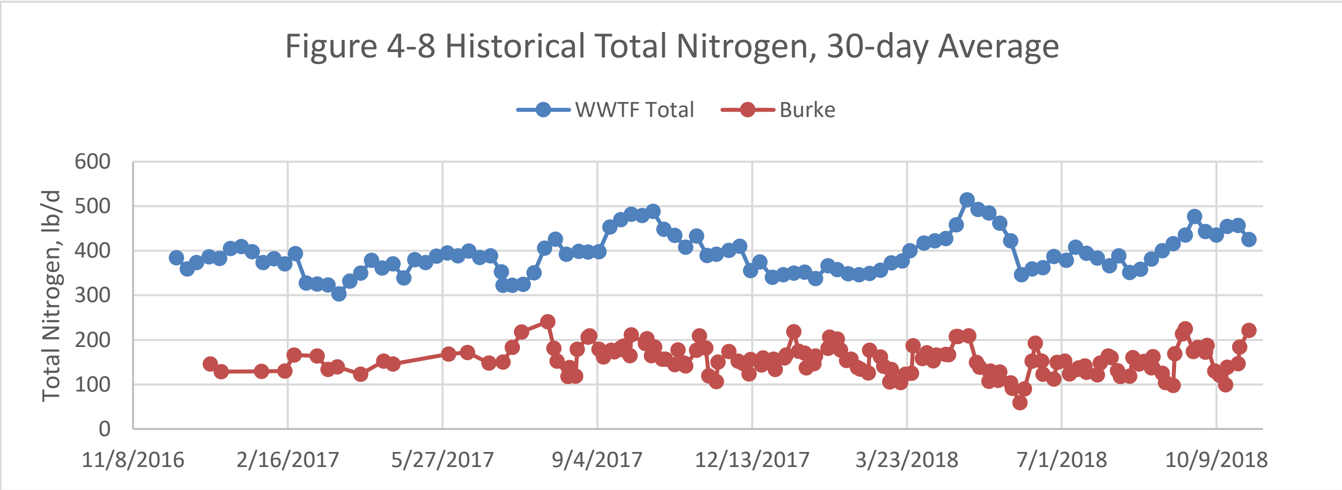

Figure 4-8: Historical Total Nitrogen, 30-day Average

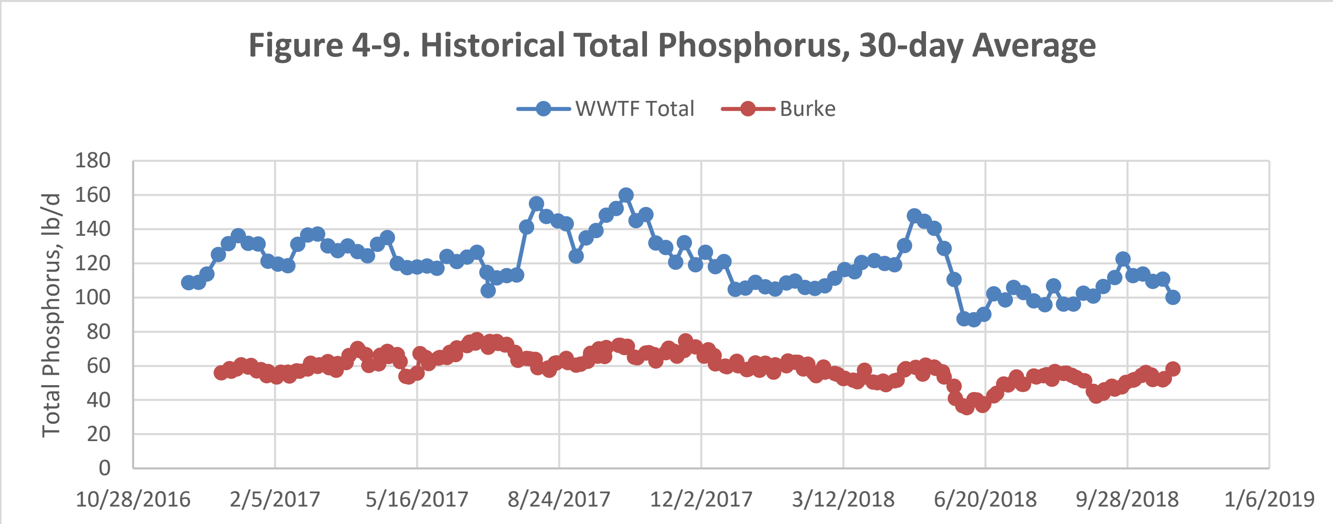

Figure 4-9: Historical Total Phosphorus, 30-day Average

Tables 4-13 and 4-14 below show the tabulated results of the data. Table 4-13 shows the historical industrial loadings and Table 4-14 shows the historical total influent loading. Again, Burke contributes a significant fraction of the total TKN, TN, and TP to the Nevada WWTF. From November 1, 2016 through October 21, 2018, Burke's input accounted for an average of 40% of the TN and 49% of the TP loads to the WWTF.

Table 4-13: Historical Industrial Nutrient Loading

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
TKN, mg/L	137	200		
TKN, lb/d	194	292	570	750
TN, mg/L	154	182	-	-
TN, lb/d	241	304	-	-
TP, mg/L	51	77	-	-
TP, lb/d	75	113	-	-
Du Pont de Nemour Corp (SIU-2)				
TKN, mg/L(1)	111	140	-	-
TKN, lb/d(1)	7	37	26	38

(1) MOR data from 11/1/16 - 10/30/18

Table 4-14: Historical Total Nutrient Loading

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
TKN, mg/L	47	61		-	-
TKN, lb/d	467	762	1004	0.039	0.064
TN, mg/L(1)	61	72		-	-
TN, lb/d(1)	515	719		0.040	0.061
TP, mg/L(2)	17	21		-	-
TP, lb/d(2)	160	205		0.012	0.013

(1) Measured from 11/29/2016 - 5/30/2018

(1) Measured from 11/8/2016 - 10/30/2018

The calculated historical 30-day average non-industrial loading per capita loading for TKN, TN, and TP are at the upper range for typical loadings for municipal wastewater[1].

Loadings Summary

Historical loadings of BOD, cBOD, TSS, TKN, TN, and TP were evaluated from the period of October 2015 through October 2018. Data from industrial loadings and total influent loadings were obtained. The historical data indicates that all organic loadings from Du Pont can be considered negligible compared to the total influent load to the WWTF. BOD, cBOD, TKN, TN, and TP loadings from Burke were found to have a significant impact on the WWTF total influent loadings. Burke's BOD, TN, and TP loadings averaged 57%, 40%, and 49% of the total influent loads, respectively.

5. PROPOSED FACILITIES EVALUATION

5.1. DESIGN WASTEWATER CHARACTERISTICS

5.1.1. Design Flows

Flow projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by calculating the average per capita hydraulic loading rate and the projected 2044 population. Per capita flow was assumed to be stable over the design period. Historical per capita flow for the non-industrial component of ADW flow was calculated using the 2015-2018 ADW divided by the most recent (2010) census population estimate for Nevada. This is calculated to be 121.7 gallons per capita per day (gpcd).

Future AWW and MWW flows to the WWTF were projected by calculating historical AWW Infiltration & Inflow (I&I) and MWW I&I values and adding them to the design ADW flow. These historical I&I values were calculated as the difference between the AWW and ADW flows and MWW and ADW flows, respectively. Given the City's efforts to rehabilitate the existing sanitary sewer collection system in conjunction with street projects, the I&I fractions are anticipated to remain constant over the design period. The design peak hourly wet weather (PHWW) flow was estimated using the IDNR peaking factor formula and the 2044 population of Nevada of 8,764.

Future industrial flows are based on the two existing SIUs. No new SIUs are anticipated during the planning period. An expansion of the WWTF would be required to accommodate any new SIUs in the future. Industrial flows are based on information from or assumptions about each major industrial contributor. Projected flows and loads from Burke Corporation were provided on December 31, 2018 by their engineering consultant (Bolton & Menk). Projected Burke Corporation flows are given in **Table 5-1**.

Projected flows from Verbio following start-up of their new facility is unknown at this time. The Du Pont facility historically discharged only a fraction of the allowable flow to the WWTF. It is assumed that the new facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Table 5-1: 2044 Design Flows

Parameter	Non-Industrial(2)	SIU-1 (Burke)	SIU-2 (VERBIO)	Total
ADW, mgd	1.07	0.5	0.072	1.64
AWW, mgd	2.45	0.5	0.072	3.02
MWW, mgd	5.29	0.7	0.144	6.13
PHWW(1), mgd	7.38	0.7	0.144	8.23

(1) The ratio of PHWW:AWW non-industrial flow is calculated by using the equation found in Appendix I, Chapter 12 of the Iowa Wastewater Facility Design Standards Peak:Average=(18+ √P)/(4+ √P), where P is population in thousands.
(2) Includes I&I component of total flow for AWW and MWW conditions

5.1.2. Design Wastewater Loads

Design wastewater loads were based on increased loadings from population growth and industry expansion.

The maximum 30-day average organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic maximum 30-day average per capita organic loading rate and the projected 2044 population. The maximum day organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic daily maximum per capita organic loading rate and the projected 2044 population. Per capita loading was assumed to be stable over the design period.

The design industrial loading for Burke Corporation is based on the planned expansion and related loadings outlined by Burke's design engineer (Bolton & Menk) in the letter dated February 27, 2019. Loading from Verbio North American Corporation are assumed to remain within the permit limits established for Du Pont in the NPDES permit issued November 1, 2016 and amended September 1, 2018. Design industrial loadings are summarized in **Table 5-2**.

Maximum 30-day design loading at the WWTF were estimated by combining industrial loading projections with non-industrial (residential/commercial) projections. Maximum day design loadings at the WWTF for process sizing, except for the aeration system sizing, were estimated by combining industrial maximum 30-day loading projections with non-industrial (residential/commercial) maximum day loading projections. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously. Review of the historical data support this assumption as well. The secondary treatment process aeration system sizing is based on the industrial maximum day loading projection only. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously; however, the aeration capacity must match the demand for the largest of the two maximum day loadings. Design loadings are summarized in **Table 5-3** .on the next page.

Table 5-2: Design Industrial Loading

Parameter	Maximum 30-day Average	Daily Maximum
Burke Corporation (SIU)-1)[(1)]		
cBOD, lbs/d	5,040	10,440
TSS, lb/d	950	2500
TKN, lbs/d	500	1110
TP, lb/d	200	350
VERBIO (SIU-2)[(2)]		
BOD, lb/d	76	114
TSS, lb/d	129	194
TKN, lb/d	26	38

(1) From Bolton & Menk February 27, 2019 projected loading letter
(2) From the Nevada STP NPDES Permit Issued 11/1/2016 and amended 9/1/2018

Table 5-3: Design Loading

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day(1)					
BOD, lb/d(3)	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d(4)	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum(2)					
BOD, lb/d	2,329	10,440	114	NA	10,554
TSS, lb/d	6,899	2,500	194	NA	6,899
TKN, lb/d	558	1,110	38	NA	1,148
TN, lb/d(4)(5)	558	1,110	38	NA	1,148
TP, lb/d	118	350	NA	NA	350

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Non-industrial daily max load OR SIU-1 + SIU-2 daily max load, used for aeration/mixing sizing only

(3) For Burke Corp assumed cBOD:BOD ratio of 0.83

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

5.2. RECEIVING STREAM CONSIDERATIONS

The existing wastewater effluent is discharged to an outfall ditch (unnamed creek) that flows to West Indian Creek. West Indian Creek ultimately discharges to the Indian Creek. Indian Creek flows to the South Skunk River which becomes the Skunk River and eventually flows into the Mississippi River. The current stream designations can be found in **Table 5-4**. Indian Creek, South Skunk River, Skunk River, and the Mississippi River are currently on Iowa's 2016 Section 303(d) list as an impaired water. The proposed wastewater treatment facility will have a new outfall that will discharge into West Indian Creek approximately 3 miles south of the existing outfall. This new outfall location will reduce the stream length that is impacted by the outfall since it is downstream of the existing outfall. A Waste Load Allocation (WLA) for West Indian Creek has been developed by the IDNR and is attached in **Appendix C** of this report. This report will help determine the necessary limits needed at the outfall to protect the existing stream's classification and water quality.

Table 5-4: Stream Designations

Stream	Designation
Outfall Ditch	Class B(WW-2) A3
West Indian Creek	Class B(WW-2) A2
Indian Creek	Class B(WW-2) A1
South Skunk River	Class B(WW-1) A1 (HH)
Skunk River	Class B(WW-1) A1 (HH)
Mississippi River	Class B(WW-1) A1 (HH)

5.3. TREATMENT PLANT SITE REQUIREMENTS

The City of Nevada has purchased a 122.6 acre parcel approximately three miles south of the existing WWTF. This site will comply with all applicable siting requirements in Subrules 567 IAC 64.2 (2) and (3) and Rule 567 IAC 64.4. This site was selected in order to expedite the process as there was a willing seller at the location. One inhabitable residence is within the1,000- foot site separation requirement. The City has already obtained permission from the owner of this site to construct new treatment facilities within the limit. The majority of the site lies outside of the 100-year floodplain. Some work will be required within the flood plain in order to extend the outfall sewer to West Indian Creek. All process structures will be outside the 100-year flood plain**. Figure 5-1** shows the new site and nearby items of importance.

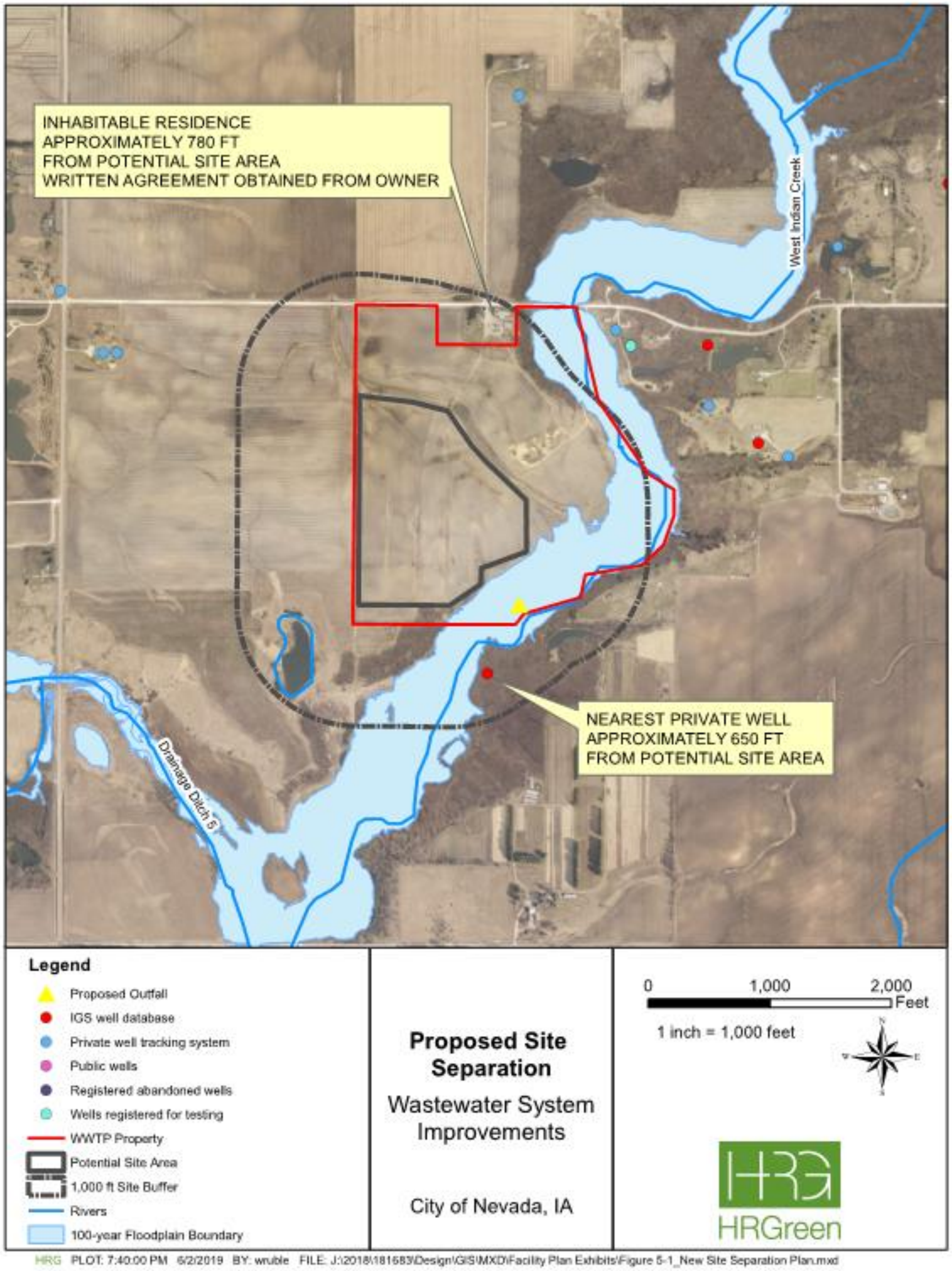

Figure 5-1: Proposed Site Separation Plan

5.4. PROPOSED INTERCEPTOR ALTERNATIVES

This chapter discusses the feasibility of the proposed gravity interceptor sewer to the new WWTF site. The design of the gravity sewer interceptor follows Chapter 12 of the IDNR Wastewater Facilities Design Standards (Design Standards.) The feasibility of the construction of this project is based on the ability to meet the requirements of IDNR Design Standards, permitting requirements, and considerations to the existing conditions to produce a cost effective solution.

The new interceptor sanitary sewer shall have capacity for the projected influent wastewater flows for the wastewater treatment facility design period. Projected flows outside of the 20-year design period are unknown. An additional trunk line and additional pumps may be added at the end of the design period if the design flows are exceeded. Two alignment alternatives are discussed below. Property acquisition costs for temporary and final easements for the sanitary sewer are not included in project cost estimates at this time.

The following components will be included in the project:

- Connection(s) to the existing sanitary network at the existing WWTF
- Approximately 18,000-21,000 linear feet of interceptor sewer between the existing and proposed WWTF sites
- One boring with steel casing pipe under U.S. Highway 30 (both alternatives)
- Two additional boring with steel casing pipe (Alternative 2 only)
- Stream crossings (Alternative 1 only)
- One lift station (both alternatives)
- Clearing, grubbing, and access
- Erosion control and surface restoration

5.4.1. Alternative S1

5.4.1.1. Sewer Alignment

See **Figure 5-2** for the proposed sanitary sewer alignment. In order to minimize bury depths and reduce the necessary excavation, the majority of the sanitary sewer alignment will follow West Indian Creek. The placement of the sewer is determined by the existing conditions. Some of the factors considered in alignment placement include accessibility of construction, proximity to West Indian Creek, and depth of the sewer.

As seen in **Figure 5-2:**
Starting from the north, the sanitary sewer alignment goes under U.S. Highway 30. The starting elevations of the sewer is based on the feasibility to connect to the existing sanitary network. The sewer then runs under West Indian Creek in order to avoid the large impoundment to the west of West Indian Creek. Two alignment options are shown in **Figure 5-3** near the impoundment. The sewer will continue to run along West Indian Creek while undergoing several stream crossings in order to improve accessibility and constructability of the sewer. Roughly two-thirds of the way towards the proposed WWTF site, the interceptor will exit the creek valley and run across farmland to the proposed WWTF site. This will require deeper excavation or a boring, but is proposed to avoid the

large bend in West Indian Creek that veers away from the WWTF site, which would result in additional pipe length.

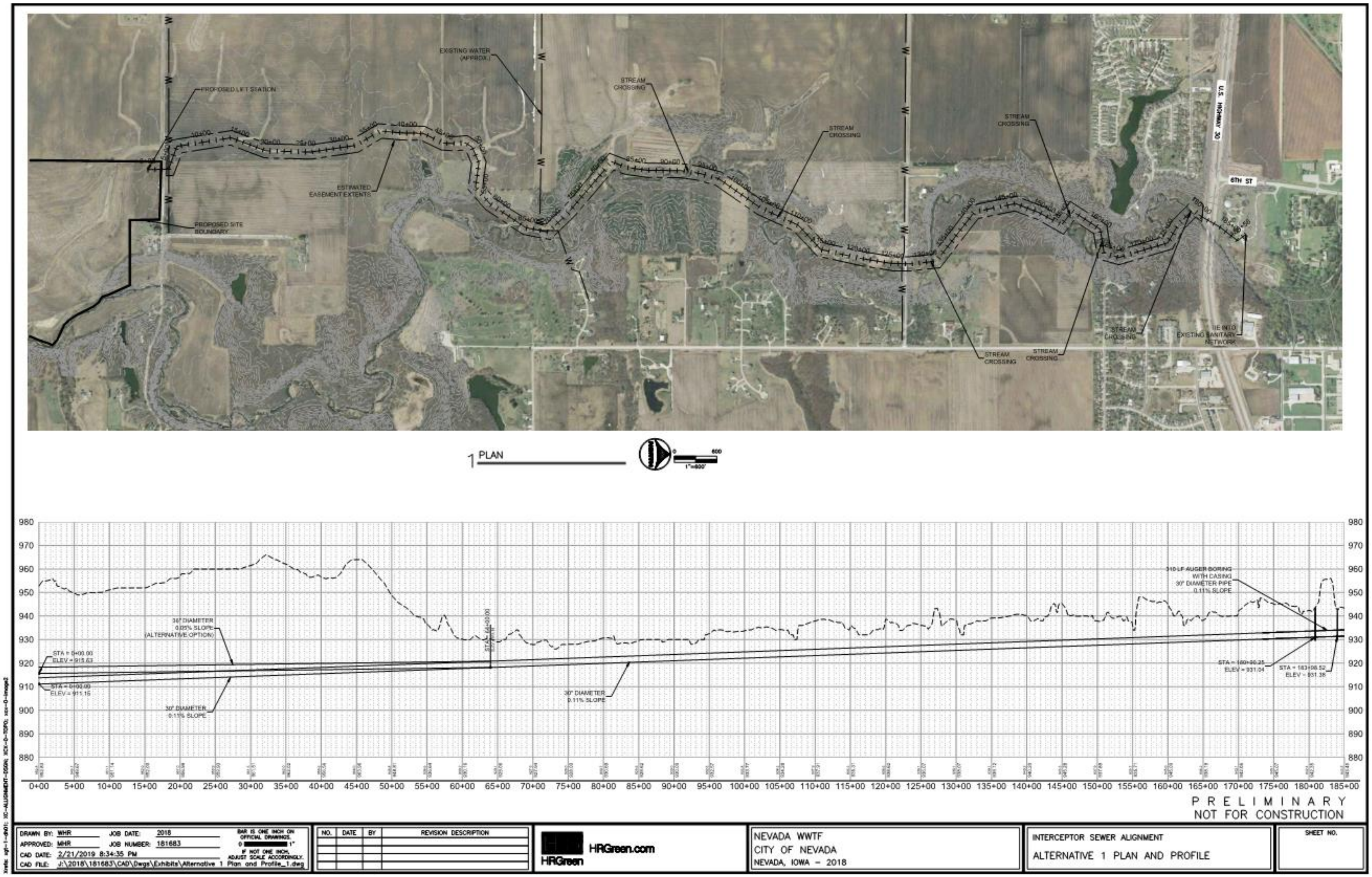

Figure 5-2: Alternative S1 Interceptor Alignment

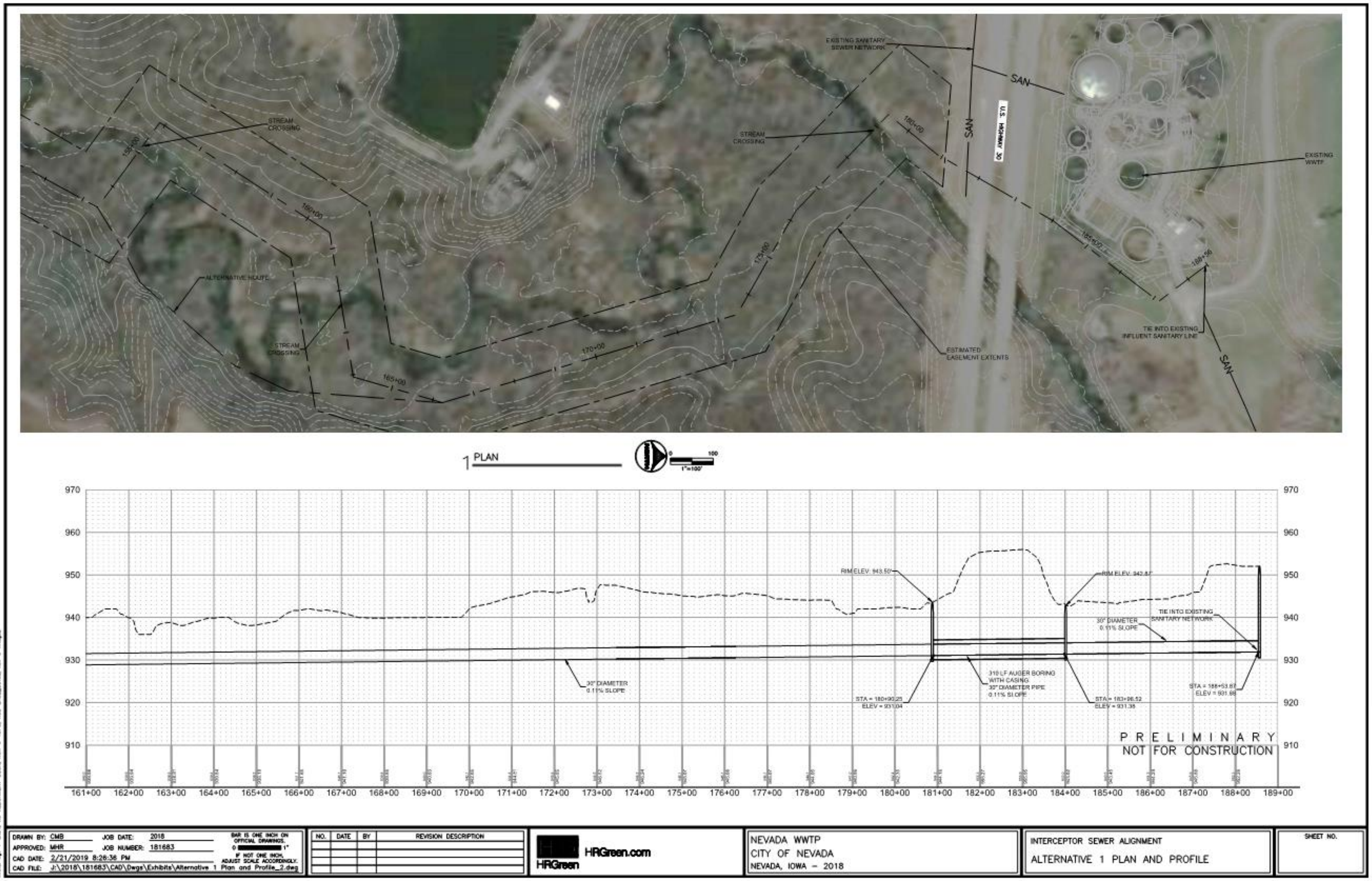

Figure 5-3: Alternative S1 Interceptor Route Options

5.4.1.2. Sewer Sizing

The sanitary sewer will be sized for the design PHWW flow while also following IDNR standards for flow velocity and pipe slope. In order to reduce excavation and costs, the design will aim to minimize the pipe slope while also maintaining a maximum of ¾ pipe flow depth at PHWW flow. **Table 5-5** below shows the projected pipe sizes, slopes, and velocities for the PHWW and ADW flows as well as the IDNR limits for pipe slopes and velocities.

Table 5-5: Alternative S1 Proposed Gravity Sewer Pipes

Pipe Diameter	Slope Range (ft/100ft)	Velocities at ADW (fps)	Velocities at PHWW (fps)	Minimum Slope (ft/100ft)	Min Velocity (@ PHWW) (fps)	Max Velocity (fps)
30-Inch	0.11	2.10	3.19	0.058	2	15
36-Inch	0.05	1.55	2.39	0.046	2	15

5.4.1.3. Manhole Spacing

Manholes will be spaced according to IDNR design standards and the feasibility to clean the sewer segments. The City of Nevada owns and operates a vacuum/water jet truck (VAC truck) with a hose capable of reaching 900 feet. In areas where the manholes are accessible to the VAC truck, the manholes will be spaced at the maximum allowed spacing of 800 feet when conditions allow. When the sewer is placed in areas not accessible to the necessary cleaning equipment, the manholes will be placed at the maximum spacing of 400 feet.

5.4.1.4. Lift Station

Based on the topography of the new WWTF site, an on-site lift station will be required at the end of the gravity interceptor sewer to convey influent flow to the headworks (beginning) of the proposed treatment facility.

The lift station will consist of an influent sump (wetwell) with submersible pumps and a valve vault or a wetwell and drywell with pumps and valves. The wetwell would be approximately 42 feet deep. A minimum of three pumps would be provided. The lift station force main would discharge all flow to the WWTF Headworks building. The Headworks building would be located within the northwest quarter of the new WWTF site.

5.4.1.5. Engineer's Opinion of Probable Construction Cost

An estimate of probable construction cost for this alternative is presented in **Table 5-6** below. This cost opinion assumes the following:

- Auger boring with steel casing for U.S. Highway 30 crossing
- Trenched construction for gravity sewer installation
- New submersible-style lift station at the new WWTF site

Table 5-6: Alternative S1 Opinion of Probable Construction Cost

Description	Approximate Quantity	Unit	Unit Price	Item Price
Mobilization	1	LS	$ 701,200	$ 701,200
Clearing & Grubbing	20	ACRE	$ 10,000	$ 200,000
Temporary Construction Entrances	1	LS	$ 50,000	$ 50,000
Sanitary Sewer Gravity Interceptor, Trenched, 25' Maximum Depth, CCFRPM, 30" Diameter	13855	LF	$ 255	$ 3,533,025
Sanitary Sewer Gravity Interceptor, Trenched, 25' Minimum Depth, CCFRPM, 30" Diameter	5000	LF	$ 510	$ 2,550,000
Sanitary Manhole, 60" Diameter	48	EA	$ 8,000	$ 384,000
Sanitary Manhole, 72" Diameter	6	EA	$ 10,000	$ 60,000
Creek Crossing	6	EA	$ 25,000	$ 150,000
SWPPP	1	LS	$ 25,000	$ 25,000
Seeding & Restoration	30	ACRE	$ 2,000	$ 60,000
Horizontal Auger Boring Pit	2	EA	$ 20,000	$ 40,000
Steel Casing Pipe, Trenchless, Auger Boring	310	LF	$ 850	$ 263,500
Lift Station	1	LS	$ 1,000,000	$ 1,000,000
General Requirements	1	LS	$ 721,300	$ 721,300
			Sub-Total	$ 9,738,025
			30% Contingency	$ 2,921,400
			Total	**$ 12,659,425**

5.4.2. Alternative S2

5.4.2.1. Sewer Alignment

See **Figures 5-4 and 5-5** for the proposed sanitary sewer alignment. This alternative will use a force main to convey all influent flow from the existing WWTF site to the gravity interceptor sewer. The gravity interceptor sewer alignment will follow ~~260th~~ Avenue (County Road S14) the majority of the way to the new WWTF. 620th Ave

.

As seen in **Figure 5-4 and 5-5:**
Starting from the north, the existing sanitary network will be directed to a new lift station at the existing WWTF site and head south under U.S. Highway 30. The force main follows the south side of U.S. Highway 30 and runs to the west until ~~260th~~ Avenue (Country Road S14). The force main than follows ~~260th~~ Avenue to the south for approximately 300 feet to the gravity interceptor sewer receiving manhole on the east side of ~~260th~~ Avenue. The gravity interceptor follows ~~260th~~ Avenue to the south within both the east and west Right-of-Ways, with several road crossings in order to avoid an existing water main. Approximately a half-mile before the intersection with 270th Street the gravity interceptor heads east across a farm field for roughly a half-mile before turning south again to eventually cross 270th Street and end at the headworks of the proposed WWTF. The route through the farm field avoids a large elevation increase along ~~260th~~ Avenue that would require deep excavation and an additional road crossing to avoid the existing water main.

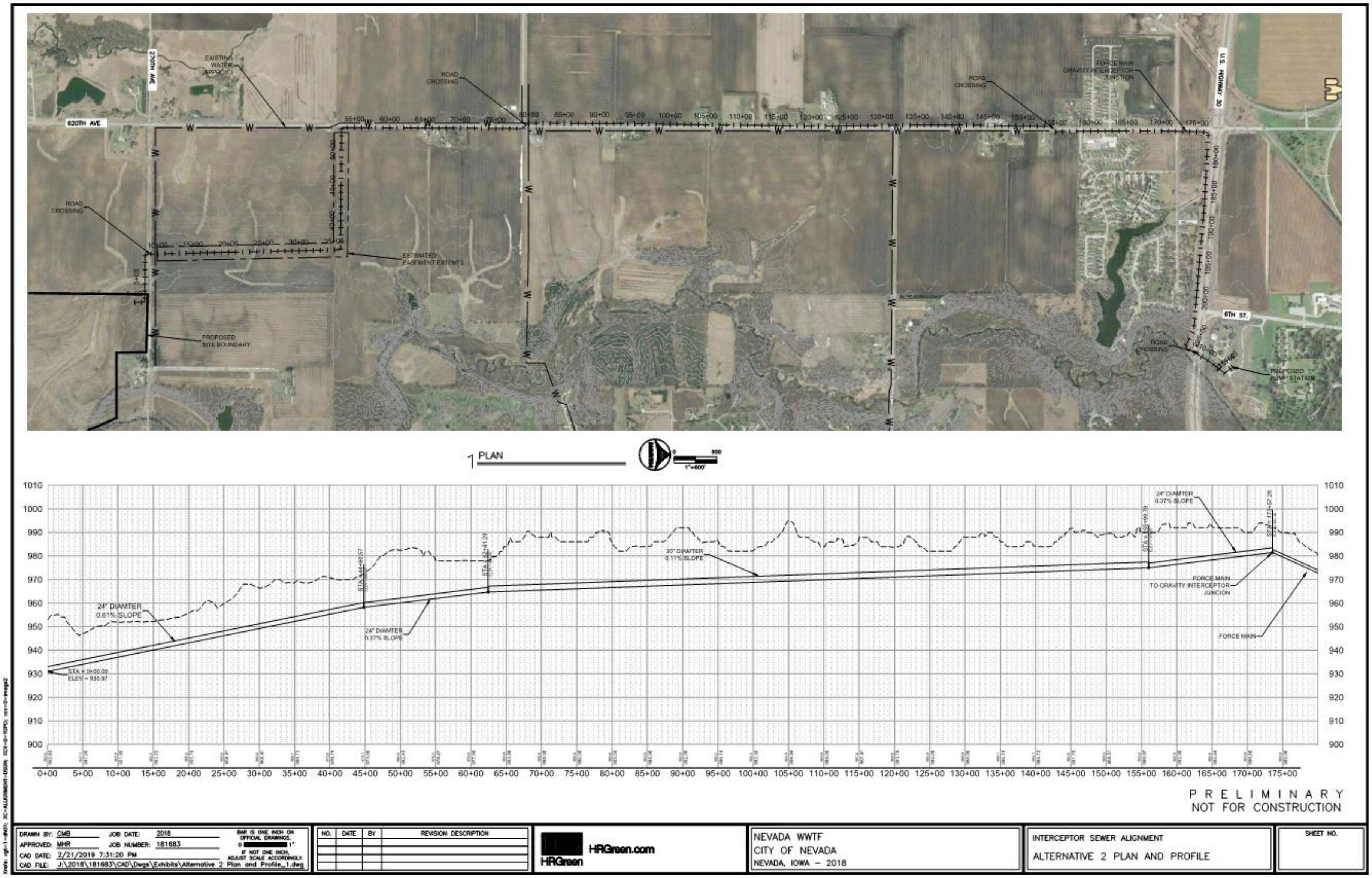

Figure 5-4: Alternative S2 Interceptor Alignment

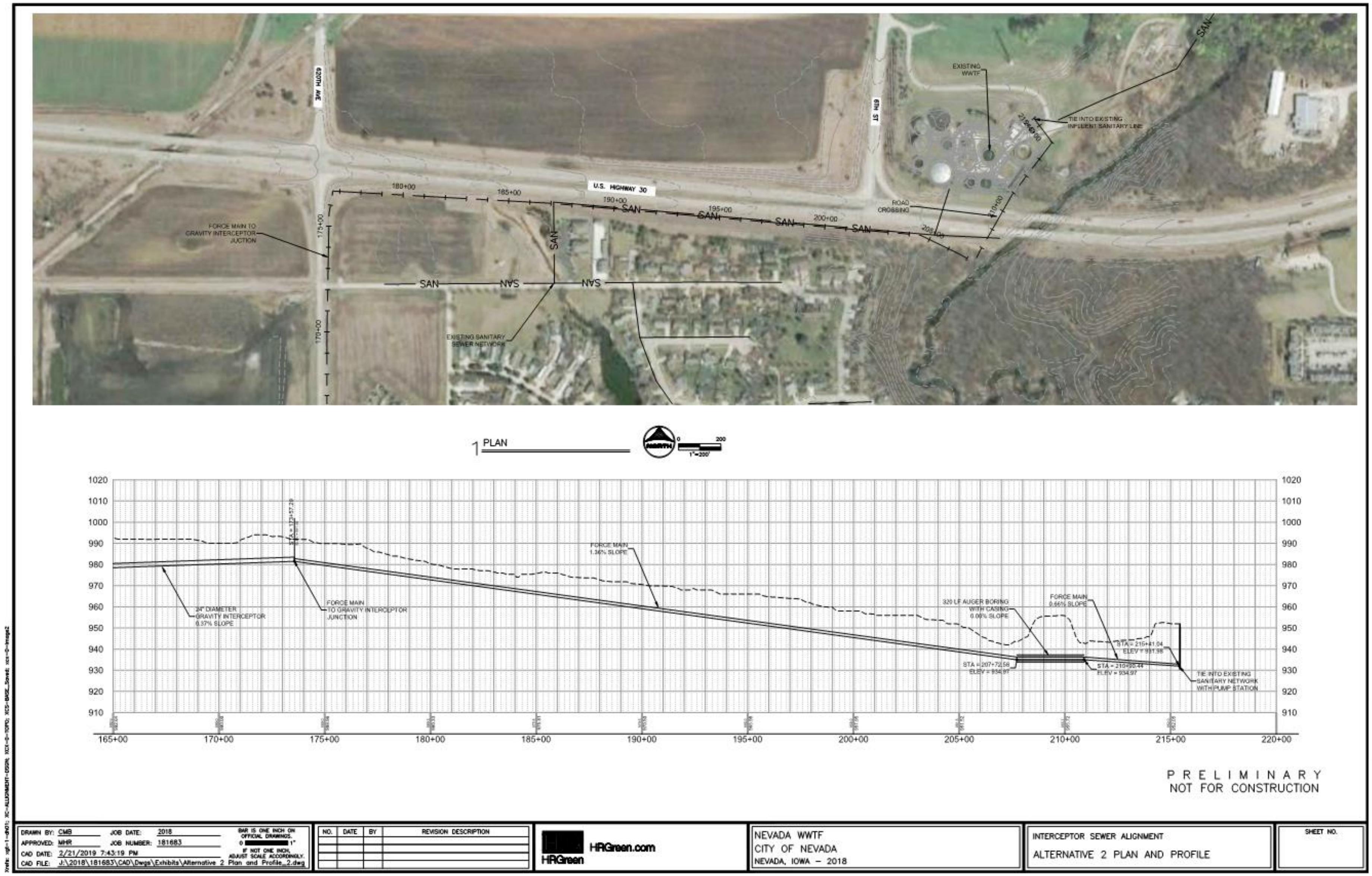

Figure 5-5: Alternative S2 Interceptor Alignment

5.4.2.2. Sewer Sizing

The sanitary sewer will be sized for the design PHWW flow while also following Iowa DNR standards for flow velocity and pipe slope. In order to reduce excavation and costs, the design will aim to minimize the pipe slope while also aiming for a maximum of ¾ pipe flow depth at PHWW flow. The force main will be sized to meet Iowa DNR standards for flow velocity while also reducing the total dynamic head to allow for the most efficient pump sizes. **Table 5-7** below shows the projected gravity interceptor pipe sizes, slopes, and velocities for the PHWW and ADW flows as well as the Iowa DNR limits for pipe slopes and velocities.

Table 5-7: Alternative S2 Proposed Gravity Sewer Pipe

Pipe Diameter	Slope Range (ft/100ft)	Velocities at ADW (fps)	Velocities at PHWW (fps)	Minimum Slope (ft/100ft)	Minimum Velocity (@ PHWW) (fps)	Maximum Velocity (fps)
24-Inch	0.37-0.61	3.29-3.91	5.04-6.17	0.08	2	15
30-Inch	0.11	2.10	3.19	0.058	2	15

5.4.2.3. Manhole Spacing

Manholes will be spaced according to Iowa DNR standards and the feasibility to clean the sewer segments. The City of Nevada owns and operates a VAC truck with a hose capable of reaching 900 feet. In areas where the manholes are accessible to the VAC truck, the manholes will be spaced at the maximum allowed spacing of 800 feet when conditions allow. This alternative will allow for the maximum spacing of 800 feet in most locations due to its proximity to the road. When the sewer is placed in areas not accessible to the necessary cleaning equipment, the manholes will be placed at the maximum spacing of 400 feet.

5.4.2.4. Lift Station

As the elevations at the intersection of 260th Avenue and U.S. Highway 30 are higher than at the existing WWTF site, a lift station will be required at the existing WWTF. The existing WWTF influent lift station pumps do not have sufficient firm capacity for the design flows. It may be possible to replace the existing pumps with larger pumps and reuse the existing lift station structure with modifications; however, this analysis assumes construction of a new lift station structure, pumps, valves, piping, etc. at the existing WWTF site.

The lift station will consist of an influent sump (wetwell) with submersible pumps and a valve vault or a wetwell and drywell with pumps and valves. The wetwell would be approximately 35 feet deep. A minimum of three pumps would be provided. The lift station force main would discharge all flow to the junction of the proposed force main and gravity interceptor. The gravity interceptor will convey the flow the rest of the way to the headworks building, which would be located within the northwest quarter of the new WWTF site.

5.4.2.5. Engineer's Opinion of Probable Construction Cost

An estimate of probable construction cost for this alternative is presented below. This cost opinion assumes the following:

- Auger boring with steel casing for U.S. Highway 30 crossing
- Horizontal Directional Drilling construction for force main installation
- Trenched construction for gravity sewer installation
- New submersible-style lift station at the existing WWTF site

Table 5-8: Alternative S2 Opinion of Probable Construction Cost

Description	Approximate Quantity	Unit	Unit Price	Item Price
Mobilization	1	LS	$ 470,100	$ 470,100
Clearing & Grubbing	1	ACRE	$ 5,000	$ 5,000
Temporary Construction Entrances	1	LS	$ 6,500	$ 6,500
Sanitary Sewer Force Main, Trenchless	4190	LF	$ 100	$ 419,000
Sanitary Sewer Gravity Interceptor, Trenched, CCFRPM, 24" Diameter	8000	LF	$ 203	$ 1,624,000
Sanitary Sewer Gravity Interceptor, Trenched, CCFRPM, 30" Diameter	9360	LF	$ 255	$ 2,386,800
Sanitary Manhole, 48" Diameter	15	EA	$ 6,500	$ 97,500
Sanitary Manhole, 60" Diameter	13	EA	$ 8,000	$ 104,000
Sanitary Manhole, 72" Diameter	4	EA	$ 10,000	$ 40,000
SWPPP	1	LS	$ 18,000	$ 18,000
Seeding and Restoration	33	ACRE	$ 2,000	$ 66,000
Horizontal Auger Boring Pit	6	EA	$ 20,000	$ 120,000
Steel Casing Pipe, Trenchless, Auger Boring, Gravity Interceptor	400	LF	$ 850	$ 340,000
Steel Casing Pipe, Trenchless, Auger Boring, Force Main	320	LF	$ 765	$ 244,800
Lift Station	1	LS	$ 1,000,000	$ 1,000,000
General Requirements	1	LS	$ 555,300	$ 555,300
			Sub-Total	$ 7,497,000
			30% Contingency	$ 2,249,100
			Total	**$ 9,746,100**

5.5. PROPOSED TREATMENT FACILITY ALTERNATIVES

Due to the increased loadings from Burke that will greatly exceed the capacity of the existing WWTF and the limited feasibility to expand the current WWTF to accommodate the design loadings, it has been determined that a new WWTF is the only practicable solution to treat the increased loadings. Additional pretreatment from the industry was determined to not be practicable or reasonable. The City has already purchased a reasonable site for the planned WWTF as discussed in **Section 5.3**. No additional sites will be evaluated for these alternatives. This Facility Plan proposes two wastewater treatment process alternatives. Each alternative was designed around the proposed secondary treatment process. Based on the antidegredation analysis, it was determined that the less degrading alternative (nutrient removal) was a practicable, reasonable, and economically efficient alternative for the new WWTF. This alternatives evaluation is based on the secondary treatment processes with nutrient removal. The alternatives evaluated herein complete the feasibility analysis of effluent nutrient reduction for the City of Nevada as required by the Iowa Nutrient Reduction Strategy. The proposed preliminary treatment and disinfection processes are the same for each alternative. This section contains analysis of two nutrient removal secondary treatment alternatives (five-stage Bardenpho process and three-stage oxidation ditch).

5.5.1. Alternative P1 Overview: Activated Sludge with Enhanced Biological Phosphorous Removal (EBPR): Five-Stage Bardenpho Process

Alternative P1 involves constructing a new WWTF at a City-owned site approximately three miles south of the existing WWTF site. The new WWTF would consist of preliminary treatment, secondary treatment, disinfection, and solids treatment processes based on the approved design flows and loads and to achieve the effluent limits established by the WLA. Preliminary treatment would consist of influent screening and grit removal. Primary treatment is not recommended as influent organic loads are necessary for the secondary treatment process. Secondary treatment would consist of a 5-Stage Bardenpho process, and subsequent secondary clarification, for removal of BOD, Total Nitrogen (TN), and Total Phosphorus (TP). Disinfection would consist of ultraviolet (UV) disinfection of secondary effluent. Solids treatment would consist of aerobic digestion to attain Class B biosolids. Liquid biosolids storage would be provided for ultimate land application disposal. A flow diagram of this alternative is provided in **Figure 1** of **Appendix E**. See **Section 5.5.3 and Appendix D** for detailed information of each process component.

Burke Corporation would maintain pretreatment of their wastewater to meet limits established by their pretreatment agreement with the City prior to discharge to the City's collection system. This agreement shall be revised to reflect the increased loading. Pretreatment consists of BOD, TSS, and FOG removal.

This alternative will provide treatment capacity for the increased loadings and results in less degradation of water quality within the receiving stream as characterized by the existing water quality assessment and limits established by the WLA. The WLA does not establish effluent TN or TP limits. Target effluent limit for TN and TP based on the Iowa Nutrient Reduction Strategy would be 10 mg/L and 1 mg/L, respectively.

The Engineer's Opinion of Probable Construction Cost for the alternative is **$32,986,000**, which includes contingency and engineering costs.

Operation and maintenance costs are included in this alternative. These costs include electricity, equipment replacement/parts, and additional labor costs to run the new plant over the design period. Existing annual operation and maintenance costs that will be the same for both plants are not included in this analysis. Existing annual costs that will be the same for the existing and proposed facilities include, but are not limited to: existing collection system maintenance costs, general maintenance costs, existing labor costs, and general administrative costs. Additional labor costs for the proposed facility is based on the number of employees needed to operate the new WWTF above the current number of employees, which is estimated to be an additional two full-time employees. Present worth for this alternative is **$10,781,000**. **Table 5-9** shows the combined opinion of construction and life cycle costs for this alternative. **Appendix F** provides a detailed breakdown of the operation and maintenance costs.

Table 5-9: Alternative P1 OPCC and Life Cycle Costs

Item	Cost
General Requirements	$ 2,241,000
Power Requirements	$ 534,000
Sitework	$ 2,480,000
Administration and Vehicle Storage Building	$ 1,912,000
Headworks and Grit Building	$ 3,037,000
Bardenpho	$ 5,526,000
Final Clarifiers	$ 3,134,000
Secondary Treatment Building	$ 1,505,000
UV Disinfection	$ 822,000
Aerobic Digesters	$ 4,977,000
Biosolids Storage/Loadout	$ 1,803,000
Contingency 20%	$ 5,092,000
Alternative 1 Total Construction Cost	$ 32,986,000
O&M Present Worth	$ 10,781,000
Total PW of Alternative 1	$ 43,767,000

This alternative was determined to be a practicable solution because the project would be constructed on City-owned property; the proposed treatment processes are well-established and accepted; and the treatment system can easily be expanded for future growth and/or additional regulatory driven permit changes.

5.5.2. Alternative P2 Overview: Activated Sludge with Enhanced Biological Phosphorous Removal (EBPR): Three-Stage Oxidation Ditch

Alternative P2 is similar to the system as proposed in Alternative P1, with the following exceptions:

1. Replace the 5-Stage Bardenpho Process with a three-stage oxidation ditch for nutrient removal.

This alternative will provide treatment capacity for the increased loadings and results in less degradation of water quality within the receiving stream as characterized by the existing water quality assessment and limits established by the WLA. The WLA does not establish effluent TN or TP limits. Target effluent limits for TN and TP based on the Iowa Nutrient Reduction Strategy would be 10 mg/L and 1 mg/L, respectively. A flow diagram of this alternative is provided in **Figure 2** of **Appendix C**. See **Section 5.5.3 and Appendix D** for a detailed breakdown of each process component.

The Engineer's Opinion of Probable Cost for the alternative is **$31,995,000.00**, which includes contingency and engineering costs.

Operation and maintenance costs are included in this alternative. These costs include electricity, equipment replacement/parts, and additional labor costs to run the new plant over the design period. Existing annual operation and maintenance costs that will be the same for both plants are not included in this analysis. Existing annual costs that will be the same for the existing and proposed facilities include, but are not limited to: existing collection system maintenance costs, general maintenance costs, existing labor costs, and general administrative costs. Additional labor costs for the proposed facility is based on the number of employees needed to operate the new WWTF above the current number of employees, which is estimated to be an additional two full-time employees. Present worth for this alternative is **$8,480,000**. **Table 5-10** shows the combined opinion of construction and life cycle costs for this alternative. **Appendix F** provides a detailed breakdown of the operation and maintenance costs.

Table 5-10: Alternative P2 OPCC and Life Cycle Costs

Item	Cost
General Requirements	$ 2,150,000
Power Requirements	$ 534,000
Sitework	$ 2,480,000
Administration and Vehicle Storage Building	$ 1,912,000
Headworks and Grit Building	$ 3,037,000
Oxidation Ditches	$ 4,756,000
Final Clarifiers	$ 3,134,000
Secondary Treatment Building	$ 1,505,000
UV Disinfection	$ 822,000
Aerobic Digesters	$ 4,977,000
Biosolids Storage/Loadout	$ 1,803,000
Contingency 20%	$ 4,885,000
Alternative 2 Total Construction Cost	$ 31,995,000
O&M Present Worth	$ 8,480,000
Total PW of Alternative 2	$ 40,475,000

This alternative was determined to be a practicable solution because the project would be constructed on City-owned property; the proposed treatment processes are well-established and accepted; and the treatment system can easily be expanded for future growth and/or additional regulatory driven permit changes.

5.5.3. Alternative P1 and P2 Process Units Analysis

5.5.3.1. Preliminary Treatment

Alternatives P1 and P2 both require the same kind of pre-treatment process. A new Headworks building with fine screens and grit removal is required for both alternatives. The preliminary treatment system will be designed to handle the influent PHWW flow of 8.23 mgd.

The Headworks building will be located with the highest hydraulic elevation in order to provide gravity flow throughout the downstream treatment processes. This elevation will be dependent on the 100-year floodplain elevation and the influent interceptor sewer elevation. If the floodplain elevation and related hydraulics through the downstream treatment processes result in a water surface elevation at the Headworks that exceeds the flow depth in the influent interceptor sewer, a lift station will be required at the Headworks building to provide the necessary elevation for gravity flow to the remainder of the plant.

The Headworks building will include two fine screens. A fine screen with ¼-inch or less openings shall be used ahead of secondary activated sludge treatment systems. The final fine screen selection will be based on factors such as: channel depth, design flow rate per screen, desired capture rate, and owner preferences.

Fine screenings increase the amount of organic material that is removed with the screenings. A screenings washer/compactor can be used to remove the organic material, dewater, and compact the screenings prior to disposal. This can be accomplished using an ancillary screenings washer/compactor. Selection of fine screenings manufacturers will occur during final design.

An influent sampling station will be located after the fine screens before the grit removal system.

The grit removal system will be provided as part of the Headworks building. Grit removal is used to remove fine particulate inorganics from the waste stream. Removal of these materials from the wastewater reduces wear and maintenance on the downstream processes such as pumps, tanks, etc. Grit not removed from the wastewater will end up in the downstream processes and reduce the capacity of these facilities. Also, land application of solids containing inorganic grit material is not desirable. Design criteria for the grit removal is 100% for particles 65 mesh or greater with a specific gravity of 2.65. Final selection of screening and grit removal equipment will occur in final design.

There are no differences between the screening and grit removal equipment that will be selected for either alternative.

5.5.3.2. Primary Treatment

No primary treatment will be required for either alternative. Both alternatives' secondary treatment processes require high organic loadings for enhanced biological nutrient removal that would be significantly removed in a primary treatment process. The proposed secondary treatment processes will be able to adequately remove BOD and TSS that would otherwise be removed in the primary treatment process.

5.5.3.3. Secondary Treatment

Given the current NPDES permit requirements with respect to the Iowa Nutrient Reduction Strategy, a priority of this Facility Plan was to determine means to economically, reasonably, and practically meet existing water quality standards, and achieving the Strategy's nutrient reduction targets. Since the Antidegredation Analysis found the less degrading alternative to be feasible this Facility Plan only evaluated secondary treatment with enhanced biological nutrient removal alternatives. Several activated sludge options were discussed and evaluated at a design workshop with the City of Nevada. Fixed-film options are not feasible for nutrient removal and were not considered. **Table 5-11** below compares the nutrient removal options that were discussed with the City of Nevada at the design workshop.

Table 5-11: Secondary Treatment Design Workshop Alternatives

Activated Sludge Process	Advantages	Disadvantages
Modified Lutzack Ettinger (MLE) or Bardenpho	-nutrient removal (TN) -separate zone addition for EBNR	-Requires more stringent process monitoring -Can be susceptible to upsets with varying flows -Proprietary designs
Sequencing Batch Reactors (SBR)	-No Final Clarifiers or RAS pumping -Low Capital Cost -Flexible Operation -Can incorporate nutrient removal	-Complicated process control, especially with nutrient removal -Flow Equalization may be needed -Sensitive to upsets/shock hydraulic loadings
Oxidation Ditches (multi-stage for nutrient removal)	-Simple Operation -Very forgiving process due to long sludge age and HRT -Less chance of bleed through -easily convertible to EBNR	-Long detention times -Potential settling issues -Possible filament issues -Large footprint

During the design workshop the City of Nevada indicated the following key secondary treatment process criteria:

1. Ease of operation
2. Process reliability to handle flow/loading spikes

Based on these preferences, oxidation ditches were suggested for further evaluation as part of the Antidegredation Analysis and Facility Plan. With the Antidegredation Analysis determining nutrient removal as a feasible alternative another criterion was included for the Facility Plan analysis: "Ability to perform nutrient removal, specifically EBPR." The five-stage Bardenpho process and three-stage Oxidation Ditch were chosen as reasonable alternatives to be evaluated against the City's criteria. Although SBRs are capable of handling flow/loading spikes and nutrient removal, they do not meet the City's preference for "ease of operation" and therefore were not evaluated. The two secondary treatment alternatives are evaluated further in the following sections.

Alternative P1: Five-Stage Bardenpho Process with Final Clarifiers

Alternative P1 proposes an activated sludge system with the use of a five-stage Bardenpho process for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The five-stage oxidation ditch consists of five zones: anaerobic, first-stage anoxic, first-stage aerobic, second-stage anoxic, and second-stage aerobic. Within these zones phosphorus release, denitrification (TN removal), BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The Bardenpho zones were sized according textbook design guidance and examples. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.5 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 10,554 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed five-stage Bardenpho process.

Three final clarifiers will follow the Bardenpho process. Clarifiers were designed in accordance with IDNR standards to account for the PHWW flow of 8.23 mgd. Three 70-feet diameter clarifies with a 14.5-feet SWD are proposed. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed final clarifiers.

The five-stage Bardenpho and final clarifier process are designed to meet Facility Reliability Class I.

Alternative P2: Three-Stage Oxidation Ditch with Final Clarifiers

Alternative P2 proposes an activated sludge system with the use of a three-stage oxidation ditch for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The three-stage oxidation ditch consists of three zones: anaerobic, anoxic, and aerobic. Within these zones phosphorus release, denitrification (TN removal), and BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The aerobic volume for extended aeration activated sludge system is based on a maximum organic loading of 15 ppd BOD/1,000 cft of aerobic reactor volume. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.5 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 10,554 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed three-stage Oxidation Ditch.

Three final clarifiers following the same design standards as in Alternative P1 will be required for this alternative as well.

The Three-Stage Oxidation Ditch and final clarifier process are designed to meet Facility Reliability Class I.

Secondary Treatment Comparison

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process is relatively more simple in terms of operational control. The “return/recycle” streams are integrated into the overall design of the oxidation ditch layout with minimal pumping required. There are fewer zones to maintain with the oxidation ditch as well.

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process has a relatively better ability to accommodate flow and loading spikes. This is due to the extended aeration configuration of the aerobic zone of the oxidation ditch; however, the operator must still be careful of hydraulic overloading to the anaerobic and anoxic zones that might result in unfavorable conditions and decreased nutrient removal performance.

Both processes are capable of nutrient removal with EBPR. Due to the favorable carbon-to-nutrient influent loadings, biological nutrient removal is anticipated without continuous need for supplemental carbon addition or for phosphorus removal via chemical precipitation. Consideration for backup supplemental carbon and chemical phosphorus precipitation systems will be considered in final design.

5.5.3.4. Solids Processing

Stabilization of wastewater treatment plant sludge is required to meet the EPA 503 regulations if land application is used for disposal. The City of Nevada currently uses land application and intends to continue using land application as their disposal method at the new site. The land applied biosolids will be required to meet Class B criteria. Multiple aerobic digestion alternatives were elevated for each alternative as no primary treatment/sludge will be present. As stated previously, the City of Nevada placed a high value on ease of operation. Aerobic digestion typically has a lower capital cost and a simpler operation than anaerobic digestion. The two aerobic digestion alternatives evaluated are:

1. Aerobic Digestion with integral membrane thickening process
2. Aerobic Digestion system with post-thickening

Aerobic Digestion with Integral Membrane Thickening

In an effort to reduce the required digestion volume, the sludge can be thickened up to 3-percent solids. Thickening should be limited to 3-percent solids in order to maintain oxygen transfer and solids destruction processes.

Thickening can be performed ahead of or integral to the aerobic digester. Thickening performed ahead of digestion can be achieved using different equipment, including gravity belt thickeners and rotary drum thickeners. Thickened sludge is then transferred to the digester. There are systems that include integral thickening processes to the aerobic digestion process to achieve the same results. These systems use multi-stage membrane thickeners (MBT) to sequentially increase the percent solids throughout the digestion process. See **Appendix D** for more detailed process calculations and sizing for the aerobic digestion process with the MBT process. **See Appendix E: Figure 5** for the solids processing schematic for this alternative. A detailed cost analysis for this aerobic digestion process with solids storage is shown below.

Table 5-12: Integral Thickening Aerobic Digestion OPCC

Aerobic Digesters	
Item	Cost
Earthwork	$ 266,880
Concrete, Cast in Place	$ 1,815,000
Metal	$ 68,500
Painting	$ 50,000
Equipment	$ 1,878,000
Mechanical	$ 308,200
Instrumentation	$ 140,000
Electrical	$ 450,000
Total Aerobic Digesters	$ 4,977,000
Biosolids Storage and Loadout	
Item	Cost
Earthwork	$ 156,168
Concrete, Cast in Place	$ 542,400

Glass Lined Bolted Steel Tank	$ 810,000
Metal	$ 30,000
Equipment	$ 124,000
Mechanical	$ 50,200
Instrumentation	$ 30,000
Electrical	$ 60,000
Total Storage and Loadout	$ 1,803,000
Total Integral Thickening Aerobic Digestion with Storage	**$ 6,780,000**
O&M Present Worth	$ 3,522,000
Total Present Worth Integral Thickening Alternative	**$ 10,302,000**

An advantage of the integral MBT process is the low nitrogen and phosphorus concentrations in the filtrate. This allows filtrate to be directly discharged with secondary effluent without the need to recycle this sidestream back to the secondary process for treatment. A disadvantage of the integral MBT process is that this process is proprietary with limited manufacturer selection options.

Aerobic Digestion with Post Thickening

In an effort to reduce the required sludge storage volume required, the sludge can be post thickened to a much higher solids concentration. For the post thickening alternative, a solids concentration of 5-percent was chosen for solids processing equipment selection and reducing the necessary storage volume. Higher degrees of biosolids volume reduction is possible via further dewatering and drying; however, these options were not desired nor evaluated.

Thickening performed after digestion can be achieved using different equipment, including gravity belt thickeners and rotary drum thickeners. Thickened biosolids is then transferred to sludge storage. See **Appendix D** for more detailed process calculations and sizing for the aerobic digestion process with a post thickening process. See **Appendix E: Figure 6** for the solids processing schematic for this alternative. A detailed cost analysis for this aerobic digestion process with solids storage is shown below.

Table 5-13: Post Thickening Aerobic Digestion OPCC

Aerobic Digesters	
Item	Cost
Earthwork	$ 380,445
Concrete, Cast in Place	$ 3,561,000
Metal	$ 68,500
Painting	$ 50,000
Equipment	$ 542,400
Mechanical	$ 308,200
Total Aerobic Digesters	$ 4,911,000
Solids Processing Building	

Earthwork	$ 74,130
Concrete, Cast in Place	$ 696,000
Superstructure	$ 355,500
Metal	$ 23,400
Painting	$ 50,000
Equipment	$ 1,176,000
Mechanical	$ 363,000
Instrumentation	$ 206,000
Electrical	$ 660,000
Total Solids Processing	$ 3,604,000
Biosolids Storage and Loadout Post Thickening	
Item	Cost
Earthwork	$ 128,658
Concrete, Cast in Place	$ 473,400
Glass Lined Bolted Steel Tank	$ 371,000
Metal	$ 30,000
Equipment	$ 62,000
Mechanical	$ 50,200
Instrumentation	$ 30,000
Electrical	$ 60,000
Total Storage and Loadout	$ 1,205,000
Total Post Thickening Aerobic Digestion with Storage	**$ 9,720,000**
O&M Present Worth	$ 4,180,000
Total Present Worth Post Thickening Alternative	**$ 13,900,000**

An advantage of the post-thickening process is the multiple process and manufacturer options as well as the widespread use of these processes compared to integral thickening. A disadvantage of the post-thickening process is the high nitrogen and phosphorus concentrations in the filtrate. This filtrate must be recycled back to the secondary process for treatment in lieu of direct discharge, and can increase the sizing of the secondary process.

Solids Processing Recommendation

The integral thickening with MBTs is more economical than the post thickening alternative. This solids processing alternative is used for the cost analysis in both alternatives P1 and P2.

The low nutrient concentrations filtrate (sidestream) from the integral thickening process is a major benefit in terms of reducing impact on the secondary treatment system. The post-thickening alternative’s filtrate impacts will need further detailed evaluation during final design if chosen.

5.5.3.5. Biosolids Storage

The City of Nevada intends to continue using land application of liquid biosolids as discussed previously at the new site. Storage should be provided for a minimum of 180 days to avoid having to land apply during winter months on frozen ground. Storage tank options include cast-in-place concrete-wall tanks and glass-lined steel-wall tanks. Both options required concrete foundations and are relatively similar in cost. Final decision regarding tank type will be made during final design. The needed biosolids storage volume will vary depending on the solids processing alternative chosen from **Section 5.5.3.4.** Volume requirements for each alternative and proposed tank sizes are shown in **Table 5-14** below. Tank sizing is subject to change during final design. The cost estimate in Section 5.5.3.4 is based on the tank sizes shown below.

Table 5-14: Biosolids Storage Volume Requirements

Solids Processing Alternative	Required 180 Day Biosolids Storage Volume (MGal)	Proposed Number of Tanks	Tank Height[1] X Diameter (feet)	Actual Biosolids Storage Volume (MGal)
Integral Thickening	2.418	2	28' x 90'	2.522
Post Thickening	1.448	1	19' x 119'	1.456

[1]Hieght includes 1.5 feet freeboard

Mixing should also be included to provide homogeneous biosolids for land application. Options for mixing are diffused air or mechanical mixing systems. Mechanical systems can be configured to provide loadout capability. A mechanical system was used for costs development in this evaluation.

Storage tanks may be covered for heat and/or odor retention. Covers were not considered as part of the evaluation.

See **Appendix D** for more detailed process calculations and sizing for the biosolids storage.

5.5.3.6. Ultraviolet (UV) Disinfection

Both alternatives P1 and P2 were evaluated with the use of a UV disinfection system. During the design workshop, at the start of the planning process, disinfection options discussed included UV, chlorine, and Pera-acetic Acid (PAA) disinfection. Though UV disinfection tends to have a higher capital cost it has many added benefits such as:

- Simple operation,
- No chemical costs for operation,
- No chlorine residual, and
- No major safety concerns

From the design workshop, the City preferred UV disinfection. There are multiple types/arrangements and manufacturers of UV systems. UV equipment selection will be made during final design. Seasonal disinfection is anticipated with the water quality limits for bacteria that are set in the Waste Load Allocation. Full redundancy is not anticipated for the disinfection system per IDNR design standards.

Two potential UV systems are provided in **Appendix D**. These proposals are provided only as guidance. The estimated disinfection system capital cost and operation and maintenance costs for both alternatives P1 and P2 are based on the Trojan UVSigna system. This proposal has a higher capital cost for planning purposes. Final systems and evaluations will be made during the final design phase.

5.6. SELECTED PROCESS AND SITE

5.6.1. Collection System

Alternative S2 is recommended for the interceptor sewer from the existing to new WWTF sites due to:

- Lower capital cost
- Better maintenance access
- Better constructability
- Minimizes environmental impacts along the alignment
- Minimizes easement needs

5.6.2. Wastewater Treatment Facility

Alternative P2 is recommended for the WWTF design because of the best relative ability for:

- Ease of operation
- Process reliability to handle flow/loading spikes
- Ability to perform nutrient removal, specifically EBPR

5.6.3. Summary of Selected Processes

After evaluations of two interceptor sewer alignments and two treatment facility alternatives, it is recommended to use alternatives S2 and P2. Alternative S2 proposes an interceptor sewer alignment that follows County Road S14 the majority of the way to the new site. This alternative will require a pump station and force main at the existing WWTF site. Alternative P2 proposes the new wastewater treatment facility to meet secondary effluent limits and includes nutrient removal capability.

These alternatives will be designed to allow for future expansion if the design flows are exceeded. Processes that are sized based on hydraulic flows may be oversized during final design to account for future flows past the design period. Other processes such as secondary treatment and solids processing will be designed to provide adequate space for future expansion. Space for additional trains to the oxidation ditch and clarifiers will be available in the secondary treatment process. Space for additional aerobic digesters and sludge storage tanks will be provided for expansion in the solids processing units.

There will be minimal environmental impact to the site outside of typical construction of the proposed facilities. The outfall will into West Indian Creek. **Figure 5-1** in Section 5.3 shows the proposed outfall location. The exact outfall location into West Indian Creek is subject to change during final design.

Due to the aggressive expansion schedule by SIU Burke, construction is anticipated to be bid and begin as soon as possible after design and permitting is completed.

Since the proposed treatment facility is at a new site, no additional methods of wastewater treatment will be necessary during project construction. The new interceptor sewer will tie into the existing sewer at the existing WWTF. Methods to keep the existing WWTF in operation during the connection of the new sewer will be determined during final design.

The combined Opinion of Probable Construction Cost is shown in **Table 5-15** on the next page. The total construction cost is estimated to be **$41,741,100.**

Table 5-15: Combined Alternatives OPCC

Item	Cost
General Requirements	$ 2,150,000
Interceptor Sewer	$ 9,746,100
Power Requirements	$ 534,000
Sitework	$ 2,480,000
Administration and Vehicle Storage Building	$ 1,912,000
Headworks and Grit Building	$ 3,037,000
Oxidation Ditches	$ 4,756,000
Final Clarifiers	$ 3,134,000
Secondary Treatment Building	$ 1,505,000
UV Disinfection	$ 822,000
Aerobic Digesters	$ 4,977,000
Biosolids Storage/Loadout	$ 1,803,000
Contingency 20%	$ 4,885,000
Alternative S2 and P2 Total Construction Cost	$ 41,741,100

5.7. PROJECT FINANCING

Project financing is anticipated through a combination of the following sources:

- Clean Water State Revolving Fund (CWSRF) Loan Program,
- Cost-share allocation to industry,
- Potential EDA grant,
- Existing City funds.

In 2013 HR Green completed a sewer rate study for the City of Nevada with proposed increases in sewer rates through 2018. The City of Nevada has used this study to define rates. Currently the City has standard rates for basic monthly charges, quantity use charges, connection fees, and sewer construction fees. In addition to these standard fees, the City of Nevada has a treatment agreement with Significant Industrial User (SIU) Burke Corporation for pretreatment of its process wastewater to defined limits prior to discharge to the City's collection system with industry surcharge fees for cBOD, TSS, TKN, and Oil and Grease exceeding those defined limits. If Burke exceeds the loading agreements, additional penalty fees (surcharges) may be applied. Using 12-month service charges from March 2019 and prior, SIU Burke currently accounts for approximately 34-percent of all sewer charges. With no outstanding wastewater-related loans, the City of Nevada currently gains an annual net revenue of approximately $650,000 from sewer service charges. **Appendix B** provides the City of Nevada's existing ordinance for service charges.

This Facility Plan does not include a sewer rate analysis for the proposed wastewater treatment facility. New treatment agreements between the City and Burke and Verbio have yet to be completed. This Facility Plan will help the City negotiate a new treatment agreement with Burke and Verbio and establish SIU's cost share of the proposed WWTF. A sewer rate analysis can be completed by the City at a future date once those agreements are made.

5.8. LEGAL, AND OTHER CONSIDERATIONS

5.8.1. Right-of-Way (ROW)/Easement Acquisition

5.8.1.1. Schedule

ROW/easement acquisition will be required mostly for the interceptor sewer. Limited easement acquisition, if any, is anticipated for the WWTF as the planned site is already owned by the City. The anticipated schedule to complete ROW acquisition is a function of regulatory approvals schedule; development of the final design alignment; and completion of legal requirements to obtain ROW/easement acquisition. We anticipate that ROW acquisition can be completed in the year 2020 for this entire project.

5.8.2. Permitting Requirements

In addition to meeting IDNR Design Standards, the proposed gravity interceptor sewer and WWTF will need to adhere to the following permits:

- IDNR Construction Permit
- Joint Application Form (Alternative S1 and WWTF only)
  - Flood Plain Permit to Iowa DNR
  - US Army Corp of Engineers Section 404 Permit
- Iowa Sovereign Lands Approval
- Story County Conditional Use Permit for WWTF site

5.8.3. Method of Bidding

The proposed method of bidding for this project will be design/bid/build with sealed competitive bid process following the public bidding requirements as outlined in the Iowa Code.

5.8.4. Number of Construction Contracts

Two separate bidding process and contracts are anticipated:

1. One construction contract for the construction of the interceptor sewer project
2. One construction contract for the construction of the WWTF project

5.8.5. Estimated Project Schedule

The estimated project schedule is given below:

Table 5-16: Overall Estimated Project Schedule

Phase	Duration (months)	Anticipated Start Date
Design Period	8 – 10	October 2019
Obtain Permits	3 – 6	June 2020
ROW & Easement Acquisition	4 – 6	June 2020
Solicitation of Bids & Award of Contract	2 – 3	January 2021
Construction Period	12 – 18	April 2021

A. Appendix A – IDNR Planning Documents

IOWA DEPARTMENT OF NATURAL RESOURCES

NUTRIENT REDUCTION STRATEGY

FOR WASTEWATER TREATMENT PLANTS

The Iowa Nutrient Reduction Strategy is a science- and technology-based approach to assess and reduce nutrients delivered to Iowa waterways and the Gulf of Mexico. The strategy outlines efforts to reduce nutrients in surface water from point sources, such as municipal and industrial wastewater treatment plants, and nonpoint sources, including farm fields and urban areas, in a scientific, reasonable and cost-effective manner.

The Iowa strategy was developed in response to the 2008 Gulf Hypoxia Action Plan, which calls for the 12 states along the Mississippi River to craft strategies to reduce nutrients reaching the Gulf of Mexico. The Iowa strategy follows the recommended framework provided by the U.S. Environmental Protection Agency (EPA) in 2011. The DNR will work with wastewater facilities throughout the state to reduce nutrient discharges from point sources with a goal of reducing total phosphorus by 16 percent and total nitrogen by 4 percent. In addition to impacting the Gulf, nutrients also negatively affect local Iowa receiving streams. Nutrient reduction will help better protect those streams, especially during low flows.

WHAT FACILITIES ARE AFFECTED?

- 102 major municipal and 46 industrial wastewater facilities where biological nutrient removal is economically and technically feasible.
- Minor municipal wastewater facilities (less than 1 million gallons per day) will evaluate nutrient reduction alternatives when increasing design loads.
- Major industrial treatment plants that do not have biological treatment will assess nutrient removal possibilities during regularly scheduled permit renewals.

HOW WILL NUTRIENTS BE REMOVED?

- Biological nutrient removal, or BNR, was considered in this strategy. Other options for nutrient removal are available and can be evaluated.

HOW WILL THIS BE IMPLEMENTED?

- When a National Pollutant Discharge Elimination System (NPDES) permit is renewed, the permit will require that the facility conduct a two-year study to evaluate the costs and feasibility of installing biological nutrient removal and submit a proposed schedule for installation. After the study is completed, the schedule will be incorporated in the facility's NPDES.
- Timeframes for construction will be based on the negotiated schedules for major municipal and certain industrial facilities, case by case.

HOW ARE LIMITS SET?

- Technology-based limits will be implemented in a facility's NPDES permit. Many nutrient removal technologies are feasible, as they are already proven and well-established.
- Limits will be no more stringent than 10 mg/L for total nitrogen and 1 mg/L for total phosphorus.
- In general, these levels of nutrient reduction are technically and economically achievable for Iowa facilities.

HOW WILL COMPLIANCE BE DETERMINED?

- After BNR is installed and operational, the facility will have one year to conduct a process optimization evaluation prior to limits being established.
- Total nitrogen and phosphorus limits will be based on demonstrated plant performance, but no more than 10 mg/L (nitrogen) and 1 mg/L (phosphorus).
- Plants will be protected from stricter limits for 10 years if nutrient removal is installed.
- The facility will have monthly limits for nitrogen and phosphorus discharged. Compliance will be determined by the annual average, rather than by the monthly limits.

WWW.NUTRIENTSTRATEGY.IASTATE.EDU

GENERAL QUESTIONS
Adam Schnieders, DNR: 515-725-8403 or adam.schnieders@dnr.iowa.gov

MUNICIPAL QUESTIONS
Eric Wiklund, DNR: 515-725-0313 or eric.wiklund@dnr.iowa.gov

INDUSTRIAL QUESTIONS
Wendy Hieb, DNR: 515-725-8405 or wendy.hieb@dnr.iowa.gov

B. Appendix B – City of Nevada Service Charges

APPENDIX TO
CODE OF ORDINANCES

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CHAPTER 500

MUNICIPAL CODE CARE AND MAINTENANCE

500.1 USE AND MAINTENANCE OF THE CODE OF ORDINANCES. The following information is provided the Code Editor, Iowa Codification, Inc., to assist in the use and proper maintenance of this Code of Ordinances.

500.2 DISTRIBUTION OF COPIES.

1. Official Copy. The "OFFICIAL COPY" of the Code of Ordinances shall be kept by the City Clerk and shall be identified as the "OFFICIAL COPY."

2. Distribution. Other copies of the Code of Ordinances shall be made available to all persons having a relatively frequent and continuing need to have access to ordinances which are in effect in the City as well as reference centers such as the Nevada Public Library and the Nevada schools, if requested by the school. The City Clerk shall be responsible for furnishing a copy and all updates as they are issued, to the District Associate Judges' chambers located at the Justice Center in Nevada and Ames City Hall in Ames, Iowa.

3. Sale. The sale or distribution of copies in a general fashion is not recommended as experience indicates that indiscriminate distribution tends to result in outdated codes being used or misused.

4. Record of Distribution. The City Clerk shall be responsible for maintaining an accurate and current record of persons having a copy of the Code of Ordinance. Each official, elected or appointed, shall return to the City, upon leaving office, all documents, records and other materials pertaining to the office, including this Code of Ordinances.

(Code of Iowa, Sec. 372.13[4])

500.3 NUMBERING OF ORDINANCES AND AMENDING THE CODE OF ORDINANCES. The Code Editor recommends that a simple numerical sequence be used in assigning ordinance numbers to ordinances as they are passed. For example, if ordinance adopting the Code of Ordinances was No. 163, we would suggest that the first ordinance passed changing, adding to or deleting from the Code be assigned the number 164; the next ordinance is assigned the number 165, and so on. We advise against using the Code of Ordinances numbering system for numbering of ordinances.

500.4 RETENTION OF AMENDING ORDINANCES. Two related Ordinance Books shall be maintained by the City Clerk: (1) the Code of Ordinances compiled in chronological order by sequential ordinance number, and (2) an ordinance book by Chapter and Section number. Iowa Codification will assist in the maintenance of the Code of Ordinances book, per the Supplement Agreement, by revising and returning appropriate pages for the Code of Ordinance book as required to accommodate ordinances amending the Code. The City Clerk is responsible for maintaining the ordinance book and must be sure that an original copy of each ordinance adopted, bearing the signatures of the Mayor and Clerk, is inserted in the ordinance book and preserved in a safe place.

500.5 SUPPLEMENT RECORD. A record of all supplements prepared for the Code of Ordinances is provided in the front of the Code. This record will indicate the number and date of the ordinances adopting the original Code and of each subsequently adopted ordinance which ahs been incorporated in the Code. For each supplemented ordinance, the Supplement Record will list the ordinance number, date, topic, and chapter number of the Code affected by the amending ordinance. A periodic review of the Supplement Record and ordinances passed will assure that all ordinances amending the Code have been incorporated therein.

500.6 DISTRIBUTION OF SUPPLEMENTS. Supplements containing revised pages for insertion in each Code will be sent to the Clerk. It is the responsibility of the Clerk to see that each person having a Code of Ordinances receives each supplement so that each Code may be properly updated to reflect action of the Council in amending the Code.

500.7 AMENDING THE CODE OF ORDINANCES. The Code of Ordinances contains most of the laws of the City as of the date of its adoption and is continually subject to amendment to reflect changing policies of the Council, mandates of the State, or decisions of the Courts. Amendment to the Code of Ordinances can only be accomplished by the adoption of an ordinance.

(Code of Iowa, Sec. 380.2)

500.8 ORDINANCES NOT CONTAINED IN THE CODE OF ORDINANCES. There are certain types of ordinances which the City will be adopting which are not required to be incorporated in the Code of Ordinances. These ordinances include ordinances (1) establishing grades of streets or sidewalks, (2) vacating streets or alleys, (3) authorizing the issuance of bonds and (4) zoning map ordinance.

(Code of Iowa, Sec. 380.8)

CHAPTER 510

SCHEDULE OF FEES AND CHARGES

510.1 WATER.

1. Monthly Water Rates (See Code Section 92.02)

A. Basic Monthly Flat Charge

(1) April, 2005 through March, 2006	$8.50 per month
(2) April, 2006 through March, 2007	$10.00 per month
(3) April, 2007 through October, 2011	$10.70 per month
(4) November, 2011 through July 2013	$11.02 per month
(5) July, 2013 through May 2014	$11.57 per month
(6) June 2014 through May 2015	$12.15 per month
(7) June 2015 through May 2016	$12.76 per month
(8) June 2016 through May 2017	$13.39 per month
(9) June 2017	$14.06 per month

And in addition thereto

B. Monthly Quantity Use Charge

	Gallons or pro-rata portion
(1) April, 2005 through March, 2006	$3.90 per 1,000
(2) April, 2006 through March, 2007	$4.60 per 1,000
(3) April, 2007	$4.92 per 1,000
(4) November, 2011 through June 2013	$5.07 per 1,000
(5) June, 2013 through May 2014	$5.32 per 1,000
(6) June, 2014 through May 2015	$5.59 per 1,000
(7) June, 2015 through May 2016	$5.87 per 1,000
(8) June 2016 through May 2017	$6.16 per 1,000
(9) June 2017	$6.47 per 1,000

2. Rates for Non-Potable Raw Water (See Code Section 92.03)

A. Basic Monthly Flat Charge

Meter Reading Date:	Monthly Service Fee:
April, 2007	$10.70 per month
November, 2011	$11.02 per month
June, 2013	$11.57 per month
June, 2014	$12.15 per month
June, 2015	$12.76 per month
June, 2016	$13.39 per month
June, 2017	$14.06 per month

B. Monthly Quantity Use Charge. In addition to the monthly flat charge set forth above, there shall be a use (consumption) charge per 1,000 gallons of water, or pro rata portion thereof, used or consumed by the customer as determined by meter readings in accordance with the following schedule:

Meter Reading Date:	Per 1,000 or pro-rata part thereof:
April, 2007	$0.70
November, 2011	$0.72
June, 2013	$0.76
June, 2014	$0.79
June, 2015	$0.83
June, 2016	$0.88
June, 2017	$0.92

3. Rates Outside City Limits. (See Code Section 92.04) — 200% of the rates provided above.

4. Miscellaneous

A. Equipment and Service Fees:

(1)	Replacement frost plate	$40.00
(2)	Replacement meter (used 5/8")	$150.00
(3)	Replacement meter (new 5/8")	$235.00
(4)	Neptune Meter Register	$150.00
(5)	Trip fee to replace meter	$20.00
(6)	Meter In	$25.00
(7)	Meter Out	$25.00
(8)	Check meter accuracy 5/8" or 1" (refundable if not accurate)	$235.00
(9)	Meters over 1" will be sent in at customers cost	
(10)	Reading Non-Neptune Meters	$35.00
(11)	Customer Requested 90-Day Meter Reading (1 free a year)	$25.00

B. Curb Box Service:

(1)	Locate curb box – 1st hour	$20.00
(2)	Locate curb box – After 1st hour	$25.00

(3)	Replace curb box	$300.00 plus labor and equipment fees
(4)	Purchase curb box (box only)	$55.00
(5)	Purchase curb stop (valve)	$70.00
(6)	Replacement curb box cap	$15.00

C. Delinquent Payment (bill, deposit, or NSF/Returned Payment), No application, and Requested Temporary Vacancy Shut-off Fees:

(1)	Blue Tag Notice Card	$20.00
(2)	Trip fee to Disconnect Service	$35.00
(3)	Disconnect Service Fee	$35.00
(4)	Trip fee to Reconnect between 7:30 a.m. and 4:00 p.m.	$35.00
(5)	Trip fee to Reconnect after 4:00 p.m. and before 7:30 a.m.	$50.00

Fees in the amounts shown in the Appendix to this Code of Ordinances shall be charged and paid before service is restored to a delinquent customer. No fee shall be charged for the usual or customary trips in the regular changes in occupancies of property.

5. Water Tapping Fees:

Tap Size	Tapping Fee
5/8” or 5/8” x 3/4"	$150.00
3/4"	$200.00
1”	$250.00
1-1/4”	$350.00
1-1/2”	$500.00
2”	$800.00
3”	$1,200.00
4”	$1,600.00
6”	$2,500.00
Larger than 6”	$3,000.00

An additional $600.00 will be charged for users located outside the corporate limits of the City.

6. Bulk Water Meters – Water Rates per 510.01.B.3. – current rate

A. Set/Installation Fee	$100.00
B. Monthly Fee for ¾” Meter	$18.00
C. Monthly Fee for 1” Meter	$32.00
D. Monthly Fee for 2” Meter	$130.00

510.2 WASTEWATER.

1. Basic Monthly Flat Charge (See Code Section 99.06)

March 1, 2004	$7.50 per month
June, 2013	$7.65 per month
June, 2014	$7.80 per month
June, 2015	$7.96 per month
June, 2016	$8.20 per month
June, 2017	$8.44 per month

And in addition thereto

2. Quantity Use Charge

March 1, 2004	$3.33 per 1,000 gallons or pro-rata
June 1, 2008	$3.43 per 1,000 gallons or pro-rata
July 1, 2009	$3.53 per 1,000 gallons or pro-rata
July 1, 2010	$3.64 per 1,000 gallons or pro-rata
July 1, 2011	$3.75 per 1,000 gallons or pro-rata
July 1, 2012	$3.86 per 1,000 gallons or pro-rata
July 1, 2013	$3.94 per 1000 gallons or pro-rata
July 1, 2014	$4.02 per 1000 gallons or pro-rata
July 1, 2015	$4.10 per 1000 gallons or pro-rata
July 1, 2016	$4.22 per 1000 gallons or pro-rata
July 1, 2017	$4.35 per 1000 gallons or pro-rata

3. Connection Fee

A. Residential	$200.00
B. Commercial/Industrial	$400.00

4. Sewer Construction

June, 2012	$1.50 per month
June, 2013	$1.53 per month
June, 2014	$1.56 per month
June, 2015	$1.59 per month
June, 2016	$1.64 per month
June, 2017	$1.69 per month

5. Surcharges (where applicable) (See Code Section 99.07):

A. Carbonaceous Biological Oxygen Demand (CBOD) per pound over 300mg/l

July 2012	July 2013	July 2014	July 2015	July 2016	July 2017
$0.180/lb	$0.185/lb	$0.189/lb	$0.194/lb	$0.199/lb	$0.204/lb

B. Total Suspended Solids (TSS) in excess of 300 mg/l

July 2012	July 2013	July 2014	July 2015	July 2016	July 2017
$0.450/lb	$0.450/lb	$0.461/lb	$0.473/lb	$0.485/lb	$0.497/lb

C. Total Kjeldahl Nitrogen (TKN) in excess of 35 mg/l

July 2012	July 2013	July 2014	July 2015	July 2016	July 2017
$0.700/lb	$0.718/lb	$0.735/lb	$0.754/lb	$0.773/lb	$0.792/lb

A. Oil and Grease:
   (1) $0.10 per pound in excess of 300 mg/l and an additional
   (2) $0.20 per pound in excess of 600 mg/l

510.3 SOLID WASTE (GARBAGE).

This fee is reviewed annually and may be adjusted as required by Chapter 106 of the Nevada Municipal Code for the July billing cycle.

1. July 1, 2005 $1.80 per month
2. July 1, 2006 $1.70 per month
3. July 1, 2007 $1.75 per month
4. July 1, 2009 $1.70 per month
5. July 1, 2010 $1.70 per month
6. July 1, 2011 $1.75 per month
7. July 1, 2012 $1.55 per month
8. July 1, 2014 $1.45 per month
9. July 1, 2017 $1.30 per month

510.4 STORM WATER

This fee is reviewed annually and may be adjusted as required by the Nevada Municipal Code.

1. Basic Monthly Flat Charge (See Code Sec. 102.4)

A. July 1, 2009	$1.50 per month
B. July 1, 2011	$5.00 per month
C. January 1, 2014	$5.25 per month

2. Connection Fees (See Code Sec. 103.4)

A. Residential	$20.00
B. Commercial/Industrial	$50.00

510.5 BUILDING, ZONING AND SUBDIVISIONS. The Zoning Administrator and Building Official shall charge the following fees:

1. Zoning and Subdivisions

A. Major Subdivision Preliminary Plat*	$150.00 plus $10.00 per lot
B. Major Subdivision Final Plat*	$75.00
C. Minor Subdivision*	$75.00
D. Administrative Subdivision*	$75.00
E. Site Plan*	$100.00
F. Special Use Permit*	$100.00
G. Text Amendment to Code*	$50.00
H. Rezoning*	$100.00 plus $1.00 per mailing address
I. Board of Adjustment Appeal – Residential	$100.00
J. Board of Adjustment Appeal – Commercial/Industrial	$200.00
K. Construction Drawings	100% of costs for outside consulting
L. Regulations Disk (Comprehensive Plan, Zoning Ordinance, Subdivision Ordinance, Zoning Map, Application Forms, Etc.)	$20.00
M. Before and After Hours Inspections:	$50.00/hour

*In addition to the above fees, 100% of the costs incurred by the City during the review process shall be charged to the developer. These include, but are not limited to, costs and fees charged by the City Engineer and other professional consultants retained by the City in connection with the review process. No plat will be considered by the City Council until all fees are paid.

2. Building Permit Fees. A fee for each building permit shall be paid to the City as set forth herein.

PERMIT FOR	FEE
Residential (New, Remodel or Addition)	$50.00 plus $0.20 per square foot of useable space
Commercial (New, Remodel or Addition)	$100.00 plus $0.20 per square foot of useable space
Industrial (New, Remodel or Addition)	$200.00 plus $0.20 per square foot of useable space
Fence, Deck, or Utility Shed or Building (Tool, Storage, Playhouse and similar uses up to 250 square feet)	$20.00
Fireplace or Woodstove	$20.00
Sign	$20.00
Demolition	$20.00
Plumbing – Residential (New, Remodel or Addition)	$35.00 plus $2.00 per fixture unit (see permit application)
Plumbing – Commercial (New)	$100.00 (see permit application)
Plumbing – Commercial (Remodel or Addition)	$35.00 plus $2.00 per fixture unit (see permit application)

PERMIT FOR	FEE
Plumbing – Industrial (New)	$200.00 (see permit application)
Plumbing – Industrial (Remodel or Addition)	$35.00 plus $2.00 per fixture unit (see permit application)
Electrical –Residential (New, Remodel or Addition)	$35.00 plus $2.00 per circuit unit (see permit application)
Electrical – Commercial (New)	$100.00 (see permit application)
Electrical – Commercial (Remodel or Addition)	$35.00 plus $2.00 per circuit unit (see permit application)
Electrical – Industrial (New)	$200.00 (see permit application)
Electrical – Industrial (Remodel or Addition)	$35.00 plus $2.00 per circuit unit (see permit application)
Mechanical – Residential (New, Remodel or Addition)	$35.00 plus $2.00 per gas outlet (see permit application)
Mechanical - Commercial (New)	$100.00 (see permit application)
Mechanical – Commercial (Remodel or Addition)	$35.00 plus $2.00 per gas outlet (see permit application)
Mechanical – Industrial (New)	$200.00 (see permit application)
Mechanical – Industrial (Remodel or Addition)	$35.00 plus $2.00 per gas outlet (see permit application)

3. Building Permit Plan Review Fee. A plan review fee shall be paid in an amount equal to one-half of the building permit and shall be paid at the time of submitting plans and specifications for review. Where plans are incomplete, or changed so as to require additional plan review, an additional fee may be charged at a rate commensurate with the additional review as required on a case-by-case basis and as established by the Building Official.

No plan review fee will be assessed for residential garages.

4. Right-of-Way License (See Code Sec. 135.10.2) $50.00 per year

5. Right-of-Way Excavation Permit (See Code Sec. 135.10.5) $20.00

6. Sidewalk Café Permit $50.00 per year

510.6 PARKS AND RECREATION.

1. Aquatic Center

A. General Admission (1 and under free)
1. Toddler Admission (2 & 3 year olds) $2.50
2. General Admission (4-54 year olds) $5.00
3. Senior Admission (55 and older) $3.50

B. Season Passes:
- Individual Pass $80.00
- 2 Person Family Pass (New Option) $115.00
- 3 Person Family Pass (New Option) $145.00
- 4 Person Family Pass (New Option) $170.00
    - Additional family members beyond 4 - $25.00 each
- Senior Individual Pass (55 and older) $63.00
- Babysitter/Grandparent Pass $55.00
  (This can be added to an individual or family pass and is limited to one (1) grandparent or babysitter not living in the same household. Babysitter must be at least 16 years of age and be providing child care/supervision.)

Family Pass– must be immediate family members living in the same house. Each additional member on the family pass beyond four will be charged at a rate of $25.00 per person.

C. Twilight Swim (after 4:00 p.m. – 1 and under free) $2.50

D. Lap Swim $2.50

E. Group Admission (20 or more) $3.50

F. Punch Pass (10 punches) $45.00

G. Senior Punch Pass (55 and older - 10 punches) $35.00

H. Pool Party (one and one-half hours)
1. Group Party during Open Swim Hours (5:30 p.m. – 7:00 p.m.) $100.00
2. Private Party (6:20 p.m. – 7:50 p.m. Saturday/Sunday only) $225.00

I. Concession Stand Operations During Pool Parties: A fee of $25.00 if the individual or group renting the pool wants the concession stand to be open during the party.

K. Private Swim Lesson (per student/time - non-open hours)
Daily Admission Rate or Season Pass

L. Ten percent Discount on all season passes (individual, senior individual, and family) purchased during the months between December and March

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Taxes and fees are included in these prices.

2. Gates Hall

A. Auditorium $60.00 per hour

B South Room $25.00 per hour

C. North Room $20.00 per hour

D. Kitchen $30.00 per hour

E. Entire Building – First 8 hours $115.00 per hour

F. Entire Building – After 8 hours on same day $60.00 per hour

G. Damage Deposit $200.00
(Damage deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

3. Pavilion.

The Pavilion is not available for rentals on the following holidays: Thanksgiving, Friday after Thanksgiving, Christmas Eve (December 24), Christmas Day (December 25), New Year's Eve (December 31) and New Year's Day (January 1). All other city holidays (President's Day, Memorial Day, 4th of July, Labor Day and Veteran's Day) are charged at the weekend rate with a half day minimum regardless of the day of the week.

A. Monday – Thursday:
- $100.00 Initial, Non-refundable Fee
- $100.00 half day rate (6 consecutive hours)
- $150.00 whole day rate (8:30 a.m. – Midnight)

B. Friday – Sunday:
- $200.00 Initial, Non-refundable Fee
- $200.00 half day rate (6 consecutive hours)
- $300.00 whole day rate (8:30 a.m. – Midnight)

C. Damage Deposit $200.00
(Damage deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

4. 4-Plex Fields.

A. One (1) day complex rental $250.00

B. Two (2) day complex rental $450.00

C. Three (3) day complex rental $600.00

D. Lights are an additional $10.00/hour/field – 1 hour minimum

E. Rental includes dragging and chalking the fields one time, concession stand will be open, and a complex attendant/site supervisor will be on hand throughout the tournament.

F. Reservations may be made by paying a $50.00 hold fee at the time of booking to hold a date and does not count towards the complex rental fee. This fee is non-refundable unless the tournament is cancelled by the Nevada Parks and Recreation Department due to weather or poor field conditions.

G. Extra chalk and drying agent used throughout the tournament will be charged at cost.

H. Extra dragging and chalking of fields will be charged at the city's regular labor and equipment rates. Rakes and field chalker will be available for use at the diamonds.

I. 7% sales tax will be added to all fees.

5. Soccer Fields. Soccer field rent will be handled on a case by case basis based on season and field availability.

6. Equipment Rental. Fees charged by the Parks and Recreation Department for equipment used in its operation, or for rental of miscellaneous equipment, shall be those charged by the Streets Department in Section 510.7 or as follows:

A. Picnic Table — $5.00 per table per day
Damages will be assessed at cost plus labor to repair.

B. Bleacher — $25.00 per set per day
Damages will be assessed at cost plus labor to repair.

510.7 STREETS.

1. Non-Motorized Equipment Rental Rates:

A. Barricades*	$20.00 each plus $25.00 Deposit
B. Traffic Cones*	$15.00 each plus $25.00 Deposit
C. Flashers*	$10.00 each plus $25.00 Deposit
D. Plastic Snow Fence	$1.00 per foot plus $25.00 Deposit

* Deposit non-refundable if items are damaged or not returned.

2. Motorized Equipment Rental Rates (includes Parks and Recreation/Cemetery) – Machine or Vehicle Only (one hour minimum). The following rates represent the actual total cost of acquiring, operating and maintaining the listed equipment, except for fuel surcharges, if applicable. The rates are used to compute the "in-house" cost of actual work performed on municipal projects, utilizing city-owned equipment operated by city employees. These costs and charges are assessed against persons who are responsible for damages to City property and the costs of abating nuisances and repairing damage caused by vandalism, with the exception of sign replacement which is set forth in Section 510.7.4 below.

[Important Notice] The equipment rates set forth below do not include the additional labor costs of the driver or operator of each individual piece of equipment. All labor costs are in addition to the equipment rates listed below. Furthermore, in the event the local retail costs of gasoline exceeds $3.25 per gallon, or the local retail costs of diesel fuel exceeds $4.25 per gallon, the City Administrator shall have the option to assess a fuel tax surcharge in an amount deemed reasonable and appropriate by the Administrator.

A.	Dump Truck	$50.00 per hour
B.	Sewer Jet-Vac Truck	$125.00 per hour
C.	Street Sweeper	$80.00 per hour
D.	End loader	$75.00 per hour
E.	Backhoe	$50.00 per hour
F.	Motor Grader	$70.00 per hour
G.	Skid Loader	$35.00 per hour
H.	Snow Blower	$35.00 per hour
I.	Concrete Saw	$30.00 per hour

J.	Air Compressor	$25.00 per hour
K.	Tractor	$35.00 per hour
L.	Weed Eater	$15.00 per hour
M.	Leaf Blower	$15.00 per hour
N.	Top Dresser	$30.00 per hour
O.	Aerifier	$30.00 per hour
P.	Walk-behind Mower	$20.00 per hour
Q.	Riding Mower with collection system	$40.00 per hour
R.	Zero Turn Mower	$35.00 per hour
S.	WAM Mower (wide area)	$50.00 per hour
T.	Pickup	$35.00 per hour
U.	Flatbed trailer (16' with ramps)	$15.00 per hour
V.	Line Painter	$20.00 per hour
W.	Utility Tractor Attachments (Tiller, Post hole auger, Snow blower, Broom, Blade, 3-point spreader, Loader, Field Groomer, Chemical Sprayer)	$20.00 per hour
X.	Power and Hand Tools	$10.00 per hour
Y.	Disposable items used during Incident, if purchased by City	Actual cost plus 15%
Z.	Charges for equipment repair, cleaning, parts and labor	Actual cost plus 15%
AA.	Charges for damaged equipment plus shipping, if applicable	Actual cost plus 15%
BB.	Gator	$25.00 per hour
CC.	Pickup/Snowplow	$55.00 per hour
DD.	Slit Seeder	$35.00 per hour
EE.	Sprayer with Gator	$45.00 per hour
FF.	Ride on Sprayer	$30.00 per hour

GG. Pickup with Dump Box $40.00 per hour

HH. Chain Saw $20.00 per hour

3. Driver, Operator and Labor Fees (includes Parks and Recreation/Cemetery):

   A. Regular (Monday–Friday, 7:30 a.m.–4:00 p.m.) $35.70 per hour (1 hour minimum)

   B. Overtime (Monday–Friday, 4:00 p.m.–7:30 a.m., weekends and holidays) $53.50 per hour (1 hour minimum)

4. Sign Replacement and Repair Charges due to Vandalism or Accidents

   A. All signs, exclusive of posts $75.00 each

   B. Wood Posts $25.00 each

   C. Steel Posts $100.00 each

510.8 FIRE.

1. Equipment Rates, Exclusive of Labor Rates (One hour minimum):

A. Engine 210 and 310	$500.00 per hour
B. Truck 110	$600.00 per hour
C. Tanker 410 and 510	$300.00 per hour
D. Attack 610 and 710	$250.00 per hour
E. Heavy Rescue 1064	$400.00 per hour
F. Medical First Response Vehicle 810	$200.00 per hour
G. Command Vehicle	$200.00 per hour
H. Disposable items used during the incident, if purchase by City	Actual cost plus 15%
I. Charges for equipment repair, cleaning, parts and labor	Actual cost plus 15%
J. Charges for damaged equipment, plus shipping, if applicable	Actual cost plus 15%
K. Water used (non-emergency)	$1.00 per gallon

2. Labor Fees in addition to Equipment Rates for Fire Chief, Assistant Fire Chief, Firefighters, Emergency Medical Technicians and First Responders salaries (One hour minimum):

A. Regular (Monday-Friday, 8:00 a.m.-5:00 p.m.)	$40.00 per hour (One hour minimum)
B. Overtime (Mon-Fri 5 p.m.-8 a.m., weekends & holidays)	$60.00 per hour (Two hour minimum)

3. Non-Resident Response:

A. Vehicle Fire Response	$500.00
B. Extrication Response	$700.00 per hour

4. False Alarm Charges – Fees are based on calendar year beginning January 1, 2013

A. 1st, 2nd, 3rd False Alarm	No Charge
B. 4th False Alarm	$100.00
C. 5th False Alarm	$200.00
D. 6th and Subsequent False Alarms	$400.00
E. Late Fee for each False Alarm Invoice	$50.00

5. Inspection Fees

A. Occupancy Inspection (below 12,000 SF)	$50.00
B. Occupancy Inspection (12,000 SF and above)	$100.00
C. 1st Revisit Inspection	No charge
D. 2nd and 3rd Revisit Inspection	$50.00

6. Plan Review

A. Fire Alarm/Sprinkler and Building Plan Review (12,000 SF and above)	$200.00
B. Building Plan Review (all other plan reviews)	$100.00

7. Miscellaneous

A. Fire Report	$10.00

510.9 POLICE.

1. Parking Violation Fines:

   A. Parking Ticket (General) $25.00 each

   B. Parking Ticket (Snow Ordinance) $50.00 each

   C. Overnight Downtown Parking Permit (One-time Administrative Fee) $20.00 each
   (1) Annual Parking Permit $5.00 each

2. Copy and Redacting Fees:

   A. Copies of Police Reports (Redacting Fees extra)
   Minimum of $10.00 each plus $0.50 per page over - 4 pages

   B. Copies of Crash or Accident Report (Redacting Fees extra)
   Minimum of $10.00 each plus $0.50 per page over - 4 pages

   C. Redacting Fees on Police, Crash or Accident Reports
   Minimum of $10.00 each plus $0.50 per page over 4 pages

   D. Copies of Audio and Video Tapes $20.00 each

   E. Copies of CD's and DVD's $20.00 each

   F. Duplicate Digital Photographs $15.00 per CD-Rom
   (accidents, nuisances, etc.)

   G. 35 mm photographs reprints $3.00 each

3. Miscellaneous Fees:

   A. Certified Mailings Actual Postage Cost

   B. Extensive Records Search $30.00 hour plus copy charges (2 hour minimum)
   Extensive Redacting Fees $30.00 per hour plus copy charges (2 hour minimum)

(1) 8-1/2" x 11"	Black and White	$0.50 per page
(2) 8-1/2" x 11"	Color	$1.00 per page
(3) 8-1/2" x 14 or 11" x 17"	Black and White	$1.50 per page
(4) 8-1/2 x 14 or 11" x 17"	Color	$2.50 per page

   C. Finger Printing $25.00 each

   D. Salvage Title Vehicle Inspection and other IDOT Inspections
   (Fees based on established rate set by State of Iowa)

E. Service of Subpoena	$35.00 each

4. Annual License Fees for Dogs and Cats

A. Four or fewer total dogs and/or cats.

(1) Each dog and cat that is spayed or neutered	$5.00 each
(2) Each dog and cat that is NOT spayed or neutered	$10.00 each

B. In Excess of four dogs and/or cats

(1) Each dog and cat that is spayed or neutered	$20.00 each
(2) Each dog and cat that is NOT spayed or neutered	$40.00 each

5. Fees Related to Animal Control. Impounding costs are established by the Council as necessary to recover all costs and charges incurred by the City in impounding and maintain the animal. In addition to all costs of impounding the animal, there is an administrative fee of $50.00 per incident per animal for each impoundment. All of the above fees and charges must be paid by the owner before the animal is released.

A. Daily Cat Impoundment Fee	$9.40 /day
B. Daily Dog Impoundment Fee	$13.40 /day
C. Rabies Observation Fee (in addition to daily impoundment)	$6.50 /day
D. Euthanasia and Cremation	$50.00
E. Cremation Only	$39.50
F. Rabies Vaccination	$16.90
G. After Hours Examination	$55.00
H. Feral Cat –Special Handling Fee (one time fee)	$24.50

6. Special License and Permit Fees:

A. Pawnbroker's License	$100.00 each
B. Peddlers/Solicitors Permit	
Application Fee (in addition to costs below)	$25.00
(1) One Day (24 Hours)	$25.00
(2) One Week (7 Calendar Days)	$75.00
(3) One Month (Calendar Month)	$100.00

7. Officer Labor Fees

A. Regular	$40.00 per hour (2 hour minimum)
B. Overtime	$60.00 per hour (2 hour minimum)
C. Out of Jurisdiction	$80.00 per hour (2 hour minimum)

8. Community Service Officer Labor Fees

A. Regular	$20.00 per hour (2 hour minimum)
B. Overtime	$40.00 per hour (2 hour minimum)

9. Use of Police Vehicle

A. Within City Jurisdiction	$25.00 per hour (2 hours minimum)
B. Out of Jurisdiction	$50.00 per hour (2 hours minimum) plus IRS Standard Mileage Rate

510.10 CEMETERY.

Payments for Lots and Niches. Payments for the purchase of lots and niches are required to be completed within one year from the date of down payment. If payment in full is not made within one year all payments will be forfeited. Monthly payments may be arranged at the time of purchase. There will be an additional cost of $5.00 per month added to scheduled payments to cover the additional record keeping. Twenty-five percent of the price of any space for in-ground burial will be entered into the Perpetual Care Fund. Twenty percent of the price of any niche space will be entered into the Perpetual Care Fund. Five percent of the price of any niche space will be entered into the Columbarium Maintenance Fund.

1. Standard Burial Space $600.00
One standard vault burial, two in-ground cremains burial urns or one two-niche columbarium may be placed in or on one standard burial space. Cremain burials on existing in-ground lots are allowed only with the permission of the Sexton.

2. Six-Foot Burial Space $775.00
Two cremation burials with one standard vault burial or three in-ground or above-ground cremation burials with no standard vault burial. Cremain burials on existing in-ground lots are allowed only with the permission of the Sexton.

3. Infant Package to be Used in Babyland $575.00
Marker, space, opening/closing included. All stones in the Babyland are one size, one color and furnished by the Cemetery. Burial containers cannot be larger than 36 inches long by 18 inches wide.

4. Columbarium Niche (above ground burial) $1,200.00
Opening and closing included; after normal business hours charge applies.

5. Columbarium Niche Plates (subject to change, actual vendor cost)
   A. As of January 2015
      (1) Single $300.00
      (2) Double $350.00
      (3) Scrolls for Previous Years $130.00

6. Cremation Garden Inurnment Lot (in ground burial) $400.00

8. Family Estate Lot (mausoleum) $4,000.00
All other costs including perpetual care of the mausoleum and opening and closing costs to be set by the Board of Trustees. A site plan must be submitted and approved by the Board of Trustees prior to the installation of all improvements, including the mausoleum, plantings, decorative ornaments, etc.

9. Grave Opening and Closing
Payment is expected and due prior to or at the time of burial. A late payment fee will be assessed for payment after burial of $25.00 for up to 30 days; of $50.00 for between 30 and 60 days; and of $75.00 for over 60 days.

	Monday through Friday*	Weekends and Holidays
Traditional Burials:		
April – November	$550.00	$850.00
December – March	$650.00	$950.00
For Infant	$225.00	$325.00
Cremation - Standard Urn Cremation in-ground burial (For standard size urn-burial hole no larger than 12” x 12”) *April-November *December-March	 $275.00 $325.00	 $475.00 $525.00
Cremation - Oversized Urn Cremation in-ground burial (For oversized urn-burial hole larger than 12” x 12” *April-November *December-March	 $350.00 $400.00	 $500.00 $550.00
Cremation in Private Monument/Stone	$100.00	
*All burials scheduled to begin after 3:00 p.m. will be subject to an additional charge of $100.00. All burials scheduled before noon on Monday will be charged the weekend rate.		

10. Trading of Spaces and New Deeds $50.00

All individuals completing a trade will be charged the fee for a new deed. With private party trades, each party will be subject to the fee for a new deed.

(Any individual desiring to trade a space(s) must have a valid deed showing proof of ownership for the space(s) they are wanting to trade.

The current prices of lots will be in effect. If the lot(s) being traded were purchased at a lower cost than the lot(s) being acquired in the trade, the purchaser must pay the cost difference. If the cost of the lot(s) being traded cost more than the lot(s) acquired in the trade, the Nevada Municipal Cemetery will not issue any refunds.

11. Disinterment fee for in-ground burial is double the amount of the grave opening and closing fee during Monday through Friday, Saturdays and Holidays

12. Disinterment fee for columbarium $100.00

510.11 LIBRARY.

1. Late Return Fines	
A. Books	$0.15 per day (limit of $3.00 per item)
B. Movies	$0.50 per day (limit of $3.00 per movie)
2. Copying of Records	
A. Black and White	$0.20 per page
B. Color	$0.30 per page
3. Fax	
A. Outgoing	$2.00 per page for first ten; $1.00 per page after 10
B. Incoming	$1.00 for first page plus $0.25 for each additional page
4. Miscellaneous	
A. Replacement Cases	$1.25 each
B. Storage Boxes	$5.00 each
C. Lost or Damaged Items	Retail cost plus $3.00 fee
5. Community Room Rental	
A. Non-profit	No Charge
B. For profit and organizations	$10.00 per hour

510.12 SENIOR COMMUNITY CENTER

1. Sunday/Holiday – 9:00 a.m. – 9:00 p.m.	$30.00 per hour or $150.00 per full day
2. Monday – Thursday – 5:00 p.m. – 9:00 p.m.	$15.00 per hour (2-hour minimum)
Full Evening Rental	$45.00/evening
3. Friday – 5:00 p.m. – 11:00 p.m.	$15.00 per hour (2-hour minimum)
Full Evening Rental	$50.00/evening
4. Saturday – 9:00 a.m. – 11:00 p.m.	$30.00 hour or $150 per full day
5. Damage/Security Deposit	$200.00

(Damage/security deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

Senior Rates (for seniors over 60 on the day of the event) – effective January 1, 2012

1. Sunday/Holiday – 9:00 a.m. – 9:00 p.m.	$24.00 per hour or $120.00 per full day
2. Monday – Thursday – 5:00 p.m. – 9:00 p.m.	$12.00 per hour (2-hour minimum)
Full Evening Rental	$36.00/evening
3. Friday – 5:00 p.m. – 11:00 p.m.	$12.00 per hour (2-hour minimum)
Full Evening Rental	$40.00/evening
4. Saturday – 9:00 a.m. – 11:00 p.m.	$24.00 hour or $120 per full day
5. Damage/Security Deposit	$200.00

(Damage/security deposit will be refunded after inspection following event, minus any damages and extraordinary cleaning expenses.)

Cleaning Fees $35.00/hour

510.13 MISCELLANEOUS

1. Copying customer provided materials (double if 2-sided)

A. 8-1/2” x 11”	Black and White	$0.25 per page
B. 8-1/2” x 11”	Color	$0.50 per page
C. 8-1/2” x 14 or 11” x 17”	Black and White	$1.00 per page
D. 8-1/2 x 14 or 11” x 17”	Color	$2.00 per page

2. Copying of Audio CDs $20.00 each

3. Copies of Video DVDs $20.00 each

4. Fax $2.00 per 3 pages

Fee applies to both sending and receiving

5. City Records Search

A. 8-1/2” x 11”	Black and White	$0.50 per page
B. 8-1/2” x 11”	Color	$1.00 per page
C. 8-1/2” x 14 or 11” x 17”	Black and White	$1.50 per page
D. 8-1/2 x 14 or 11” x 17”	Color	$2.50 per page

6. Extensive City Records Search $20.00 per hour plus copy charges (one hour minimum)

7. Non-Sufficient Funds/Returned Payment $30.00

CHAPTER 520

CIVIL PENALITIES FOR MUNICIPAL INFRACTIONS

CODE SECTION NO.	OFFENSE	FIRST OFFENSE	REPEAT OFFENSES
40.07(1)	Nudity-Licensed Premises	750.00	$1,000.00
40.07(2)	Nudity-Unlicensed Premises	500.00	800.00
40.07(3)(A)	Public Sex Act	750.00	1,000.00
40.07(3)(B)	Displaying Sex Acts	750.00	1,000.00
40.07(3)(C)	Advertising Sex Act	500.00	800.00
40.08	Invasion of Privacy	500.00	800.00
40.09	Prowling	500.00	800.00
40.10	Public Nudity	500.00	800.00
41.08	Antenna and Radio Wires	400.00	700.00
41.09	Barbed Wire and Electric Fence	400.00	700.00
41.10	Discharging Weapons	500.00	800.00
41.11	Throwing and Shooting	500.00	800.00
41.12	Urinating and Defecating	400.00	700.00
41.13	Fireworks	500.00	800.00
41.14	Drug Paraphernalia	750.00	1,000.00
41.16	Fire Code	250.00	400.00
42.05	Unauthorized Entry	400.00	700.00
45.02(1)	Possession of Alcohol Under Legal Age	400.00	700.00
45.02(2)	Misrepresentation of Age	400.00	700.00
45.03(1)	Consumption of Alcohol in a Public Place	400.00	700.00
45.03(1)	Public Intoxication	500.00	800.00
45.04 & 62.07	Open Container in Vehicle	400.00	700.00
46.02	Curfew Violation	300.00	500.00
46.03	Underage Use or Purchase of Tobacco	300.00	500.00
46.05	Underage Person in Tavern	300.00	500.00
47.04	Park Roadways and Use of Parks	300.00	500.00
47.05	Violation of Park Board Regulations	300.00	500.00
50.14	Failure to Abate Nuisance	500.00	800.00
51.04	Failure to Remove Refuse, Junk, Junk Cars, etc.	250.00	500.00
55.02	Standard of Care for Animals	400.00	700.00
55.03	Endangering, Neglect and Abandoning Animals	400.00	700.00
55.04	Failure to Dispose of Animal Waste	200.00	400.00
55.05	Failure to Supervise Animals ("At Large" Animals)	400.00	700.00
55.06	Prohibited Domestic Animal Nuisances	500.00	800.00

CODE SECTION NO.	OFFENSE	FIRST OFFENSE	REPEAT OFFENSES
55.07	Keeping or Harboring Prohibited Animals	500.00	800.00
55.08	Keeping or Harboring Vicious Animals	750.00	1000.00
55.13	Failure to Report Animal Attacks or Suspected Rabies	500.00	800.00
55.14	Failure to Report Striking An Animal	300.00	500.00
55.15	Failure to Vaccinate For Rabies	300.00	500.00
55.16	Failure to Display Rabies Tags	300.00	500.00
55.17	Failure to Cooperate with Rabies Quarantine	400.00	700.00
55.18	Trapping Prohibited	300.00	500.00
55.19	Pet Awards Prohibited	400.00	700.00
55A	Urban Chickens	350.00	650.00
56	License Dog or Cat	350.00	650.00
60.07	Failure to Obey Peace Officer While Directing Traffic	400.00	700.00
61.03	Traffic Lanes	750.00	1,000.00
61.05	Failure to Obey Traffic Control Device	400.00	700.00
61.06	Tampering with or Striking Railroad Traffic Control Devices	750.00	1,000.00
61.07	Damage, Removal or Alteration to any Traffic Control Devises	100.00 or replacement	100.00 or replacement
62.01 et seq.	All State of Iowa Traffic Violations that are incorporated by reference in the City Code shall be prosecuted as criminal offenses and all State Code scheduled fines shall apply		
62.02 through 62.06	Miscellaneous Motor Vehicle Violations not included in 62.01 or otherwise incorporated by State Code	400.00	700.00
62.08	Obstructing View at Intersection	400.00	700.00
62.09	Reckless Driving	750.00	1,000.00
62.10	Careless Driving	400.00	700.00
62.11	Milling ("Scooping the Loop")	200.00	400.00
62.12	Excessive Motor Vehicle Noise	300.00	500.00
Chapter 63	Speed Regulations shall be prosecuted as simple misdemeanors with scheduled fines adopted from State Code		
Chapter 64	Turning Regulations [Same as Chapter 63 Above]		
Chapter 65	Stops [Same as Chapter 63 Above]		
66.01 - 66.04	Load Limits, Permits, etc.	750.00	1,000.00
66.05	Violation of Truck Route	300.00	500.00

CODE SECTION NO.	OFFENSE	FIRST OFFENSE	REPEAT OFFENSES
Chapter 67	Pedestrian Violations	200.00	400.00
Chapter 68	One Way Traffic Violations	300.00	500.00
Chapter 69	Parking Violations shall be charged pursuant to Chapter 69 with fines assessed pursuant to Section 70.03 of the City Code		
Chapters 75.03, 75.04 and 75.05	Illegal Operation of ATV or Snowmobile	300.00	500.00
Chapter 76	Bicycle, Skateboard and Scooter Violations	200.00	400.00
Chapters 90 and 91	Water System Violations and Water Meter Violations	300.00	500.00
Chapter 95, 96, 97, and 103	Sanitary Sewer System, Sewer Connection and Storm Water Drainage System Violations	300.00	500.00
Chapter 98	On-Site Wastewater Systems	300.00	500.00
Chapter 105	Solid Waste Control Violations	300.00	500.00
Chapters 110, 111, 112 and 113	Violation of Franchise Ordinances by Franchisees	750.00	1,000.00
Chapters 120 and 121	Violations of Liquor Licenses and Cigarette Permits (except as set by Section 121.07)	750.00	1,000.00
Section 122.06	Peddling or Soliciting Without a Permit	300.00	600.00
Section 122.08	Permit Violations: Outside Location of Permit Before or After Hours Operation on Public Street or ROW Operation on Expired Permit	 200.00 200.00 200.00 300.00	 500.00 500.00 500.00 600.00
Section 122.14	Failure to Carry or Show Permit	100.00	250.00
Section 122.17	Failure to Obey “No Solicitors” or “No Peddlers” Sign	250.00	500.00
Chapters 123, 124	Violations of House Movers and Pawnbrokers Ordinances	500.00	800.00
Chapters 135 and 136	Violations of Street and Sidewalk Ordinances	300.00	500.00
Chapters 145, 151, 155, 156, 157	Violations of Building and Property Regulation Ordinances	500.00	800.00
Chapters 165	Violations of Zoning and Subdivision	500.00	800.00

and 166	Ordinances		
	All other municipal infractions not mentioned above shall be subject to the following penalties:	500.00*	800.00*
***EXCEPTION:** those arising from noncompliance with a pretreatment standard or requirement by an industrial user, which shall not exceed $1,000 for each day. It is recommended that this specific type of penalty be set by resolution of the Council on a case-by-case basis.			
NOTE: The maximum penalties now allowed by both the State Code and City Code are $750 for first offense and $1,000 for each repeat offense, except for the pretreatment violations mentioned above.			

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C. Appendix C – WLA

Feb. 19, 2019 *NPDES # 6- 85-62-0-01*

City of Nevada

Proposed New Mechanical Facility

(Please do not microfiche this document.)

This Package Contains

WASTELOAD ALLOCATION CALCULATIONS & NOTES

Please Do Not Separate

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP   Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
CBOD5	Secondary Treatment Levels Will Not Violate WQS			
Total D.O.	Minimum Concentration (mg/l)			
January - December	5.0			
Ammonia – Nitrogen*				
January	3.5	15.2	87.6	382.8
February	4.1	14.2	101.6	357.8
March	3.5	14.7	87.5	370.1
April	1.6	15.7	39.2	395.7
May	1.8	15.2	44.7	382.7
June	1.4	**12.7**	33.7	**292.2**
July	1.0	**8.8**	25.8	**199.0**
August	1.0	**8.2**	24.5	**186.4**
September	1.1	**11.3**	27.2	**256.9**
October	1.6	15.7	40.0	395.7
November	2.4	14.7	59.7	370.1
December	2.6	16.0	63.6	402.2
Bacteria	Geometric Mean (#org./100 ml)		March 15th – November 15th	
E. coli	211			
Chloride	392	629	9,837	15,847
Sulfate	1,515	1,515	38,145	38,145
TRC**	0.008	0.019	0.199	0.479
pH	6.5 - 9.0 Standard Units			

Major Facility Acute WET Testing Ratio: Use 99.9% of effluent and 0.1% of dilution water for the testing

Stream Network/Classification of Receiving Stream:
West Branch Indian Creek (A2, B(WW-2)) to Indian Creek (A1, B(WW-2)) to the South Skunk River (A1, B(WW-1) HH)

Annual critical low flows in West Branch Indian Creek at the outfall:
1Q10 flow 0.1 cfs, 7Q10 flow 0.1 cfs, 30Q10 flow 0.1 cfs

Annual critical low flows in the South Skunk River at (or just upstream of) the mouth of Indian Creek:
1Q10 flow 9.20 cfs, 7Q10 flow 12.3 cfs, 30Q10 flow 16.7 cfs, 30Q5 flow 26.3 cfs, harmonic mean flow 88.5 cfs

Excel spreadsheet calculations [X]   Qual II E model [ ]   Qual II E modeling date [ ]

Performed by: Ian Willard

* **Bold** values are governed by CBOD5/DO modeling; the others are based on ammonia nitrogen toxicity protection for aquatic life.
** Only required if chlorine is used for disinfection.

Antidegradation Review Requirement

A tier II antidegradation review is required. See Section 2 for details.

Please note that the antidegradation review conducted in this wasteload allocation is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP — Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
Toxics				
1,1,1-Trichloroethane	2.643E+01	2.643E+01	6.653E+02	6.653E+02
1,1-Dichloroethylene	5.405E+01	5.405E+01	1.026E+03	1.361E+03
1,2-Dichloroethane	3.597E+00	5.906E+01	5.345E+01	1.487E+03
1,2-Dichloropropane	1.458E+00	1.458E+00	2.167E+01	2.167E+01
2,3,7,8-TCDD (Dioxin)	4.958E-10	4.958E-10	7.368E-09	7.368E-09
3,3-Dichlorobenzidine	2.722E-03	2.722E-03	4.045E-02	4.045E-02
4,4' DDT	1.010E-06	1.101E-03	2.532E-05	2.772E-02
Aldrin	4.860E-06	3.003E-03	7.223E-05	7.560E-02
Aluminum	8.786E-02	7.507E-01	2.203E+00	1.890E+01
Antimony	2.299E+00	1.101E+01	3.881E+01	2.772E+02
Arsenic (III)	1.515E-01	3.403E-01	3.798E+00	8.568E+00
Barium	2.052E+02	2.052E+02	5.166E+03	5.166E+03
Benzene	4.958E+00	1.652E+01	7.368E+01	4.158E+02
Benzo(a)Pyrene	1.750E-03	1.750E-03	2.600E-02	2.600E-02
Beryllium	5.005E-01	5.005E-01	1.260E+01	1.260E+01
Bis(2-ethylhexyl)phthalate	2.139E-01	2.139E-01	3.178E+00	3.178E+00
Bromoform	1.361E+01	1.361E+01	2.023E+02	2.023E+02
Cadmium	4.567E-04	4.320E-03	1.145E-02	1.088E-01
Carbon Tetrachloride	1.555E-01	2.157E+01	2.311E+00	5.431E+02
Chlordane	4.342E-06	2.402E-03	1.089E-04	6.048E-02
Chloride	3.92E+02	6.29E+02	9.837E+03	1.5847E+04
Chlorobenzene	5.746E+00	1.612E+01	9.701E+01	4.057E+02
Chlorodibromomethane	1.264E+00	1.264E+00	1.878E+01	1.878E+01
Chloroform	4.569E+01	4.569E+01	6.790E+02	6.790E+02
Chloropyrifos	4.140E-05	8.308E-05	1.038E-03	2.092E-03
Chromium (VI)	1.111E-02	1.602E-02	2.785E-01	4.032E-01
Copper	1.703E-02	2.693E-02	4.271E-01	6.779E-01
Cyanide	5.251E-03	2.202E-02	1.317E-01	5.544E-01
Dichlorobromomethane	1.653E+00	1.653E+00	2.456E+01	2.456E+01
Dieldrin	5.249E-06	2.402E-04	7.801E-05	6.048E-03
Endosulfan	5.655E-05	2.202E-04	1.418E-03	5.544E-03
Endrin	3.635E-05	8.608E-05	9.116E-04	2.167E-03
Ethylbenzene	7.542E+00	2.267E+01	1.273E+02	5.708E+02
Fluoride	8.085E+00	8.085E+00	2.035E+02	2.035E+02
gamma-Hexachlorocyclohexane (Lindane)	9.509E-04	9.509E-04	2.394E-02	2.394E-02
Heptachlor	3.837E-06	5.205E-04	9.622E-05	1.310E-02

ENVIRONMENTAL SERVICES DIVISION
WATER QUALITY BASED PERMIT LIMITS

SECTION VI: WATER QUALITY-BASED PERMIT LIMITS

Facility Name: Nevada, City of STP — Sewage File Number: 6-85-62-0-01

Parameters	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Mass (lbs/d)	Max. Mass (lbs/d)
Outfall No. 001	**ADW = 1.64 mgd & AWW = 3.02 mgd**			
Toxics				
Heptachlor epoxide	3.791E-06	5.205E-04	5.634E-05	1.310E-02
Hexachlorobenzene	2.819E-05	2.819E-05	4.189E-04	4.189E-04
Hexachlorocyclopentadiene	3.951E+00	3.951E+00	6.670E+01	6.670E+01
Iron	1.001E+00	1.001E+00	2.520E+01	2.520E+01
Lead	7.769E-03	1.976E-01	1.948E-01	4.975E+00
Mercury (II)	5.387E-04	1.642E-03	9.095E-03	4.133E-02
Nickel	9.469E-02	8.442E-01	2.374E+00	2.125E+01
Nitrate as N	3.203E+02	3.203E+02	8.064E+03	8.064E+03
Nitrate+Nitrite as N	3.203E+02	3.203E+02	8.064E+03	8.064E+03
para-Dichlorobenzene	6.824E-01	2.002E+00	1.152E+01	5.040E+01
Parathion	1.313E-05	6.506E-05	3.292E-04	1.638E-03
Pentachlorophenol (PCP)	2.257E-02	2.917E-02	5.660E-01	7.343E-01
Phenols	5.049E-02	2.502E+00	1.266E+00	6.300E+01
Polychlorinated Biphenyls (PCBs)	6.221E-06	2.002E-03	9.246E-05	5.040E-02
Polynuclear Aromatic Hydrocarbons (PAHs)	6.636E-05	3.003E-02	1.253E-03	7.560E-01
Selenium	5.049E-03	1.932E-02	1.266E-01	4.864E-01
Silver	3.804E-03	3.804E-03	9.576E-02	9.576E-02
Sulfate	1.515E+03	1.515E+03	3.8145E+04	3.8145E+04
Tetrachloroethlyene	3.208E-01	3.208E-01	4.767E+00	4.767E+00
Thallium	1.688E-03	5.986E-01	2.850E-02	1.507E+01
Toluene	1.106E-01	2.727E+00	2.088E+00	6.607E+01
Total Residual Chlorine (TRC)**	8E-03	1.9E-02	1.99E-01	4.79E-01
Toxaphene	2.020E-06	7.307E-04	5.064E-05	1.840E-02
trans-1,2-Dichloroethylene	5.028E-01	5.028E-01	8.489E+00	8.489E+00
Trichloroethylene (TCE)	8.079E-02	4.004E+00	2.026E+00	1.008E+02
Vinyl Chloride	2.333E-01	2.333E-01	3.467E+00	3.467E+00
Zinc	2.158E-01	2.158E-01	5.432E+00	5.432E+00

WLAs/Permit Limits for the City of Nevada's Proposed New Mechanical Facility

These wasteload allocations and water quality based permit limitations are for the City of Nevada's wastewater discharge from a proposed new mechanical facility. The wasteload allocations/permit limits are based on the Water Quality Standards (IAC 567.61) and 'Iowa Wasteload Allocation (WLA) Procedure', February 21, 2018. The chloride allocation/permit limits are based on the criteria that became effective on November 11, 2009.

The water quality based limits in this WLA are calculated to meet the surface water quality criteria to protect downstream uses. There could be technology based limits applicable to this facility that are more stringent than the water quality based limits shown in this WLA. The technology based limits could be derived from either federal guidelines based on different industrial categories or permit writer's judgment.

1. BACKGROUND:

The City of Nevada currently discharges treated domestic wastewater from a mechanical (trickling filter) wastewater treatment facility into Unnamed Creek.

The City of Nevada is proposing to build a new mechanical (activated sludge) wastewater treatment facility at a new location. The design flows and design mass loadings used throughout this WLA are proposed values for the proposed new mechanical facility. The proposed new mechanical facility would discharge into West Branch Indian Creek (at 41° 57' 31.667" N, 93° 26' 50.871" W).

Route of flow and use designations:
At the outfall, West Branch Indian Creek is an A2, B(WW-2) designated use waterbody. Approximately 23,980 ft downstream of the outfall, West Branch Indian Creek flows into Indian Creek. Directly downstream of the mouth of West Branch Indian Creek, Indian Creek is an A1, B(WW-2) designated use waterbody. Approximately 128,710 ft downstream of the mouth of West Branch Indian Creek, Indian Creek flows into the South Skunk River. Directly downstream of the mouth of Indian Creek, the South Skunk River is an A1, B(WW-1) HH designated use waterbody.

The designations have been adopted in Iowa's state rule described in the rule referenced document of Surface Water Classification effective on June 17, 2015. Based on the pollutants of concern, the use designations of waterbodies further downstream will not impact the resulting limits for this facility.

Critical low flow determination:
The annual critical low flows in West Branch Indian Creek at the outfall are estimated based on the Regional Regression Equations (RRE) from 'Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa', 2012 (revised 2013).

The annual critical low flows in the South Skunk River at (or just upstream of) the mouth of Indian Creek are estimated based on the Weighted Drainage Area Ratio (WDAR) method from 'Methods for estimating selected low-flow frequency statistics and harmonic mean flows for streams in Iowa', 2012 (revised 2013) and flow statistics obtained at USGS gage station 05471050, located on the South Skunk River at Colfax, Iowa.

Table 1a: Annual Critical Low Flows in West Branch Indian Creek

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)
West Branch Indian Creek at the outfall	44	0.1	0.1	0.1

Table 1b: Annual Critical Low Flows in the South Skunk River

Location	D.A. (mi^2)	1Q10 (cfs)	7Q10 (cfs)	30Q10 (cfs)	30Q5 (cfs)	Harmonic Mean (cfs)
The South Skunk River at (or just upstream of) the mouth of Indian Creek	814	9.20	12.3	16.7	26.3	88.5

2. ANTIDEGRADATION REVIEW:
According to the Iowa Antidegradation Implementation Procedure, effective February 17, 2010 (IAC 567-61.2(2).e), all new or expanded regulated activities (with limited exceptions, such as unsewered communities) are subject to antidegradation review requirements.

Table 2: Antidegradation Review Analysis

Item #	Factor or Scenario	Antidegradation Determination	Analysis/Comments
1	Design Capacity Increase	Yes ☒, No ☐, or Not Applicable ☐	1: Proposed design capacity shown on the request form.
2	Significant Industrial Users (SIU) Contributing New Pollutant of Concern (POC)	Yes ☐, No ☒, or Not Applicable ☐	
3	New Process Contributing New Pollutant of Concern (POC)	Yes ☒, No ☐, or Not Applicable ☐	1: Note that if chlorine is utilized for disinfection in the future an antidegradation review will be required.
4	Less Stringent Water Quality Based Limits?	Yes ☒, No ☐, or Not Applicable ☐	1: Less stringent copper and ammonia nitrogen limits will trigger an antidegradation review.
5	Outfall Location Change	Yes ☒, No ☐, or Not Applicable ☐	
Conclusion and discussion: Due to Items 1, 3, 4, and 5, a tier II antidegradation review is required. Please note that the antidegradation review conducted in this WLA is based on the current information available. Antidegradation could also be triggered during the NPDES permitting process based on new information.			

3. TOTAL MAXIMUM DAILY LOAD (TMDL) LIMITATIONS:
The following waterbodies in the discharge route are on the 2016 impaired waters list:

- Indian Creek for bacteria (indicator bacteria, *E. coli*) and biological (low aquatic macroinvertebrate IBI)
- The South Skunk River for bacteria (indicator bacteria, *E. coli*)
- The Skunk River for bacteria (indicator bacteria, *E. coli*)
- The Mississippi River for metals (aluminum)

The City of Nevada STP has not been assigned allocations in any TMDLs at this time.

Please note that the results presented in this report are wasteload allocations based on meeting the State's current water quality standards in the receiving waterbody. Additional and/or more stringent effluent limits may be applicable to this discharge based on approved TMDLs for impaired waterbodies, which may provide watershed based wasteload allocations. Information on impaired streams in Iowa and approved TMDLs can be found at the following website: http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Watershed-Improvement/Impaired-Waters.

4. CALCULATIONS:
The WLAs/permit limits for this outfall are calculated based on the facility's proposed Average Dry Weather (ADW) design flow of 1.64 mgd and its proposed Average Wet Weather (AWW) design flow of 3.02 mgd.

Please note that only wasteload allocations/permit limits (water quality based effluent limits) calculated using DNR approved design flows can be applied in NPDES permits. Water quality based effluent limits calculated using proposed flows that have not been approved by the DNR for permitting and compliance may be used for informational purposes only.

The water quality based permit concentration limits are derived using the allowed stream flow and the proposed ADW design flow, while the loading limits are derived using the allowed stream flow and the proposed AWW design flow.

Toxics:
The toxics wasteload allocations will consider the procedures included in the 2000 revised WQS and the 2007 chemical criteria.

<u>To protect the aquatic life use</u>:
Important to toxics is the use of the 1Q10 stream flow in association with the acute wasteload allocation calculation. The chronic WLA will continue to use the 7Q10 stream flow in its calculations. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall are used as the Mixing Zone (MZ) and the Zone of Initial Dilution (ZID), respectively.

<u>To protect the human health (HH) use</u>:
For pollutants that are non-carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the 30Q5 flow in the South Skunk River at (or just upstream of) the mouth of Indian Creek.

For pollutants that are carcinogenic and have criteria for human health protection, the criteria apply at the end of the MZ, which in this case is 25% of the harmonic mean flow in the South Skunk River at (or just upstream of) the mouth of Indian Creek.

<u>Final limits</u>:
The maximum limits are those calculated for the protection of the aquatic life use and the average limits are the more stringent between those for the protection of the aquatic life use and those for the protection of the HH use.

Please note that the TRC limits are based on a sampling frequency of 5/week, based on a proposed design population equivalent (PE) of 36,365; the limits for other toxics are based on a sampling frequency of 1/week.

Ammonia Nitrogen:
Standard stream background pH, temperatures, and concentrations of NH_3-N are mixed with the discharge from the facility's effluent pH and temperature values to calculate the applicable instream criteria for the protection of West Branch Indian Creek.

Based on the ratio of the stream flow to the discharge flow, 5% of the 1Q10 flow and 100% of the 30Q10 flow in West Branch Indian Creek at the outfall are used as the ZID and the MZ, respectively. At the outfall, West Branch Indian Creek is a B(WW-2) stream; therefore, early life protection will begin in April and run through September.

The monthly background pH, temperatures, and NH3-N concentrations shown in Table 3 are used for the wasteload allocation/permit limits calculations based on the Year 2000 ammonia nitrogen criteria. Table 4 shows the statewide monthly effluent pH and temperature values for mechanical facilities. Table 5a shows the calculated toxicity based ammonia nitrogen wasteload allocations for this facility. Additionally, Table 5b shows the final ammonia nitrogen wasteload allocations for this facility with reductions from the CBOD5/DO modeling (discussed below).

Table 3: Background pH, Temperatures, and NH3-N Concentrations
For Use with Year 2000 Ammonia Nitrogen Criteria

Months	pH	Temperature (°C)	NH_3-N (mg/l)
January	8.1	0.3	0.02
February	8.0	0.1	0.08
March	8.1	1.5	0.12
April	8.3	9.3	0.03
May	8.2	15.0	0.03
June	8.2	19.4	0.02
July	8.2	23.5	0.02
August	8.2	24.3	0.02
September	8.3	20.2	0.02
October	8.3	14.2	0.02
November	8.3	8.0	0.02
December	8.3	0.8	0.03

Table 4: Standard Effluent pH & Temperature Values for Mechanical Facilities

Months	pH	Temperature (°C)
January	7.67	12.4
February	7.71	11.3
March	7.69	13.1
April	7.65	16.2
May	7.67	19.3
June	7.70	22.1
July	7.58	24.1
August	7.63	24.4
September	7.62	22.8
October	7.65	20.2
November	7.69	17.1
December	7.64	14.1

Table 5a: Toxicity Based Wasteload Allocations for Ammonia Nitrogen
For the Protection of Aquatic Life

Months	ADW-Based*		AWW-Based**	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	15.2	3.5	15.2	3.5
February	14.2	4.1	14.2	4.0
March	14.7	3.5	14.7	3.5
April	15.7	1.6	15.7	1.6
May	15.2	1.8	15.2	1.8
June	14.5	1.4	14.4	1.3
July	17.6	1.0	17.6	1.0
August	16.2	1.0	16.2	1.0
September	16.5	1.1	16.5	1.1
October	15.7	1.6	15.7	1.6
November	14.7	2.4	14.7	2.4
December	16.0	2.6	16.0	2.5

*: bases for concentration limits; **: bases for mass loading limits

Table 5b: Final Wasteload Allocations for Ammonia Nitrogen
For the Protection of Aquatic Life after CBOD5/DO Modeling*

Months	ADW-Based**		AWW-Based***	
	Acute (mg/l)	Chronic (mg/l)	Acute (mg/l)	Chronic (mg/l)
January	15.2	3.5	15.2	3.5
February	14.2	4.1	14.2	4.0
March	14.7	3.5	14.7	3.5
April	15.7	1.6	15.7	1.6
May	15.2	1.8	15.2	1.8
June	**12.7**	1.4	**11.6**	1.3
July	**8.8**	1.0	**7.9**	1.0
August	**8.2**	1.0	**7.4**	1.0
September	**11.3**	1.1	**10.2**	1.1
October	15.7	1.6	15.7	1.6
November	14.7	2.4	14.7	2.4
December	16.0	2.6	16.0	2.5

*: **Bold** values are governed by CBOD5/DO modeling, while the other values are based on ammonia nitrogen toxicity protection for aquatic life
**: bases for concentration limits
***: bases for mass loading limits

CBOD5/Total Dissolved Oxygen:
Streeter-Phelps DO Sag Model is used to simulate the decay of CBOD and dispersion of total Dissolved Oxygen (DO) in the receiving water downstream from the outfall. The criterion is that the discharge cannot cause the DO level in the receiving stream (warm water) to be below 5.0 mg/l.

The parameter values used in the modeling are listed below:

<u>Background</u>:
The temperature and ammonia nitrogen levels are shown in Table 3. The ultimate CBOD and DO levels are assumed to be 6.0 mg/l and 6.0 mg/l, respectively.

Effluent:
The temperatures are shown in Table 4. The CBOD5 level used in the modeling is 40 mg/l, which is the technology based maximum limit for standard secondary treatment. The ammonia nitrogen values used in the modeling are the calculated toxicity based acute wasteload allocations shown in Table 5a. Both ADW and AWW flows and the ammonia nitrogen limits associated with them are used in the modeling.

Receiving stream parameters:
There is an average water channel slope of 0.00126 (the water channel elevation changes from 898 ft to 870 ft over a distance of approximately 22,310 ft, estimated based on the GIS LiDAR 2-ft contour coverage).

Field Use Attainability Assessment (UAA) had one site along West Branch Indian Creek that was downstream of the outfall. Two observations of stream width, depth, and velocity were made at the site. Based on these UAA data, the stream average width, depth, and velocity at 7Q10 + ADW and 7Q10 + AWW conditions are estimated and are shown in Table 6.

Table 6: Stream Width, Depth, and Velocity

Flow Condition	Flow (cfs)	Width (ft)	Depth (ft)	Velocity (fps)
7Q10 + ADW	2.64	23.0	0.28	0.42
7Q10 + AWW	4.77	24.7	0.36	0.54

Reaeration:
The UAA site on West Branch Indian Creek downstream of the outfall indicated that the stream contains both riffle and run features. Aerial imagery showed that the stream exhibits a moderate amount of meander downstream of the outfall. Therefore, the USGS pool-riffle model (Melching and Flores 1999) is used.

Discussion and conclusion:
The modeling results show that the effluent, which could have an allowed maximum effluent CBOD5 level of 40 mg/l (technology based limits for secondary treatment) and a minimum DO level of 5.0 mg/l, will not cause the DO level in the receiving stream to be below 5.0 mg/l at any time; however, some of the calculated water quality based ammonia nitrogen wasteload allocations, as shown in Table 5a, need to be reduced. The final ammonia nitrogen wasteload allocations are shown in Table 5b.

***E. coli*:**
To protect the Class A2 waterbody:
The water quality standard for *E. coli* in a Class A2 waterbody is a geometric mean of 630 org./100 ml and a sample maximum of 2,880 org./100 ml from March 15th through November 15th. The criteria apply at "end-of-pipe".

To protect the Class A1 waterbody:
The water quality standard for *E. coli* in a Class A1 waterbody is a geometric mean of 126 org./100 ml and a sample maximum of 235 org./100 ml from March 15th through November 15th. *E. coli* decay in West Branch Indian Creek between the outfall and its mouth is taken into consideration. The decay is estimated by using a first order decay model with a length of 23,980 ft, a decay rate of 1.0/day, and a flow velocity of 0.54 fps for 7Q10 + AWW conditions. When *E. coli* decay in West Branch Indian Creek between the outfall and its mouth is taken into consideration, the limits for the protection of the Class A1 waterbody are a geometric mean of 211 org./100 ml and a sample maximum of 393 org./100 ml from March 15th through November 15th.

Final limits:
The limits for the protection of the Class A1 waterbody are more stringent than those for the protection of the Class A2 waterbody; therefore, the limits for the protection of the Class A1 waterbody govern. However, 567 IAC 62.8(2) states that "the daily sample maximum criteria for *E. coli* set forth in Part E of the 'Supporting Document for Iowa Water Quality Management Plans' shall not be used as an end-of-pipe permit limitation." Therefore, only the geometric mean limit of 211 org./100 ml applies.

Chloride and Sulfate:
The chloride and sulfate criteria became effective on Nov. 11, 2009. The default hardness for background and effluent is 200 mg/l.

Chloride criteria are functions of hardness and sulfate concentration, shown as follows:

$$\text{Acute criteria} = 287.8*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$
$$\text{Chronic criteria} = 177.87*(\text{Hardness})^{0.205797}*(\text{Sulfate})^{-0.07452}$$

The criteria apply to all Class B waters.

Sulfate criteria, shown in Table 7, are functions of hardness and chloride concentration.

Table 7: Sulfate Criteria

Hardness (mg/l as CaCO3)	Sulfate Criteria (mg/l)		
	Chloride < 5 mg/l	5 mg/l <= Chloride < 25 mg/l	25 mg/l <= Chloride < 500 mg/l
< 100	500	500	500
100<=H<=500	500	(-57.478+5.79*H+54.163*Cl)*0.65	(1276.7+5.508*H-1.457*Cl)*0.65
H> 500	500	2,000	2,000

The criteria defined in Table 7 serve as both acute and chronic criteria and apply to all Class B waters.

The acute criteria apply at the end of the ZID, and the chronic criteria apply at the end of the MZ. In this case, 25% of the 7Q10 flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall are used as the MZ and the ZID, respectively.

The default chloride concentration for both background water and effluent is 34 mg/l, while the default sulfate concentration for both background water and effluent is 63 mg/l. The limits are calculated based on an assumed sampling frequency of 1/week.

Iron:
The current iron criteria are defined in the 2005 issue paper entitled "Iron Criteria and Implementation for Iowa's Surface Waters (December 5, 2005)". An iron criterion of 1 mg/l applies at the end of the ZID for both general use and designated use streams. In this case, the ZID is 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall.

pH:
Iowa Water Quality Standards (IAC 567.61.3.(3).a.(2) and IAC 567.61.3.(3).b.(2)) require that pH in Class A or Class B waters "Shall not be less than 6.5 nor greater than 9.0". The criteria apply at the end of the MZ, which is 25% of the 7Q10 flow in West Branch Indian Creek at the outfall. Therefore, the pH in the effluent at the outfall must be between 6.5 and 9.0 Standard Units.

TDS:
Effective Nov. 11, 2009, the site-specific TDS approach is no longer applicable; instead the new chloride and sulfate criteria became applicable. However, the TDS level should be controlled to a level such that the narrative criteria stated in IAC 567.61.3 are fulfilled.

Major Facility Acute WET Testing Ratio:
Use 99.9% of effluent and 0.1% of dilution water for the testing. The ratio is calculated using the ADW design flow and 2.5% of the 1Q10 flow in West Branch Indian Creek at the outfall as the ZID.

5. PERMIT LIMITATIONS:

- *Based on the Year 2006 Water Quality Standards & 2002 Permit Derivation Procedure.*

The acute and chronic WLAs are used as the values for input into the current permit derivation procedure. Under the 2002 permit derivation procedure, only for toxic parameters is the monitoring frequency considered in the calculation of final limits. The water quality based limits are shown on Pages 1 – 3 of this report.

D. Appendix D – Process Facilities Evaluation

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P1

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Max 30-Day	Max Day
cBOD, lbs/day	6,692	10,554
TSS, lbs,day	4,300	6,899
TKN, lbs/day	869	1,148
Total Phosphorus, lbs/day	309	350
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Secondary Treatment System (Five-Stage Bardenpho)

No of units/process trains	2
Sidewater Depth, ft	15
Anaerobic Tank Volume, each, gallons	63,000
First Anoxic Tank Volume, each, gallons	78,300
Aerobic Tank volume, each, gallons	1,493,000
Second Anoxic Tank volume, each, gallons	25,000
Reaeration Tank volume, each, gallons	62,900
Hydraulic Detention Time @ AWW, hrs	27
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15.4
SRT, days	15
Equipment	Mixer/Aerator/Diffusers
Anaerobic Tank	2 Submersible mixers
First Anoxic Tank	4 Submersible mixers
Aerobic Tank	4 Aeration blowers (est., type TBD)
	Fine bubble Diffused aeration (type TBD)
	4 Submersible mixers
	6 Recycle Submersible Pumps (est.)
Second Anoxic Tank	2 Submersible mixers
Reaeration	Fine bubble diffused aeration (type TBD)
	Use Aerobic Tank blowers
Lbs. O2/lbs. BOD5, Applied	1.5
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	14.9
Solids Loading Rate, max, lbs/sf/day	38.4

RAS Pumps

Type	Centrifugal
No of units	6
Rated Capacity each, gpm	~800
Rated head, ft	~12 (estimated)
RAS firm capacity, mgd	~5.75
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No of units	2
Rated Capacity each, gpm	200

Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel - Horizontal
No of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, µW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No of units	2
Tank dim, ft x ft	20 x 10 (tank 1); 15 x 10 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	350 (tank 1) 250 (tank 2)
No of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No of units	2
Capacity, MGal	2.42
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P2

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Avg. Day	Max Day
cBOD, lbs/day	6,692	10,554
TSS, lbs,day	4,300	6,899
TKN, lbs/day	869	1,148
Total Phosphorus, lbs/day	309	350
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Oxidation Ditches

No. of units	2
Sidewater Depth, ft	14.5
Aerobic Tank volume, each, gallons	1,670,000
Anoxic Tank volume, each, gallons	60,000
Anaerobic Tank volume, each, gallons	60,000
Hydraulic Detention Time @ AWW, hrs	28.4
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15
SRT, days	26
Aeration equipment type	Vertical shaft Mixer/Aerator
Size, Hp, each	100
No. of units	2 per train, 4 total
Anoxic/Anaerobic mixing	Submersible mixers
No. of units	1 per zone, 4 total
Lbs. O2/lbs. BOD5, Applied	1.5
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97
Aeration Demand, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	18,900
Daily Maximum Loading, lbs O2/d	31,700
Denitrification Oxygen Credit, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	1,572
Daily Maximum Loading, lbs O2/d	3,530
Design Temperature,	
Winter, degrees-C	10
Summer, degrees-C	25
Sludge Recycle, % AWW	
RAS Rate, Max 30-day	80
RAS Rate, Max day	80
Sludge Wasting	
WAS Rate, lbs/d	4,271
Operational Mode	Continuous

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	14.9
Solids Loading Rate, max, lbs/sf/day	38.4

RAS Pumps

Type	Centrifugal
No. of units	6
Rated Capacity each, gpm	~800
Rated head, ft	~12 (estimated)

RAS firm capacity, mgd	~5.75
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No. of units	2
Rated Capacity each, gpm	200
Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel - Horizontal
No. of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, μW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No. of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No. of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No. of units	2
Tank dimensions, ft x ft	20 x 10 (tank 1); 15 x 10 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	350 (tank 1) 250 (tank 2)
No. of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No. of units	2
Capacity, MGal	2.42
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN SOLIDS PROCESSING POST THICKENING ALTERNATIVE

Item	Size/Capacity
Aerobic Digesters	
Operation Type	series flow
No. of trains	2
No. of units per train	2
Tank dimensions, ft x ft, each	63 x 63
Tank SWD, ft	20
SRT, days	42
Aeration Requirement, SCFM, total	1,630
Mechanical Mixing, HP, each	80
No. of mixers	4 (estimated, See Note)
Diffused Air Mixing, SCFM	9,525
No. of blowers	4 (estimated, See Note)
Type	Positive displacement
Digester Transfer pumps	2

Note:
Final mixing/aeration system will be determined during final design to meet IDNR requirements if this alternative is chosen. Cost estimate based on combined diffused aeration and mechanical mixing with 4 aeration blowers and 4 mechanical mixers.

Item	Size/Capacity
Post Sludge Thickening	
Type	Mechanical (See Note)
No. of units	2 (estimated, See Note)
Thickened Sludge Concentration	5%
Thickened Sludge Transfer Pumps	2

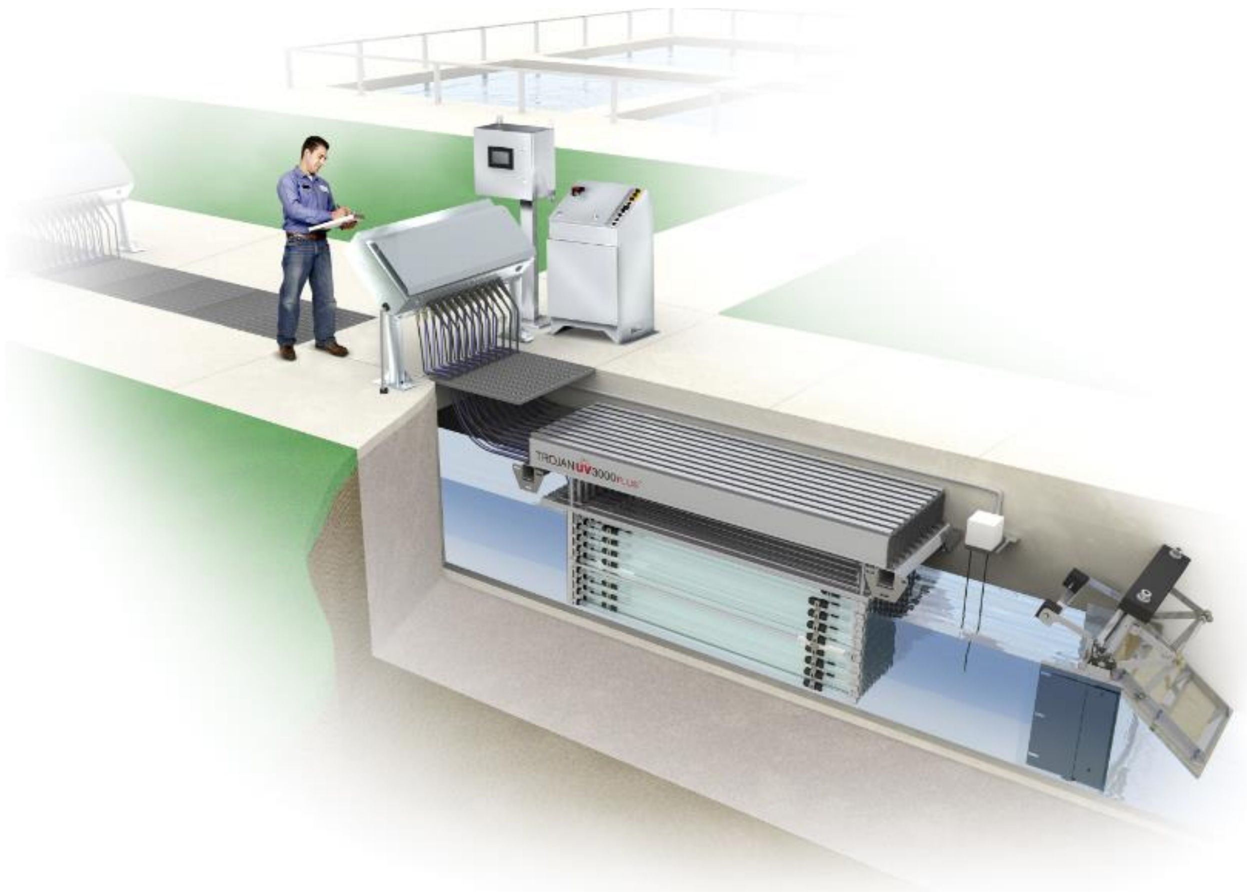
Note:
Alternatives for post sludge thickening include rotary drum thickeners and gravity belt thickeners. Final post thickening equipment will be chosen during final design if this alternative is chosen. Cost estimate based on 2 rotary drum thickeners and supporting equipment.

Item	Size/Capacity
Biosolids Storage Tank	
Type	Above grade open top bolted steel
No of units	1
Capacity, MGal	1.45
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

UV Disinfection Proposals

TROJANUV3000PLUS™

PROPOSAL FOR THE CITY OF NEVADA, IA
QUOTE: 220576
06/17/2019



The TrojanUV3000Plus™ is operating in **over 2000** municipal wastewater plants around the world. Disinfecting **over 17 billion** gallons a day, the TrojanUV3000Plus™ has become the reference standard in the industry.

August 19, 2019

In response to your request, we are pleased to provide the following TrojanUV3000Plus™ proposal for the NEVADA project.

The TrojanUV3000Plus™ has been shown in over 2000 installations to provide dependable performance, simplified maintenance, and superior electrical efficiency. As explained in this proposal, the system incorporates innovative features to reduce O&M costs, including variable output electronic ballasts to provide dimming capability and Trojan's revolutionary ActiClean-WW™ system – the industry's only online chemical and mechanical quartz sleeve cleaning system. All Trojan installations are supported by a global network of certified Service Representatives providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the TrojanUV3000Plus™ and we look forward to working with you on this project.

With best regards,

Una Duncan
3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
4280 E 14th Street
Des Moines , IA
US
515-979-4648

DESIGN CRITERIA
NEVADA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65 %** (minimum)
Total Suspended Solids:	**15 mg/l** (30 Day Average, grab sample)
Disinfection Limit:	**126 E.coli per 100 ml,** based on a day 30 of consecutive daily grab samples

DESIGN SUMMARY
QUOTE: 220576

Based on the above design criteria, the TrojanUV3000Plus™ proposed consists of:

CHANNEL	
Number of Channels:	**1**
Approximate Channel Length Required:	**25 ft 4 in**
Channel Width Based on Number of UV Modules:	**24 in**
Channel Depth Recommended for UV Module Access:	**62 in**
UV MODULES	
Total Number of Banks:	**2**
Number of Modules per Bank:	**6**
Number of Lamps per Module:	**8**
Total Number of UV Lamps:	**96**
Maximum Power Draw:	**23.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**2**
System Control Center Quantity:	**1**
MISCELLANEOUS EQUIPMENT	
Level Controller Quantity:	**1**
Type of Level Controller:	**Weighted Gate (ALC)**
Automatic Chemical / Mechanical Cleaning:	**Trojan ActiClean-WW™**
UV Module Lifting Device:	**Davit Crane and Lifting Sling**
On-line UVT Monitor:	**Hach UVAS sc Sensor – Optionally Available**
Standard Spare Parts / Safety Equipment:	**(8) lamps, (8) sleeves, operator kit**

ELECTRICAL REQUIREMENTS

1. Each Power Distribution Center requires an electrical supply of one (1) 480/277V 60Hz
2. The Hydraulic System Center requires an electrical supply of one (1), 480V 60Hz, 2.5 kVA.
3. The System Control Center requires an electrical supply of one (1) 120V 60Hz , 15 Amps.

4.	Electrical disconnects required per local code are not included in this proposal.

COMMERCIAL INFORMATION

Total Capital Cost: $216,000 (USD)

This price excludes any taxes that may be applicable and is valid for 90 days from the date of this letter.

EQUIPMENT WARRANTEES

1. Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.

2. UV lamps purchased are warranted for 12,000 hours of operation or 3 years from shipment, whichever comes first. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.

3. Electronic ballasts are warranted for 5 years, pro-rated after 1 year.

PROPOSAL FOR NEVADA, IA
QUOTE: 220578
06/17/2019

TrojanUVSigna™ incorporates revolutionary innovations, including TrojanUV Solo Lamp™ technology, to reduce the total cost of ownership and drastically simplify operation and maintenance. It is the ideal solution for facilities wanting to upgrade their disinfection system easily and cost-effectively.

We are pleased to provide the enclosed TrojanUVSigna proposal. Please do not hesitate to contact us if you have any questions regarding this proposal. We look forward to working with you.

With best regards,

3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
515-979-4648
marci@mc2h2o.com

DESIGN CRITERIA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65%** (minimum)
Total Suspended Solids:	**15 mg/l (30 Day Average,** grab sample)
Disinfection Limit:	**126 E.coli per 100 ml**, 30 day Geometric Mean of consecutive daily grab samples

DESIGN SUMMARY

CHANNEL	
Number of Channels:	**1**
Minimum Channel Length Required:	**~20' (not including level control area)**
Channel Width at UV Banks:	**2.9'**
Channel Depth Recommended:	**7.8'**
UV BANKS	
Number of Banks per Channel:	**2**
Number of Lamps per Bank:	**10**
Total Number of UV Lamps:	**20**
Maximum Duty Power Draw:	**21.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**1**
Hydraulic System Center Quantity:	**1**
System Control Center Quantity:	**1**
ANCILLARY EQUIPMENT	
Level Controller Quantity and Type:	**1 Fixed Weir**
Integral Bank Walls:	**Included**
On-line UVT Monitoring:	**Hach UVAS sc Sensor – Optionally Available**
Other Equipment:	

ELECTRICAL REQUIREMENTS

1. Each Power Distribution Center requires an electrical supply of one (1) 480V, 3 phase, 4 wire + GND, 50/60 Hz
2. Electrical supply for Hydraulic System Center will be (1) 480V, 3 phase, 3 wire + GND, 60 Hz, 2.5 kVA
3. Electrical supply for System Control Center will be (1) 120V, 1 phase, 2 wire + GND, 60 Hz, 1.8 kVA
4. Electrical disconnects are not included in this proposal. Refer to local electrical codes

COMMERCIAL INFORMATION

Total Capital Cost: $237,500 (USD)

This price excludes any taxes or duties that may be applicable.

Standard equipment warrantees and start up by Trojan-certified technicians are included.

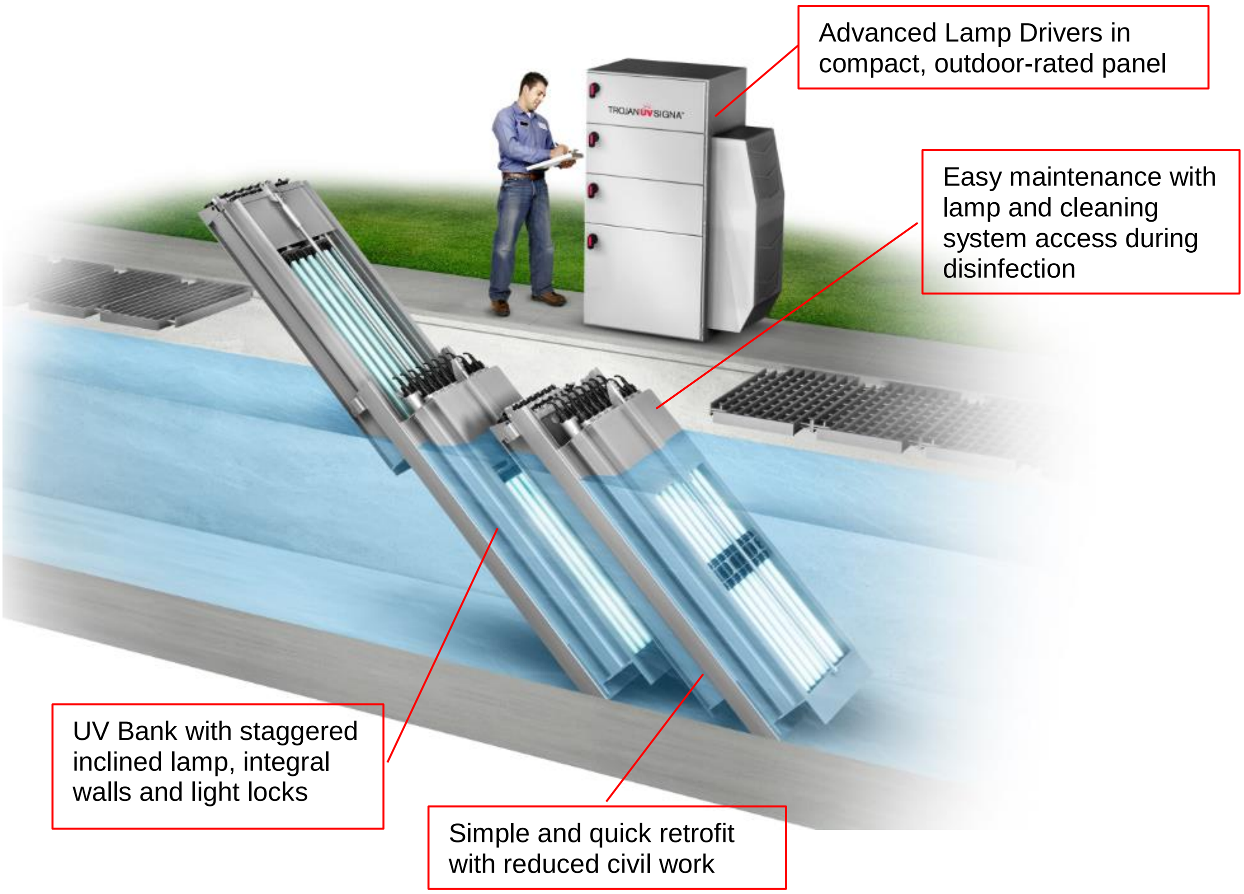
Easy and Cost-Effective Maintenance

- The 1000 watt TrojanUV Solo Lamp combines the benefits of both low pressure and medium pressure lamps
- Fewer lamps, long lamp life and easy change-outs save time and money
- Lamp change-outs and cleaning solution replacement are done while the UV system is in the channel – minimizing downtime and simplifying maintenance
- Routine maintenance can be performed while banks are in the channel, but an Automatic Raising Mechanism (ARM) makes other tasks, such as winterization, simple, safe and easy
- Lamp plugs with LED status indicators and integral safety interlock prevent an operator from accidentally removing an energized lamp
- ActiClean WW™ chemical/mechanical cleaning system to keep sleeves clean during operation

TROJANUVSIGNA™

SYSTEM OVERVIEW

SOLO LAMP TECHNOLOGY



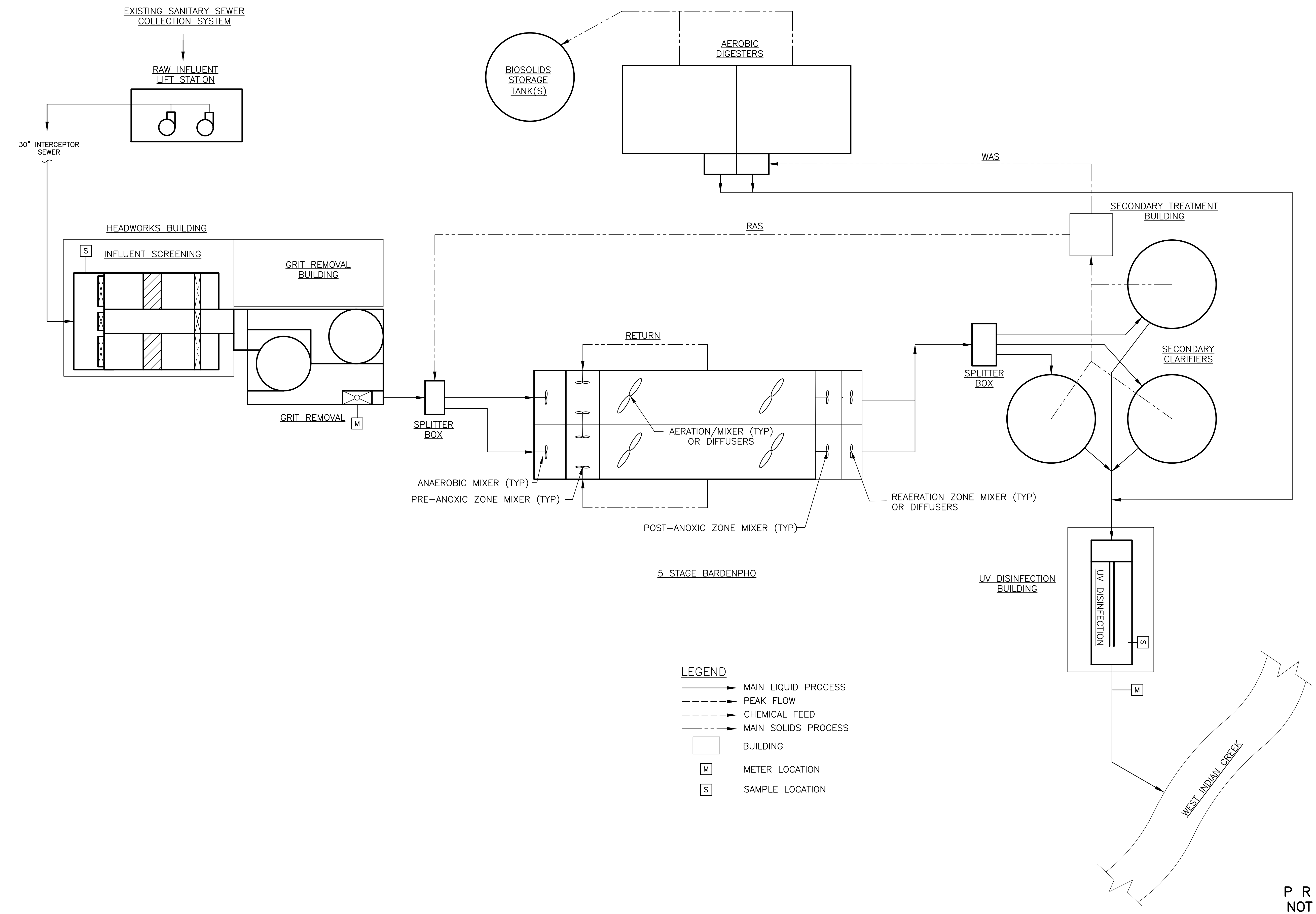
Simple to Design and Install

- Light locks on the UV banks control water level within the channel, reducing dependence on downstream weirs and preventing short-circuiting above the lamp arc
- UV Banks include integral reactor walls to make installation easy and prevent short circuiting at the channel walls
- Stringent tolerances on concrete channel walls are not required – making retrofits simple and cost-effective

Supported by Trojan Technologies

- Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
- UV lamps are warranted for 15,000 hours of operation or 3 years from shipment, whichever comes first. Lamp warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
- Trojan offers an unparalleled Lifetime Performance Guarantee. The spirit of this guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system.

E. Appendix E – Process Diagrams



PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: WHR
APPROVED: MJR
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CAD FILE: J:\2018\181683\CAD\Dwgs\Antideg\DWGS\Figure_1_Facility Plant.dwg
JOB DATE: 2018
JOB NUMBER: 181683

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

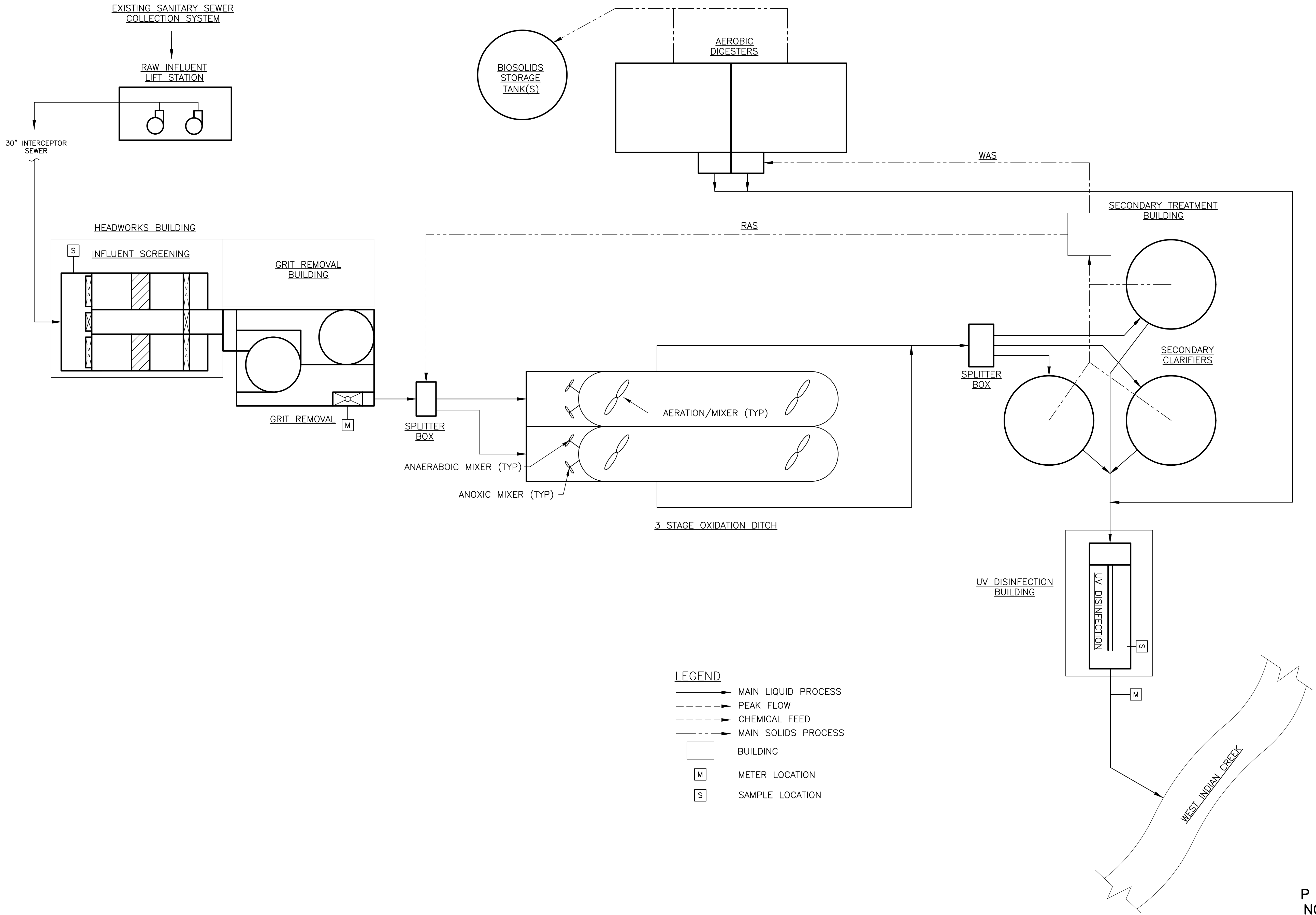
HRGreen
HRGreen.com

NEVADA – FACILITY PLAN
CITY OF NEVADA
NEVADA, IOWA 2019

NEVADA ANTIDEG
ALTERNATIVE 1 SCHEMATIC

SHEET NO.
FIG 1

Xrefs: xgt-1-dh01; XP-0-PID



PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: WHR	JOB DATE: 2018	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"	
APPROVED: MJR	JOB NUMBER: 181683	IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD DATE: 8/23/2019 11:01:51 AM			
CAD FILE: J:\2018\181683\CAD\Dwgs\Antideg\DWGS\Figure_2_Facility Plan.dwg			

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com
HRGreen

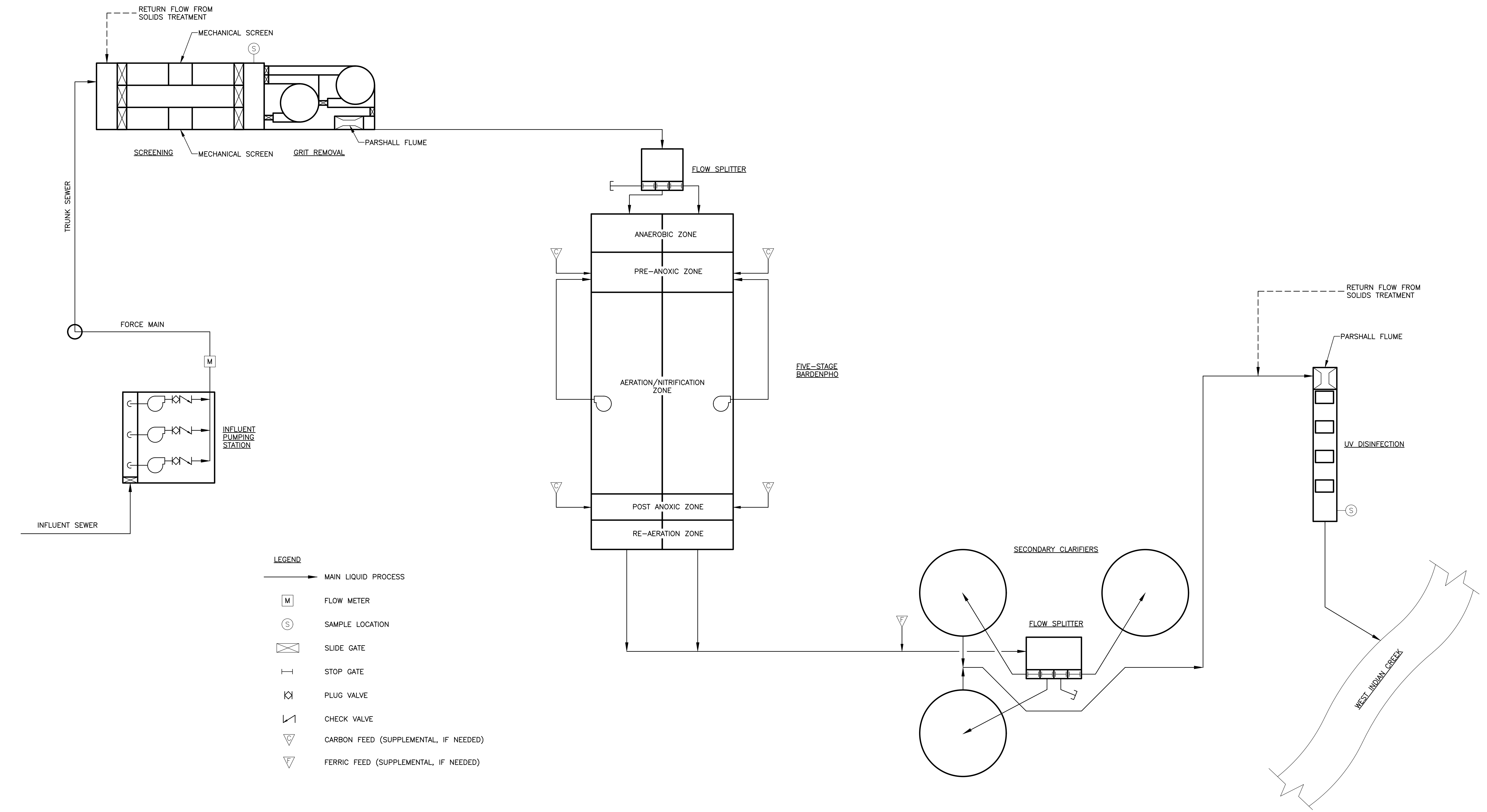
NEVADA – FACILITY PLAN
CITY OF NEVADA
NEVADA, IOWA 2019

NEVADA ANTIDEG
ALTERNATIVE 2 SCHEMATIC

SHEET NO.
FIG 2

Xrefs: xgt-1-dh01; XP-0-PID

Figures 3 and 4 on the following pages show the process diagrams for wastewater flow for both process alternatives (Alternative P1 and P2), assuming the integral thickening solids processing alternative. Figures 5 and 6 show the two proposed solids handling process flow diagrams (one process with aerobic digestion with integral thickening and one process with aerobic digestion with post thickening).



PRELIMINARY
NOT FOR CONSTRUCTION

Xrefs: xgt-1-dh01; XP-0-PID

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APPROVED: MJR	JOB NUMBER: 181683		
CAD DATE: 8/23/2019 9:57:01 AM			
CAD FILE: J:\2018\181683\CAD\Dwgs\G\G..09 LIQUID PROCESS SCHEMATIC_Bardenpho.dwg			

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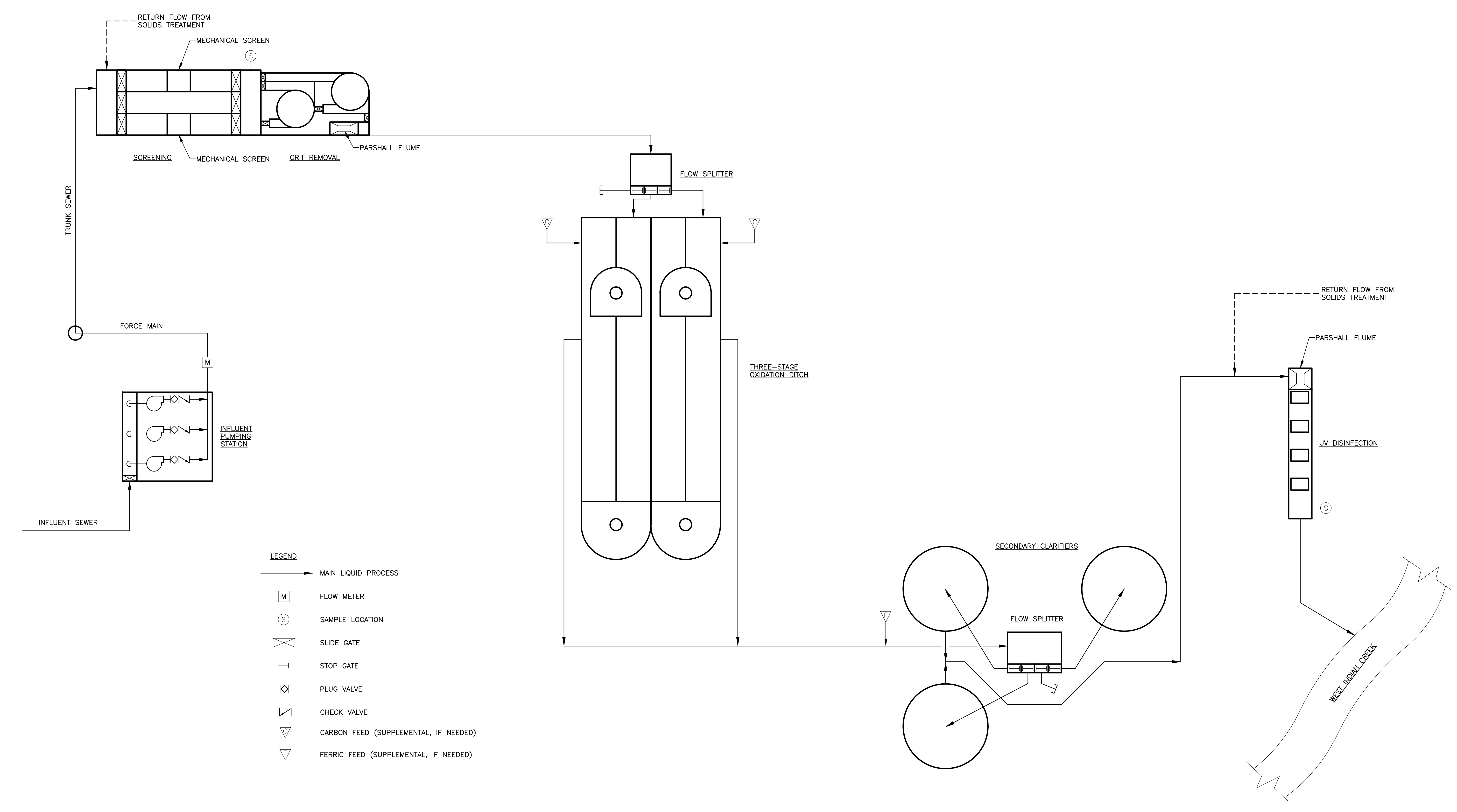
NEVADA, IOWA – 2019

GENERAL
LIQUID PROCESS SCHEMATIC
ALTERNATIVE P1: FIVE-STAGE BARDENPHO

SHEET NO.
FIG 3



PRELIMINARY
NOT FOR CONSTRUCTION

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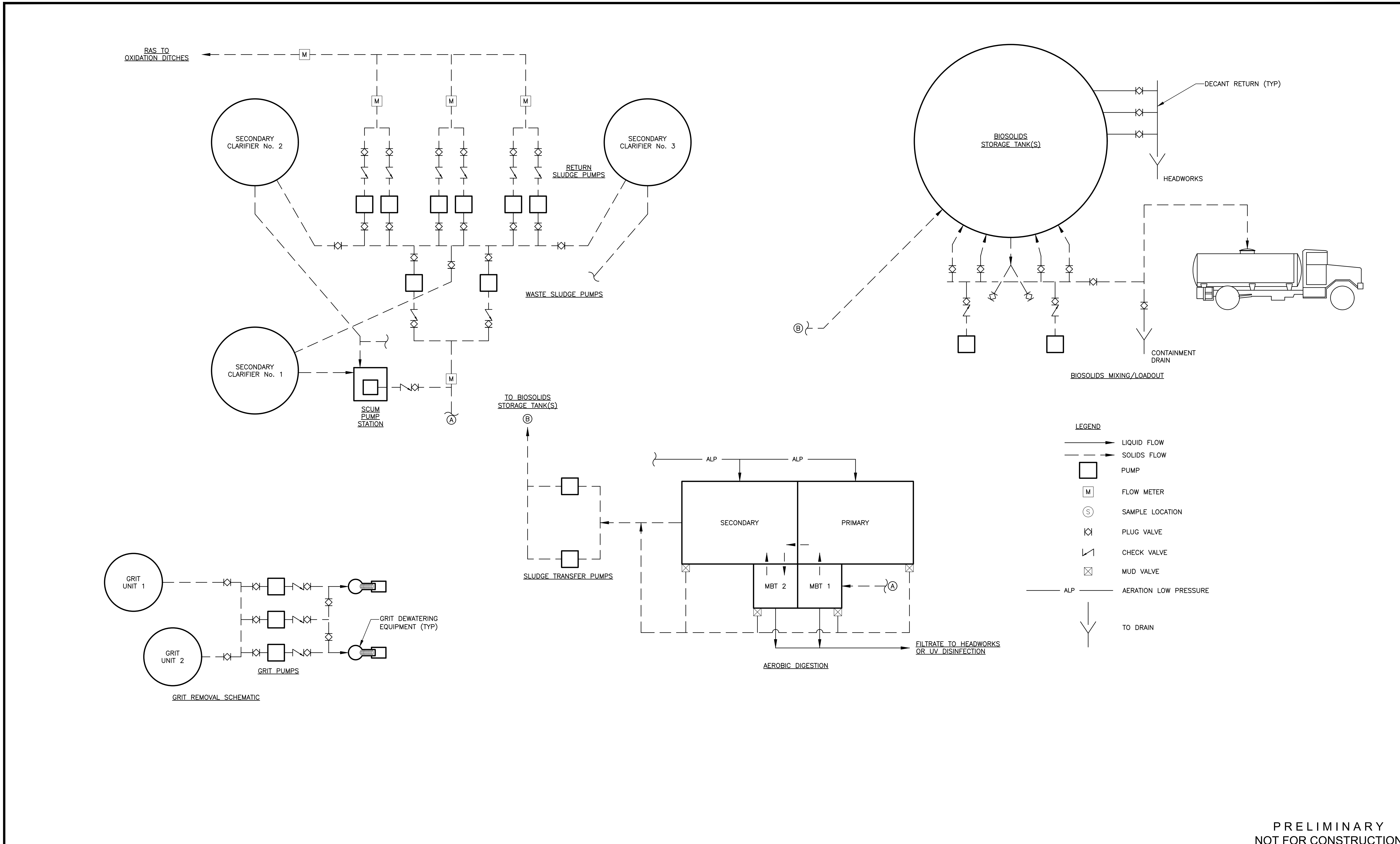
GENERAL
LIQUID PROCESS SCHEMATIC
ALTERNATIVE P2: 3–STAGE OXIDATION DITCH

SHEET NO.
FIG 4

Xrefs: xgt-1-dh01; XP-0-PID



DRAWN BY: MAP	JOB DATE: 2019	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
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CAD DATE: 8/23/2019 11:11:42 AM			
CAD FILE: J:\2018\181683\CAD\Dwgs\G\G.10 SOLIDS PROCESSING SCHEMATIC.dwg			

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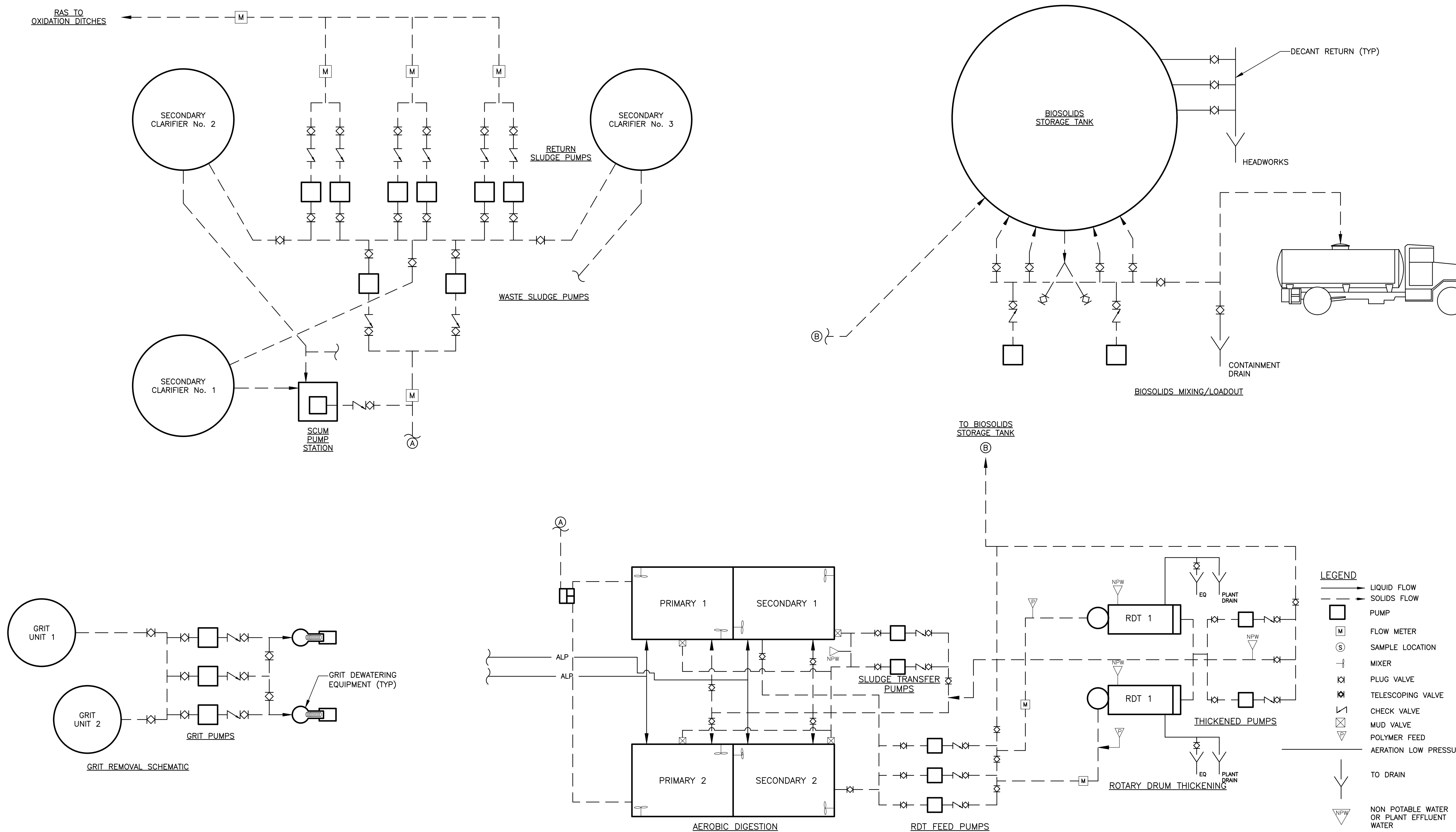
NEVADA, IOWA – 2019

GENERAL
SOLIDS PROCESSING SCHEMATIC
AEROBIC DIGESTION WITH INTEGRAL THICKENING

SHEET NO.
FIG 5

Xrefs: xgt-1-dh01; XP-0-PID



PRELIMINARY
NOT FOR CONSTRUCTION

DRAWN BY: MAP	JOB DATE: 2019	BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
APPROVED: MJR	JOB NUMBER: 181683		
CAD DATE: 8/23/2019 10:44:19 AM			
CAD FILE: J:\2018\181683\CAD\Dwgs\G\G.10 SOLIDS PROCESSING SCHEMATIC_Post thickening.dwg			

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CITY OF NEVADA
NEVADA, IOWA – 2019

GENERAL
SOLIDS PROCESSING SCHEMATIC
AEROBIC DIGESTION WITH POST THICKENING

SHEET NO.
FIG 6

Xrefs: xgt-1-dh01; XP-0-PID

F. Appendix F – Process Facilities Operation and Maintenance

Basis of O&M Estimate

Present worth costs assume an interest rate of 3.5% and inflation rate of 2.2%. Interest rate based on 2019 value from the OMB Circular NO. A-94 and inflation rate is the average inflation rate from 2000 to present from the U.S. Department of Labor.

Power requirements assume power demand and usage costs provided by Consumers Electric. See the following page for Consumer's Electric service charge breakdown.

LARGE COMMERCIAL FLAT DEMAND RATE

SCHEDULE NUMBER: 40

SINGLE PHASE OR MULTI-PHASE: Single and Multi-Phase

FIRM OR INTERRUPTIBLE: Firm

SERVICE COMMITMENT: *High Reliability Firm* = we strive to have availability of power across our entire distribution grid from 99.96% to 99.98% of the time. Due to the possibility that severe storms occur from time-to-time, as well as our dependence on the transmission grid from which we receive power to distribute, these cannot be guaranteed.

SIZE PARAMETERS: 25 kVa through 300 kVa with load factor equal to or greater than 40% or services greater than 300 kVa with load factor less than 80%.

SERVICE AREA: All areas served by the Cooperative.

MEMBER CLASS: Large Commercial

AVAILABILITY: Large Commercial Demand Service is available to members with a load factor of 40 percent but less than 80 percent annually and are subject to the Cooperative's standard service as described in Section 4 of this tariff and within the limit of any incorporated area. All are subject to the terms of the service contract and membership application approved by the Board of Directors.

Consumers Energy may assist the member in choosing a rate schedule. However, it is the member's responsibility to select the rate schedule best adapted to the member's requirements. Consumers Energy will not be liable for any assistance given to the member in choosing a rate schedule.

LARGE COMMERCIAL FLAT DEMAND RATE

DELIVERY & SUPPLY RATE:

Access Charge: $100.00 per month

Distribution Delivery Demand Charge: $14.00 per kW
Per Non Coincident Peak kW Demand

Power Supply Rate:
Purchased Power Demand Charge $7.56 per kW
Per Non Coincident Peak kW Demand

Energy Charge (Based on Member's Preference):

100% Traditional (Coal & Nuclear)	3.60 cents per kWh
90% Traditional & 10% Renewable	3.85 cents per kWh
50% Traditional & 50% Renewable	4.85 cents per kWh
0% Traditional & 100% Renewable	6.10 cents per kWh

REQUISITE RIDERS:	Rider #1	Tax Clause
	Rider #2	Purchased Power Adjustment Clause
	Rider #3	Billing Option
RIDERS:	Rider #11	HomeGuard Over-Voltage Protection
	Rider #12	HomeGuard Plus Over-Voltage Protection
	Rider #13	Round-Up for Renewables
	Rider #14	Neighbors Helping Neighbors Renewable Energy Blocks
	Rider #15	Worry Free Meter Loop Protection
	Rider #16	Operation Round-Up
	Rider #17	Energy Information

PROMPT PAYMENT PROVISION: The above rates are net, the gross rates being 1½% higher. In the event the current monthly bill for this service, plus its requisite riders, are not paid within 20 days after they are rendered, the gross rates shall apply, as described in Section 11 of this tariff.

LARGE COMMERCIAL FLAT DEMAND RATE

BILLING DEMAND: The billing demand shall be the maximum distribution non-coincident kilowatt demand established by the member for any period of fifteen consecutive minutes during the month for which the bill is rendered, as indicated or recorded by a demand meter and adjusted for power factor as provided hereafter.

The billing demand charges will be adjusted periodically in accordance to the Cooperative's Wholesale Power Supplier Rate Schedule.

POWER FACTOR ADJUSTMENT: The member agrees to maintain unity power factor as nearly as practicable. Demand charges will be adjusted to correct the average power factors lower than 95 percent. Such adjustments will be made by increasing the measured demand one percent by which the average power factor is less than 95 percent lagging.

MINIMUM CHARGE: The minimum charge shall be the highest one of the following charges:

1. The billing demand charge.
2. The minimum monthly charge specified in the contract.

SERVICE PROVISIONS:

1. Delivery Point. If service is furnished at secondary voltage the delivery point shall be the metering point unless otherwise specified in the contract for service. All wiring, pole lines and other electric equipment on the load side of the delivery point shall be owned and maintained by the member. If service is furnished at seller's primary line voltage the delivery point shall be the point of attachment of seller's primary line to member's transformer structure unless otherwise specified in the contract for service. All wiring, pole lines and other electric equipment (except metering equipment) on the load side of delivery point shall be owned, leased and maintained by the member.
2. Lighting. Both power and lighting shall be billed at the foregoing rate. If a separate meter is required for the lighting circuit, the registration of the two watt-hour meters shall be added to obtain total kilowatt hours used and the registrations of the two demand meters shall be added to obtain the total kilowatt demand for billing purposes.

LARGE COMMERCIAL FLAT DEMAND RATE

3. Primary Service. If service is furnished at primary distribution voltage, a discount of two percent shall apply to the demand and energy charges, and if the minimum charge is based on transformer capacity, a discount of two percent shall also apply to the minimum charge. However, the seller shall have the option of metering secondary voltage and adding the estimated transformer losses to the metered kilowatt hours and kilowatt demand.

Preliminary Treatment Treatment O&M

Replacement - Preliminary Treatment Only												
	Headworks Building Parts											
	Yearly Mechanical Screen Maintenance		Mechanical screen rebuild Every 15 years		Grit Pump Seals Once every 5 years		Grit Pump Wear Plate Once every 2 years		Grit Pump Oil Change			
Year	Present Cost 2 @ $500 ea.	Inflated Yearly Cost	2 @ $20,000 ea.	Inflated Yearly Cost	1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $500 ea.	Inflated Yearly Cost	Present Cost 2 @ $500 ea		Total Inflated Yearly Cost	Present Worth
0	$ 1,000.00	$ -	$ 40,000.00	$ -	$ 1,000.00	$ -	$ 500.00	$ -	$ 1,000.00	$ -	$ -	$ -
1		$ 1,022.00		$ -		$ -		$ -		$ 1,022.00	$ 2,044.00	$ 1,974.88
2		$ 1,044.48		$ -		$ -		$ 522.24		$ 1,044.48	$ 2,611.21	$ 2,437.59
3		$ 1,067.46		$ -		$ -		$ -		$ 1,067.46	$ 2,134.93	$ 1,925.58
4		$ 1,090.95		$ -		$ -		$ 545.47		$ 1,090.95	$ 2,727.37	$ 2,376.74
5		$ 1,114.95		$ -		$ 1,114.95		$ -		$ 1,114.95	$ 3,344.84	$ 2,816.27
6		$ 1,139.48		$ -		$ -		$ 569.74		$ 1,139.48	$ 2,848.69	$ 2,317.41
7		$ 1,164.54		$ -		$ -		$ -		$ 1,164.54	$ 2,329.09	$ 1,830.64
8		$ 1,190.16		$ -		$ -		$ 595.08		$ 1,190.16	$ 2,975.41	$ 2,259.56
9		$ 1,216.35		$ -		$ -		$ -		$ 1,216.35	$ 2,432.70	$ 1,784.95
10		$ 1,243.11		$ -		$ 1,243.11		$ 621.55		$ 1,243.11	$ 4,350.88	$ 3,084.42
11		$ 1,270.46		$ -		$ -		$ -		$ 1,270.46	$ 2,540.91	$ 1,740.39
12		$ 1,298.41		$ -		$ -		$ 649.20		$ 1,298.41	$ 3,246.02	$ 2,148.16
13		$ 1,326.97		$ -		$ -		$ -		$ 1,326.97	$ 2,653.94	$ 1,696.94
14		$ 1,356.17		$ -		$ -		$ 678.08		$ 1,356.17	$ 3,390.41	$ 2,094.54
15		$ 1,386.00		$ 55,440.03		$ 1,386.00		$ -		$ 1,386.00	$ 59,598.03	$ 35,573.50
16		$ 1,416.49		$ -		$ -		$ 708.25		$ 1,416.49	$ 3,541.23	$ 2,042.25
17		$ 1,447.66		$ -		$ -		$ -		$ 1,447.66	$ 2,895.31	$ 1,613.28
18		$ 1,479.50		$ -		$ -		$ 739.75		$ 1,479.50	$ 3,698.76	$ 1,991.27
19		$ 1,512.05		$ -		$ -		$ -		$ 1,512.05	$ 3,024.11	$ 1,573.01
20		$ 1,545.32		$ -		$ 1,545.32		$ 772.66		$ 1,545.32	$ 5,408.61	$ 2,718.18
											=	**$ 75,999.56**

Preliminary Treatment Process Power Requirements					
	Headworks Building				
	Fine Screen	Washing Press	Grit Unit/vortex	Grit Dewatering Screw	Grit Pump
Nameplate Horsepower	0.5	5	1	1	10
Hours of Operation	12	6	24	6	6
Electricity Cost, $	0.036				
Electricity Demand Cost, $	$21.56				
1 hp = 0.746 KWH					
Max Electricity Draw, KWH	0.373	3.73	0.746	0.746	7.46
Electricity Cost	$ 155.32	$ 1,259.10	$ 235.26	$ 251.82	$ 2,518.20
Number of Units	2	2	2	2	2
Total Electricity Cost	$ 310.63	$ 2,518.20	$ 470.52	$ 503.64	$ 5,036.40
TOTAL	**$ 8,839.38**				

Preliminary Treatment-Alternatives 1 and 2 Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Fine Screen	$ 310.63	$ 5,337.55
Washing Press	$ 2,518.20	$ 43,269.57
Grit Unit/vortex	$ 470.52	$ 8,084.78
Grit Dewatering Screw	$ 503.64	$ 8,653.91
Grit Pump	$ 5,036.40	$ 86,539.14
Subtotal	$ 8,839.38	$ 151,884.96
Maintenance		
Labor[2]	$ -	$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 5,347.33	$ 75,999.56
Subtotal	$ 5,347.33	$ 75,999.56
TOTAL	**$ 14,186.71**	**$ 227,884.52**

Secondary Treatment O&M Alternative 1

Replacement - Secondary Treatment-Alternative 1																				
	Final Clarifier and Sectondary Treatement Building Parts																			
	Once every year		Every 5 years		Every 5 years		Every 5 years		Every 5 years		Once per Year		Every 15 years		Once per Year		Return Pump Seals			
Year	Present Cost 3@ $1,000 ea	Inflated Yearly Cost	Present Cost 6 @ $1000 ea.	Inflated Yearly Cost	Present Cost 2 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1@ $2047	Inflated Yearly Cost	Present Cost 8@ $15000	Inflated Yearly Cost	Present Cost 8@ $150	Inflated Yearly Cost	Present Cost 6@ $1000	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 3,000.00	$ -	$ 6,000.00	$ -	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 2,047.00	$ -	$ 120,000.00	$ -	$ 1,200.00	$ -	$ 6,000.00	$ -	$ -	$ -
1		$ 3,066.00		$ -		$ -		$ -		$ -		$ 2,092.03		$ -		$ 1,226.40		$ -	$ 6,384.43	$ 6,168.54
2		$ 3,133.45		$ -		$ -		$ -		$ -		$ 2,138.06		$ -		$ 1,253.38		$ -	$ 6,524.89	$ 6,091.06
3		$ 3,202.39		$ -		$ -		$ -		$ -		$ 2,185.10		$ -		$ 1,280.96		$ -	$ 6,668.44	$ 6,014.55
4		$ 3,272.84		$ -		$ -		$ -		$ -		$ 2,233.17		$ -		$ 1,309.14		$ -	$ 6,815.14	$ 5,939.00
5		$ 3,344.84		$ 6,689.69		$ 2,229.90		$ 1,114.95		$ 1,114.95		$ 2,282.30		$ -		$ 1,337.94		$ 6,689.69	$ 24,804.24	$ 20,884.50
6		$ 3,418.43		$ -		$ -		$ -		$ -		$ 2,332.51		$ -		$ 1,367.37		$ -	$ 7,118.31	$ 5,790.75
7		$ 3,493.63		$ -		$ -		$ -		$ -		$ 2,383.82		$ -		$ 1,397.45		$ -	$ 7,274.91	$ 5,718.02
8		$ 3,570.49		$ -		$ -		$ -		$ -		$ 2,436.27		$ -		$ 1,428.20		$ -	$ 7,434.96	$ 5,646.20
9		$ 3,649.05		$ -		$ -		$ -		$ -		$ 2,489.87		$ -		$ 1,459.62		$ -	$ 7,598.53	$ 5,575.28
10		$ 3,729.32		$ 7,458.65		$ 2,486.22		$ 1,243.11		$ 1,243.11		$ 2,544.64		$ -		$ 1,491.73		$ 7,458.65	$ 27,655.43	$ 19,605.45
11		$ 3,811.37		$ -		$ -		$ -		$ -		$ 2,600.62		$ -		$ 1,524.55		$ -	$ 7,936.54	$ 5,436.10
12		$ 3,895.22		$ -		$ -		$ -		$ -		$ 2,657.84		$ -		$ 1,558.09		$ -	$ 8,111.15	$ 5,367.82
13		$ 3,980.91		$ -		$ -		$ -		$ -		$ 2,716.31		$ -		$ 1,592.37		$ -	$ 8,289.59	$ 5,300.40
14		$ 4,068.50		$ -		$ -		$ -		$ -		$ 2,776.07		$ -		$ 1,627.40		$ -	$ 8,471.96	$ 5,233.82
15		$ 4,158.00		$ 8,316.00		$ 2,772.00		$ 1,386.00		$ 1,386.00		$ 2,837.14		$ 166,320.08		$ 1,663.20		$ 8,316.00	$ 197,154.44	$ 117,679.63
16		$ 4,249.48		$ -		$ -		$ -		$ -		$ 2,899.56		$ -		$ 1,699.79		$ -	$ 8,848.83	$ 5,103.17
17		$ 4,342.97		$ -		$ -		$ -		$ -		$ 2,963.35		$ -		$ 1,737.19		$ -	$ 9,043.50	$ 5,039.07
18		$ 4,438.51		$ -		$ -		$ -		$ -		$ 3,028.54		$ -		$ 1,775.40		$ -	$ 9,242.46	$ 4,975.78
19		$ 4,536.16		$ -		$ -		$ -		$ -		$ 3,095.17		$ -		$ 1,814.46		$ -	$ 9,445.80	$ 4,913.28
20		$ 4,635.95		$ 9,271.91		$ 3,090.64		$ 1,545.32		$ 1,545.32		$ 3,163.27		$ -		$ 1,854.38		$ 9,271.91	$ 34,378.69	$ 17,277.56
										TOTAL PRESENT WORTH									=	$ 263,759.99

Bardenpho-Alt. 1 Power Req.			
	Aerator	Submersible Mixers	Return Pumps
Nameplate Horsepower	100	10	40
Hours of Operation	24	24	24
Electricity Cost, $	0.036		
Electricity Demand cost, $	21.56		
1 hp = 0.746 KWH			
Max Electricity Draw, KWH	74.6	7.46	29.84
Electricity Cost	$ 42,826.37	$ 4,282.64	$ 17,130.55
Number of Units	2	8	6
Total Electricity Cost	$ 85,652.74	$ 34,261.09	$ 102,783.28
TOTAL			**$ 222,697.11**

Secondary Clarifiers-Alternatives 1 and 2 Power Requirements					
	Final Clarifiers Drives	Ras Pumps	Was Pumps	Scum Pump	Sump Pump
Nameplate Horsepower	1	7.5	3	2.1	0.5
Hours of Operation	24	24	24	6	6
Electricity Cost, $	0.036				
Electricity Demand Cost, $	21.56				
1 hp = 0.746 KWH					
Max Electricity Draw, KWH	0.746	5.595	2.238	1.5666	0.373
Electricity Cost	$ 428.26	$ 3,211.98	$ 1,284.79	$ 528.82	$ 125.91
Number of Units	3	4	2	1	1
Total Electricity Cost	$ 1,284.79	$ 12,847.91	$ 2,569.58	$ 528.82	$ 125.91
TOTAL			**$**		**17,357.01**

Secondary Treatment-Alternative 1 Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Aerator	$ 85,652.74	$ 1,471,749.87
Submersible Mixers	$ 34,261.09	$ 588,699.95
Return Pumps	$ 102,783.28	$ 1,766,099.84
Final Clarifiers Drives	$ 1,284.79	$ 22,076.25
Ras Pumps	$ 12,847.91	$ 220,762.48
Was Pumps	$ 2,569.58	$ 44,152.50
Scum Pump	$ 528.82	$ 9,086.61
Sump Pump	$ 125.91	$ 2,163.48
Subtotal	$ 240,054.13	$ 4,124,790.97
Maintenance		
Labor[2]	$ -	$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 18,558.15	$ 263,759.99
Subtotal	$ 18,558.15	$ 263,759.99
TOTAL	**$ 258,612.28**	**$ 4,388,550.96**

Secondary Treatment O&M Alternative 2

Replacement - Secondary Treatment-Alternative 2																		
	Final Clarifier and Sectondary Treatement Building Parts																	
	Final Clarifier Drives Oil Change Once every year		Ras Pump Seals Every 5 years		WAS Pump Seals Every 5 years		Scum Pump Seals Every 5 years		Sump Pump Seals Every 5 years		Oil Replacement Aerators Once per Year		Complete Replacement Mixers Every 15 years		Mixer Lubricant Change Once per Year			
Year	Present Cost 3@ $1,000 ea	Inflated Yearly Cost	Present Cost 6 @ $1000 ea.	Inflated Yearly Cost	Present Cost 2 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1 @ $1000 ea.	Inflated Yearly Cost	Present Cost 1@ $2047	Inflated Yearly Cost	Present Cost 4@ $15000	Inflated Yearly Cost	Present Cost 4@ $150	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 3,000.00	$ -	$ 6,000.00	$ -	$ 2,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 2,047.00	$ -	$ 60,000.00	$ -	$ 600.00	$ -	$ -	$ -
1		$ 3,066.00		$ -		$ -		$ -		$ -		$ 2,092.03		$ -		$ 613.20	$ 5,771.23	$ 5,576.07
2		$ 3,133.45		$ -		$ -		$ -		$ -		$ 2,138.06		$ -		$ 626.69	$ 5,898.20	$ 5,506.03
3		$ 3,202.39		$ -		$ -		$ -		$ -		$ 2,185.10		$ -		$ 640.48	$ 6,027.96	$ 5,436.88
4		$ 3,272.84		$ -		$ -		$ -		$ -		$ 2,233.17		$ -		$ 654.57	$ 6,160.58	$ 5,368.59
5		$ 3,344.84		$ 6,689.69		$ 2,229.90		$ 1,114.95		$ 1,114.95		$ 2,282.30		$ -		$ 668.97	$ 17,445.59	$ 14,688.72
6		$ 3,418.43		$ -		$ -		$ -		$ -		$ 2,332.51		$ -		$ 683.69	$ 6,434.62	$ 5,234.57
7		$ 3,493.63		$ -		$ -		$ -		$ -		$ 2,383.82		$ -		$ 698.73	$ 6,576.19	$ 5,168.82
8		$ 3,570.49		$ -		$ -		$ -		$ -		$ 2,436.27		$ -		$ 714.10	$ 6,720.86	$ 5,103.90
9		$ 3,649.05		$ -		$ -		$ -		$ -		$ 2,489.87		$ -		$ 729.81	$ 6,868.72	$ 5,039.79
10		$ 3,729.32		$ 7,458.65		$ 2,486.22		$ 1,243.11		$ 1,243.11		$ 2,544.64		$ -		$ 745.86	$ 19,450.92	$ 13,789.12
11		$ 3,811.37		$ -		$ -		$ -		$ -		$ 2,600.62		$ -		$ 762.27	$ 7,174.27	$ 4,913.98
12		$ 3,895.22		$ -		$ -		$ -		$ -		$ 2,657.84		$ -		$ 779.04	$ 7,332.10	$ 4,852.26
13		$ 3,980.91		$ -		$ -		$ -		$ -		$ 2,716.31		$ -		$ 796.18	$ 7,493.41	$ 4,791.32
14		$ 4,068.50		$ -		$ -		$ -		$ -		$ 2,776.07		$ -		$ 813.70	$ 7,658.26	$ 4,731.14
15		$ 4,158.00		$ 8,316.00		$ 2,772.00		$ 1,386.00		$ 1,386.00		$ 2,837.14		$ 83,160.04		$ 831.60	$ 104,846.79	$ 62,582.07
16		$ 4,249.48		$ -		$ -		$ -		$ -		$ 2,899.56		$ -		$ 849.90	$ 7,998.93	$ 4,613.03
17		$ 4,342.97		$ -		$ -		$ -		$ -		$ 2,963.35		$ -		$ 868.59	$ 8,174.91	$ 4,555.09
18		$ 4,438.51		$ -		$ -		$ -		$ -		$ 3,028.54		$ -		$ 887.70	$ 8,354.76	$ 4,497.88
19		$ 4,536.16		$ -		$ -		$ -		$ -		$ 3,095.17		$ -		$ 907.23	$ 8,538.56	$ 4,441.38
20		$ 4,635.95		$ 9,271.91		$ 3,090.64		$ 1,545.32		$ 1,545.32		$ 3,163.27		$ -		$ 927.19	$ 24,179.59	$ 12,151.84
									TOTAL PRESENT WORTH								=	**$ 183,042.48**

Oxidation Ditches-Alt. 2 Power Requirements		
	Anoxic Mixer	Aerator
Nameplate Horsepower	4.56	100
Hours of Operation	24	24
Electricity Cost, $	0.036	
Electricity Demand cost, $	21.56	
1 hp = 0.746 KWH		
Max Electricity Draw, KWH	3.40176	74.6
Electricity Cost	$ 1,952.88	$ 42,826.37
Number of Units	4	2
Total Electricity Cost	$ 7,811.53	$ 85,652.74
TOTAL	**$**	**93,464.27**

Secondary Clarifiers-Alternatives 1 and 2 Power Requirements					
	Final Clarifiers Drives	Ras Pumps	Was Pumps	Scum Pump	Sump Pump
Nameplate Horsepower	1	7.5	3	2.1	0.5
Hours of Operation	24	24	24	6	6
Electricity Cost, $	0.036				
Electricity Demand Cost, $	21.56				
1 hp = 0.746 KWH					
Max Electricity Draw, KWH	0.746	5.595	2.238	1.5666	0.373
Electricity Cost	$ 428.26	$ 3,211.98	$ 1,284.79	$ 528.82	$ 125.91
Number of Units	3	4	2	1	1
Total Electricity Cost	$ 1,284.79	$ 12,847.91	$ 2,569.58	$ 528.82	$ 125.91
TOTAL			**$**		**17,357.01**

Secondary Treatment-Alternative 2 Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Anoxic Mixer	$ 7,811.53	$ 134,223.59
Aerator	$ 85,652.74	$ 1,471,749.87
Final Clarifiers Drives	$ 1,284.79	$ 22,076.25
Ras Pumps	$ 12,847.91	$ 220,762.48
Was Pumps	$ 2,569.58	$ 44,152.50
Scum Pump	$ 528.82	$ 9,086.61
Sump Pump	$ 125.91	$ 2,163.48
Subtotal	$ 110,821.28	$ 1,904,214.77
Maintenance		
Labor[2]	$ -	$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 12,878.87	$ 183,042.48
Subtotal	$ 12,878.87	$ 183,042.48
TOTAL	**$ 123,700.15**	**$ 2,087,257.25**

Solids Processing O&M - Integral Thickening Alternative

Replacement - Biosolids Treatment-Integral Thickening														
	Digerster Equipment										Biosolids Tank (storage)			
	Permeate Pump Seals Every 5 years		Sludge Transfer Pump Seals Every 5 years		Blower Belts Every 2 years		Blower Lubrication Every year		Blower Filters 6 times per year		Biosolids Mixing Pump Seals Every 5 years			
Year	Present Cost 4@ $1000 ea	Inflated Yearly Cost	Present Cost 2@ $2000 ea	Inflated Yearly Cost	Present Cost 4 @ $100 ea.	Inflated Yearly Cost	Present Cost 4 @ $1,000 ea.	Inflated Yearly Cost	Present Cost 24 @ $200 ea.	Inflated Yearly Cost	Present Cost 2@ $1000 ea	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 400.00	$ -	$ 4,000.00	$ -	$ 4,800.00	$ -	$ 2,000.00	$ -	$ -	$ -
1		$ -		$ -		$ -		$ 4,088.00		$ 4,905.60		$ -	$ 8,993.60	$ 8,689.47
2		$ -		$ -		$ 417.79		$ 4,177.94		$ 5,013.52		$ -	$ 9,609.25	$ 8,970.34
3		$ -		$ -				$ 4,269.85		$ 5,123.82		$ -	$ 9,393.67	$ 8,472.55
4		$ -		$ -		$ 436.38		$ 4,363.79		$ 5,236.54		$ -	$ 10,036.71	$ 8,746.41
5		$ 4,459.79		$ 4,459.79				$ 4,459.79		$ 5,351.75		$ 2,229.90	$ 20,961.02	$ 17,648.61
6		$ -		$ -		$ 455.79		$ 4,557.91		$ 5,469.49		$ -	$ 10,483.18	$ 8,528.08
7		$ -		$ -				$ 4,658.18		$ 5,589.82		$ -	$ 10,248.00	$ 8,054.83
8		$ -		$ -		$ 476.07		$ 4,760.66		$ 5,712.79		$ -	$ 10,949.52	$ 8,315.19
9		$ -		$ -				$ 4,865.39		$ 5,838.47		$ -	$ 10,703.87	$ 7,853.76
10		$ 4,972.43		$ 4,972.43		$ 497.24		$ 4,972.43		$ 5,966.92		$ 2,486.22	$ 23,867.68	$ 16,920.25
11		$ -		$ -				$ 5,081.83		$ 6,098.19		$ -	$ 11,180.02	$ 7,657.71
12		$ -		$ -		$ 519.36		$ 5,193.63		$ 6,232.35		$ -	$ 11,945.34	$ 7,905.23
13		$ -		$ -				$ 5,307.89		$ 6,369.46		$ -	$ 11,677.35	$ 7,466.55
14		$ -		$ -		$ 542.47		$ 5,424.66		$ 6,509.59		$ -	$ 12,476.72	$ 7,707.89
15		$ 5,544.00		$ 5,544.00				$ 5,544.00		$ 6,652.80		$ 2,772.00	$ 26,056.81	$ 15,553.07
16		$ -		$ -		$ 566.60		$ 5,665.97		$ 6,799.16		$ -	$ 13,031.73	$ 7,515.48
17		$ -		$ -				$ 5,790.62		$ 6,948.75		$ -	$ 12,739.37	$ 7,098.42
18		$ -		$ -		$ 591.80		$ 5,918.02		$ 7,101.62		$ -	$ 13,611.44	$ 7,327.87
19		$ -		$ -				$ 6,048.21		$ 7,257.85		$ -	$ 13,306.07	$ 6,921.23
20		$ 6,181.27		$ 6,181.27		$ 618.13		$ 6,181.27		$ 7,417.53		$ 3,090.64	$ 29,670.11	$ 14,911.18
													=	**$ 192,264.11**

Solids Treatment & Disposal Integral Thickening Power Requirement								
	Aerobic Digester Equipment							Biosolids Tank
	Permeate Pump 1	Permeate Pump 2	MBT Blower 1	MBT Blower 2	Digester Blowers	Fine Screen	Sludge Transfer Pumps	Biosolids Mixer
Nameplate Horsepower	10	5	20	15	125	0.5	10	150
Hours of Operation	19.2	19.2	24	24	24	24	8	0.2
Electricity Cost, $	0.036							
Electricity Demand Cost, $	21.56							
	1 hp = 0.746 KWH							
Max Electricity Draw, KWH	7.46	3.73	14.92	11.19	93.25	0.373	7.46	111.9
Electricity Cost	$ 3,812.12	$ 1,906.06	$ 8,565.27	$ 6,423.96	$ 53,532.96	$ 214.13	$ 2,714.25	$ 29,244.84
Number of Units	1	1	1	1	2	1	2	2
Total Electricity Cost	$ 3,812.12	$ 1,906.06	$ 8,565.27	$ 6,423.96	$ 107,065.92	$ 214.13	$ 5,428.49	$ 58,489.68
TOTAL	**$**							**191,905.64**

Biosolids Treatment- Integral Thickening Summary		
Capital Cost(3):		
Item	Annual Cost	Present Worth
Operation		
Electricity(1)		
Permeate Pump 1	$ 3,812.12	$ 65,502.71
Permeate Pump 2	$ 1,906.06	$ 32,751.36
MBT Blower 1	$ 8,565.27	$ 147,174.99
MBT Blower 2	$ 6,423.96	$ 110,381.24
Digester Blowers	$ 107,065.92	$ 1,839,687.34
Fine Screen	$ 214.13	$ 3,679.37
Sludge Transfer Pumps	$ 5,428.49	$ 93,276.45
Biosolids Mixer	$ 58,489.68	$ 1,005,013.81
Subtotal	$ 191,905.64	$ 3,297,467.27
Maintenance		
MBT Chemical Usage (NaHCl)	$ 960.00	$ 16,495.44
Labor(2)	$ 900.00	$ 15,464.48
Subtotal	$ 1,860.00	$ 31,959.92
Replacement		
Parts	$ 13,527.70	$ 192,264.11
Subtotal	$ 13,527.70	$ 192,264.11
TOTAL	**$ 207,293.34**	**$ 3,521,691.30**

Solids Processing O&M Post Thickening Alternative O&M

Replacement - Biosolids Treatment-Post Thickening																		
	Digerster Equipment														Biosolids Tank (storage)			
	Mixer Seals Every 5 years		Digerster Transfer Pump Seals Every 5 years		Sludge Transfer Pump Seals Every 5 years		RDT Pump Seals Every 5 years		Blower Belts Every 2 years		Blower Lubrication Every year		Blower Filters 6 times per year		Biosolids Mixing Pump Seals Every 5 years			
Year	Present Cost 4@ $1000 ea	Inflated Yearly Cost	Present Cost 2@ $2000 ea	Inflated Yearly Cost	Present Cost 2@ $2000 ea	Inflated Yearly Cost	Present Cost 4@ $1000 ea	Inflated Yearly Cost	Present Cost 4 @ $100 ea.	Inflated Yearly Cost	4 @ $1,000 ea.	Inflated Yearly Cost	Present Cost 24 @ $200 ea.	Inflated Yearly Cost	Present Cost 1@ $1000 ea	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 4,000.00	$ -	$ 400.00	$ -	$ 4,000.00	$ -	$ 4,800.00	$ -	$ 1,000.00	$ -	$ -	$ -
1		$ -		$ -		$ -		$ -		$ -		$ 4,088.00		$ 4,905.60		$ -	$ 8,993.60	$ 8,689.47
2		$ -		$ -		$ -		$ -		$ 417.79		$ 4,177.94		$ 5,013.52		$ -	$ 9,609.25	$ 8,970.34
3		$ -		$ -		$ -		$ -				$ 4,269.85		$ 5,123.82		$ -	$ 9,393.67	$ 8,472.55
4		$ -		$ -		$ -		$ -		$ 436.38		$ 4,363.79		$ 5,236.54		$ -	$ 10,036.71	$ 8,746.41
5		$ 4,459.79		$ 4,459.79		$ 4,459.79		$ 4,459.79				$ 4,459.79		$ 5,351.75		$ 1,114.95	$ 28,765.65	$ 24,219.91
6		$ -		$ -		$ -		$ -		$ 455.79		$ 4,557.91		$ 5,469.49		$ -	$ 10,483.18	$ 8,528.08
7		$ -		$ -		$ -		$ -				$ 4,658.18		$ 5,589.82		$ -	$ 10,248.00	$ 8,054.83
8		$ -		$ -		$ -		$ -		$ 476.07		$ 4,760.66		$ 5,712.79		$ -	$ 10,949.52	$ 8,315.19
9		$ -		$ -		$ -		$ -				$ 4,865.39		$ 5,838.47		$ -	$ 10,703.87	$ 7,853.76
10		$ 4,972.43		$ 4,972.43		$ 4,972.43		$ 4,972.43		$ 497.24		$ 4,972.43		$ 5,966.92		$ 1,243.11	$ 32,569.44	$ 23,089.09
11		$ -		$ -		$ -		$ -				$ 5,081.83		$ 6,098.19		$ -	$ 11,180.02	$ 7,657.71
12		$ -		$ -		$ -		$ -		$ 519.36		$ 5,193.63		$ 6,232.35		$ -	$ 11,945.34	$ 7,905.23
13		$ -		$ -		$ -		$ -				$ 5,307.89		$ 6,369.46		$ -	$ 11,677.35	$ 7,466.55
14		$ -		$ -		$ -		$ -		$ 542.47		$ 5,424.66		$ 6,509.59		$ -	$ 12,476.72	$ 7,707.89
15		$ 5,544.00		$ 5,544.00		$ 5,544.00		$ 5,544.00				$ 5,544.00		$ 6,652.80		$ 1,386.00	$ 35,758.82	$ 21,344.10
16		$ -		$ -		$ -		$ -		$ 566.60		$ 5,665.97		$ 6,799.16		$ -	$ 13,031.73	$ 7,515.48
17		$ -		$ -		$ -		$ -				$ 5,790.62		$ 6,948.75		$ -	$ 12,739.37	$ 7,098.42
18		$ -		$ -		$ -		$ -		$ 591.80		$ 5,918.02		$ 7,101.62		$ -	$ 13,611.44	$ 7,327.87
19		$ -		$ -		$ -		$ -				$ 6,048.21		$ 7,257.85		$ -	$ 13,306.07	$ 6,921.23
20		$ 6,181.27		$ 6,181.27		$ 6,181.27		$ 6,181.27		$ 618.13		$ 6,181.27		$ 7,417.53		$ 1,545.32	$ 40,487.34	$ 20,347.55
																	=	**$ 216,231.65**

Solids Treatment & Disposal-Post Thickening Power Requirements									
	Aerobic Digester and Thickening Equipment								Biosolids Tank
	Digester Mixers	Digester Transfer Pump	Sludge Transfer Pump	RDT	RDT Floc Drive	RDT Booster Pump	RDT Feed Pump	Aeration Blower	Biosolids Mixers
Nameplate Horsepower	25	20	15	2	0.5	3	15	100	150
Hours of Operation	24	8	8	8	8	8	8	24	0.2
Electricity Cost, $	0.036								
Electricity Demand Cost, $	21.56								
	1 hp = 0.746 KWH								
Max Electricity Draw, KWH	18.65	14.92	11.19	1.492	0.373	2.238	11.19	74.6	111.9
Electricity Cost	$ 10,706.59	$ 5,428.49	$ 4,071.37	$ 542.85	$ 135.71	$ 814.27	$ 4,071.37	$ 42,826.37	$ 29,244.84
Number of Units	4	2	2	2	2	2	2	3	1
Total Electricity Cost	$ 42,826.37	$ 10,856.99	$ 8,142.74	$ 1,085.70	$ 271.42	$ 1,628.55	$ 8,142.74	$ 128,479.10	$ 29,244.84
TOTAL	**$ 230,678.45**								

Biosolids Treatment-Post Thickening Summary		
Capital Cost[3]:		
Item	Annual Cost	Present Worth
Operation		
Electricity[1]		
Digester Mixers	$ 42,826.37	$ 735,874.93
Digester Transfer Pump	$ 10,856.99	$ 186,552.91
Sludge Transfer Pump	$ 8,142.74	$ 139,914.68
RDT	$ 1,085.70	$ 18,655.29
RDT Floc Drive	$ 271.42	$ 4,663.82
RDT Booster Pump	$ 1,628.55	$ 27,982.94
RDT Feed Pump	$ 8,142.74	$ 139,914.68
Aeration Blower	$ 128,479.10	$ 2,207,624.80
Biosolids Mixers	$ 29,244.84	$ 502,506.90
Subtotal	$ 230,678.45	$ 3,963,690.97
Maintenance		
		$ -
Labor[2]		$ -
Subtotal	$ -	$ -
Replacement		
Parts	$ 15,214.06	$ 216,231.65
Subtotal	$ 15,214.06	$ 216,231.65
TOTAL	**$ 245,892.51**	**$ 4,179,922.61**

Disinfection O&M Trojan UV Signa

Replacemet- Disinfection-Trojan UV3000 Plus				
	UV LAMP			
Year	Present Cost 8@$300 ea	Inflated Yearly Cost	Total Inflated Yearly Cost	Present Worth
0	$ 2,400.00	$ -	$ -	$ -
1		$ 2,452.80	$ 2,452.80	$ 2,369.86
2		$ 2,506.76	$ 2,506.76	$ 2,340.09
3		$ 2,561.91	$ 2,561.91	$ 2,310.70
4		$ 2,618.27	$ 2,618.27	$ 2,281.67
5		$ 2,675.87	$ 2,675.87	$ 2,253.01
6		$ 2,734.74	$ 2,734.74	$ 2,224.72
7		$ 2,794.91	$ 2,794.91	$ 2,196.77
8		$ 2,856.40	$ 2,856.40	$ 2,169.18
9		$ 2,919.24	$ 2,919.24	$ 2,141.93
10		$ 2,983.46	$ 2,983.46	$ 2,115.03
11		$ 3,049.10	$ 3,049.10	$ 2,088.47
12		$ 3,116.18	$ 3,116.18	$ 2,062.23
13		$ 3,184.73	$ 3,184.73	$ 2,036.33
14		$ 3,254.80	$ 3,254.80	$ 2,010.75
15		$ 3,326.40	$ 3,326.40	$ 1,985.50
16		$ 3,399.58	$ 3,399.58	$ 1,960.56
17		$ 3,474.37	$ 3,474.37	$ 1,935.93
18		$ 3,550.81	$ 3,550.81	$ 1,911.62
19		$ 3,628.93	$ 3,628.93	$ 1,887.61
20		$ 3,708.76	$ 3,708.76	$ 1,863.90
			=	**$ 42,145.86**

Trojan UV Signa Power Requirments		
	UV	
Nameplate Horsepower		
Hours of Operation		16
Electricity Cost, $		0.036
Electricity Demand Cost, $		21.56
1 hp = 0.746 KWH		
Max Electricity Draw, KWH		21.1
Electricity Cost	$	9,895.06
Number of Units		1
Total Electricity Cost	$	9,895.06
TOTAL	**$**	**9,895.06**

Disinfection Trojan UV Signa Summary		
Capital Cost(3):	$237,500	
Item	Annual Cost	Present Worth
Operation		
Electricity		
UV	$ 9,895.06	$ 170,024.31
Subtotal	$ 9,895.06	$ 170,024.31
Maintenance		
Labor(1)	$ 141,470.00	$ 2,430,844.17
Subtotal	$ 141,470.00	$ 2,430,844.17
Replacement		
Parts	$ 2,965.38	$ 42,145.86
Subtotal	$ 2,965.38	$ 42,145.86
TOTAL	**$ 154,330.44**	**$ 2,643,014.34**

NOTE: Labor in disinfection category is estimate of 2 additional full time employees for the entire wastewater treatment plant necessary for both alternatives' operation.

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Alternative 1 O&M Summary

Alternative 1 O&M COSTS		
	Annual	**Present Worth**
Total Electrical	$ 450,694.20	$ 7,744,167.51
Total Maintanance	$ 143,330.00	$ 2,462,804.09
Total Replacement	$ 40,398.57	$ 574,169.52
Rounded Total	**$ 634,000.00**	**$ 10,781,000.00**

Alternative 2 O&M Summary

Alternative 2 O&M COSTS		
	Annual	**Present Worth**
Total Electrical	$ 321,461.36	$ 5,523,591.31
Total Maintanance	$ 143,330.00	$ 2,462,804.09
Total Replacement	$ 34,719.28	$ 493,452.01
Rounded Total	**$ 500,000.00**	**$ 8,480,000.00**

G. Appendix G – Flows and Loads Memo

HRGreen

MEMO

To: City of Nevada, Iowa

From: HR Green, Inc.

Subject: Flow & Loading Summary

Date: February 4, 2019 (Revised 2/12/19)

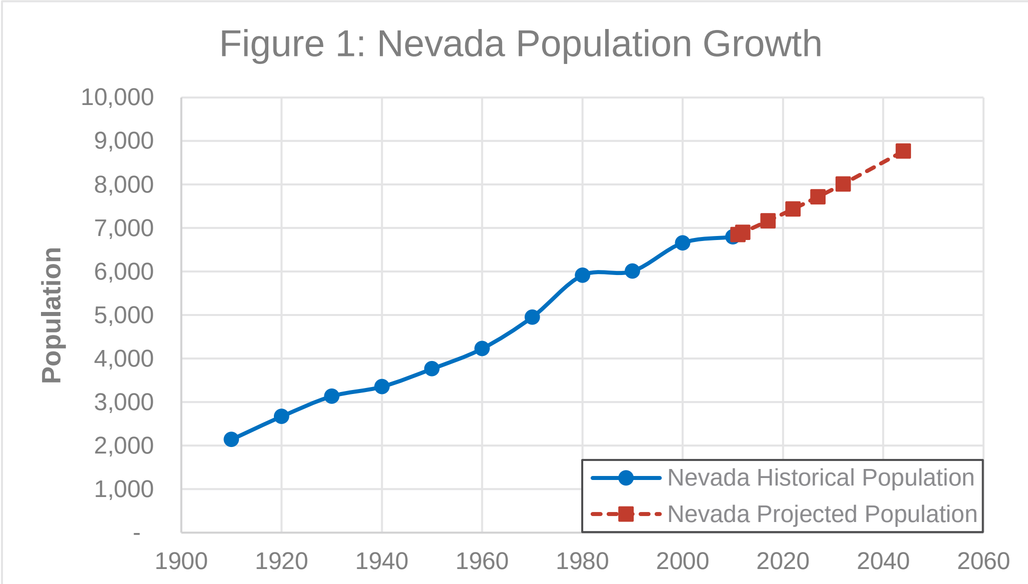
Introduction

Influent hydraulic and organic loadings into the City's WWTF derive from domestic, commercial, and significant industrial users (SIU). Non-industrial flow consists of residential and commercial flows. Nevada's WWTF has two significant industrial users (SIU): Burke Corporation (SIU-1) and Du Pont (SIU-2). The Du Pont facility has recently been acquired by VERBIO North American Corporation, with continued discharge to City sewers is anticipated.

HR Green has completed the wastewater flow and loading evaluation using monthly operating report (MOR) data provided by the City. Historical data from October 31, 2015 to October 31, 2018 has been analyzed for design purposes. Per the Iowa DNR (IDNR) Wastewater Facilities Design Standards, the design flows and loads for the treatment facility shall be established for the design period, which shall be 20 years beyond the date of completion of construction. Therefore, the design year for this project will be 2044.

Population Projection

According to the U.S. Bureau of the Census, in 2010 the total population of Nevada was 6,798. Since 1920, Nevada has experienced an annual average population growth of 1.25%, with growth slowing from 2000 – 2010. In the 2013 Facility Plan submitted by HR Green, an average annual growth rate of 0.75% was determined to be a reasonable estimation of 20-year growth for design purposes. City staff have recently reaffirmed the validity of this assumption. Therefore, this report will also assume a 0.75% annual average growth rate. Applying this growth rate will result in a 2044 population of 8,764 which is used as the reference population for flow and loading projections. Census population data for the past 100 years as well as projections to 2044 are shown in Figure 1, below.



<u>Historical Hydraulic Loading</u>

The City's historical wastewater flows are summarized in Table 1. Average Dry Weather (ADW) flow is defined as the daily flow when there is no runoff and the groundwater table is low. For existing facilities, this period of measurement should extend for as long as possible, up to 30 days. The Average Wet Weather (AWW) flow is based on the wettest 30 consecutive days. Maximum Wet Weather (MWW) flow is calculated based on the total maximum flow received in a 24-hour period. Therefore, we have assumed the historical ADW, AWW, and MWW flows are represented by the lowest running 30-day average value, highest running 30-day average value, and maximum day value within the review period, respectively. Table 1 indicates that the City's 3-year average historical flows are within the NPDES permit limits.

Table 1: Historical Influent Total Flow Summary

	2015–2016	2016–2017	2017–2018	Average	Current NPDES Permit Limit
ADW, mgd	1.164	0.963	0.862	0.996	1.658
AWW, mgd	2.389(1)	1.973	2.785	2.382	3.710
MWW, mgd	4.776(1)	3.720	5.219	4.572	6.218

(1) Flow meter was submerged on 12/14/15. Data point excluded.

Table 2 summarizes the historical and current permitted SIU hydraulic loadings. SIUs flows are a function of operations/production, and are not subject to wet weather conditions. Therefore, AWW, MWW, and PHWW conditions do not apply. Historical SIU flows are analyzed for 30-day running average (representative of ADW condition) and maximum day (representative of MWW condition) values.

Table 2: Historical SIU Hydraulic Loadings

Parameter	SIU-1 (Burke)		SIU-2 (DuPont)	
	Permitted	Actual	Permitted	Actual(1)
30-d Avg (ADW), mgd	0.35	0.119	0.072	0.016
AWW, mgd	NA	NA	NA	NA
Max Day (MWW), mgd	0.50	0.283	0.144	0.106
PHWW, mgd	NA	NA	NA	NA
(1) Period of 11/1/16 to 10/30/18.				

Historical flows and current WWTF NPDES permit limits are plotted in Figure 2 (12/14/15 data point excluded). Industrial flow in Figure 2 is the combined daily total of Du Pont and Burke Corporation.

Precipitation data for Nevada, Iowa from the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service databases and is also shown in Figure 2 to determine correlation of influent flow peaks. Figure 2 shows that Nevada's sanitary collection system is subject to significant inflow and infiltration (I&I) loading as the major peaks in influent flow to the WWTF are highly correlated with heavy precipitation events. This facility plan will not address any collection system improvements to reduce I&I loading. However, future collection system improvements may reduce the peaking experienced by the WWTF for MWW and PHWW conditions.

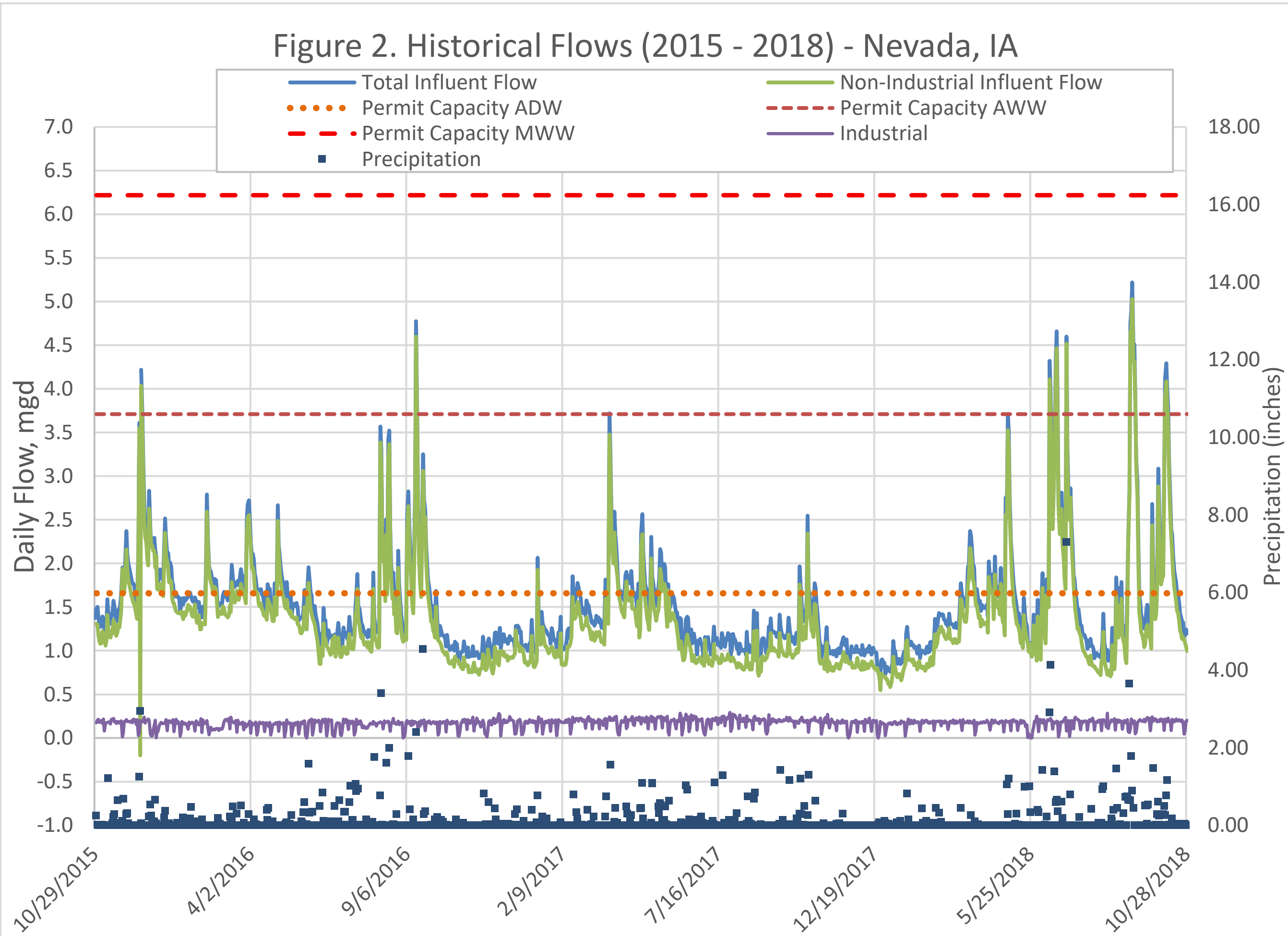


Figure 2 also indicates that the total historical daily average industrial flow is approximately 0.17 mgd, or approximately 17% of the average ADW reported in Table 1. The current NPDES permit issued for the Nevada WWTF on November 1, 2016 and amended September 1, 2018, contains permitted 30-day average flow and daily maximum flow limits for both SIUs.

Historical Organic Loadings

Loading from any input to the WWTF cannot exceed total influent loading measured at the WWTF; however the reviewed data shows dates where loadings from Burke exceeded the total influent organic load for a given constituent at the WWTF. Reasons for these inconsistencies could be:

(1) WWTF sample not collected on the same day as SIU sample (e.g. WWTF samples on Monday and Wednesday; SIU sample on Tuesday)
(2) Delay of SIU load reaching the WWTF due to collection system residence time
(3) Unrepresentative sample event/sampling error

In an effort to eliminate these anomalies, an outlier analysis was performed on Burke's historical data. Data points found to be outside of 1.5 times the interquartile range (middle 2 parts of the data distribution, Q1-Q3) were eliminated from the data set and analysis.

Influent organic loadings into the City's WWTF are derived from domestic, commercial, and the two SIUs. Historical total influent loading measured at the WWTF is shown in Table 3, below.

Historical per capita loadings for the non-industrial component of influent loading was calculated using the subtracting the historical total industrial maximum 30-day average load (SIU-1 maximum 30-day average + SIU-2 maximum 30-day average) from the historical total influent maximum 30-day average load, divided by the most recent (2010) census population estimate for Nevada. Equation 1 is the generic equation for the per capita non-industrial load calculation.

$$Non-Industrial\ Load, lb/cap \cdot d = \frac{(Total\ Infl\ Load)-(SIU-1\ Infl\ Load+SIU-2\ Infl\ Load), lb/d}{2010\ population} \quad \text{(Equation 1)}$$

Table 3: Historical Total Influent Loading

Parameter	Maximum 30-day Average	Daily Maximum	Design Loading Capacity	Non-Industrial Max 30-day Avg Per Capita Loading	Non-Industrial Daily Max Per Capita Loading
cBOD, mg/L(1)	227	320		-	-
cBOD, lb/d(1)	2388	3366		0.09	0.09
BOD, mg/L(2)	327	440		-	-
BOD, lb/d(2)	3114	5287	4871	0.18	0.27
TSS, mg/L	210	320		-	-
TSS, lb/d	2822	5976		0.37	0.79
TKN, mg/L	47	61		-	-
TKN, lb/d	467	762	1004	0.039	0.064
TN, mg/L(3)	61	72		-	-
TN, lb/d(3)	515	719		0.040	0.061
TP, mg/L(4)	17	21		-	-
TP, lb/d(4)	160	205		0.012	0.013

(1) Measured from 10/1/2015 - 10/31/2016

(2) Measured from 11/1/2016 - 10/30/2018

(3) Measured from 11/29/2016 - 5/30/2018

(4) Measured from 11/8/2016 - 10/30/2018

Historic maximum 30-day average non-industrial per capita loading for BOD is within typical values for municipal wastewater(1). Historic maximum 30-day average non-industrial per capita loadings for TSS, TKN, TN, and TP are at the upper end of typical range for municipal wastewater(1).

Burke Corporation contributes a significant fraction of the total cBOD/BOD and nutrient loading to the Nevada WWTF. From November 1, 2016 through October 21, 2018, Burke's BOD input accounted for an average 57% of the total BOD, 40% of the total nitrogen, and 49% of the total phosphorus loads to the WWTF. Burke Corporation has recently notified the City of plans to expand production and increase loading of organics and nutrients which will exceed the design capacity of the existing WWTF.

Projected loads from VERBIO following start-up of their new facility is unknown at this time. The Du Pont facility historically discharged only a fraction of the allowable loading to the WWTF. It is assumed that the new facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Historical industrial loading to the Nevada WWTF is shown in Table 4, below.

(1) Table 3-12, *Wastewater Engineering Treatment and Reuse,* Metcalf & Eddy, 4th Ed.

Table 4: Historical Industrial Loading

Parameter	Maximum 30-day Average	Daily Maximum	Current Max 30-day Avg Limit	Current Daily Maximum Limit
Burke Corporation (SIU-1)				
cBOD, mg/L	1323	1900	-	-
cBOD, lb/d	1762	2694	3073	3750
BOD, mg/L	1284	1900	-	-
BOD, lb/d	1877	3439	-	-
TSS, mg/L	205	330	-	-
TSS, lb/d	293	548	646	750
TKN, mg/L	137	200		
TKN, lb/d	194	292	570	750
TN, mg/L	154	182	-	-
TN, lb/d	241	304	-	-
TP, mg/L	51	77	-	-
TP, lb/d	75	113	-	-
Du Pont de Nemour Corp (SIU-2)				
BOD, mg/L(1)	116	170	-	-
BOD, lb/d(1)	15	41	76	114
TSS, mg/L(1)	119	180	-	-
TSS, lb/d(1)	31	77	129	194
TKN, mg/L(1)	111	140	-	-
TKN, lb/d(1)	7	37	26	38

(1) MOR data from 11/1/16 - 10/30/18

Trends of the 30-day average loading of BOD, cBOD, TSS, TKN, TN, and TP at the WWTF over the period of review are shown Figures 3 – 8, respectively.

The trends indicate that BOD, cBOD, TKN, TN, and TP loadings from Burke has a significant effect on the overall loadings for these parameters observed at the WWTF. There is negligible effect of TSS loading from Burke on the overall TSS loading observed at the WWTF. The trends also indicate that Du Pont loadings have a negligible effect on the overall loadings for all parameters observed at the WWTF. Also note there was no historical cBOD, TN, or TP data from Du Pont for review.

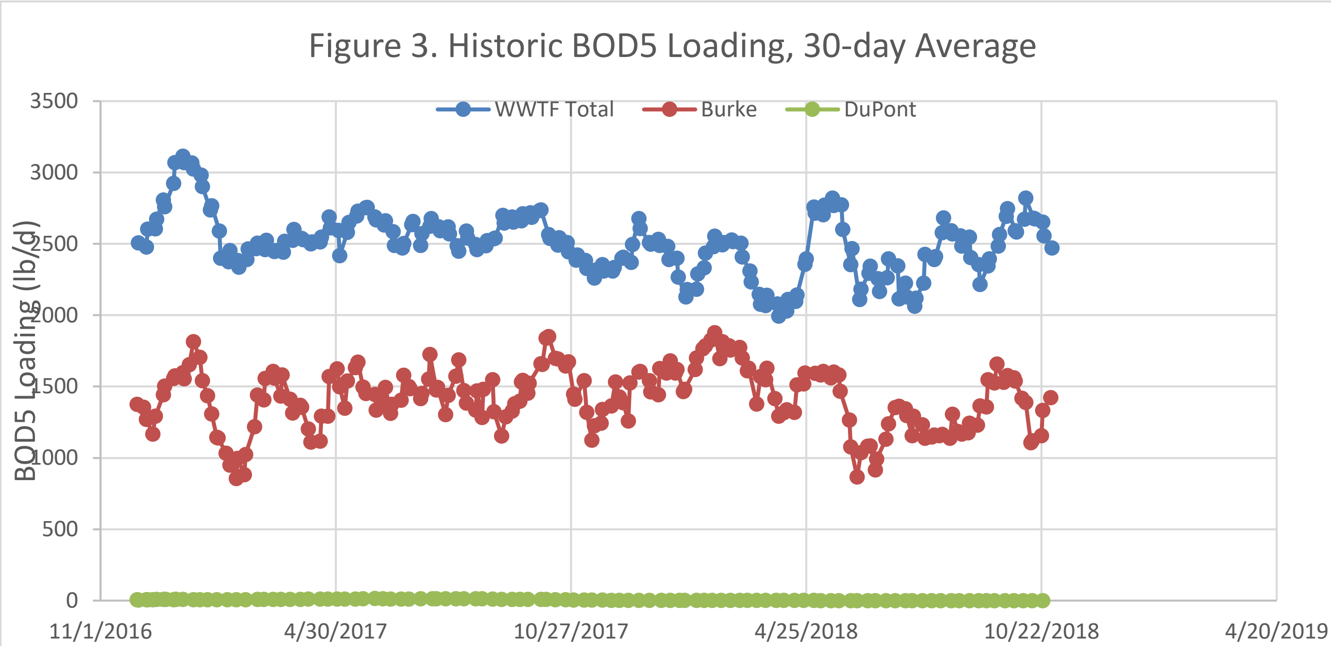


Figure 3. Historic BOD5 Loading, 30-day Average
WWTF Total
Burke
DuPont
BOD5 Loading (lb/d)
3500
3000
2500
2000
1500
1000
500
0
11/1/2016
4/30/2017
10/27/2017
4/25/2018
10/22/2018
4/20/2019

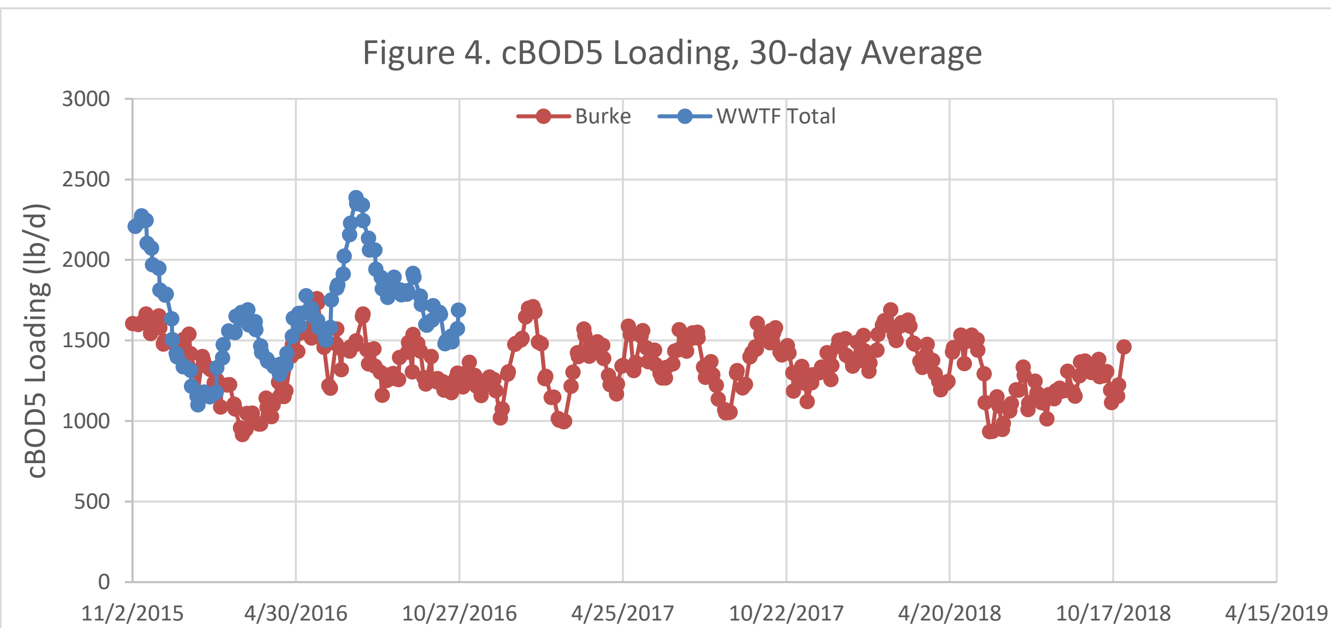


Figure 4. cBOD5 Loading, 30-day Average
Burke
WWTF Total
cBOD5 Loading (lb/d)
3000
2500
2000
1500
1000
500
0
11/2/2015
4/30/2016
10/27/2016
4/25/2017
10/22/2017
4/20/2018
10/17/2018
4/15/2019

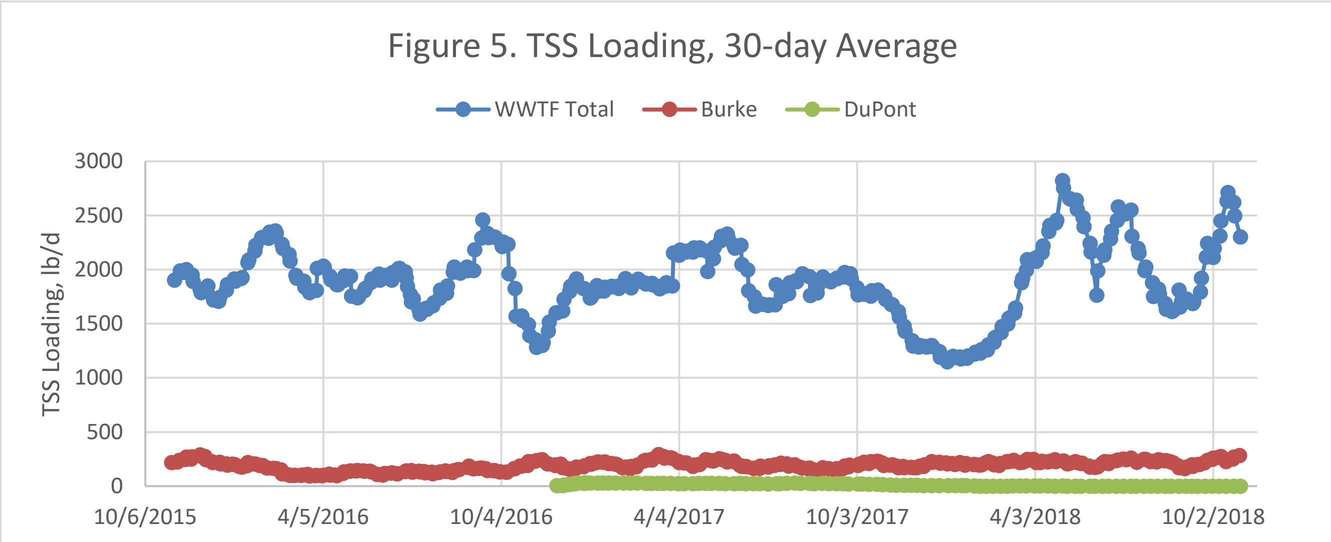


Figure 5. TSS Loading, 30-day Average
WWTF Total
Burke
DuPont
TSS Loading, lb/d
3000
2500
2000
1500
1000
500
0
10/6/2015
4/5/2016
10/4/2016
4/4/2017
10/3/2017
4/3/2018
10/2/2018

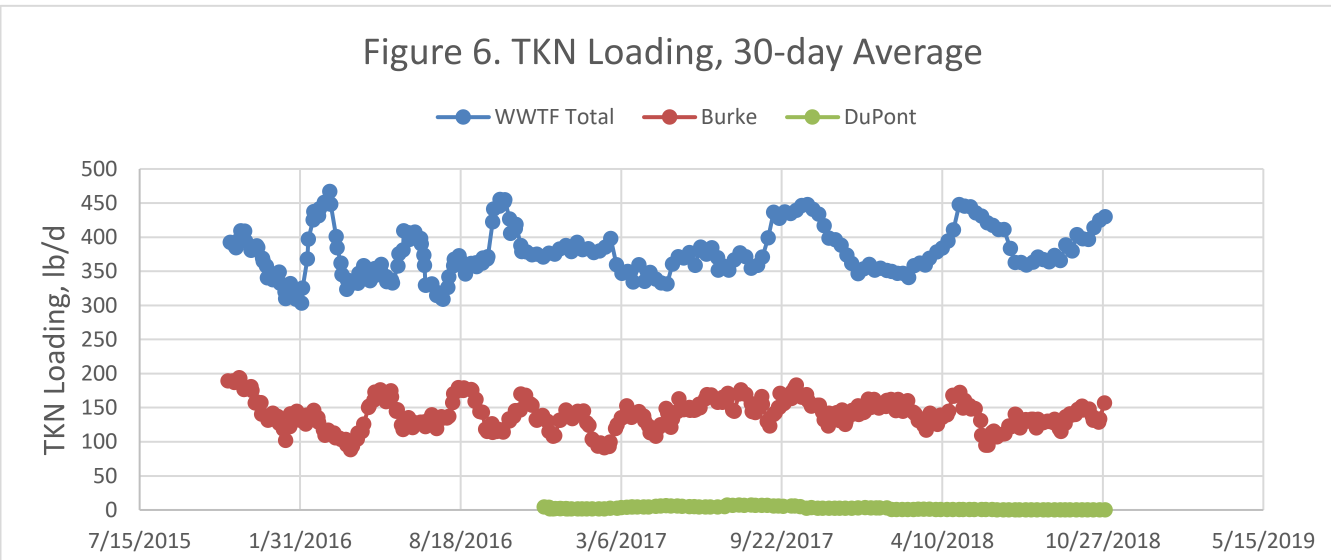


Figure 6. TKN Loading, 30-day Average
WWTF Total
Burke
DuPont
TKN Loading, lb/d
500
450
400
350
300
250
200
150
100
50
0
7/15/2015
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019

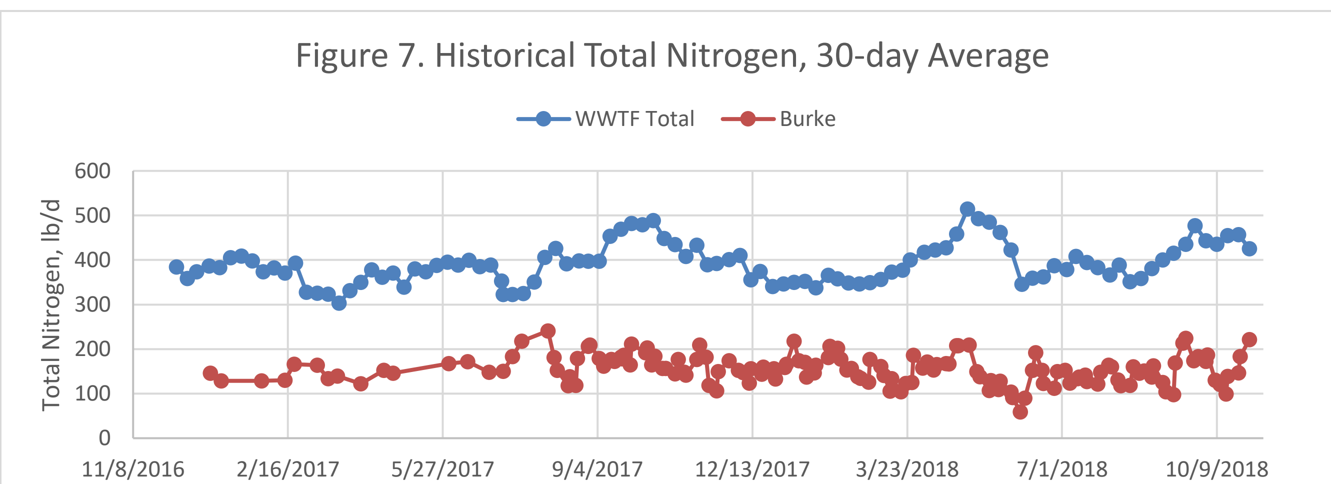
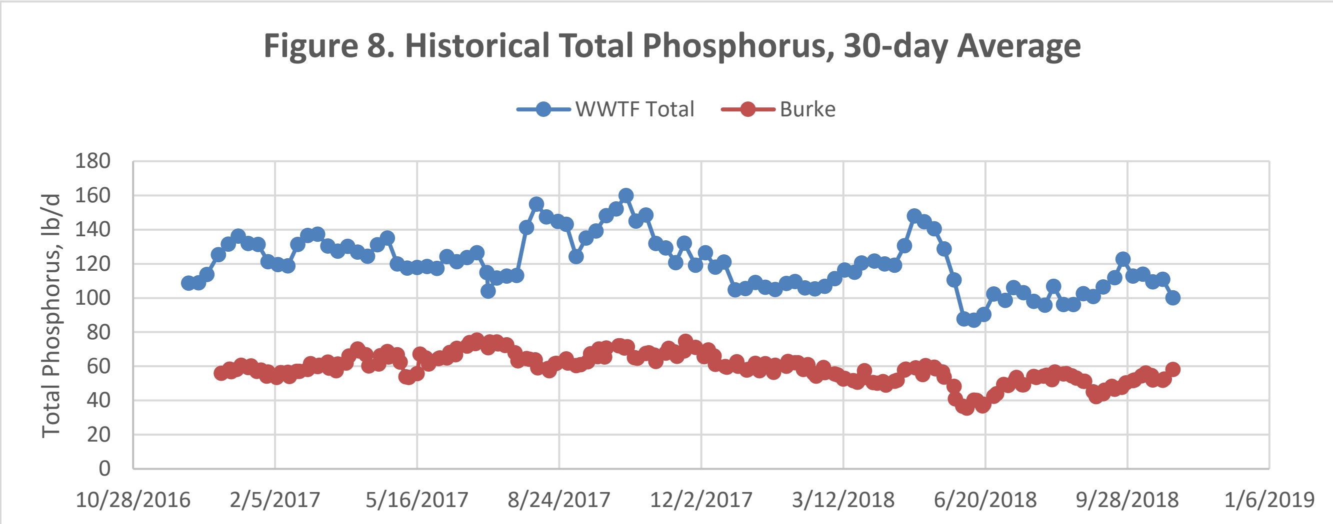


Figure 7. Historical Total Nitrogen, 30-day Average
WWTF Total
Burke
Total Nitrogen, lb/d
600
500
400
300
200
100
0
11/8/2016
2/16/2017
5/27/2017
9/4/2017
12/13/2017
3/23/2018
7/1/2018
10/9/2018



<u>Design Hydraulic Loading</u>

Flow projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by calculating the average per capita hydraulic loading rate and the projected 2044 population. Per capita flow was assumed to be stable over the design period. Historical per capita flow for the non-industrial component of ADW flow was calculated using the 2015-2018 ADW divided by the most recent (2010) census population estimate for Nevada. This is calculated to be 121.7 gallons per capita per day (gpcd).

Future AWW and MWW flows to the WWTF were projected by calculating historical AWW Infiltration & Inflow (I&I) and MWW I&I values and adding them to the design ADW flow. These historical I&I values were calculated as the difference between the AWW and ADW flows and MWW and ADW flows, respectively. Given the City's efforts to rehabilitate the existing sanitary sewer collection system in conjunction with street projects, the I&I fractions are anticipated to remain constant over the design period. The design peak hourly wet weather (PHWW) flow was estimated using the IDNR peaking factor formula and the 2044 population of Nevada of 8,764**.**

Future industrial flows are based on the two existing SIUs. No new SIUs are anticipated during the planning period. An expansion of the WWTF would be required to accommodate any new SIUs in the future. Industrial flows are based on information from or assumptions about each major industrial contributor. Projected flows and loads from Burke Corporation were provided on December 31, 2018 by their engineering consultant (Bolton & Menk). Projected Burke Corporation flows are given in Table 5.

Projected flows from VERBIO following start-up of their new facility is unknown at this time. The Du Pont facility historically discharged only a fraction of the allowable flow to the WWTF. It is assumed that the new facility will continue to operate within the NPDES permit discharge limits that were established for Du Pont by the NPDES permit issued November 1, 2016 and amended September 1, 2018.

Table 5: 2044 Design Flow Values

Parameter	Non-Industrial[(2)]	SIU-1 (Burke)	SIU-2 (VERBIO)	Total
ADW, mgd	1.07	0.5	0.072	1.64
AWW, mgd	2.45	0.5	0.072	3.02
MWW, mgd	5.29	0.7	0.144	6.13
PHWW[(1)], mgd	7.38	0.7	0.144	8.23

(1) The ratio of PHWW:AWW non-industrial flow is calculated by using the equation found in Appendix I, Chapter 12 of the Iowa Wastewater Facility Design Standards Peak:Average=(18+ √P)/(4+ √P), where P is population in thousands.
(2) Includes I&I component of total flow for AWW and MWW conditions

Design Organic Loadings

The maximum 30-day average organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic maximum 30-day average per capita organic loading rate and the projected 2044 population. The maximum day organic loading projections for the non-industrial (residential/commercial) component of WWTF influent was estimated by multiplying the historic daily maximum per capita organic loading rate and the projected 2044 population. Per capita loading was assumed to be stable over the design period.

The design industrial loading for Burke Corporation is based on the planned expansion and related loadings outlined by Burke's design engineer (Bolton & Menk) in the letter dated December 31, 2018. Loading from VERBIO North American Corporation are assumed to remain within the permit limits established for Du Pont in the NPDES permit issued November 1, 2016 and amended September 1, 2018. Design industrial loadings are summarized in Table 6.

Maximum 30-day design loading at the WWTF were estimated by combining industrial loading projections with non-industrial (residential/commercial) projections. Maximum day design loadings at the WWTF for process sizing, except for the aeration system sizing, were estimated by combining industrial maximum 30-day loading projections with non-industrial (residential/commercial) maximum day loading projections. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously. Review of the historical data support this assumption as well. The secondary treatment process aeration system sizing is based on the industrial maximum day loading projection only. This is based on the assumption that the maximum day loadings from both industrial and non-industrial sources would likely not occur simultaneously; however, the aeration capacity must match the demand for the largest of the two maximum day loadings. Design loadings are summarized in Table 7.

Table 6: Design Industrial Loading

Parameter	Maximum 30-day Average	Daily Maximum
Burke Corporation (SIU)-1)[(1)]		
cBOD, lbs/d	4200	8700
TSS, lb/d	950	2500
TKN, lbs/d	500	1110
TP, lb/d	200	350
VERBIO (SIU-2)[(2)]		
BOD, lb/d	76	114
TSS, lb/d	129	194
TKN, lb/d	26	38

(1) From Bolton & Menk December 31, 2018 projected loading letter

(2) From the Nevada STP NPDES Permit Issued 11/1/2016 and amended 9/1/2018

Table 7: Design Loading

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day[(1)]					
BOD, lb/d[(3)]	1,576	4,421	76	6,073	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d[(4)]	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum[(2)]					
BOD, lb/d	2,329	9,158	114	NA	9,272
TSS, lb/d	6,899	2,500	194	NA	6,899
TKN, lb/d	558	1,110	38	NA	1,148
TN, lb/d[(4)(5)]	558	1,110	38	NA	1,148
TP, lb/d	118	350	NA	NA	350

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Non-industrial daily max load OR SIU-1 + SIU-2 daily max load, used for aeration/mixing sizing only

(3) For Burke Corp assumed cBOD:BOD ratio of 0.95 (Burke MOR data from 11/1/16 - 10/29/18)

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

Updated Table 7: Design Loading (New BOD values per Burke cBOD:BOD Ratio Update)

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day[1]					
BOD, lb/d[3]	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d[4]	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum[2]					
BOD, lb/d	2,329	10,440	114	NA	10,554
TSS, lb/d	6,899	2,500	194	NA	6,899
TKN, lb/d	558	1,110	38	NA	1,148
TN, lb/d[4][5]	558	1,110	38	NA	1,148
TP, lb/d	118	350	NA	NA	350

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Non-industrial daily max load OR SIU-1 + SIU-2 daily max load, used for aeration/mixing sizing only

(3) For Burke Corp assumed cBOD:BOD ratio of 0.833 (updated ratio from Burke)

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

Note: The Updated Table 7 above shows updated BOD values from the approved report shown previously. BOD values have been updated due to Burke Corporation updating their cBOD/BOD ratio after the initial flows and loads memo was issued. All process design and calculations are based on the updated BOD values shown in the Updated Table 7 above.

H. Appendix H – Ancillary Improvements

ADMINISTRATION BUILDING

An administration building will be constructed at the new wastewater treatment facility. This building will also serve as a vehicle storage building and maintenance shop. It will include a minimum of the following spaces:

- Non-certified laboratory for process testing
- Office space
- Men's and women's rest room/locker room
- Reception area
- Breakroom/Lunchroom
- Office Storage
- Electrical Room
- Mechanical Room
- Vehicle/Equipment bays
- Maintenance tools and parts storage

VACTOR RECEIVING STATION

A vactor receiving station will be provided near the Headworks Building to allow for dumping of the City's vactor truck. The vactor receiving station will be provided with flushing water to help clean the area and push the dumped debris into the mechanical screens for removal. The vactor receiving station is not planned to receive hauled waste from other sources.

EMERGENCY ENGINE GENERATOR

An emergency engine generator will be provided for the stand-by-power service for the Nevada wastewater treatment facility. The stand-by generator will be a self-enclosed generator with base fuel tank. An automatic transfer switch will transfer the critical treatment process plant load and life-safety systems to the stand-by generator on loss of utility power. The emergency generator will not be used for peak load shaving.

PERSONELL REQUIREMENTS

The City of Nevada's WWTF currently has a staff of three employees to manage, operate, and maintain the wastewater treatment plant. The operations staff completes the laboratory analysis needed for operations as well as doing routine and minor maintenance on equipment. The City of Nevada supports this staff with administration and clerical employees as well as assistance with sanitary sewer maintenance within other departments.

The recommended WWTF staffing levels for the proposed new wastewater treatment plant and collection system maintenance is shown below:

Position	No of Full-Time Employees
Superintendent	1
Operations Staff (includes collection)	4
Total	5

The proposed increase over the current level is two (2) full-time employees. This staffing level was determined based on the increased labor required to operate and maintain the proposed treatment facilities and expanded collection system (interceptor sewer and lift station). The increased staffing level from the current WWTF is due to increased operations and maintenance labor needs for secondary treatment process with nutrient removal; increased biosolids production due to increased loadings; addition of effluent disinfection treatment process. The increased operations and maintenance costs of these employees are included in the present worth costs provided in the report. See the UV Disinfection O&M evaluation in Appendix F for the additional costs associated with these employees.

There is no recommended increase in administrative and clerical staffing levels with the proposed improvements. The City can also continue to augment sewer staff with other City departments staff when needed for any increased sewer maintenance needs.

I. Appendix I – Nutrient Reduction Strategy

1.0 NUTRIENT REDUCTION FEASIBILITY

As outlined in the November 17, 2017 letter to the Department requesting an amendment to the compliance schedule for nutrient reduction (approved by September 1, 2018 Amended NPDES Permit), nutrient reduction in support of the Iowa Nutrient Reduction Strategy (INRS) will be addressed during facility planning and included within the Facility Plan report. The Antidegradation Alternatives Analysis, as submitted separately from this report, found the alternative for nutrient removal (less degrading alternative) to be reasonable, practical, and economical. Therefore, the facility planning effort addressed two alternatives for secondary treatment with nutrient removal (Total Nitrogen (TN) and Total Phosphorus (TP) ability. Targeted TN and TP effluent nutrient limits 10 mg/L and 1 mg/L, respectively. The INRS goals are to reduce TN and TP in the effluent by 66-percent and 75-percent, respectively.

1.1 Existing Facility Removal Capability & Operational Changes

The existing WWTF has limited ability to remove nutrients with the current fixed-film secondary treatment processes. Given that the existing WWTF will be replaced due to insufficient capacity for the design loadings, no further evaluation for nutrient removal capabilities of or operational changes to the existing WWTF was completed.

1.2 Nutrient Source Reduction

Historical influent nutrient loadings are generally at the upper range or higher than typical “domestic waste” ranges recognized by Iowa Department of Natural Resources (IDNR). Existing significant industrial contributor, Burke Corporation, is a significant source of nutrient loads. Burke Corporation currently pretreats their wastewater prior to discharge to the City; however, the current pretreatment agreement does not include requirements for reduction of or limits on TN or TP. The overall strategy for nutrient reduction based on discussions during the facility planning effort with Burke is to design the new WWTF with capacity to accept and treat Burke’s design TN and TP loadings, without requiring pretreatment of Burke’s wastewater for nutrient removal prior to discharge to the City. Nutrient source reduction from Burke is possible, but would require extensive expansion of Burke’s pretreatment process which may not be feasible on their site. The City and Burke are proceeding based on no nutrient source reduction beyond pretreatment system capabilities.

1.3 Evaluation of Nutrient Removal Treatment Technologies

Evaluation of treatment processes for nutrient removal is covered in the Alternative P2 section of the report. The economic feasibility of nutrient removal is covered by the Affordability Analysis section of the related Antidegradation Alternatives Analysis as submitted separately from this report.

1.4 Preferred Method for Nutrient Reduction

The preferred method to address nutrient removal is covered in the Selected Process section of the report.

1.5 Schedule

The schedule to address nutrient removal will coincide with the new WWTF construction schedule. The new WWTF construction is anticipated to be completed by late Fall 2023. Six months of WWTF operational optimization will follow startup, followed by one year of weekly influent and effluent TN and TP data collection to establish effluent nutrient limits.

J. Appendix J – Exhibit 9B

Iowa Department of Natural Resources
Wastewater Engineering Section

Exhibit 9B - Preliminary Review of Facility Plan Checklist

"Facility Plan" means a report certified by a professional engineer licensed to practice in Iowa and prepared in conformance with Chapter 11 of the Iowa Wastewater Facilities Design Standards (IWWFDS). A Facility Plan will not be required for non-funded minor sewer extensions, minor trunk and interceptor sewers, and minor pump stations where comprehensive planning is not completed, necessary or required. Facility planning submittals may be returned if they are deemed incomplete by the Department.

The transmittal letter referenced in Section 11.2.2 of the IWWFDS and a completed Exhibit 9B checklist by the engineer shall be bound with the engineering report. The transmittal letter must:

- Describe fully the scope of the project identified in Design Schedule A.
- Provide a statement on the feasibility of the project.
- Include a statement that this report has been accepted by the client.
- Indicate that the proposed project is in conformance with the long range planning of the area.
- Reference all information and approved planning reports necessary for a review.
- Clearly indicate the purpose of the submittal.

Exhibit 9B is divided into four sections as follows:

- Section 1 – All Projects
- Section 2 – New or Expanded Wastewater Treatment Facility Projects
- Section 3 – Earthen Basin Projects
- Section 4 – SRF Funded Projects

Section 1 must be completed for all projects. Sections 1 and 2 must be completed for projects involving new or expanded wastewater treatment facilities. Sections 1, 2, and 3 must be completed for projects that consist of new or expanded wastewater treatment lagoon facilities. Sections 1 and 3 must be completed for projects involving new or expanded equalization with earthen basins. In addition, complete Section 4 if the project is SRF funded.

Responses of **"Yes", "No", "?", or Not Applicable ("N/A")** may be used by DNR in completing Exhibit 9B Preliminary Review with explanations given, as appropriate. A "?" mark may be used by DNR staff where additional follow-up, or the consideration of additional information may be warranted before a comment is offered. Every attempt should be made to complete the Exhibit 9B preliminary review checklist using good engineering judgment and as accurately as possible for the benefit of decision makers. If the response is "No" by the engineer for location maps and/or geotechnical report, the transmittal letter must acknowledge that the Facility Plan is incomplete and provide adequate need and justification for the Department to initiate a concept review.

Section 1 – All Projects

1. Yes — A work initiation meeting determination has been made. If the meeting was determined to be necessary, the meeting has been held. The scope and milestones for the project have been clearly established.
2. Yes — A project location and a recommended alternative have been proposed by the A/E and the conclusion accepted by the Owner in accordance with Step 17, Section 11.2 of the Iowa Wastewater Facilities Design Standards and Design Schedule A.
3. Yes — A completed and signed Design Schedule A has been submitted in accordance with Section 11.1 of the Iowa Wastewater Facilities Design Standards.
4. NA — Any proposed variation from the design standards contained in Chapter 567 IAC 64 is identified by the Engineer in accordance with Design Schedule A with justification provided in accordance with DNR rules.
5. Yes — A complete and achievable project implementation schedule has been provided identifying all project milestones in accordance with Section 11.2.5.3(k) of the Design Standards.
6. Yes — The Appendix (Technical Information and Design Criteria) is provided per Design Standard 11.2.11.
7. Yes — The facility plan is signed and certified by a professional engineer licensed in the State of Iowa.

Section 1 – Comment Box:

Regarding item 2: Owner accepted facility plan at city council meeting on August 26, 2019.
Regarding item 5: Project implementation schedule is located in section 5.8.5 of the report, rather than the executive summary.

Section 2 – New or Expanded Wastewater Treatment Plant Projects

8. No — The Owner has filed an application for a new or amended NPDES permit as needed for the improvements described in the Facility Plan and has notified the review engineer of this submission.

9. Yes — Completed Design Schedules F and G have been submitted in accordance with Section 11.1 of the Iowa Wastewater Facilities Design Standards.

10. Yes — The location maps are prepared by the Engineer in accordance with Design Schedule F to the recommended scale and provide all requested detail to conduct a site survey investigation for the proposed new or expanded wastewater treatment facilities.

11. Yes — All hydraulic and organic design loadings in Design Schedule G and the Facility Plan are consistent with the preliminary design loadings concurred by the Department.

12. Yes — The project has conformed to the Waste Load Allocation (WLA) determination and the effluent limits which have been established by the DNR through Steps 9, 11, 12, 13, and 14 of the wastewater construction permitting procedures.

13. Yes — Where anti-degradation requirements apply, the recommended alternative is consistent with the anti-degradation alternatives analysis approved by the Department.

14. NA — New Process Evaluation - all required engineering data and design basis formulated from the data for New Process Evaluation has been approved by the Department under Section 14.4.3 and was prepared by a licensed professional engineer other than the one employed by the manufacturer or patent holder.

Section 2 – Comment Box:

Regarding Item 14: No new innovative technologies are proposed.

Section 3 – Projects with Earthen Basins (Lagoon and Equalization Basins)

15. NA A completed geotechnical investigation engineering report is provided as a supplement to the engineer's report.

Section 3 – Comment Box:

Section 4 – State Revolving Fund (SRF) Loan Projects

16. Yes The proposed project is a fundable category (Refer to Subrule 567 IAC 90.2) for receipt of a CWSRF loan.
17. Yes The Intended Use Plan application (Exhibit 8) is enclosed with the Facility Plan and the "Assurance with Respect to Real Property Acquisition" form.
18. Yes The Property/Easement Acquisition Schedule is included.
19. ---- The Owner has submitted all required Exhibit 5 information to the Environmental Review Services Coordinator in order to initiate the SRF environmental review.

Section 4 – Comment Box:

Regarding Item 18: See section 5.8.1 of the Facility Plan.
Regarding Item 19: Exhibit 5 included with facility plan submission.

This page for DNR Use Only

DNR Decisions:

---- 9B Complete

---- Concept Review Request

Conclusions by DNR:

FACILITY PLAN AMMENDMENT 1

FACILITY PLAN AMENDMENT 1

WASTEWATER TREATMENT FACILITY IMPROVEMENTS

CITY OF NEVADA, IOWA

DECEMBER 2019

The items contained in this amendment shall replace their respective pages, appendices, and/or tables from the City of Nevada's WWTF Improvements Facility Plan. The amended items are highlighted in RED for reference.

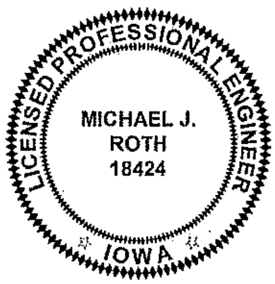
- **Page 52: Includes a revised max day loading reference.**
- **Page 53: Includes a revised max day loading reference and updated design oxygen requirement for oxygen/lb. BOD_5.**
- **Table 5-3, Page 30: Includes a revised Table 5-3 with the updated max day loads.**
- **Table 5-14, Page 57: Includes a revised Table 5-14 with updated biosolids storage volume requirements.**
- **Appendix D: Includes updated max day loading values, and sizing to the secondary treatment process and biosolids processing. Note: The changes in process sizes due to the updated max day loading values are minimal. As such, the cost opinions provided in the original submittal remains accurate within the 30% contingency and no updates to the cost opinions are necessary.**
- **Table 7, Appendix G: Includes a revised Table 7 with the updated max day loads.**

This amendment resolves updated Daily Maximum loading values as agreed by HR Green and the DNR on October 17, 2019. There is no change to the recommended alternative proposed in the Facility Plan.

OWNERSHIP OF DOCUMENT

This document, and the ideas and designs incorporated herein, as an instrument of professional service, is the property of HR. Green, Inc. and is not to be used, in whole or in part, for any other project without the written authorization of HR Green, Inc.

CERTIFICATION



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Date: 12/13/19

MICHAEL J. ROTH, P.E.

License No. **18424**

My renewal date is **December 31, 2020**

Pages or sheets covered by this seal:

Entire Document

Alternative P1: Five-Stage Bardenpho Process with Final Clarifiers

Alternative P1 proposes an activated sludge system with the use of a five-stage Bardenpho process for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The five-stage oxidation ditch consists of five zones: anaerobic, first-stage anoxic, first-stage aerobic, second-stage anoxic, and second-stage aerobic. Within these zones phosphorus release, denitrification (TN removal), BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The Bardenpho zones were sized according textbook design guidance and examples. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.5 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 12,130 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed five-stage Bardenpho process.

Three final clarifiers will follow the Bardenpho process. Clarifiers were designed in accordance with IDNR standards to account for the PHWW flow of 8.23 mgd. Three 70-feet diameter clarifies with a 14.5-feet SWD are proposed. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed final clarifiers.

The five-stage Bardenpho and final clarifier process are designed to meet Facility Reliability Class I.

Alternative P2: Three-Stage Oxidation Ditch with Final Clarifiers

Alternative P2 proposes an activated sludge system with the use of a three-stage oxidation ditch for removal of cBOD and ammonia-N and nutrient removal of TN and TP followed by final clarifiers for TSS removal. The three-stage oxidation ditch consists of three zones: anaerobic, anoxic, and aerobic. Within these zones phosphorus release, denitrification (TN removal), and BOD-removal, nitrification, and phosphorus uptake (TP removal) occur, respectively. Given the favorable influent cBOD:TN and cBOD:TP ratios (due to industrial loading) biological nutrient removal is favorable.

The aerobic volume for extended aeration activated sludge system is based on a maximum organic loading of 15 ppd BOD/1,000 cft of aerobic reactor volume. The aerobic volume was based off the AWW flow of 3.02 mgd and 30-day average load of 6,692 lb/day BOD. The aeration loading applied is 1.27 lb O2/lb BOD removed and 4.6 O2/lb N removed. The dialy maximum design loads (lbs/day) used for this calculation were 12,130 lbs/day BOD. The Basis of Design included in **Appendix D** details dimensions, volumes, and design conditions for the proposed three-stage Oxidation Ditch.

Three final clarifiers following the same design standards as in Alternative P1 will be required for this alternative as well.

The Three-Stage Oxidation Ditch and final clarifier process are designed to meet Facility Reliability Class I.

Secondary Treatment Comparison

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process is relatively more simple in terms of operational control. The “return/recycle” streams are integrated into the overall design of the oxidation ditch layout with minimal pumping required. There are fewer zones to maintain with the oxidation ditch as well.

When compared to the five-stage Bardenpho process, the three-stage Oxidation Ditch process has a relatively better ability to accommodate flow and loading spikes. This is due to the extended aeration configuration of the aerobic zone of the oxidation ditch; however, the operator must still be careful of hydraulic overloading to the anaerobic and anoxic zones that might result in unfavorable conditions and decreased nutrient removal performance.

Both processes are capable of nutrient removal with EBPR. Due to the favorable carbon-to-nutrient influent loadings, biological nutrient removal is anticipated without continuous need for supplemental carbon addition or for phosphorus removal via chemical precipitation. Consideration for backup supplemental carbon and chemical phosphorus precipitation systems will be considered in final design.

Table 5-3: Design Loading

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day[1]					
BOD, lb/d[3]	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d[4]	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum[2]					
BOD, lb/d	2,329	10,440	114	NA	12,130
TSS, lb/d	6,899	2,500	194	NA	7,978
TKN, lb/d	558	1,110	38	NA	1,491
TN, lb/d[4][5]	558	1,110	38	NA	1,501
TP, lb/d	118	350	NA	NA	459

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Scenario 1 or Scenario 2

Scenario 1 = Non-industrial daily max + SIU-1 Maximum 30 day + SIU-2 Maximum 30 day

Scenario 2 = Non-industrial Maximum 30 day + SIU-1 Daily Max + SIU-2 Daily Max

(3) For Burke Corp assumed cBOD:BOD ratio of 0.833

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads

Table 5-14: Biosolids Storage Volume Requirements

Solids Processing Alternative	Required 180 Day Biosolids Storage Volume (MGal)	Proposed Number of Tanks	Tank Height[1] X Diameter (feet)	Actual Biosolids Storage Volume (MGal)
Integral Thickening	2.541	2	28.5' x 90'	2.570
Post Thickening	1.517	1	19.5' x 120'	1.523

[1]Hieght includes 1.5 feet freeboard

D. Appendix D – Process Facilities Evaluation

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P1

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Max 30-Day	Max Day
cBOD, lbs/day	6,692	12,130
TSS, lbs,day	4,300	7,978
TKN, lbs/day	869	1,491
Total Phosphorus, lbs/day	309	459
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Secondary Treatment System (Five-Stage Bardenpho)

No of units/process trains	2
Sidewater Depth, ft	15
Anaerobic Tank Volume, each, gallons	63,000
First Anoxic Tank Volume, each, gallons	78,300
Aerobic Tank volume, each, gallons	1,493,000
Second Anoxic Tank volume, each, gallons	25,000
Reaeration Tank volume, each, gallons	62,900
Hydraulic Detention Time @ AWW, hrs	27
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15.4
SRT, days	15
Equipment	Mixer/Aerator/Diffusers
Anaerobic Tank	2 Submersible mixers
First Anoxic Tank	4 Submersible mixers
Aerobic Tank	4 Aeration blowers (est., type TBD) Fine bubble Diffused aeration (type TBD) 4 Submersible mixers 6 Recycle Submersible Pumps (est.)
Second Anoxic Tank	2 Submersible mixers
Reaeration	Fine bubble diffused aeration (type TBD) Use Aerobic Tank blowers
Lbs. O2/lbs. BOD5, Applied	1.5
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	12.4
Solids Loading Rate, max, lbs/sf/day	35.0

RAS Pumps

Type	Centrifugal
No of units	6
Rated Capacity each, gpm	~650
Rated head, ft	~12 (estimated)
RAS firm capacity, mgd	~4.53
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No of units	2
Rated Capacity each, gpm	200

Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel – Horizontal or Inclined bulb orientation
No of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, µW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No of units	2
Tank dim, ft x ft	15 x 12 (tank 1); 15 x 12 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	300 (tank 1); 250 (tank 2)
No of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No of units	2
Capacity, MGal	2.54
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN ALTERNATIVE P2

Item		Size/Capacity
WWTP Flows		
ADW		1.64 mgd
AWW		3.02 mgd
MWW		6.13 mgd
PHWW		8.23 mgd
WWTP Loads	Avg. Day	Max Day
cBOD, lbs/day	6,692	12,130
TSS, lbs,day	4,300	7,978
TKN, lbs/day	869	1,491
Total Phosphorus, lbs/day	309	459
Flow Measurement		
Influent		Parshall Flume
Effluent		Parshall Flume
Return Sludge		Magnetic Flowmeter
Waste Sludge		Magnetic Flowmeter
Sampling		
Influent Sampler		
Type		Automatic Composite
Location		Headworks Building
Effluent Sampler		
Type		Automatic Composite
Location		UV Disinfection Bldg.
Mechanical Fine Screens		
No. of units		2
Clear opening size, in		¼
Max flow per screen, mgd		8.3
Influent Pumping		
Type		Non-clog centrifugal
No. of units		4 (estimated)
Rated capacity each, gpm		~1450
Firm capacity, mgd		8.3
Rated head, ft		~110
Grit Removal		
Type		vortex
No. of units		2
Max capacity per unit, mgd		4.5
Grit pumps, units		3
Firm grit pumping capacity, gpm		500
Washing/Dewatering, units		2

Oxidation Ditches (Based on Preliminary Ovivo Proposal)

No. of units	2
Sidewater Depth, ft	14.5
Aerobic Tank volume, each, gallons	1,668,000
Anoxic Tank volume, each, gallons	125,000
Anaerobic Tank volume, each, gallons	125,000
Hydraulic Detention Time @ AWW, hrs	26.5
MLSS, mg/L	3,800
Organic Loading, lbs. BOD_5/1000 CF	15
SRT, days	19.8
Aeration equipment type	Vertical shaft Mixer/Aerator
Size, Hp, each	100
No. of units	2 per train, 4 total
Anoxic/Anaerobic mixing	Submersible mixers
No. of units	1 per zone, 4 total
Lbs. O2/lbs. BOD5, Applied	1.27
Lbs. O2/lbs. TKN, Applied	4.60
Alpha Factor	0.93
Beta Factor	0.97
Aeration Demand, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	16,196
Daily Maximum Loading, lbs O2/d	29,137
Denitrification Oxygen Credit, SOR - aerobic tank	
Max 30-day Loading, lbs O2/d	1,515
Daily Maximum Loading, lbs O2/d	3,087
Design Temperature,	
Winter, degrees-C	10
Summer, degrees-C	25
Sludge Recycle, % AWW	
RAS Rate, Max 30-day	50
RAS Rate, Max day	75
Sludge Wasting	
WAS Rate, lbs/d	5,340
Operational Mode	Continuous

Secondary Clarifiers

Type	Circular center-feed, peripheral draw
No of units	3
Diameter, ft	70
Sidewater depth, ft	14.5
Volume, each, cu ft	55,800
Surface Overflow Rate @ PHWW, gpd/sf	713
Detention time @ PHWW, hours	3.65
Solids Loading Rate, avg, lbs/sf/day	12.4
Solids Loading Rate, max, lbs/sf/day	35.0

RAS Pumps

Type	Centrifugal
No. of units	6
Rated Capacity each, gpm	~650
Rated head, ft	~12 (estimated)

RAS firm capacity, mgd	~4.53
Control	VFD

Digester Feed Pumps (WAS Pumps)

Type	Centrifugal
No. of units	2
Rated Capacity each, gpm	200
Rated head, ft	~20 (estimated)
Control	VFD

UV Disinfection

Type	Open Channel – Horizontal or Inclined bulb orientation
No. of channels	1
Capacity, mgd	8.5
UV Transmittance	65%
UV Radiation Dose, μW-second/cm^2	35,000
Number of banks	Varies
Number of Modules/Bank	Varies
Number of Lamps/Module	Varies

Integral Thickening Solids Processing Alternative

Aerobic Digesters

Type	series flow
No. of units	2
Tank dim, ft x ft	68 x 34
Tank SWD, ft	24 (tank 1) 23.5 (tank 2)
SRT, days	42
Aeration Demand, SCFM	1,665 (tank 1) 1,630 (tank 2)
No. of blowers	3
Type	Positive displacement
Digester Transfer Pumps	2

Integral Sludge Thickening

Type	Silicon Carbide Membrane cassettes in tank
No. of units	2
Tank dimensions, ft x ft	15 x 12 (tank 1); 15 x 12 (tank 2)
Tank SWD, ft	8 (tank 1 & 2)
Membrane Pore size, avg, microns	0.1
Trans-membrane Pressure Gradient, psig	1.5
Aeration Demand, SCFM	300 (tank 1); 250 (tank 2)
No. of blowers	3
Digester Recycle Pumps	2
Permeate Pumps	4 (2 duty, 2 standby)

Biosolids Storage Tank

Type	Above grade open top bolted steel
No. of units	2
Capacity, MGal	2.54
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles

Pump Type	Chopper

Emergency (Stand-By) Power Generator

Type	Diesel
Transfer Switch type	Automatic
Size, kW	1,000 (estimated)
Facility Reliability Class	I

NEVADA WWTF - BASIS OF DESIGN SOLIDS PROCESSING POST THICKENING ALTERNATIVE

Item	Size/Capacity
Aerobic Digesters	
Operation Type	series flow
No. of trains	2
No. of units per train	2
Tank dimensions, ft x ft, each	64 x 64
Tank SWD, ft	20
SRT, days	42
Aeration Requirement, SCFM, total	1,707
Mechanical Mixing, HP, each	82
No. of mixers	4 (estimated, See Note)
Diffused Air Mixing, SCFM	9,830
No. of blowers	4 (estimated, See Note)
Type	Positive displacement
Digester Transfer pumps	2

Note:
Final mixing/aeration system will be determined during final design to meet IDNR requirements if this alternative is chosen. Cost estimate based on combined diffused aeration and mechanical mixing with 4 aeration blowers and 4 mechanical mixers.

Item	Size/Capacity
Post Sludge Thickening	
Type	Mechanical (See Note)
No. of units	2 (estimated, See Note)
Thickened Sludge Concentration	5%
Thickened Sludge Transfer Pumps	2

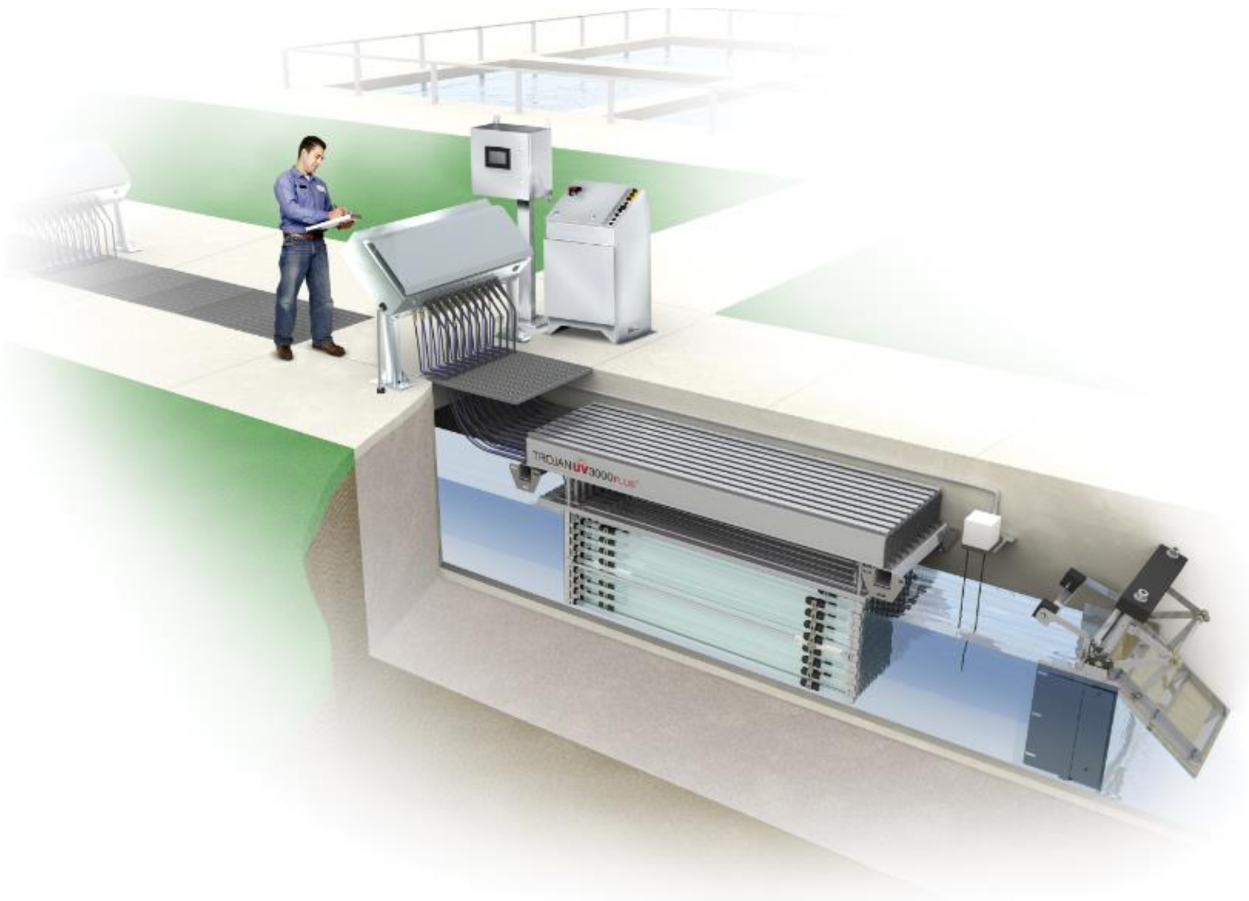
Note:
Alternatives for post sludge thickening include rotary drum thickeners and gravity belt thickeners. Final post thickening equipment will be chosen during final design if this alternative is chosen. Cost estimate based on 2 rotary drum thickeners and supporting equipment.

Item	Size/Capacity
Biosolids Storage Tank	
Type	Above grade open top bolted steel
No of units	1
Capacity, MGal	1.52
Capacity at design, days	180
Mixing system	pumped recirculation w/mixing nozzles
Pump Type	Chopper

UV Disinfection Proposals

TROJANUV3000PLUS™

PROPOSAL FOR THE CITY OF NEVADA, IA
QUOTE: 220576
06/17/2019



The TrojanUV3000Plus™ is operating in **over 2000** municipal wastewater plants around the world. Disinfecting **over 17 billion** gallons a day, the TrojanUV3000Plus™ has become the reference standard in the industry.

TROJANUV3000PLUS™

August 19, 2019

In response to your request, we are pleased to provide the following TrojanUV3000Plus™ proposal for the NEVADA project.

The TrojanUV3000Plus™ has been shown in over 2000 installations to provide dependable performance, simplified maintenance, and superior electrical efficiency. As explained in this proposal, the system incorporates innovative features to reduce O&M costs, including variable output electronic ballasts to provide dimming capability and Trojan's revolutionary ActiClean-WW™ system – the industry's only online chemical and mechanical quartz sleeve cleaning system. All Trojan installations are supported by a global network of certified Service Representatives providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the TrojanUV3000Plus™ and we look forward to working with you on this project.

With best regards,

Una Duncan
3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
4280 E 14th Street
Des Moines , IA
US
515-979-4648

DESIGN CRITERIA

NEVADA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65 %** (minimum)
Total Suspended Solids:	**15 mg/l** (30 Day Average, grab sample)
Disinfection Limit:	**126 E.coli per 100 ml,** based on a day 30 of consecutive daily grab samples

DESIGN SUMMARY

QUOTE: 220576

Based on the above design criteria, the TrojanUV3000Plus™ proposed consists of:

CHANNEL	
Number of Channels:	**1**
Approximate Channel Length Required:	**25 ft 4 in**
Channel Width Based on Number of UV Modules:	**24 in**
Channel Depth Recommended for UV Module Access:	**62 in**
UV MODULES	
Total Number of Banks:	**2**
Number of Modules per Bank:	**6**
Number of Lamps per Module:	**8**
Total Number of UV Lamps:	**96**
Maximum Power Draw:	**23.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**2**
System Control Center Quantity:	**1**
MISCELLANEOUS EQUIPMENT	
Level Controller Quantity:	**1**
Type of Level Controller:	**Weighted Gate (ALC)**
Automatic Chemical / Mechanical Cleaning:	**Trojan ActiClean-WW™**
UV Module Lifting Device:	**Davit Crane and Lifting Sling**
On-line UVT Monitor:	**Hach UVAS sc Sensor – Optionally Available**
Standard Spare Parts / Safety Equipment:	**(8) lamps, (8) sleeves, operator kit**
ELECTRICAL REQUIREMENTS	

1. Each Power Distribution Center requires an electrical supply of one (1) 480/277V 60Hz
2. The Hydraulic System Center requires an electrical supply of one (1), 480V 60Hz, 2.5 kVA.
3. The System Control Center requires an electrical supply of one (1) 120V 60Hz , 15 Amps.

4.	Electrical disconnects required per local code are not included in this proposal.

COMMERCIAL INFORMATION

Total Capital Cost: $216,000 (USD)

This price excludes any taxes that may be applicable and is valid for 90 days from the date of this letter.

EQUIPMENT WARRANTEES

1. Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
2. UV lamps purchased are warranted for 12,000 hours of operation or 3 years from shipment, whichever comes first. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
3. Electronic ballasts are warranted for 5 years, pro-rated after 1 year.

PROPOSAL FOR NEVADA, IA
QUOTE: 220578
06/17/2019

TrojanUVSigna™ incorporates revolutionary innovations, including TrojanUV Solo Lamp™ technology, to reduce the total cost of ownership and drastically simplify operation and maintenance. It is the ideal solution for facilities wanting to upgrade their disinfection system easily and cost-effectively.

We are pleased to provide the enclosed TrojanUVSigna proposal. Please do not hesitate to contact us if you have any questions regarding this proposal. We look forward to working with you.

With best regards,

3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400
uduncan@trojanuv.com

Local Representative:

Marci Whitaker
Electric Pump & MC2
515-979-4648
marci@mc2h2o.com

TROJANUVSIGNA™

DESIGN CRITERIA

Peak Design Flow:	**8.23 MGD(US)**
UV Transmittance:	**65%** (minimum)
Total Suspended Solids:	**15 mg/l (30 Day Average,** grab sample)
Disinfection Limit:	**126 E.coli per 100 ml**, 30 day Geometric Mean of consecutive daily grab samples

DESIGN SUMMARY

CHANNEL	
Number of Channels:	**1**
Minimum Channel Length Required:	**~20' (not including level control area)**
Channel Width at UV Banks:	**2.9'**
Channel Depth Recommended:	**7.8'**
UV BANKS	
Number of Banks per Channel:	**2**
Number of Lamps per Bank:	**10**
Total Number of UV Lamps:	**20**
Maximum Duty Power Draw:	**21.1 kW**
UV PANELS	
Power Distribution Center Quantity:	**1**
Hydraulic System Center Quantity:	**1**
System Control Center Quantity:	**1**
ANCILLARY EQUIPMENT	
Level Controller Quantity and Type:	**1 Fixed Weir**
Integral Bank Walls:	**Included**
On-line UVT Monitoring:	**Hach UVAS sc Sensor – Optionally Available**
Other Equipment:	

ELECTRICAL REQUIREMENTS

1. Each Power Distribution Center requires an electrical supply of one (1) 480V, 3 phase, 4 wire + GND, 50/60 Hz
2. Electrical supply for Hydraulic System Center will be (1) 480V, 3 phase, 3 wire + GND, 60 Hz, 2.5 kVA
3. Electrical supply for System Control Center will be (1) 120V, 1 phase, 2 wire + GND, 60 Hz, 1.8 kVA
4. Electrical disconnects are not included in this proposal. Refer to local electrical codes

COMMERCIAL INFORMATION

Total Capital Cost: $237,500 (USD)

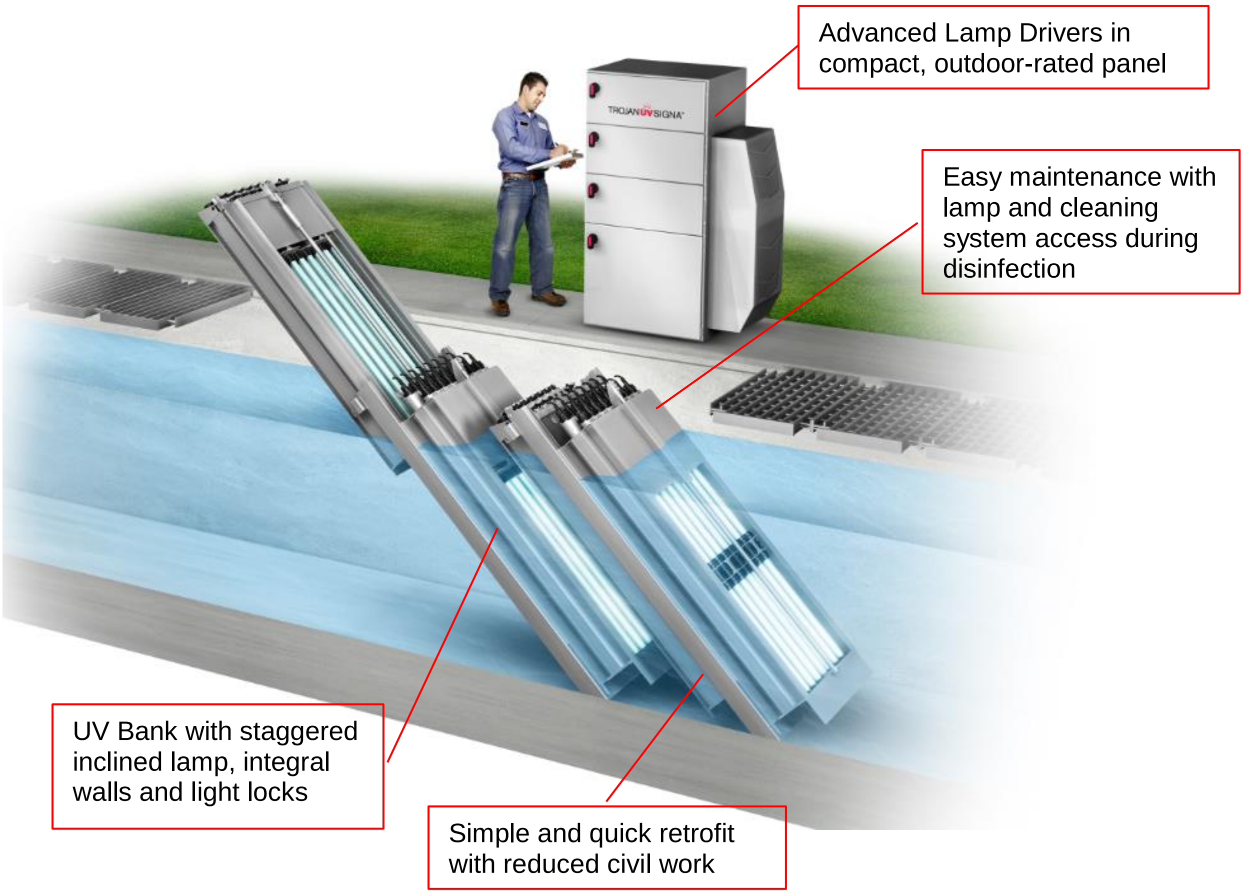
This price excludes any taxes or duties that may be applicable.

Standard equipment warrantees and start up by Trojan-certified technicians are included.

Easy and Cost-Effective Maintenance

- The 1000 watt TrojanUV Solo Lamp combines the benefits of both low pressure and medium pressure lamps
- Fewer lamps, long lamp life and easy change-outs save time and money
- Lamp change-outs and cleaning solution replacement are done while the UV system is in the channel – minimizing downtime and simplifying maintenance
- Routine maintenance can be performed while banks are in the channel, but an Automatic Raising Mechanism (ARM) makes other tasks, such as winterization, simple, safe and easy
- Lamp plugs with LED status indicators and integral safety interlock prevent an operator from accidentally removing an energized lamp
- ActiClean WW™ chemical/mechanical cleaning system to keep sleeves clean during operation

SYSTEM OVERVIEW



Simple to Design and Install

- Light locks on the UV banks control water level within the channel, reducing dependence on downstream weirs and preventing short-circuiting above the lamp arc
- UV Banks include integral reactor walls to make installation easy and prevent short circuiting at the channel walls
- Stringent tolerances on concrete channel walls are not required – making retrofits simple and cost-effective

Supported by Trojan Technologies

- Trojan Technologies warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever comes first.
- UV lamps are warranted for 15,000 hours of operation or 3 years from shipment, whichever comes first. Lamp warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails prior to 9,000 hours of use, a new lamp is provided at no charge.
- Trojan offers an unparalleled Lifetime Performance Guarantee. The spirit of this guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system.

Updated Table 7: Design Loading (Revised Max Day Loading)

Parameter	Non-Industrial	Burke Corporation (SIU-1)	VERBIO (SIU-2)	Total	
				Basin Sizing	Aeration/Mixing Sizing
Maximum 30-day(1)					
BOD, lb/d(3)	1,576	5,040	76	6,692	NA
TSS, lb/d	3,221	950	129	4,300	NA
TKN, lb/d	343	500	26	869	NA
TN, lb/d(4)	353	500	26	879	NA
TP, lb/d	109	200	NA	309	NA
Daily Maximum(2)					
BOD, lb/d	2,329	10,440	114	NA	12,130
TSS, lb/d	6,899	2,500	194	NA	7,978
TKN, lb/d	558	1,110	38	NA	1,491
TN, lb/d(4)(5)	558	1,110	38	NA	1,501
TP, lb/d	118	350	NA	NA	459

(1) Max 30-day load used for basin sizing only

(2) Daily Max = Greater of Scenario 1 or Scenario 2

Scenario 1 = Non-industrial daily max + SIU-1 Maximum 30 day + SIU-2 Maximum 30 day

Scenario 2 = Non-industrial Maximum 30 day + SIU-1 Daily Max + SIU-2 Daily Max

Per agreement with IDNR that non-industrial and SIU daily maximum loads are very unlikely to occur on the same day. Daily Max used for aeration/mixing system sizing.

(3) For Burke Corp assumed cBOD:BOD ratio of 0.833

(4) Assumes SIU TN design loads = SIU TKN design loads

(5) Assumes Non-industrial TN design loads = Non-industrial TKN design loads