City of Newman Wastewater Treatment and Reclamation Facility Upgrade

Project Report

Prepared for:
City of Newman

Prepared by:
Stantec Consulting Services Inc.

September 20, 2018

Sign-off Sheet

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1.0 PURPOSE

The purpose of this report is to evaluate alternatives for upgrades to the City of Newman Wastewater Treatment and Reclamation Facility (WWTRF) and associated reclamation facilities, select the best apparent of those alternatives and describe the project for which the City is seeking financial assistance from the State Water Board Division of Financial Assistance (DFA).

The City of Newman wishes to increase the capacity of its WWTRF to serve growth in the City's Primary Sphere of Influence (PSI), defined in its 2030 General Plan (2007, Design, Community and Environment). This capacity increase is expected to be completed in several phases of development. The alternatives evaluation completed and summarized in this report will support the upgrades required to address existing plant capacity needs as well as reduce the salinity impact of the City's reclamation operation. This report describes the improvements needed to serve the PSI growth described in the 2030 General Plan, which were taken into consideration in selection of the apparent best alternative. The goal of the City is to select the best long-term solution for serving the PSI, identifying an initial phase project to address existing and near-term needs for which funds may be requested from the DFA for construction. The recommended project presented in this document addresses existing plant deficiencies, and development of additional reclamation lands to provide capacity sufficient to address needs within the existing City Limits (infill) as well as development of facilities required to comply with salinity limitations.

2.0 PROJECT AREA

The City of Newman is located on the west side of the San Joaquin Valley, along the southern boundary of Stanislaus County, just west of the confluence of the San Joaquin and Merced Rivers (**Figure 1**). The City owns and operates a Wastewater Treatment and Reclamation Facility (WWTRF) that treats all of the Wastewater from the City. The City WWTRF is located approximately one-mile northeast of the City, west of the San Joaquin River, and southeast of Hills Ferry Road. Portions of the WWTRF and associated Use Areas are located in Stanislaus County and Merced County.

The City has an estimated population of 11,361 (US Census, July 2017). This includes approximately 5,210 equivalent dwelling units (EDUs) including 3,007 residential EDUs, 259 commercial EDUs and 1,373 industrial EDUs. The WWTRF accepts wastewater from two industrial dischargers. A cheese manufacturer and a tomato processor.

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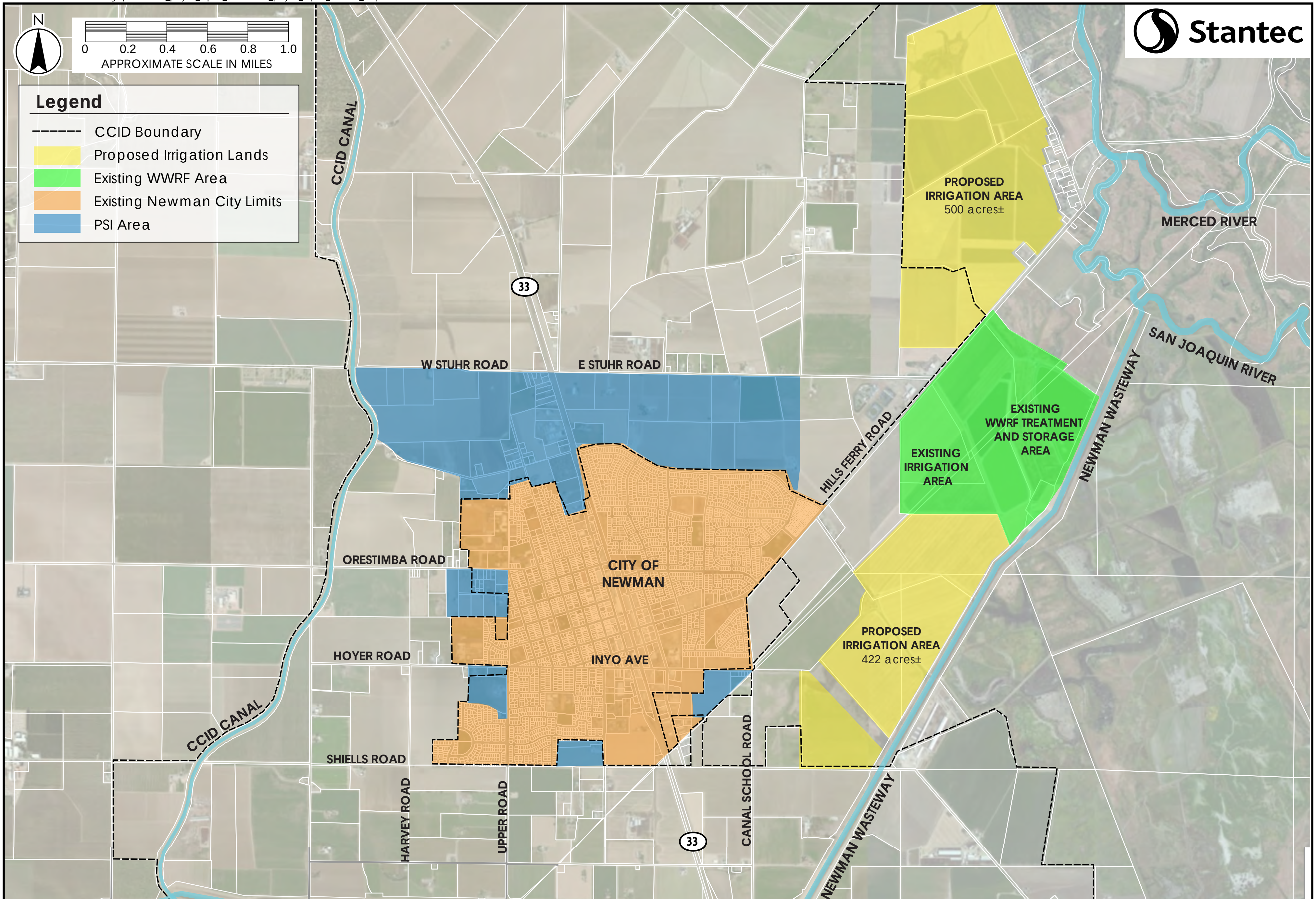

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Figure 1
City of Newman WWTRF Location

3.0 EXISTING FACILITIES

The City owns and operates a WWTRF and associated reclamation lands. The City operates the WWTRF in accordance with Waste Discharge Requirements Order No. R5-2018-0024 (the Order). The City's wastewater treatment facility was originally placed in operation in 1908 and has undergone several expansions, modifications, and/or upgrades since. Currently the WWTRF uses an aerated pond system to treat wastewater from the residential population of the City of Newman as well as from commercial food processing facilities in the City.

The existing facilities consist of a headworks, an anaerobic treatment basin (BASIN-1), an aerated treatment basin (BASIN-2), an Oxidation Pond, overland flow treatment areas (or overland flow terraces), two unlined effluent (recycled water) storage reservoirs, and irrigation systems located on City-owned land surrounding the WWTRF. The City's existing treatment and reclamation facilities are shown in **Figure 2**. A flow diagram of the WWTRF is shown in **Figure 3**. Under gravity flow influent is delivered from the City's collection system to the treatment plant via two trunk lines, sometimes referred to as influent trunk lines, or outfall lines. The Influent passes through a bar screen at the headworks and enters a Parshall flume with an ultrasonic flow meter. Flow from the flume enters Junction Box 1 which transfers wastewater to BASIN-1 or diverts it to Junction Box 2. Junction Box 2 also receives the effluent from BASIN-1. All flow from the Junction Box 2 flows into BASIN-2. Effluent from BASIN-2 flows by gravity to the Oxidation Pond. The Oxidation Pond has a recirculation channel and a lift station that allows recirculation of treated effluent to the head of BASIN-2. Treated effluent is transferred from the Oxidation Pond to effluent Storage Reservoir 1 (SR 1), and to the overland flow treatment area via the Overland Flow and Transfer Pump Station. Effluent is conveyed from SR 1 to the Use Areas or Land Application Areas (LAAs) for irrigation via the existing Irrigation Pump Station 1(hereafter also referred to as Irrigation Pump Station 1, or IPS 1), located west of SR 1and adjacent to the City's J-Pipe groundwater well. Use Area fields are flood irrigated and all excess applied effluent or groundwater runoff is diverted to the Tailwater Reservoir and returned to SR 1 via the existing Tailwater Pump Station A.

Stored effluent is transferred between SR 1 and SR 2 via Irrigation Pump Station 2 (IPS 2), located at the southern end of SR 1. IPS 2 is currently functioning as a gravity transfer connection point between SR 1 and SR 2 as pumps have not yet been installed. Gated effluent pipes enter the lower portion of IPS 2 and, depending on the water level in the two reservoirs, water can be transferred from one to the other by gravity.

The following sections describe in greater detail various key components of the WWTRF.

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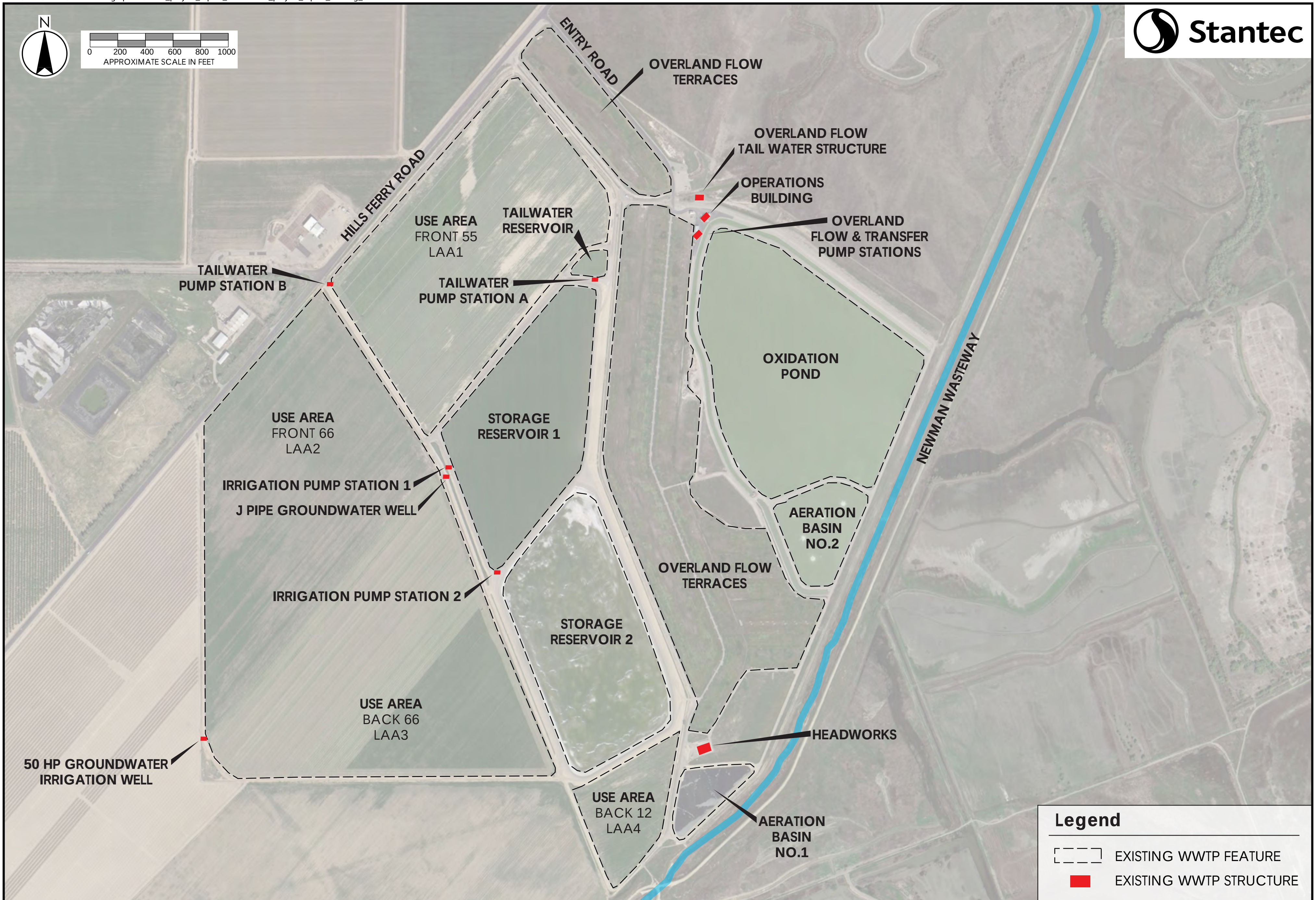

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Figure 2
Existing Treatment and Reclamation Facilities

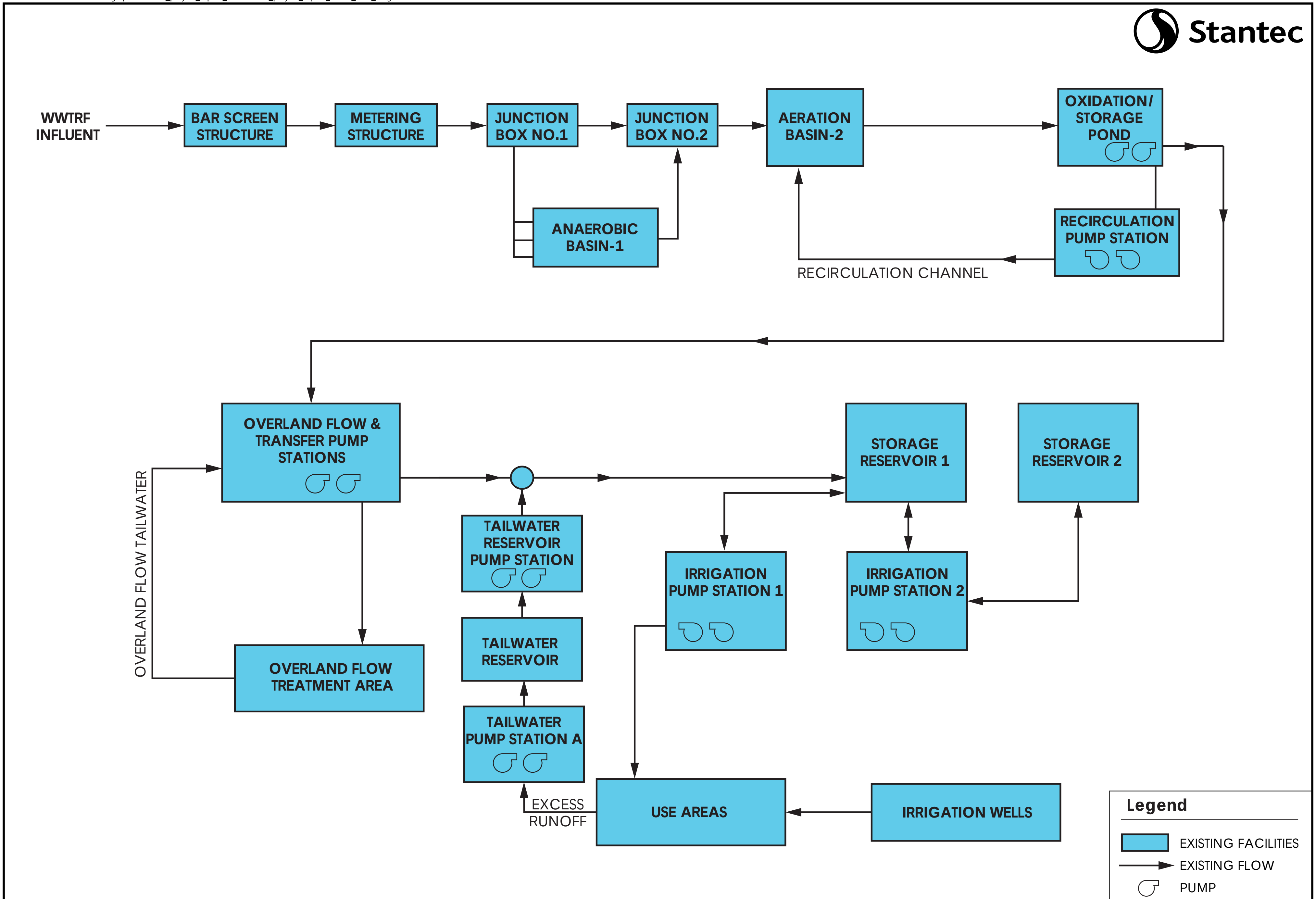

Figure 3
WWTRF Flow Diagram

3.1 HEADWORKS

The headworks consists of a manual bar screen, a 9-inch Parshall flume, and a flow distribution structure (Junction Box 1). At Junction Box 1, wastewater influent is either directed to BASIN-1 or bypassed to Junction Box 2. Junction Box 2 receives effluent from BASIN-1 plus any diverted raw wastewater from Junction Box 1. All flow received in Junction Box 2 is routed to BASIN-2.

3.2 ANAEROBIC BASIN 1

The WWTRF was initially designed with the first pond (BASIN-1) as an aerobic basin. It has become clear through testing and observation that BASIN-1 is currently operating as an anaerobic pond. Even though it was not engineered to be an anaerobic pond it seems to be efficiently reducing the load on the downstream ponds. On pages 8 and 9 of the *AB-1 – Treatment Cell Volume Assessment* (H&S Environmental, March 2017, **Appendix A**) BASIN-1 is described as having a BOD removal efficiency of 68% to 69% and that operation of the basin anaerobically is critical to the success of the Newman WWTRF. Recognizing the importance of maintaining this pond as an anaerobic basin is important in understanding and cost effectively preserving the treatment capacity of the facility.

BASIN-1 has an effective volume of approximately 7.0 million gallons (MG). This pond accumulates sludge which digests in-place at a rate slower than the accumulation rate. To prevent sludge from accumulating to the point of interfering with BASIN-1 treatment, the City operations team adds enzymes to BASIN-1 to accelerate decomposition. The operations team reports the BASIN-1 sludge accumulation is maintained at an average depth of one to four feet via this operational protocol.

Though BASIN-1 is in fact operated as an anaerobic pond, the ASI small bubble diffuser system provided as part of the original construction of BASIN-1 (originally designed as an aerated pond) is still operated. This aeration system is powered by a total of nine (9) 10-hp blowers, and is now utilized primarily for mixing purposes. The horsepower required to oxidize the influent load is substantially more than the horsepower applied. Further discussion of BASIN-1 as an anaerobic pond, rather than aeration basin, is provided later in Section 6.0 of this report, where alternatives considered are discussed.

3.3 AERATION BASIN 2

Aeration Basin No. 2 (BASIN-2) is a 5-acre aerated treatment pond with a minimum depth of 5.5 feet and maximum depth of 9.0 feet. The minimum volume of this pond is approximately 9 MG and the maximum volume is 14.7 MG. The detention time at minimum water levels is approximately 4 days. Oxygen in this pond is provided by 5 floating surface aerators. This includes three (3) 40-hp units and two (2) 50-hp units. To assist in providing more oxygen to BASIN-2 and to reduce the incoming wastewater hydraulic residence time in the basin, higher dissolved oxygen water from the Oxidation Pond is recirculated at a rate of approximately 1.1 Mgal/d to the inlet of BASIN-2. Similar to BASIN-1, to prevent sludge from accumulating in BASIN-2, the City operations team completed a four-year sludge treatment project adding enzymes to accelerate decomposition. The WWTRF operations team reports no material accumulation of sludge in BASIN-2, possibly as a consequence of residual sludge digestion enzymes flowing from BASIN-1 when sludge control measures are being practiced there. It is expected, that after some time sludge will accumulate to an observable degree and the operations staff will find it necessary to undertake a similar sludge treatment project in BASIN-2 to manage sludge levels.

3.4 OXIDATION POND

The Oxidation Pond is a 50-acre pond with a minimum depth of 5.5 feet and maximum depth of 9 feet. The greater depth is generally used during the wet season as an effluent storage feature. The minimum and maximum volumes of the Oxidation Pond are 90 and 147 MG, respectively. The effective volume for treatment purposes is assumed to be 90 million gallons. The WWTRF operations team reports very little accumulation of sludge in the Oxidation Pond, the exception being the area around the discharge point from BASIN-2. The City treats this area from time to time to prevent significant sludge accumulation, similar to activities conducting in the upstream basins. There are currently no mechanical aerators in the Oxidation Pond and aeration is provided by oxygen transfer across the pond surface, aided by wind, and algal photosynthesis. Recirculation via a recirculation channel, which encircles the Oxidation Pond, to BASIN-2, provides additional oxygen. Under Central Valley climatic conditions, the effective design BOD5 loading capacity for this pond is 30 lbs/ac/d based on Stantec's experience in the valley and application of best professional judgement.

Existing design criteria for the City of Newman WWTRF are provided in **Table 1**.

Table 1 City of Newman WWTRF Existing Design Criteria [a]

Item	Units [b]	Design Value
Design Flows and Loads		
Average Dry Weather Flow (ADWF)	Mgal/d	1.25
Parshall Flume		
Throat Width, in	in	9
Bar Screen		
Channel Width	ft	4
Bar Spacing	in	1.5
Bar Width	in	3/8
Bar Depth	in	2.0
BASIN-1 Characteristics		
Area	ac	2.7
Water Depth	ft	8.0
Effective Volume	MG	7.0
BASIN-1 Diffused Air Blowers (currently utilized for mixing)		
Blower Type		Regenerative
Number of Blowers		9
Horsepower, ea	hp	10
Diffuser Type	(currently utilized for mixing)	ASI Bubble Diffuser
BASIN-2 Characteristics		
Surface Area	ac	5.0
Water Depth (min to max)	ft	5.5 - 9.0
Volume (min to max)	MG	9.0 - 14.7 (critical design volume 9.0 MG)
BASIN-2 Floating Surface Mechanical Aerators		
Quantity	Each	3
Horsepower, ea	hp	40
Quantity	Each	2
Horsepower, ea	hp	50
Oxidation Pond		
Area	ac	50
Water Depth (min to max)	ft	5.5 - 9.0
Volume (min to max)	MG	90 – 147[c]
Maximum Organic Loading	lbs/d/ac	30 to 50 (winter to summer)

Item	Units (b)	Design Value
Recirculation Pumps		
Number		2
Capacity, ea	gpm	1,000
TDH	ft	4.0
Horsepower, ea		7.5
Overland Flow & Transfer Pumps		
Overland Flow Pump Number		2
Capacity, ea	gpm	500
TDH	ft	150
Horsepower, ea		25
Transfer Pump Number		2
Pump Type		Mixed Flow
Capacity, ea	Gpm	1,000
TDH	Ft	36
Horsepower, ea		10
Overland Flow System		
Area	ac	58
Slope Grade	%	- 5.5

(a) Current waste discharge requirements for the existing facility (which is described in this table) has an average dry weather flow (ADWF) limitation of 1.25 Mgal/d, and a total annual flow limitation of 490 MG.
(b) Mgal/d = million gallons per day; in = inches; ac = acres; hp = horsepower; ft = feet; MG = million gallons; gpm = gallons per minute; lbs/d/ac=pounds per day per acre.

3.5 RECLAMATION FACILITIES

The City's current waste discharge requirements (WDRs) allow an average dry weather influent flow of 1.25 Mgal/d into the WWTRF. This flow is treated and reclaimed on the existing land application areas (LAAs) shown in **Figure 2**. In accordance with all Title 22 requirements undisinfected secondary effluent is reclaimed on these lands via flood irrigation of fodder crops. The salinity of the WWTRF effluent is relatively high due to the relatively high salinity of the source water for the City. Typical salinity (measured as electrical conductivity, EC) in the effluent storage basins at the WWTRF is around 3,100 µmhos/cm. The Orders the City must operate under stipulate that the flow-weighted EC of the treated effluent applied to LAAs may not exceed 4,200 µmhos/cm as an annual average. Two groundwater wells shown in **Figure 2** (J Pipe and 50 hp wells), are also used to supply irrigation to the existing use areas both to supplement the WWTRF effluent and to reduce the overall salinity of the combined water applied to the LAAs. **Table 2** summarizes the characteristics of the reclamation facilities located at the WWTRF, which are shown in **Figure 2**.

Table 2 City of Newman Reclamation Facilities Existing Design Criteria

Item	Units (a)	Design Value
Storage Reservoir 1		
Maximum Surface Area	ac	29
Maximum Water Depth	ft	12
Maximum Volume	MG	95
Storage Reservoir 2		
Maximum Surface Area	ac	40
Maximum Water Depth	ft	12
Maximum Volume	MG	135
Land Application Areas (LAA 1, LAA 2, LAA 3 & LAA 4)		
Area	ac	199
Crops		Alfalfa, Winter Oats, Pasture Grass
Irrigation Pumping Station 1 (IPS 1)		
Pump Type		Mixed Flow
Number		2
Capacity, ea	gpm	1,000
TDH	ft	19
Horsepower, ea		10
Irrigation Pumping Station 2 (IPS2) **This facility was previously designed, but not completed and operational.**		
Pump Type		Vertical Turbine
Number		2
Capacity, ea		1,875
TDH		
Horsepower, ea		25
Tailwater Return System A		
Reservoir Depth	ft	5.0
Maximum Volume	MG	1.6
Pumps		
Type		Mixed Flow
Number		2
Capacity, ea	gpm	700
TDH	ft	21
Horsepower, ea		7.5

Item	Units (a)	Design Value
Tailwater Return System B		
Pumps		
Type		Mixed Flow
Number		2
Horsepower, ea		5
(a) Mgal/d = million gallons per day; ac = acre; ft = feet; MG = million gallons; gpm = gallons per minute; lbs/d/ac=pounds per day per acre.		

The City is making operational adjustments to incorporate the application of groundwater and effluent into the monitoring and reporting required by the Order. The addition of new LAA acreage is part of their plan for the future, it is described in the Order and is discussed further in the following sections of this report.

4.0 NEED FOR PROJECT

The City of Newman WWTRF expansion is driven by the need to serve the existing users, allow development within the General Plan Primary Sphere of Influence (PSI), and address potential groundwater degradation caused by high salinity effluent used in reclamation.

4.1 EXISTING USERS

The existing WWTRF treatment and reclamation facilities have sufficient capacity to adequately comply with the existing Order. The plant currently receives an influent ADWF of around 1.1 Mgal/d. The existing Order permits treatment and reclamation of up to an average dry weather influent flow of 1.25 Mgal/d and a total annual flow of 490 MG (on a calendar year basis).

Although the current plant capacity is adequate under the existing Order the Regional Water Quality Control Board has voiced concern over the potential degradation of local area shallow groundwater due to reclamation of the WWTRF high salinity effluent. The adoption of the Order involved significant analysis of these possible impacts and incorporates measures to address the high salinity of the plant effluent for existing and future effluent flows. As a result, the City needs to address new salinity requirements for the existing users contained in the Order, which is included in **Appendix B** of this report. The groundwater limitations presented in the Order (Section E) require that waste constituents form any portion of the facility shall not cause groundwater to contain concentrations that exceed either the greater of: Title 22 Primary or Secondary Maximum Contaminant Levels or background groundwater quality. Although this groundwater limitation will not be in effect until the 1st of January 2023, the City has decided to begin addressing it now through its irrigation management practices. This primarily involves the application of lower salinity groundwater in addition to the higher salinity effluent, to reduce the resulting average salinity of water applied to the LAAs.

4.2 DEVELOPMENT OF THE PSI

For the City to continue development in the PSI the City will need to provide additional capacity at the WWTRF. The total required capacity with the complete buildout of the PSI has been estimated at 2.4 Mgal/d, ADWF. The current WWTRF and appurtenant reclamation facilities require upgrades to meet the capacity required for buildout of the PSI.

4.3 REDUCE IRRIGATION SALINITY AND PREVENT DEGRADATION OF USE AREA GROUNDWATER TO THE EXTENT FEASIBLE

The Regional Board has requested that the irrigation salinity be reduced in order to prevent groundwater degradation to the extent feasible. Groundwater limitations in the Order (**Appendix B**) require that as of the 1st of January 2023 activities at the facility will not cause groundwater salinity concentrations to exceed background groundwater quality. A report titled *City of Newman Wastewater Treatment Facility Anti-Degradation Analysis and Groundwater Conditions* (Anti-degradation Analysis) was prepared which presents analysis to determine a target salinity for the applied irrigation. The Anti-degradation Analysis found that the salinity of applied irrigation should not exceed an average EC of 2,100 µmhos/cm. The Order incorporates the findings of this analysis and additional studies completed by the City. The resulting effluent limitation in the Order requires the flow-weighted annual average EC of the effluent applied to the reclamation land not exceed 4,200 µmhos/cm, in order to protect the site-specific groundwater goals established in the Anti-Degradation Analysis. In addition, the Order requires the City to meet a mass loading effluent limitation for BOD of 300 lb/acre/day as a maximum and 100 lb/acre/day as an annual average. What does this mean?

In order to meet the salinity and BOD limitations, the effluent can be diluted with other sources of lower salinity water or be treated with reverse osmosis (RO). The sources of lower salinity water used as supplemental water may vary as long as the long-term average salinity and BOD of all water applied to the Use Areas can meet the groundwater limitations in the Order.

As a consequence of adding additional supplemental water additional Use Area land will be required due to the increase in irrigation volume, compared to the reclamation operations under the previous Order, which did not include this supplemental water. The amount of additional land required will depend on the salinity of supplemental water used for irrigation. The lower the salinity of the supplemental water the less supplemental water will be needed to reduce the salinity of applied water and the less additional land will be necessary for irrigation.

Any additional reclamation land that is put into production will need to be retrofitted to satisfy all applicable requirements. The City has purchased additional land for this purpose, but the required infrastructure and improvements have not been completed. The proposed project is intended to address a portion of the required retrofits. This could include irrigation improvements, distribution lines for supplemental water and effluent, backflow prevention, and tailwater management. What proposed project?

4.4 PROJECT OBJECTIVES

The objectives of the proposed project are to:

1. Complete the WWTRF improvements required to serve all existing users
2. Complete the WWTRF improvements required to serve the PSI
3. Prevent groundwater degradation caused by the reclamation operations

5.0 DESIGN CRITERIA

In this section, common design criteria for all base project improvement alternatives are discussed. These common design criteria include wastewater flows and contaminant loads/strengths, effluent quality requirements (i.e., wastewater treatment requirements), and effluent disposal requirements (which include seasonal effluent storage requirements).

5.1 PHASING PLAN

The improvements described in this report will be completed in phases. The City does not have the funds required to complete all the capital improvements to the WWTRF and the reclamation lands to treat an ADWF of 2.4 Mgal/d, associated with build-out of the PSI. It is recognized that the existing users should not be required to fund an expansion to the treatment and reclamation capacity that will they will not need. The City intends to finance improvements required for all future users through development fees raised as part of the development of the PSI. However, some of the required WWTRF improvements described here are required for the existing users. These improvements will be completed first and those for which the City is requesting financial assistance from DFA at this time are described in Section 8.

The planned phases for improvements at the WWTRF can be broken into roughly three categories based on the users benefiting from those improvements. These improvements are based on the incremental flow increases for different phases of development that were established in the City of Newman Wastewater Treatment and Disposal Master Plan (2008, ECO:LOGIC), referenced in the Order and as shown in **Table 3**. Phase 1 Master Plan improvements include any upgrades required to serve the existing users. Existing flows have been established at approximately 1.1 Mgal/d. Phase 2 includes all improvements required to serve infill of the City limits. This will require treatment and reclamation improvements to treat up to 1.5 Mgal/d, ADWF. Phase 3 will include WWTRF and reclamation improvements necessary for 2.4 Mgal/d in order to serve build-out of the City's PSI. The City of Newman projected influent flow and loads were developed based on these pre-set flow projections of 1.5 Mgal/d and 2.4 Mgal/d.

NEED TO READ

Table 3 Master Plan Phased Growth in Flows and Loads[(a)]

	Existing	Additional within Existing City Limits	Additional within Primary SOI
Population (b)	10,140	1,972	11,118
Residential (c) (EDUs)	2,805	580	3,270
Commercial (d) (acres)	37	35	116
Industrial (e) (acres)	57	41	25
Public/Quasi-Public (f) (acres)	102	10	--
Flow, gallons per day (gpd)			
Residential	0.64	0.12	0.70
Commercial	0.06	0.05	0.17
Industrial	0.09	0.07	0.04
Public/Quasi-Public	0.12	0.10	--
Saputo (g)	0.20	0.07	--
Total 3-month average dry weather influent flow, (Mgal/d), rounded	1.1	0.4	0.9

(a) This table was generated for the City of Newman Wastewater Master Plan. Existing population and flows have increased slightly since the completion of the Master Plan.
(b) Existing population and units' information obtained from the City of Newman and City of Newman Public Review 2030 General Plan EIR (October 2006). Projected population at 3.4 people/EDU (City of Newman 2030 General Plan).
(c) Projected units represent the potential number of units that could be added through build-out. Source: City of Newman 2030 General Plan (April 2007), Public Review Newman 2030 General Plan EIR (October 2006), Geographical Information System (GIS) database provided by DC&E.
(d) Includes Business Park, General Commercial, Downtown Commercial, and Office uses.
(e) Additional industrial acres within the Secondary SOI includes 310 acres of Industrial Reserve.
(f) Includes Schools and Public Buildings areas.
(g) Assumes Saputo industrial wastewater will contribute up to their currently permitted average flow of 0.300 Mgal/d to the total wastewater flow and BOD5 concentration of 4,010 mg/l.

5.2 FLOWS AND LOADS

5.2.1 WWTRF Influent

5.2.1.1 Influent Flows

Influent flow data for the period from May 2011 through December 2016 were obtained and analyzed. Daily, Monthly, and Annual Average Flows are shown in **Figure 4**. The monthly flow was calculated as the rolling 30-day centered average based on the period from 14 days before to 15 days after the day in question. The annual average flow was calculated as the rolling 365-day centered average based on 182 days before to 182 days after the date in question. As shown in **Figure 4**, the annual average flow (365-day average) is relatively constant with an average value of about 1.13 Mgal/d. The daily flow variations are not high compared to other communities of similar size, which indicates low inflow/infiltration problems within the collection system. The maximum daily flow in the data set was approximately 2.5 Mgal/d, which occurred on December 12, 2014 as shown in **Figure 4.**

5.2.1.2 Influent Loads

Plant influent BOD and TSS concentrations from May 2011 through December 2016 were collected and analyzed. Samples were flow proportional composites and were taken once a week. BOD and TSS concentrations and the daily influent flows were used to calculate influent load. The monthly and annual loadings were calculated as the 30-day rolling average and 365-day rolling average, respectively. The BOD load is more variable than the influent flow. The annual average influent BOD5 load ranges from 6,800 lb/d to 11,800 lb/d. The 30-day rolling average ranges from approximately 4,000 to 16,000 lbs/d as shown in **Figure 5**.

The variability in the TSS load was even more pronounced than the BOD. The TSS average influent TSS load is about 5,500 lbs/d, with a 30-day rolling average ranging from approximately 2,500 to 19,000 lbs/d as shown in **Figure 6**.

5.2.2 Industrial Wastewater Contribution

The City WWTRF also treats wastewater generated by Saputo Cheese USA Inc. Based on historical data, the average annual (365-day rolling average) flow of Saputo discharge ranges from 0.2 Mgal/d to 0.4 Mgal/d (see **Figure 7**). The average BOD5 load ranges from 3,000 to 6,000 lb/d (see **Figure 8**). The BOD load contribution of Saputo to the WWTRF is significant. The influent BOD load trend at the WWTRF follows the BOD load trend from Saputo as shown in **Figure 9**. It must be noted that Saputo has a contract with the City that limits their BOD5 load contribution to 4,010 lb/d and their monthly average flow to 0.3 Mgal/d. Analysis of historical data show that these limits have been exceeded in the past.

The City assumes for purposes of this Project Report that Saputo will limit their BOD contribution to their contractual limit of BOD load of 4,010 lb/d and flow of 0.3 Mgal/d. The City may require Saputo to either install pre-treatment at their processing facility or at the WWTRF if BOD5 loads exceed 4,010 lb/d in the future.

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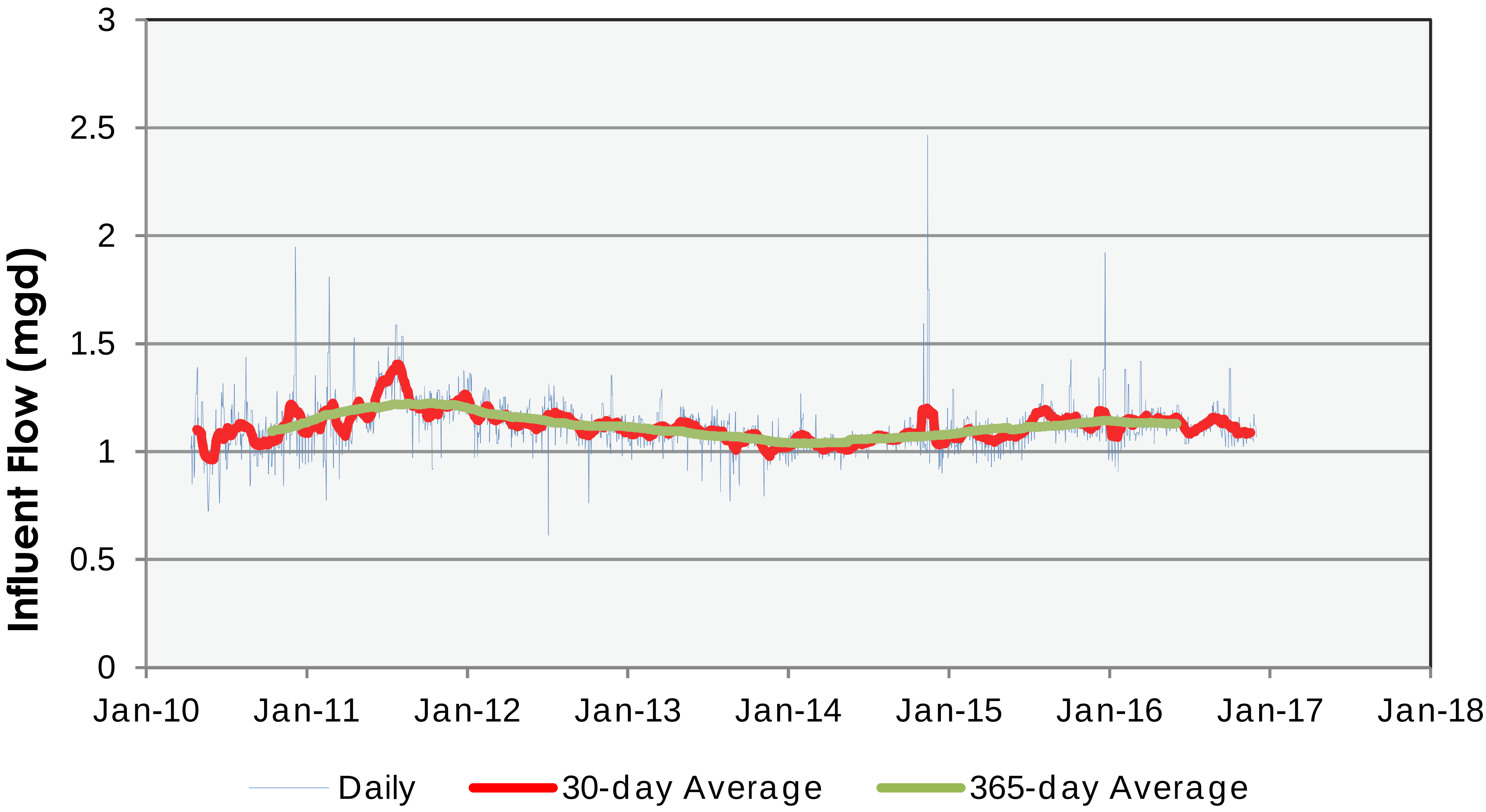

Figure 4
Influent Flow

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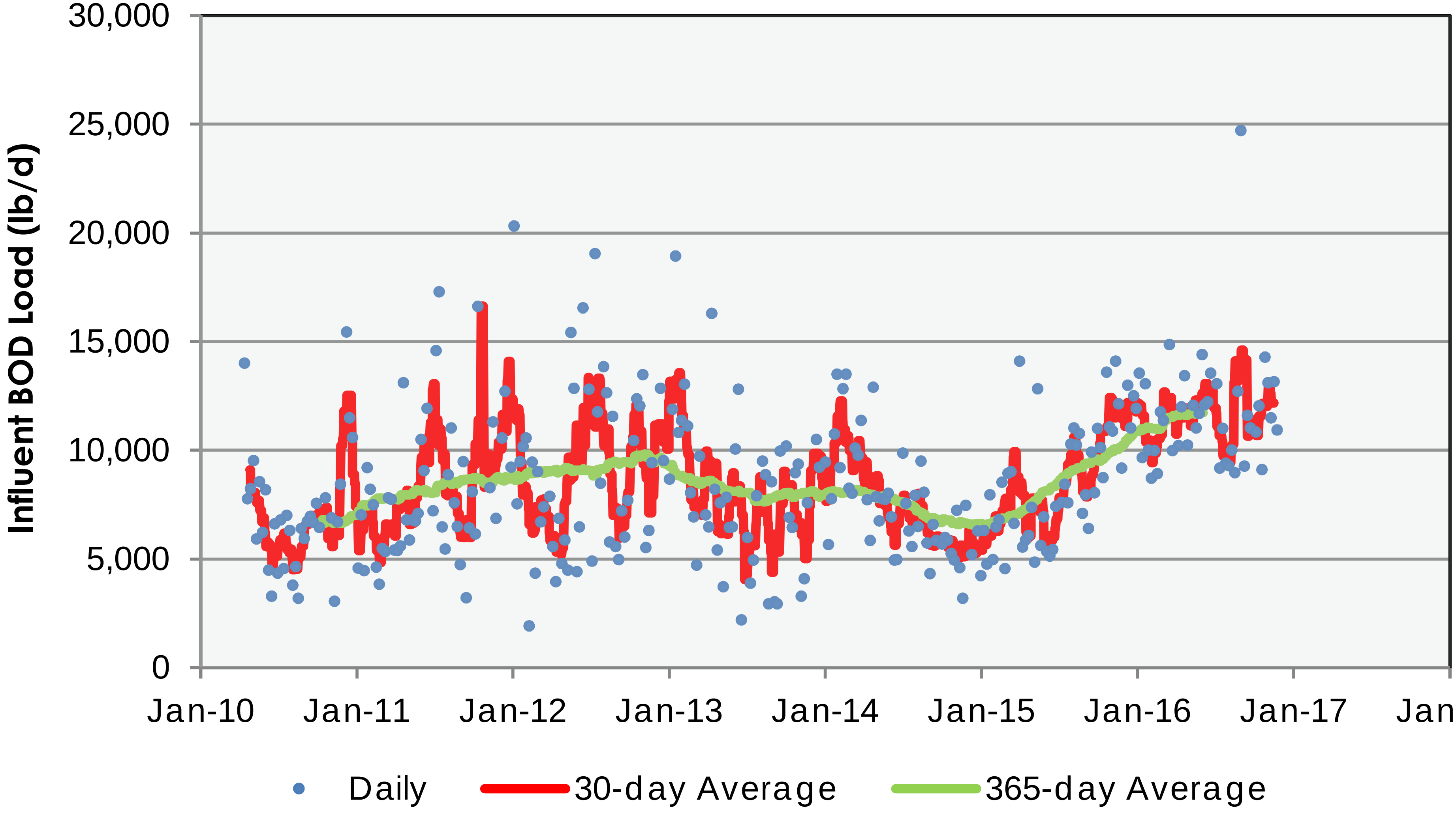

Figure 5
Influent BOD Load

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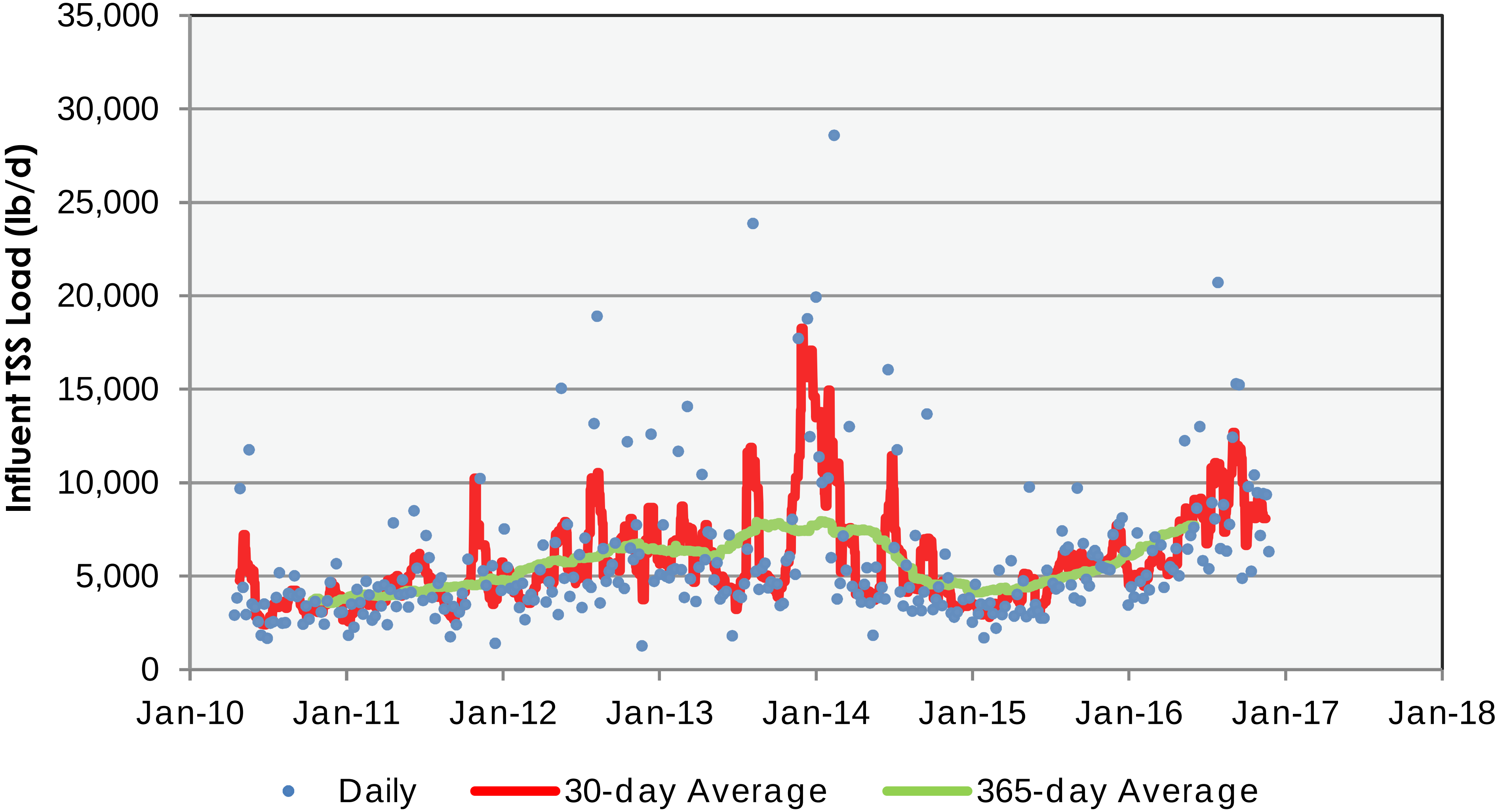

Figure 6
Influent TSS Load

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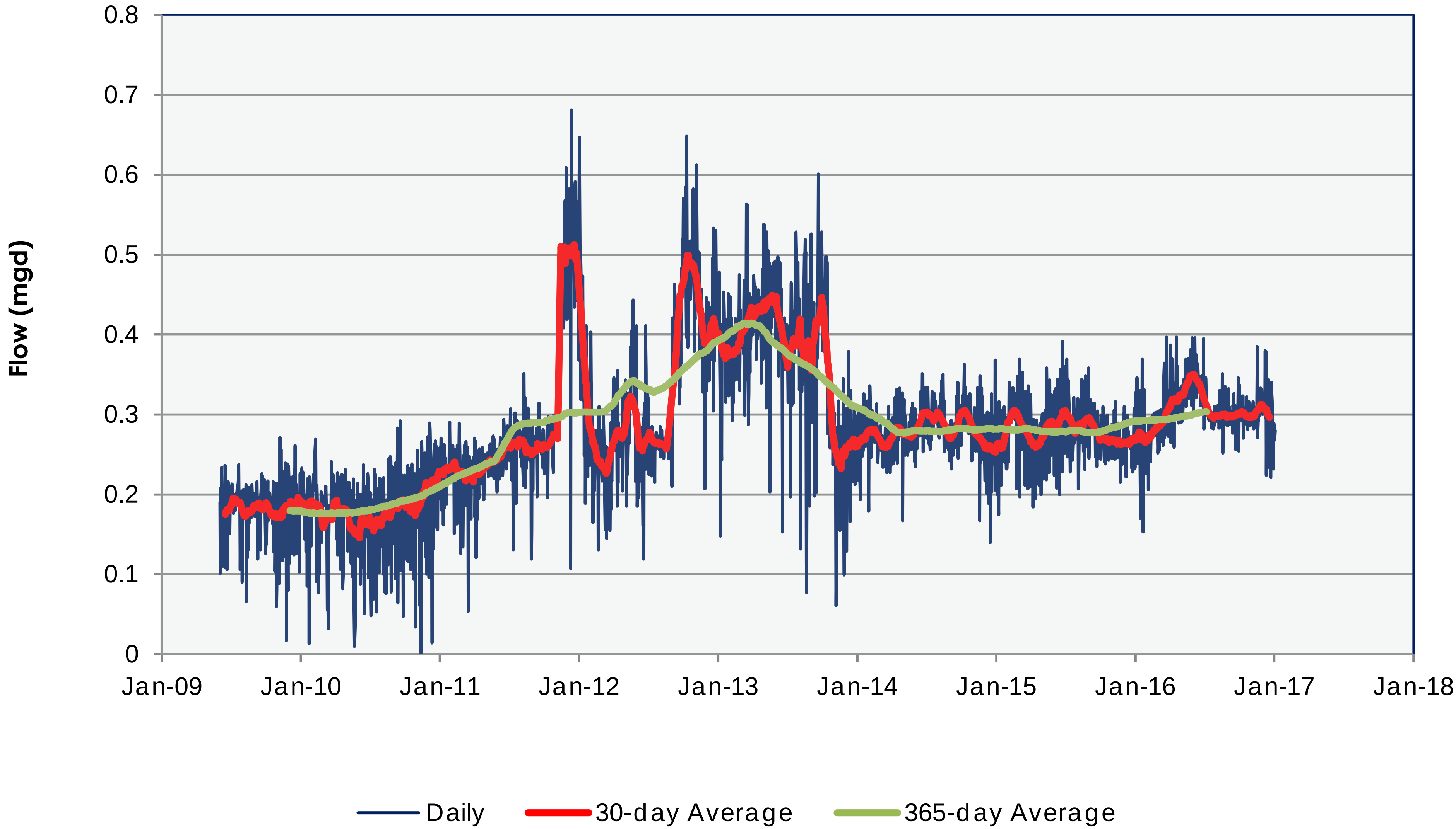

Figure 7
Saputo Discharge Flow

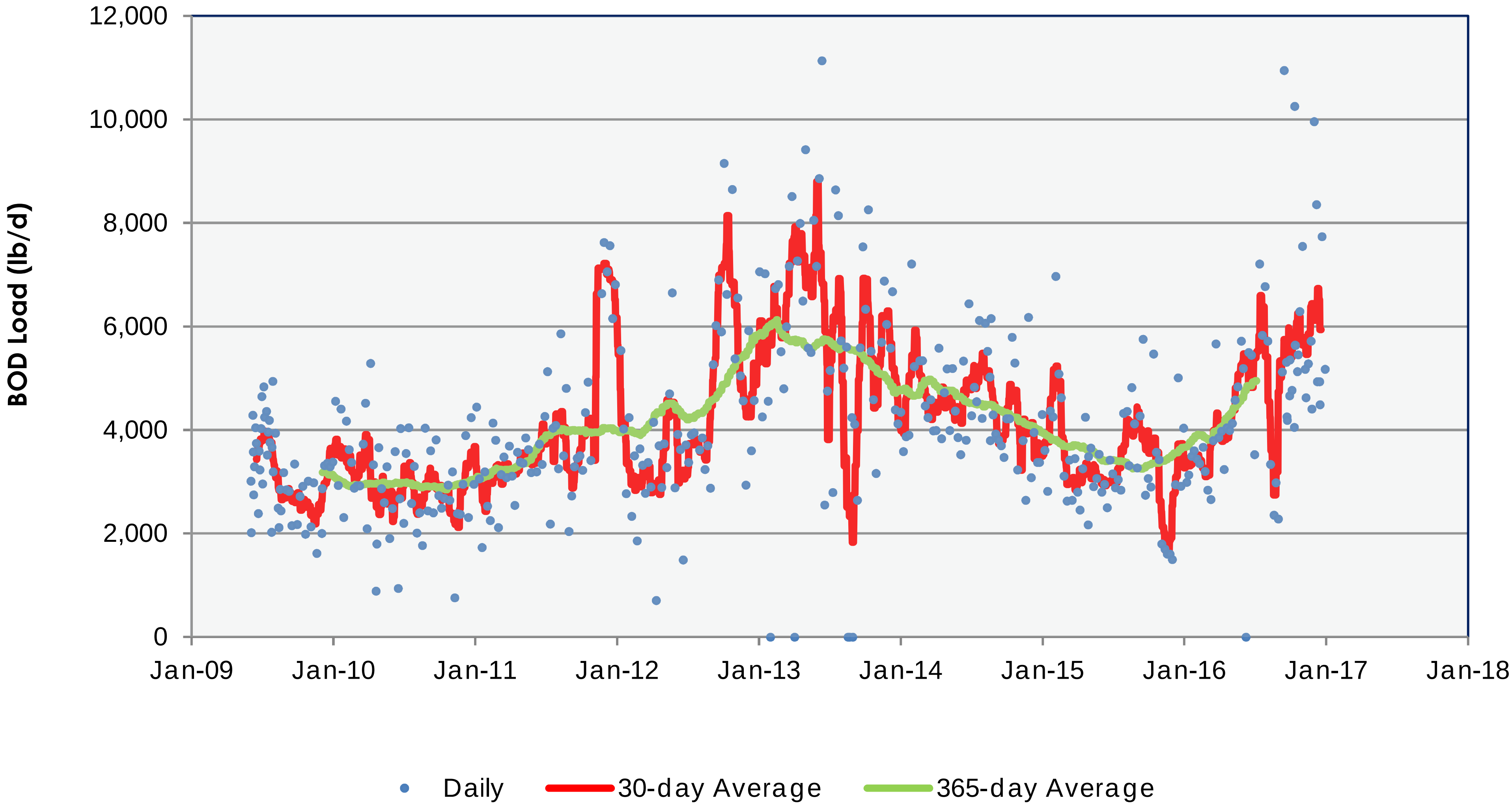

Figure 8
Saputo BOD Load

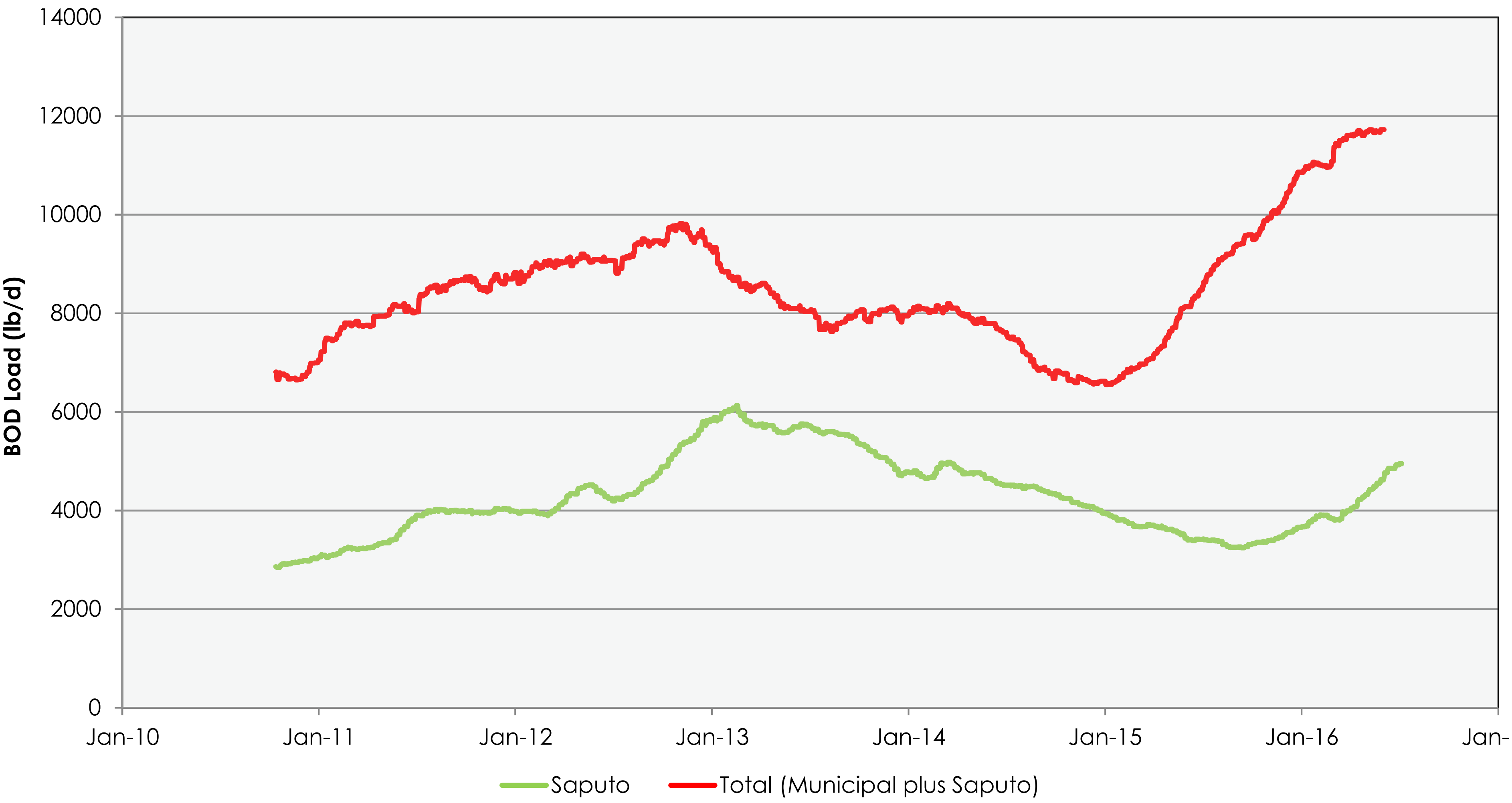

Figure 9
WWTRF Influent BOD Load Contribution from Saputo

5.2.3 Data Reconciliation

In 2008, a special BOD study revealed that the BOD5 of the combined waste measured at the wastewater treatment plant is not "typical" for a municipal waste. This was discovered when the BOD load measured at the WWTRF was significantly higher than the sum of the individual BOD loads coming from the City and from Saputo. The cause for this phenomenon was attributed to a synergy between the City waste and dairy waste which accelerated the kinetics of the BOD5 test.

Specifically, the BOD5/BOD20 ratio for typical municipal wastewater is generally in the 0.6 to 0.7 range. This ratio was 0.62 and 0.59 for City waste on the two sampling dates (i.e., on the low end of "typical"). At the WWTRF (after the City waste is combined with dairy waste), the BOD5/BOD20 ratios were 0.97 and 0.80, both well above the typical range. Although the actual total organic load at the WWTRF (as measured by BOD20, or possibly COD) may not change from the City to the WWTRF, the "apparent" organic load as measured by the BOD5 test would increase. Therefore, considering the measured BOD5 as "typical BOD5"may lead to overestimating the required capacity of the treatment plant and the aeration system. To convert the BOD5 measured at WWTRF to a "typical" BOD5, the concentration and load would need to be multiplied by 0.68 (i.e., (0.62+0.59)/ (0.97+0.8) = 0.68).

As shown in **Figure 5**, the annual current average measured BOD5 load is as high as 11,800 lb/d, which is equivalent to "typical" municipal BOD5 load of 8,100 lb/d (11,800 x 0.68 = 8,100). Currently, Saputo contributes about 5,700 lb/d of BOD load at an average flow of 0.3 Mgal/d. Based on these estimates, conventional BOD load of City wastes at the WWTRF is about 2,400 lb/d (8,100-5,700 = 2,400). This municipal BOD load, applied to the 0.83 Mgal/d, average annual flow for the municipal waste contribution, would result in an average BOD concentration of the municipal waste of 347 mg/L, which is a reasonable value. If the 2,400 lb/d City BOD load is distributed over a current City population of roughly 11,000, then the per capita BOD load is about 0.22 lb/capita/d, which is also a reasonable value.

5.2.4 Design Flows and Loads

Table 4 summarizes the design flows and loads used to analyze alternatives for improving the WWTRF discussed in subsequent sections of this report. This includes estimated flows and loads for existing conditions, infill of the existing City Limits (Near Term) and development of the PSI (Long Term) described in section 3.0.

How can current conditions be higher with limits than without? Maybe this is current capacity, not current conditions.

Table 4 Design Flows and Loads

	Existing Conditions	Estimated current Conditions after limiting Saputo BOD Load to 4,010 lb/d	Near Term	Long Term (1)
Average Flow (Mgal/d)				
Combined	1.13	1.25	1.5	2.4
Municipal	0.83	0.95	1.2	2.1
Saputo	0.3	0.3	0.3	0.3
Average BOD Load (lb/d)				
Combined (2)	8,100	7,090	7,480	10,080
Municipal	2,400	3,080	3,470	6,070
Saputo	5,700	4,010	4,010	4,010
BOD Concentration – calculated (mg/L)				
Combined (2)	859	680	598	504
Municipal	347	347	347	347
Saputo	2,278	1,603	1,603	1,603

1) The long-term design condition may be achieved via multiple steps depending on the actual rate of development of the PSI
2) Typical Municipal BOD5 at the WWTP will be higher (indicated value divided by 0.68) because of the accelerated kinetics

5.3 EFFLUENT QUALITY

Effluent water quality requirements established by the Regional Water Board for land disposal of effluent are relatively simple. The wastewater BOD must be oxidized. The Order includes limitations on the concentration and mass loading of the BOD of the effluent applied to the LAAs. The flow-weighted average BOD concentration of the effluent may not exceed 100 mg/L on a quarterly basis and be no greater than 80 mg/L on an annual basis. In addition, the BOD load of the combined effluent and supplemental water applied to the LAAs may not exceed 300 lb/acre/day on any given day and 100 lb/acre/day as an average over the course of the irrigation cycle.

The effluent, when applied to the disposal area, must not cause pollution of the underlying groundwater (as measured in shallow groundwater monitoring wells). The most common effluent contaminants causing groundwater pollution (as measured in the monitoring wells) are nitrates, overall salinity, and specific salt ions such as sodium and chloride. The Existing Order includes the following limitations on overall salinity and nitrate:

- The facility will not cause groundwater concentrations to exceed either the associated Primary or Secondary MCLs established in Title 22 or the background groundwater quality, whichever is greater. What are these?
- The flow-weighted average EC of the effluent applied to the LAAs may not exceed 4,200 µmhos/cm on an annual basis.
- The total nitrogen mass loading of the combined effluent and supplemental water applied to the LAAs may not exceed the crop demand on an annual basis as determined using published nitrogen uptake rates for the grown vegetation/crops.

5.4 RECLAMATION DESIGN CRITERIA

In this section, typical Regional Water Board requirements for effluent disposal by irrigation of land are discussed. The requirements in the City's Order are also discussed.

5.4.1 Effluent Reclamation Requirements

Effluent reclamation in California is regulated by Title 22 of the California Code of Regulations. For the Newman WWTRF project, the only proposed reclamation use of effluent involves irrigation of fodder crops as described and regulated in Title 22, Section 60304. For this reclamation, the minimum level of wastewater treatment is undisinfected secondary (i.e., oxidized) effluent. Effluent reclamation requirements for the Newman WWTRF are defined in section D of the Order (Discharge Specifications), section E of the Order (Groundwater Limitations) and section F of the Order (Water Recycling Specifications). These include, but are not limited to the following (a copy of the Order is included in **Appendix B**):

1. All effluent must be contained on land with the design condition being 100-year rainfall conditions.
2. All rainfall must be contained on land with the design condition being 100-year rainfall conditions.
3. Application rates of recycled water and irrigation shall be reasonable agronomic rates and shall be managed to maximize crop nutrient uptake, maximize breakdown of organic waste constituents in the root zone, minimize concentration of waste constituents percolating below the root zone, and provide water and leaching as needed to manage salt in the root zone of crops for production.
4. Effluent application to land cannot cause pollution of underlying and down-gradient shallow groundwater, typically as determined by results from shallow groundwater monitoring wells. The effluent contaminants at greatest risk of causing pollution are nitrate (measured as total nitrogen), salinity, and specific ions such as sodium and chloride. Total coliform are often listed as being a pollutant of concern; but in virtually all cases not involving very coarse-grained soil, the origins of total coliform in shallow groundwater monitoring wells are the soil and well, themselves, not the effluent.

5. At the Newman WWTRF all storm runoff must be contained onsite and stored in the effluent storage reservoirs.
6. Neither effluent storage nor effluent irrigation can cause conditions fostering mosquito breeding.
7. Effluent disposal shall not cause or create nuisance conditions. This is a generic "catch-all" requirement for possible consequences of effluent disposal that may occur on a case-by-case basis and may include such things as effluent odor or mists drifting off property, shallow groundwater occurring and possibly surfacing down-gradient of the effluent disposal area, weed growth in the effluent irrigation area causing nuisance conditions (e.g., weed infestations off-property, fire hazard, wildlife nuisance, insect nuisance, etc.).

6.0 ALTERNATIVES CONSIDERED

Six (6) treatment alternatives and four (4) reclamation alternatives were considered for upgrade of the City's wastewater treatment and reclamation facilities. All of the alternatives were considered in the context of the 2.4 Mgal/d flow limit that is contained in the City's Order which is the estimated ADWF generated at build-out of the PSI.

The alternatives presented here have been divided into treatment alternatives and reclamation alternatives. The treatment alternatives address solutions for meeting the treatment goals. The reclamation alternatives present potential solutions to meet the reclamation requirements in the Order and to protect groundwater quality, including descriptions of the corresponding LAA improvements. **Table 5** lists the alternatives considered and their descriptions.

Table 5 WWTRF Alternatives

	Reclamation Alternatives	Description
A	Do Nothing	No change in facilities other than maintenance. Continue reclaiming an average flow of 1.1 Mgal/d on existing lands.
B	CCID	Upgrade facilities and increase use area to reclaim up to 2.4 Mgal/d using CCID water and groundwater as a supplemental water source.
C	Groundwater	Upgrade facilities and increase use area to reclaim up to 2.4 Mgal/d using only groundwater as a supplemental water source.
D	Reverse Osmosis	Upgrade facilities and increase use area to reclaim up to 2.4 Mgal/d using RO to achieve the target salinity for effluent.
	Treatment Alternatives	**Description**
1	Aerated Ponds	Convert BASIN-1 into a completely mixed aerated pond. Modify BASIN-2 to act as a settling pond and add two additional settling ponds
2	Saputo Pretreatment	Construct a new anaerobic pretreatment system to treat Saputo wastewater to the same strength as the municipal wastewater prior to delivering it to the WWTRF headworks
3	Activated Sludge	Construct new oxidation ditches and clarifiers. Convert BASIN-2 into a sludge storage pond and construct two new sludge storage ponds.
4	Advanced Facultative Ponds	Install Advanced Integrated Wastewater Pond System, type II. This is an Advanced Facultative Pond followed by aerated ponds.
5	Separate Treatment System for Future Flows	Install a separate treatment system of 4 additional partially mixed ponds to treat flows from all future connections. Make improvements to the existing treatment system for all existing users.

6.1 RECLAMATION ALTERNATIVES

In general, the method of disposal for wastewater plays a role in dictating the required wastewater quality, and therefore the level of treatment necessary for that wastewater. The reclamation alternatives presented here begin to establish the basis for the potential treatment alternatives described in this report.

Effluent disposal in Newman is regulated by the Regional Water Board which has established policies for effluent disposal in its Basin Plan. The Basin Plan prioritizes effluent disposal alternatives as follows from most acceptable to least acceptable:

- Reclamation
- Land disposal
- Discharge to surface waters

The City of Newman historically discharged rainy season effluent to the San Joaquin River and reclaimed dry season effluent via irrigation of fodder crops, specifically alfalfa and associated rotation fodder crops which are commercially grown throughout the greater Newman area. In the 1990's, the City installed winter effluent storage reservoirs that allowed for the reclamation of all treated wastewater and ceased all effluent discharges to the San Joaquin River (in concert with Regional Water Board policies).

Agricultural reclamation of all City effluent through 2.4 Mgal/d ADWF design conditions (the anticipated wastewater flow at the end of this project's 20-year planning period and the estimated need at build-out of the City's PSI) has been determined to be technically, financially, and environmentally feasible by the City. Therefore, under the Basin Plan it is inappropriate for the City to consider other effluent disposal methods until such time as new information comes forth indicating that full reclamation of all Newman effluent is not feasible in the eyes of both the City and Regional Water Board.

Based on the foregoing, the City is planning to implement full reclamation of all City effluent via fodder crop irrigation for project design flows of up to 2.4 Mgal/d (ADWF) through 100-year rainfall conditions (per Regional Water Board policy). This method of effluent reclamation is required to comply with Title 22 of the California Code of Regulations. Title 22 specifies the level of municipal wastewater treatment needed for surface irrigation of fodder crops in Section 60304(d) (4).

> *(d) Recycled wastewater used for surface irrigation of the following shall be at least un-disinfected secondary recycled water:*
>
> > *(4) Fodder and fiber crops and pasture for animals not producing milk for human consumption.*

Where within Title 22 the following definition of un-disinfected secondary recycled water is used:

> *§60301.900. Un-disinfected secondary recycled water.*
>
> > *"Oxidized wastewater" means wastewater in which the organic matter has been stabilized, is nonputrescible, and contains dissolved oxygen.*

The Regional Water Board implements these Title 22 requirements in Waste Discharge Requirements (WDRs) it adopts for specific effluent reclamation projects. For Newman, the Regional Water Board adopted Order No. R5-2018-0024 in April of 2018.

The current and future WDRs will not contain effluent disinfection requirements because 1) disinfection is not required by Title 22 for the production of fodder and fiber crops, and 2) stormwater runoff from the reclamation fields is entirely contained on-site. There is no risk of effluent pathogens leaving the property via storm runoff, therefore effluent disinfection is not needed from a Basin Plan perspective.

The current Order does not contain numeric nitrogen limits, per se. As mentioned in section 4.3, the City may not apply a combination of effluent and supplemental water to the LAAs such that the total nitrogen mass loading applied exceeds the crop demand on an annual basis as determined using published nitrogen uptake rates for the grown vegetation/crops. Removal of nitrogen from the wastewater is not necessary currently, and is not envisioned to be necessary based on both the nitrogen need of alfalfa, and based on the California Fertilizer Association's Western Fertilizer Handbook (8th Edition, p.98) estimating that alfalfa utilizes 480 lbs/ac/year of nitrogen for an 8-ton yield. City shallow groundwater monitoring results at the reclamation site (MW-2, MW-3, and MW-5) indicate that shallow groundwater nitrate concentrations are remaining below the 10 mg/L water quality objective even with the current and on-going intensive agricultural activity on the effluent reclamation site.

The situation is different for salinity. The City's potable water supply is relatively saline and hard groundwater. This results in a relatively saline wastewater, with that salinity being concentrated by evaporation from the City's effluent storage reservoirs and evapotranspiration by the fodder crops being grown. The Regional Water Board executive officer has stated:

> "*In short, the City must immediately start taking steps to address the current pollution caused by the WWTRF discharge before expanding the WWTRF.*"

The City has determined that the most appropriate method to address pollution caused by the high salinity wastewater is to blend the City effluent with lower salinity water to meet acceptable salinity limits. The City has purchased additional reclamation land in anticipation of an expanded reclamation operation to accommodate the larger volume of irrigation water resulting from the blending of effluent with other water sources. The Regional Water Board recently adopted new WDRs (the Order) that includes an effluent salinity limit (a flow-weighted average of 4,200 µmhos/cm on an annual basis) on the effluent applied to the City's LAAs and a groundwater limitation on the concentration of waste constituents (including salinity) released from the facility. ~~These~~ compliance with these limitations is intended to eliminate the current state of shallow groundwater pollution by salinity. Compliance with the proposed limitation will be achieved by source control and dilution, not by installation of reverse osmosis treatment.

There are four alternatives presented here for the reclamation improvements required to address existing and future needs in the context of the new Order. Each alternative presents a different source of supplemental water that can be used to meet the limitations of the Order. Water balances for typical year and 100-year rainfall conditions have been developed for each alternative and are included in **Appendix C** Typical year water balances are used to simulate the conditions required for compliance with the salinity limitations and 100-year water balances are used to simulate conditions required for compliance with the storage limitations. **Table 6** presents a summary of the water balances for each alternative.

Table 6 Water Balance Summary

Alternative	Irrigation Land (Acres)	Typical Supplemental Irrigation Water (MG)	Typical Annual Average Salinity (EC)	100-Year Rainfall Storage Required (MG)
Alternative A Do Nothing	199	188	2,460	199
Alternative B CCID	607	684[a]	2,051	391
Alternative C Groundwater	1,050	1,598	2,073	383
Alternative D Reverse Osmosis [b]	531	527[c]	1,570	392

(a) Assumes CCID water will be available approximately 60% of the time on average.
(b) Assumes effluent salinity will be reduced to an EC of 2,000 µmhos/cm
(c) Supplemental water is only used in this scenario to provide irrigation sufficient to maintain all crops on City owned land, it is not needed for diluent water in this scenario.

6.1.1 Reclamation Alternative A Do Nothing

Alternative A, Do Nothing, is presented to describe the scenario in which no improvements are made to the existing reclamation lands. This alternative is not compatible with any of the treatment alternatives presented in this report. If the city does not implement any changes to their treatment process or in their reclamation activity they will not be able to expand capacity as allowed in the Order, which would result in a moratorium on growth, and they may not be able to comply with the prohibitions and limitations contained in the Order. If the City continues to operate under their existing permit and continues to reclaim all effluent (up to the 1.25 Mgal/d, ADWF limit) on their existing lands without improvements – the operation will not be protective of groundwater quality as outlined in the Anti-Degradation Analysis that was generated by Stantec which served as the basis for the limitations in the Order. The City will not be able to expand to 1.5 Mgal/d to serve City infill (moratorium), or 2.4 Mgal/d and consequently will not be able to expand development into the PSI.

6.1.1.1 Water balance

Water balances presenting the irrigation, land, and storage requirements for the Do Nothing Alternative are included in **Appendix C** The water balances indicate that there is not enough existing land to meet the salinity targets identified as protective of groundwater (2100 EC annual average applied to land) in the Anti-Degradation Analysis and meet the BOD loading (300 lb/acre/day, maximum, and 100 lb/acre/day, average) limitations in the Order using the existing wells.

6.1.1.2 Storage and Land

230 + 30 do not equal 270

Currently the LAAs encompass 199 acres of available land for irrigation. Two existing storage basins provide 230 MG of effluent storage, and the Oxidation pond provides an additional 30 MG of storage for a total of 270 MG of available storage. The 100-Year water balance for existing conditions provided in **Appendix C** indicates that more than 199 MG of Storage is required. Although the available storage is adequate for existing reclamation needs it is unlikely that this will be adequate for buildout of the PSI, which is a requirement of the City to show they have sufficient capacity to serve their General Plan area.

6.1.1.3 Cost

There are no direct additional reclamation costs imposed by this alternative. Operations, maintenance, labor, utility, and capital costs presented in the other reclamation alternatives presented in this report are costs beyond what is required to run the existing WWTRF. No costs have been included for operations, repair or maintenance of the existing infrastructure. However, the cost could be quantified in terms of economic losses incurred due to limited growth in the primary sphere of influence. The City's goal is to maintain a program that is consistent with their General Plan. This alternative will not allow the City to continue with the growth outlined in the General Plan.

6.1.2 Reclamation Alternative B CCID

Alternative B, CCID, will use supplemental irrigation water supplied by the Central California Irrigation District (CCID) to maintain overall irrigation salinity protective of groundwater quality and to meet requirements for BOD loading. An adequate volume of CCID water and supplemental groundwater will be applied to the reclamation areas such that the flow weighted average salinity of all water applied will prevent shallow groundwater degradation. Salinity of the CCID water is anticipated to be approximately 800 µmhos/cm. This is significantly lower than the available groundwater that is used for irrigation. This alternative will require a use agreement for CCID water that is not yet in place. The City has been in negotiations with CCID to secure an agreement for the use of CCID water on the City's existing and future reclamation land. Although no agreement is in place it is anticipated that the future use agreement would require the City to supply CCID with an equal volume of water from a groundwater production well in the Northwest Corner of the City. A new groundwater production well would be constructed for this purpose. The CCID water would be delivered to the LAAs via the Miller Ditch on the McPike 2 property. A takeout pump will be required to deliver the CCID water into the reclamation irrigation system. All required precautionary measures will be implemented, as necessary to prevent cross contamination between effluent and CCID water, including but not limited to an air gap where CCID water is delivered to the WWTRF irrigation system. Although this alternative will utilize CCID water to the maximum extent feasible it is anticipated that it may only be available 2 out of every three years. For the purposes of this report it has been assumed that CCID water will be available approximately 60% of the time. The existing WWTRF irrigation wells will continue to be used to provide the remaining required supplemental water, as long as groundwater salinity can be maintained, cost effectively.

6.1.2.1 Alternative B Water Balances

Water balances presenting the irrigation, land, and storage requirements for Reclamation Alternative B are presented in **Appendix C** A summary of the land, water, and storage needs for this alternative are presented in **Table 6** above. The water balances indicate that at full buildout of the PSI (2.4 Mgal/d) Alternative B will require 607 acres of reclamation land, 684 MG of additional irrigation water (with an estimated annual volume weighted EC of 1,113 µmhos /cm in a typical year), and 391 MG of available storage. The volume and salinity of irrigation water at the WWTRF can vary significantly under different conditions and these water balances are only an estimate of the average and 100-year rainfall conditions.

6.1.2.2 Alternative B Storage and Land Requirements

As described above the water balances for Alternative B indicate that 607 acres of irrigated land and 391 MG of storage will be required for PSI buildout at 2.4 Mgal/d. The required land will include the City's existing reclamation Land (LAA1, LAA2, LAA3, & LAA4), McPike 1 (LAA5), McPike 2 (LAA6), and an additional 120 acres of irrigated land. The additional land will either be purchased from nearby land owners, or the City will enter into a use agreement with nearby land owners that will use the effluent as irrigation. For the purposes of this alternatives analysis it is assumed that the City will enter into a use agreement with the land owners and will only incur the cost of land improvements required to meet all applicable reclamation requirements. A schematic of the buildout of reclamation lands for Alternative B is shown in **Figure 10**. Alternative B will also include development of a new storage reservoir adding an additional 135 MG of storage. The new storage reservoir is planned to be built adjacent to the existing reservoirs as shown in **Figure 10.** When new storage is constructed, some operational irrigation land will be lost. All new land will be developed to meet any applicable reclamation permit and storm water permit requirements. This will include fencing, signage, backflow prevention, tailwater facilities, and flood protection if necessary.

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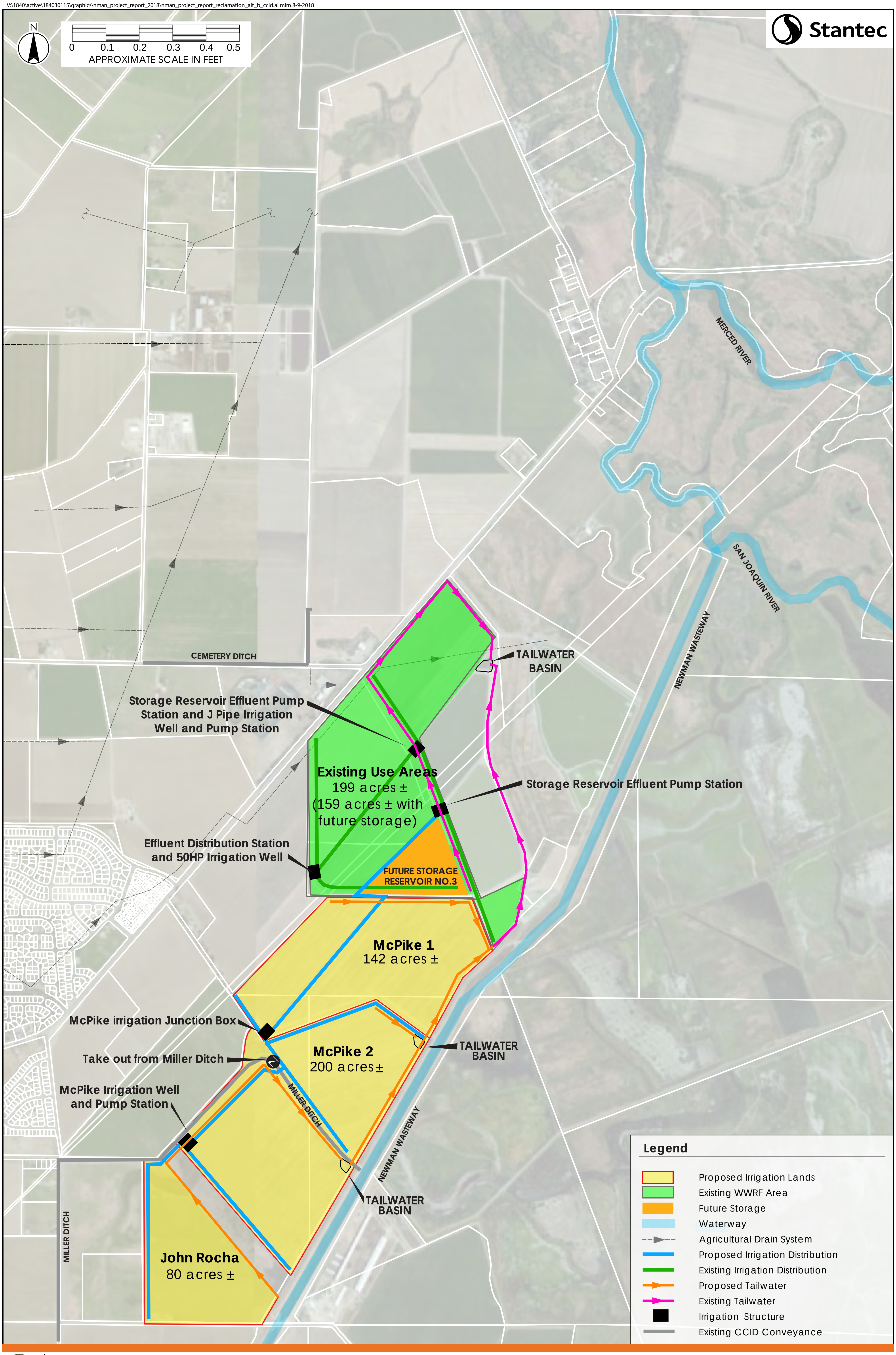

Figure 10
Reclamation Alternative B, CCID

6.1.2.3 Alternative B Costs

The cost for implementing the Alternative B improvements is presented in **Table 7**. These costs include use area improvements, storage improvements, an irrigation pump station upgrade, construction of a takeout structure to deliver CCID water to the use area, a new groundwater production well to transfer water to CCID, and annual operations and maintenance (O&M) costs. A total present worth value for Alternative B (shown on **Table 7**) includes the estimated additional O&M costs (beyond what is required for existing) at a discount rate of 3% with a useful life of 25 years.

Table 7 Alternative B Costs

Capital Improvements	Cost[(a)]
Irrigation Pump Station 2 Upgrade	$165,000
Use Area Improvements	$5,497,000
CCID Take Out Construction Costs	$56,000
CCID Transfer Well Construction Costs	$2,267,000
Additional Storage	$4,995,000
Construction Subtotal	**$12,980,000**
Engineering 20%	$2,596,000
Environmental 10%	$1,298,000
Contingency 30%	$3,894,000
Total Capital Cost	**$20,768,000**
Annual O&M[(b)]	**Cost[(a)]**
Annual Irrigation Pumping Costs	$13,000
Groundwater Pumping Costs	$15,000
Operations Personal/Labor Costs	$184,000
Estimated Repair and Maintenance	$6,000
O&M subtotal	$218,000
O&M Present Worth	$3,757,000
Salvage Value [(b)]	($7,139,300)
Total Present Worth	**$17,386,000**

(a) All costs are based on the same cost basis; Engineering News Record (ENR) Construction Cost Index (CCI) of 11,116, July 2018
(b) Annual O&M costs above and beyond what is being spent at the existing facility for O&M.
(c) Salvage value is based on a project useful life of 25 years

6.1.3 Reclamation Alternative C Groundwater

Reclamation Alternative C, Groundwater, will use supplemental irrigation water supplied by groundwater supply wells to meet groundwater anti-degradation and BOD loading requirements. An adequate volume of groundwater water will be applied to the reclamation areas such that the total annual flow weighted average salinity of all water applied will meet the established goal for salinity. The typical volume weighted average salinity of the irrigation wells in this alternative is predicted to be 1,838 µmhos /cm. In addition to the use of the existing irrigation wells on the existing and future reclamation lands this alternative may require the installation of additional wells. It has been assumed that an additional 1,000 MG of irrigation water with an EC of 2,000 µmhos /cm will be used in this alternative.

should these two paragraphs be the same? 1000 MG v 1598 MG?

6.1.3.1 Alternative C Water Balances

Water balances presenting the irrigation and land requirements for Reclamation Alternative C are presented in **Appendix C.** A summary of the land, water, and storage needs for this alternative are presented in **Table 6** above. The water balances indicate that at full buildout (2.4 Mgal/d) Alternative C will require 1,050 acres of reclamation land, 1,598 MG of additional irrigation water (with an estimated annual volume weighted EC of 2,073 µmhos/cm in a typical year), and 383 MG of available storage. The volume and salinity of irrigation water at the WWTRF can vary significantly under different conditions and these water balances are only an estimate of the average and 100-year rainfall conditions with the specific improvements described under this scenario.

6.1.3.2 Alternative C Storage and Land Requirements

As described above the water balances for Alternative C indicate that 1,050 acres of irrigated land and 383 MG of storage will be required for full treatment plant buildout at 2.4 Mgal/d. The required land will include the City's existing reclamation Land (LAA1, LAA2, LAA3, & LAA4), McPike 1(LAA5), McPike 2 (LAA6), and an additional 563 acres of irrigated land. The additional land will either be purchased from nearby land owners or the City will enter a use agreement with nearby land owners that will use the effluent as irrigation. For the purposes of this alternatives analysis it is assumed that the City will enter into a use agreement with the land owners and will only incur the cost of land improvements required to meet all applicable reclamation requirements. A schematic of the buildout of reclamation lands for Alternative C is shown in **Figure 11**. Alternative C will also include development of a new storage reservoir adding an additional 135 MG of storage. The new storage reservoir will be built adjacent to the existing reservoirs as shown in **Figure 11**. As with Alternative B, when new storage is constructed, some operational irrigation land will be lost. All new land will be developed to meet any applicable reclamation permit and storm water permit requirements. This will include fencing, signage, backflow prevention, tailwater facilities, and flood protection if necessary.

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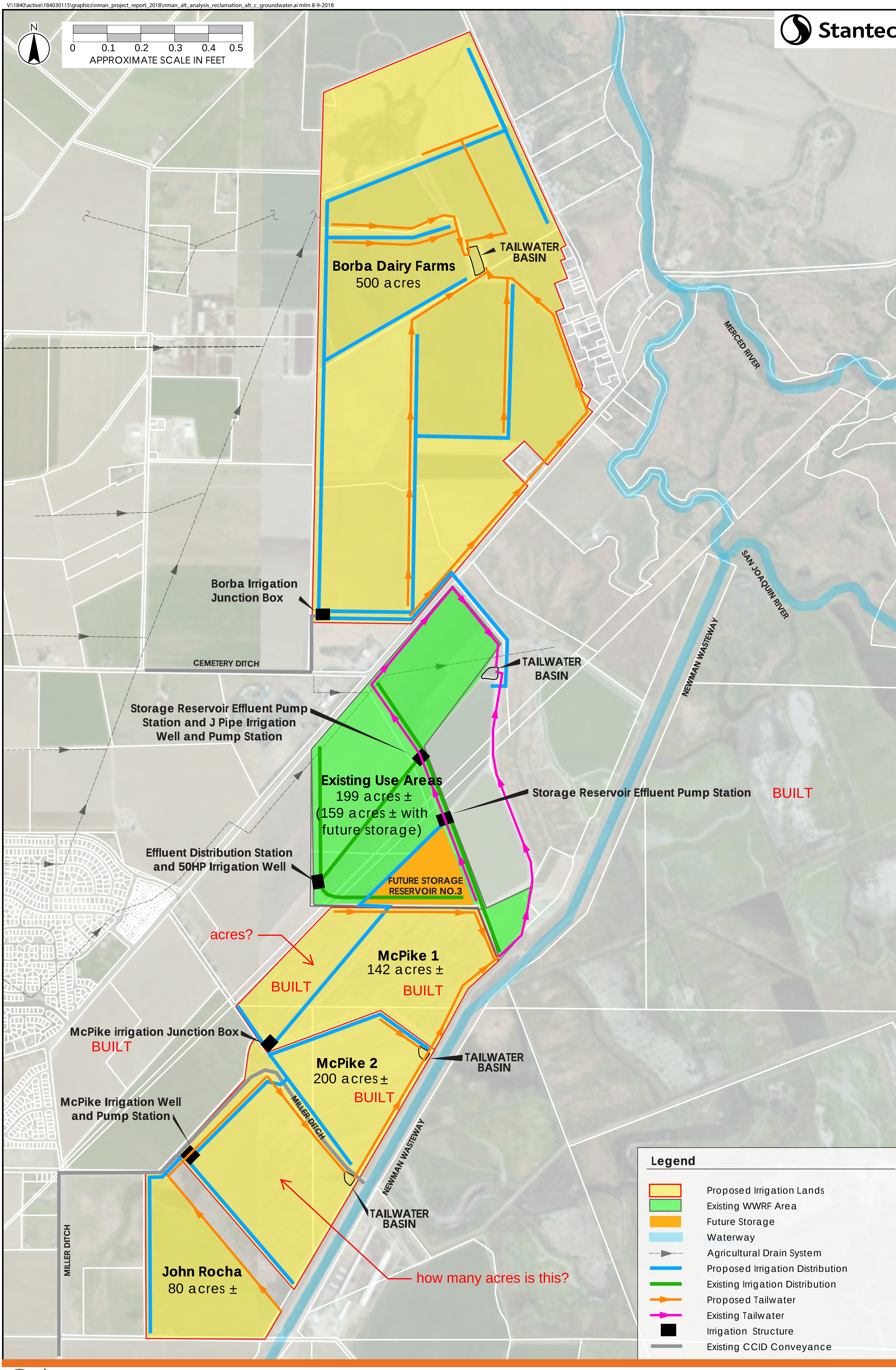

Figure 11
Reclamation Alternative C, Groundwater

6.1.3.3 Alternative C Costs

The cost for implementing Alternative C improvements is presented in **Table 8**. These costs include use area improvements, storage improvements, an irrigation pump station upgrade, construction of an additional irrigation well, and annual operations and maintenance costs.

Table 8 Alternative C Costs

Capital Improvements	Cost[a]
Effluent Pump Station Upgrade	$165,000
Use Area Improvements	$9,759,000
Additional Wells	$2,267,000
Additional Storage	$4,995,000
Construction Cost Subtotal	**$17,186,000**
Engineering 20%	$3,437,200
Environmental 10%	$1,718,600
Contingency 30%	$5,155,800
Total Capital Cost	**$27,498,000**
Annual O&M[b]	**Cost[a]**
Annual Irrigation Pumping Costs	$27,000
Groundwater Pumping Costs	$43,000
Operations Personal/Labor Costs	$383,000
Repair and Maintenance	$13,000
O&M Subtotal	$466,000
O&M Present Worth	$8,031,000
Salvage Value[c]	($7,877,000)
Total Present Worth	**$27,652,000**

(a) All costs are based on the same cost basis; Engineering News Record (ENR) Construction Cost Index (CCI) of 11,116, July 2018
(b) Annual O&M costs above and beyond what is being spent at the existing facility for O&M.
(c) Salvage value is based on a project useful life of 25 years

6.1.4 Reclamation Alternative D Reverse Osmosis

Alternative D presents the option of using reverse osmosis (RO) to reduce the salinity of the WWTRF effluent to an acceptable level to be used for irrigation or to be discharged into the San Joaquin River. Capital costs for a RO facility will be very high (at least $16 million) and will also have extremely high O&M costs which will include brine management (at least $500,000 annually). This alternative was included here for completeness, and to clarify that RO will not be considered at this time to address the wastewater salinity management for the City of Newman. Additionally, the City met with the executive officer of the Regional Board who recognizes that controlling effluent salinity by reverse osmosis treatment is not economically feasible for a community like Newman.

6.1.4.1 Alternative D Water Balances

Water balances presenting the irrigation and land requirements for Reclamation Alternative D are presented in **Appendix C.** A summary of the land, water, and storage needs for this alternative are presented in **Table 6** above. The water balances indicate that at full buildout (2.4 Mgal/d) Alternative D will require 531 acres of reclamation land, 527 MG of additional irrigation water (with an estimated annual volume weighted EC of 1,571 µmhos/cm in a typical year), and 392 MG of available storage. The volume and salinity of irrigation water at the WWTRF can vary significantly under different conditions and these water balances are only an estimate of the average and 100-year rainfall conditions with the specific improvements described under this scenario.

6.1.4.2 Alternative D Storage and Land Requirements

As described above the water balances for Alternative D indicate that 531 acres of irrigated land and 392 MG of storage will be required for full treatment plant buildout at 2.4 Mgal/d. The required land will include the City's existing reclamation Land (LAA1, LAA2, LAA3, & LAA4), McPike 1(LAA5), and McPike 2 (LAA6).

6.1.4.3 Alternative D Costs

The cost for implementing Alternative D improvements is presented in **Table 9**. These costs include use area improvements, storage improvements, an irrigation pump station upgrade, construction of RO treatment, and annual operations and maintenance costs.

Table 9 Alternative D Costs

Capital Improvements	Cost[a]
Effluent Pump Station Upgrade	$165,000
Use Area Improvements	$5,497,000
RO Treatment	$16,000,000
Additional Storage	$4,995,000
Construction Cost Subtotal	**$26,657,000**
Engineering 20%	$2,665,700
Environmental 10%	$2,665,700
Contingency 30%	$7,997,100
Total Capital Cost	**$39,986,000**
Annual O&M[b]	**Cost[a]**
Annual Irrigation Pumping Costs	$11,000
Groundwater Pumping Costs	$10,000
RO O&M	$500,000
Operations Personal/Labor Costs	$149,000
Repair and Maintenance	$5,000
O&M Subtotal	$675,000
O&M Present Worth	$11,633,000
Salvage Value[c]	$5,746,000
Total Present Worth	**$26,655,000**

(a) All costs are based on the same cost basis; Engineering News Record (ENR) Construction Cost Index (CCI) of 11,116, July 2018
(b) Annual O&M costs above and beyond what is being spent at the existing facility for O&M.
(c) Salvage value is based on a project useful life of 25 years

6.2 TREATMENT ALTERNATIVES

The following five treatment alternatives were considered for improving the WWTRF. They are described in greater detail in this section.

- Aerated Ponds – Alternative 1
- Pre-treat Saputo Anaerobically – Alternative 2
- Activated Sludge with Nitrogen Removal – Alternative 3
- Advanced Facultative Ponds Anaerobic/Aerobic – Alternative 4
- Improvement of Existing WWTRF and Separate Treatment System for Future flows – Alternative 5

6.2.1 Aerated Ponds – Alternative 1

As indicated in Section 2.0, although BASIN-1 is designed to be fully aerobic, it is currently operated as an anaerobic basin with only 90 HP which is much less than the design power requirements of 280 HP (1991 Expansion Drawings by Larry Walker & Associates).

Due to the high influent wastewater strength (BOD concentration) at the WWTRF resulting from waste discharged by Saputo, if partially mixed aerated ponds are assumed in the model, higher than typical aeration energy will be required in the first pond, resulting in very high unit horsepower per unit volume. Thus, the dual power pond design methodology lends itself well to the Newman WWTRF. The concept of dual power ponds is that the first pond would be designed as a completely mixed pond where the heterotrophic bacteria oxidize organic load similar to an aerated basin in an activated sludge process. The effluent from the first pond (mixed liquor) will flow by gravity to the downstream pond(s) that act as passive clarifier ponds. Solids will settle in these ponds and will undergo anaerobic degradation. After a few years, the ponds will need to be drained and the sludge hauled away. For this reason, at least two settling ponds will be required. Enough aeration is added in the settling ponds to supply the BOD reduction in the liquid column and meet the benthic demand.

As shown in **Table 10**, to provide the existing WWTRF capacity of 1.25 Mgal/d, ADWF, 7.0 acres would be required for settling ponds and would need to be expanded to 10.9 acres to meet the long-term conditions. The existing BASIN-2 (5 ac pond) could serve as a settling pond, but would need to be excavated an additional 2 feet increasing its depth to 10 feet. A second 6-acre pond would be required under current conditions so that one pond can be taken out of service during sludge drying and hauling. A third, 6 acre settling pond would be required for the long-term condition. The second and third ponds could be constructed west of BASIN-2 as shown in **Figure 12**.

Table 10 Design Criteria – Aerated Ponds, Alternative 1 (Dual Power Ponds)

	Existing Conditions	Near Term	Long Term
Influent Parameters			
Flow, mgd	1.25	1.5	2.4
Volume of Aeration Basin 1, Mgal	7	7	7
Number of Settling Ponds	2	2	2 3?
BOD mg/L(1)	680	598	503.8
BOD Load, lb/day(1)	7090	7480	10080
Temperature, degrees	27	27	27
Aeration Basin 1			
HRT and MCRT, days	5.6	4.7	2.9
Power Required, hp	360	380	520
power per unit volume HP/Mgal	51	54	74
Settling Ponds			
Area of Settling Ponds, Acres	7.0	7.6	10.9
Total HP required	122	132	190
Total Volume of Ponds (assume depth of 10 feet (2 ft sludge and 8 ft water cap), Mgal	21	22	32
Sludge Accumulation, lb/d	4550	4900	7150
Sludge Accumulation, gpd	10492	11299	16487
Sludge Accumulation, Mgal/year	4	4	6
Sludge Accumulation, ft3/year	512,000	551,000	805,000
Area of Settling Ponds, ft2	305,000	330,000	475,000
Sludge blanket depth rising rate, ft/year	1.7	1.7	1.7
Total Horsepower Required	480	510	710

(1) Values are for Typical Municipal BOD. Measured BOD at the WWTP will be higher due to increased kinetics of the combined dairy and municipal waste

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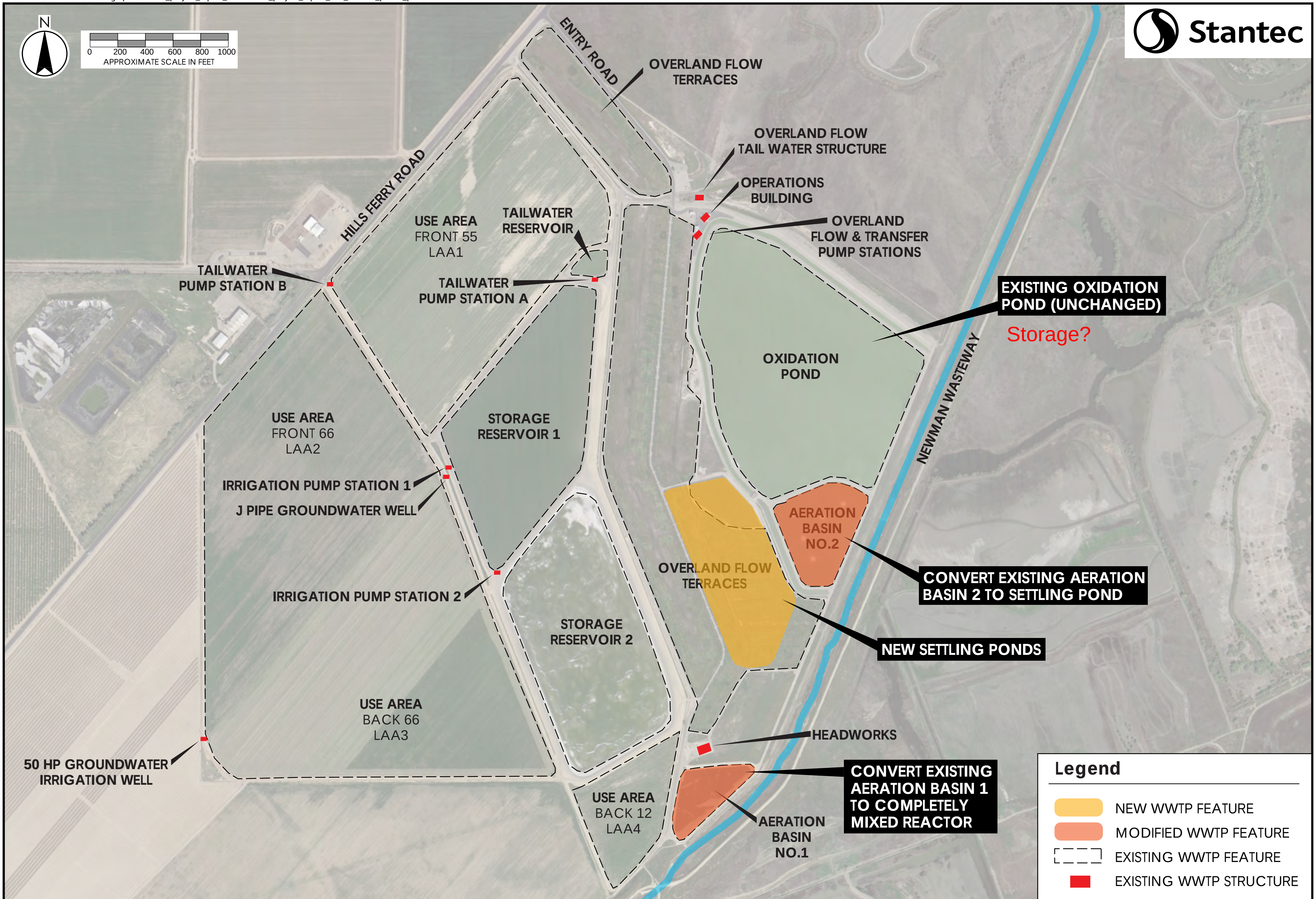

Figure 12
Aerated Ponds, Treatment Alternative 1 - Plan View

All costs appear way low

Table 11 Opinion of Probable Cost - Aerated Ponds, Alternative 1

	Existing Conditions	Near Term	Long Term
CAPITAL COST			
Headworks	**$650,000**		
Aerobic Pond 1			
Sludge Removal	$50,000		
Lining	$150,000		
Aerators	$230,000	$60,000	$200,000
Piping	$75,000		
Subtotal	**$505,000**	**$60,000**	**$200,000**
Settling Ponds			
Modify Aeration Basin 2	$400,000		
6 Ac pond with ashphalt bottom	$1,100,000	$1,100,000	
Subtotal	**$1,500,000**	**$1,100,000**	
Electrical	**$132,750**	**$58,000**	**$10,000**
Total Base Construction Cost	$2,787,750	$1,218,000	$210,000
Contingencies 20%	$558,000	$244,000	$42,000
Subtotal	$3,345,750	$1,462,000	$252,000
General Conditions, Overhead, Profit @ 20%	$669,000	$292,000	$50,000
Total Construction Cost	**$4,015,000**	**$1,754,000**	**$302,000**
Engineering, Admin, Environmental @ 25%	$1,004,000	$439,000	$76,000
Incremental Capital Cost	$5,019,000	$2,193,000	$378,000
Total Capital Cost	**$5,019,000**	**$7,212,000**	**$7,590,000**
O&M COST			
Annual Aeration Cost	$314,000	$333,000	$464,000
Annual Pond Leaning and Sludge Hauling Cost	$40,000	$60,000	$80,000
Total Annual Cost	**$354,000**	**$393,000**	**$544,000**
Present Worth of O&M Cost	**$5,267,000**	**$5,847,000**	**$8,093,000**
TOTAL LIFE CYCLE COST	**$10,286,000**	**$13,059,000**	**$15,683,000**

need new sewer or force main

6.2.2 Pre-Treat Saputo Anaerobically – Alternative 2

This alternative includes a separate anaerobic treatment process for the Saputo dairy waste. The pretreatment system would be located at the WWTRF site. This system would be designed such that the effluent from the pre-treatment system would have the same strength as the municipal wastewater and would flow to the existing pond system for further treatment. This alternative will require the dairy waste to be separately conveyed by gravity to the WWTRF site. A tentative location of the gravity line and the pretreatment system is shown in **Figure 13**.

The combined domestic waste and anaerobically pretreated dairy waste effluent will be polished in the existing WWTRF. The plant will be modified to operate as a dual power pond system where the load will be oxidized in the first pond and the mixed liquor will settle in downstream settling ponds where it can be anaerobically digested.

To provide 1.25 Mgal/d, ADWF capacity, minor modifications to the existing WWTRF will be required, including construction of a splitter structure and adding/relocating some aerators. The depth of BASIN-2 (5 acre) can function as a settling pond but its depth would need to be increased to 10 feet. A second 4.4-acre pond is needed initially, to allow one pond to be taken out of service during sludge drying and hauling. Under long term conditions, a third 4.4-acre pond will be required. An opinion of the probable cost of this alternative is presented in **Table 13.**

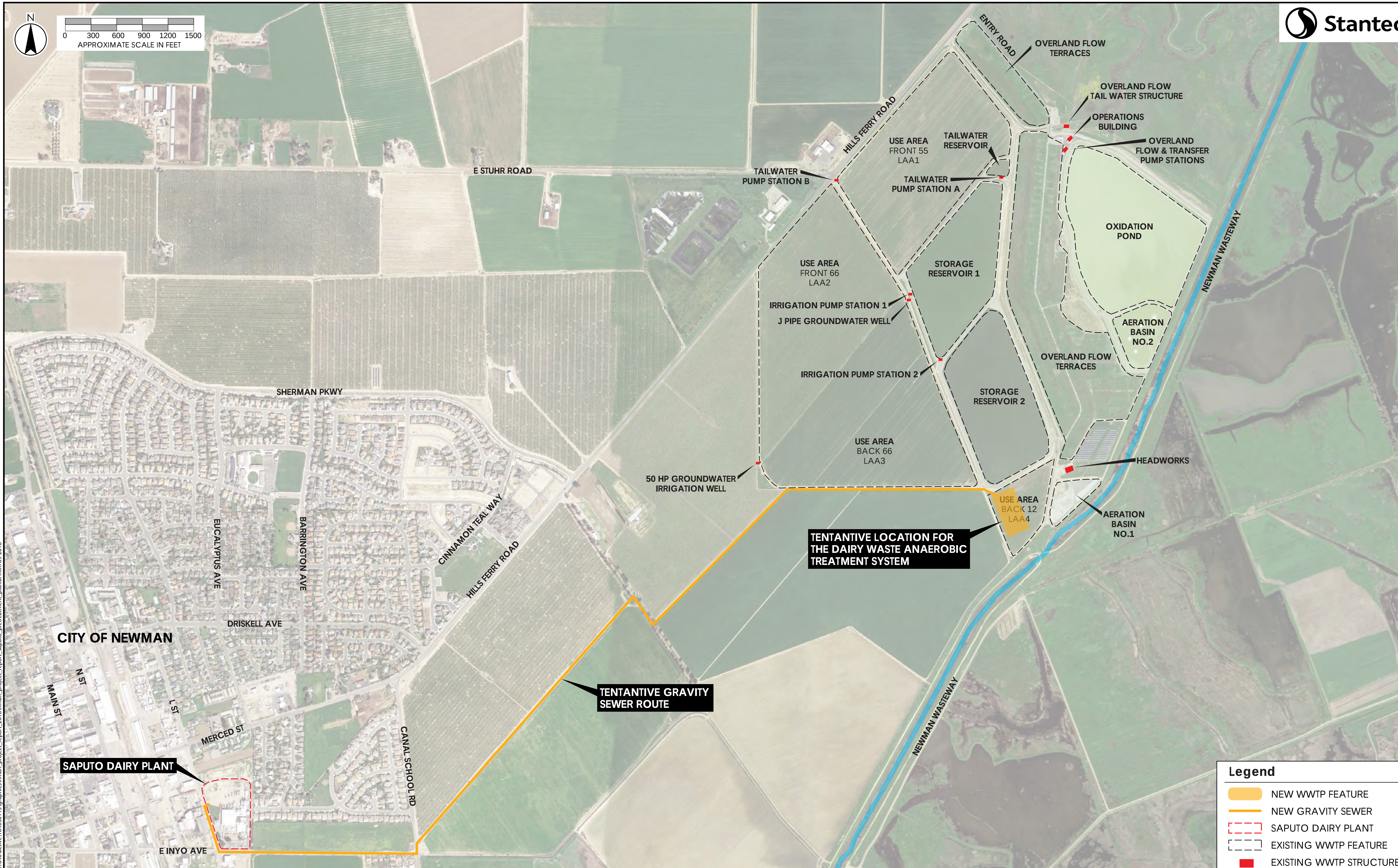

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Figure 13
Saputo Pretreatment, Treatment Alternative 2 - Plan View

Table 12 Design Criteria – Saputo Pretreatment, Alternative 2

	Existing Conditions	Near Term	Long Term
Influent Parameters			
Flow, mgd	1.25	1.5	2.4
Volume of Aeration Basin 1, Mgal	7	7	7
Number of Settling Ponds	2	2	2
BOD mg/L	347	347	347
BOD Load, lb/day	3617	4341	6946
Temperature, degrees	27	27	27
Aeration Basin 1			
HRT and MCRT, days	5.6	4.7	2.9
Power Required, hp	190	220	360
Settling Ponds			
Minimum Area Required for Settling Ponds, Acres	3.6	4.4	7.6
Total HP required	62	76	132
Total Volume of Ponds (assume depth of 10 feet (2 ft sludge and 8 ft water cap)), Mgal	10	13	22
Sludge Accumulation, lb/d	2350	2900	4900
Sludge Accumulation, gpd	5419	6687	11299
Sludge Accumulation, Mgal/year	2	2	4
Sludge Accumulation, ft3/year	264,000	326,000	551,000
Area of Settling Ponds, ft2	155,000	190,000	330,000
Sludge blanket depth rising rate, ft/year	1.7	1.7	1.7
Total Horsepower Required	250	300	490

Table 13 Opinion of Probable Cost – Saputo Pretreatment, Alternative 2

	Existing Conditions	Near Term	Long Term
CAPITAL COST			
Gravity Sewer from Dairy Plant to WWTP Site	**$1,320,000**		
Anaerobic Pre-Treatment System	**$3,400,000**		
Headworks	**$650,000**		
Aerobic Pond 1			
Sludge Removal	$50,000		
Lining	$150,000		
Aerators	$70,000	$130,000	$270,000
Splitter Structure & Piping	$175,000		
Subtotal	**$445,000**	**$130,000**	**$270,000**
Settling Ponds			
Modify Aeration Basin 2	$400,000		
5 Ac pond with ashphalt bottom	$920,000		$920,000
Subtotal	**$1,320,000**		**$920,000**
Electrical	**$581,500**	**$6,500**	**$59,500**
Total Base Construction Cost	$6,485,000	$130,000	$1,190,000
Contingencies 20%	$1,297,000	$26,000	$238,000
Subtotal	$7,782,000	$156,000	$1,428,000
General Conditions, Overhead, Profit @ 20%	$1,556,000	$31,000	$286,000
Total Construction Cost	**$9,338,000**	**$187,000**	**$1,714,000**
Engineering, Admin, Environmental @ 25%	$2,335,000	$47,000	$429,000
Incremental Capital Cost	$11,673,000	$234,000	$2,143,000
Total Capital Cost	**$11,673,000**	**$11,907,000**	**$14,050,000**
O&M COST			
Annual O&M Cost of the Pretreatment System	$38,000	$50,000	$60,000
Annual Aeration Cost of the Aerated Pond Plant	$163,000	$196,000	$320,000
Annual Pond Leaning and Sludge Hauling Cost	$40,000	$60,000	$80,000
Total Annual Cost	**$241,000**	**$306,000**	**$460,000**
Present Worth of O&M Cost	**$3,585,000**	**$4,553,000**	**$6,844,000**
TOTAL LIFE CYCLE COST	**$15,258,000**	**$16,460,000**	**$20,894,000**

6.2.3 Activated Sludge with Nitrogen Removal – Alternative 3

If it is determined that groundwater degradation is occurring due to nitrogen in the applied effluent, a secondary treatment process that removes nitrogen would be required. The most commonly used activated sludge system is the oxidation ditch technology. Other technologies are available. However, for the purpose of screening alternatives in this Project Report, only the oxidation ditch will be considered. To provide capacity equal to the existing WWTRF facilities (1.25 Mgal/d, ADWF), two ditches and two clarifiers would be necessary. Under near-term conditions, a third secondary clarifier would be added. At long-term condition, a third ditch and a fourth clarifier would be required.

This alternative assumes sludge generated from the activated sludge process would be stored in sludge storage ponds. BASIN-2 can be repurposed to be a sludge holding basin. Some modifications to BASIN-2 will be required, including a concrete asphalt bottom and side lining. A second, approximately 6-acre pond will also be required to allow one sludge pond to be taken out of service for sludge drying and cleaning. A third sludge storage pond will be required for the long-term conditions.

A summary of the oxidation ditch system components is summarized in **Table 14** and an opinion of probable costs (Capital and O&M) is presented in **Table 15.**

Table 14 Design Criteria – Activated Sludge with Nitrogen Removal, Alternative 3

Item	Unit	Initial Phase 1.25 mgd	Near Term 1.5 mgd	Long Term 2.4 mgd
Anoxic Basins				
Number	EA	2	2	3
Volume (Each)	Mgal	0.42	0.42	0.42
Average Liquid Depth	ft	16.25	16.25	16.25
Anoxic Mixers				
Type	-	Submersible	Submersible	Submersible
Number per Basin	EA	2	2	2
Oxidation Ditches				
Number	EA	2	2	3
Volume (Each)	Mgal	1.13	1.13	1.13
Average Liquid Depth	ft	16.25	16.25	16.25
Oxidation Ditch Mixers				
Type	-	Banana Blade	Banana Blade	Banana Blade
Number per Basin	EA	2	2	2
Aeration Diffusers				
Type	-	Fine Bubble	Fine Bubble	Fine Bubble
Submergence	ft	16	16	16
Mixed Liquor Recycle Pumps				
Type	-	Wall	Wall	Wall
Number per Train	EA	2	2	2
Aeration Blowers				
Number	EA	3	3	4
Type	-	Positive Displacement	Positive Displacement	Positive Displacement
Secondary Clarifiers				
Number	EA	2	3	4
Diameter	ft	75	75	75
Side Water Depth	ft	14	14	14
RAS Pump Station				
Number of Pumps	EA	3	4	5
Type	-	Screw Centrifugal	Screw Centrifugal	Screw Centrifugal

Table 15 Opinion of Probable Cost – Activated Sludge with Nitrogen Removal, Alternative 3

	Existing Conditions	Near Term	Long Term
CAPITAL COST			
Headworks	**$650,000**		
Oxidation Ditches	**$5,800,000**		**$2,900,000**
Secondary Clarifiers	**$2,400,000**	**$1,200,000**	**$1,200,000**
RAS/WAS Pump Station	**$700,000**	**$50,000**	
Sludge Storage Ponds			
Modify Aeration Basin 2	$400,000		
6 Ac pond with ashphalt bottom	$1,100,000		$1,100,000
Subtotal	**$1,500,000**		**$1,100,000**
Electrical and Instrumentation	**$2,210,000**	**$250,000**	**$1,040,000**
Total Base Construction Cost	$13,260,000	$1,500,000	$6,240,000
Contingencies 20%	$2,652,000	$300,000	$1,248,000
Subtotal	$15,912,000	$1,800,000	$7,488,000
General Conditions, Overhead, Profit @ 20%	$3,182,000	$360,000	$1,498,000
Total Construction Cost	**$19,094,000**	**$2,160,000**	**$8,986,000**
Engineering, Admin, Environmental @ 25%	$4,774,000	$540,000	$2,247,000
Incremental Capital Cost	$23,868,000	$2,700,000	$11,233,000
Total Capital Cost	**$23,868,000**	**$26,568,000**	**$37,801,000**
O&M COST			
Annual Aeration Cost	$122,000	$129,000	$187,000
Other Energy Costs	$31,000	$32,000	$47,000
Annual Pond Cleaning and Sludge Hauling Cost	$40,000	$60,000	$80,000
Total Annual Cost	**$193,000**	**$221,000**	**$314,000**
Present Worth of O&M Cost	**$2,871,000**	**$3,288,000**	**$4,672,000**
TOTAL LIFE CYCLE COST	**$26,739,000**	**$29,856,000**	**$42,473,000**

6.2.4 Advanced Facultative Ponds Anaerobic/Aerobic- Alternative 4

This alternative involves the design of an Advanced Integrated Wastewater Pond System, type II (AIWPS, type II), which was developed by Dr. William Oswald at the University of California, Berkeley. This system consists of an Advanced Facultative Pond (AFP) followed by aerated ponds for polishing. The AFP contains a deep anaerobic digestion and methane fermentation pit within an aerobic pond around it (see **Figure 14**). The influent wastewater will be introduced at the bottom of the anaerobic zone, where it flows upward through an anaerobic sludge blanket.

The effluent from the anaerobic pond will flow to the aerated pond on the outside. Surface aerators would be provided to oxidize the remaining organic load and to control odor. One pond will be required for each of the development phases (existing, near term and long term). Pond sizes and aeration requirements for each phase would be as listed in **Table 16**. Ponds 1 and 2 can be constructed west of BASIN-2. At buildout, BASIN-1 will be demolished and the third AFP will be constructed (see **Figure 14**). The effluent from the AFPs will be directed to the existing BASIN-2 for further treatment (see **Figure 15**). An opinion of the capital and O&M cost of this alternative is summarized in **Table 17.**

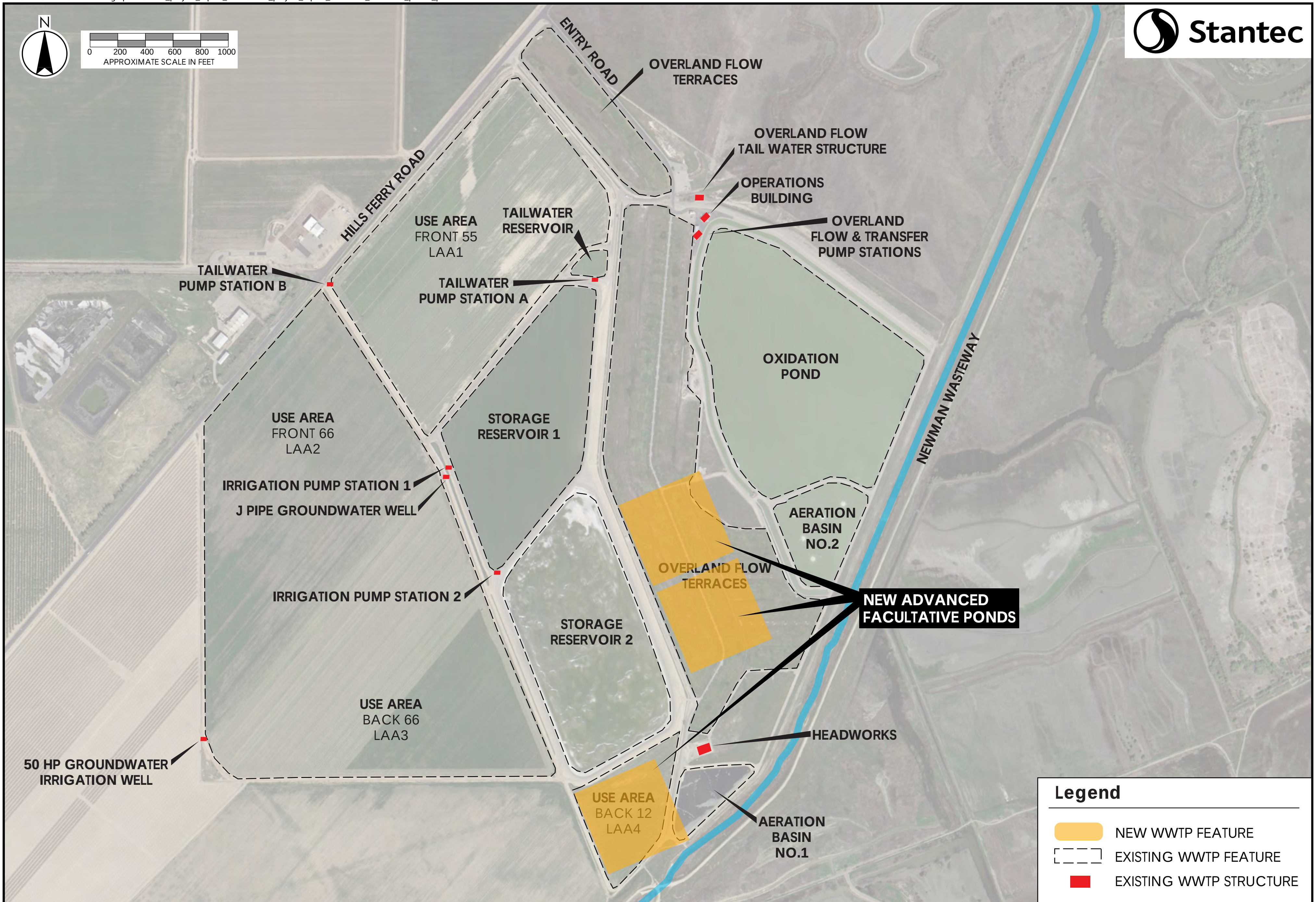

Figure 14
Treatment Alternative 4, Advanced Facultative Ponds

Table 16 Design Criteria – Advanced Facultative Ponds, Alternative 4

	Existing Conditions	Near Term	Long Term
Influent Parameters What is this?			
Flow, mgd	1.25	1.5	2.4
Number of ADF Ponds	2	2	2 3?
BOD mg/L	680	598	504
BOD Load, lb/day	7089	7481	10088
AFP (The Anaerobic Zone)			
Total Anaerobic Volume Required, Mgal	8	8	11
Recommended Number of Anaerobic Ponds, -	2	2	3
Recommended Anaerobic Volume per Pond, Mgal	4	4	4
Recommended Total Anaerobic Volume, Mgal	8	8	12
AFP (The Aerated Zone)			
Volume of Aerobic Zone, Mgal	8	8	11
HP requirements, HP	204	209	259
Aeration Basin 2			
Volume of Aeration Basin 2, Mgal	9	9	9
HP requirements, HP	30.7	28.1	24.7

Why does HP go down with increased flow?

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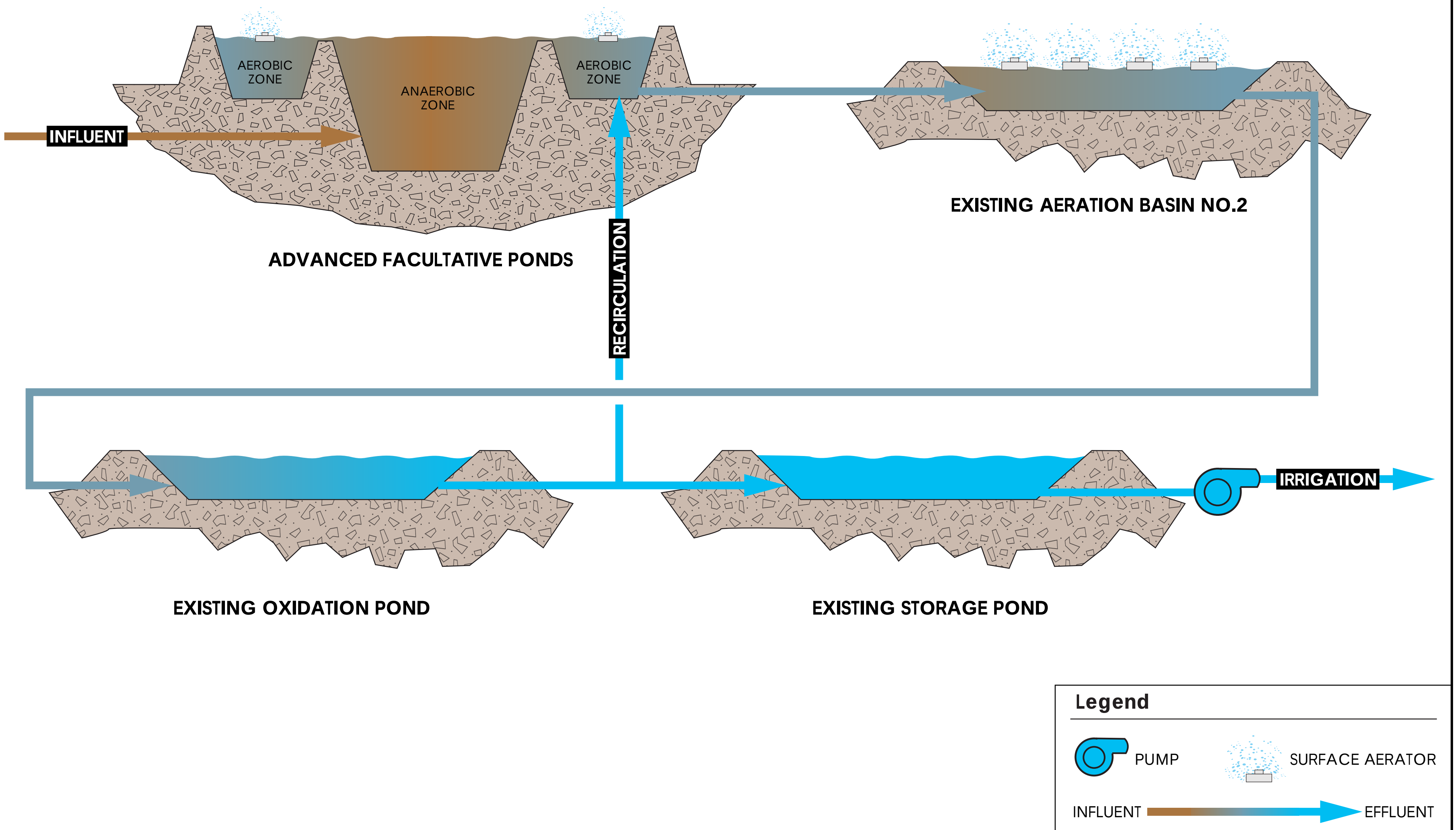

Figure 15

Treatment Alternative 4, Advanced Facultative Ponds - Flow Diagram

Table 17 Opinion of Probable Cost – Advanced Facultative Ponds, Alternative 4

	Existing Conditions	Near Term	Long Term
CAPITAL COST			
Headworks	**$650,000**		
Decommissioning of AB #1			**$200,000**
Advanced Facultative Pond	**$2,280,000**		**$1,140,000**
Aerators	**$230,000**	**$30,000**	**$120,000**
Electrical	**$158,000**	**$1,500**	**$63,000**
Total Base Construction Cost	$3,318,000	$31,500	$1,523,000
Contingencies 20%	$664,000	$6,000	$305,000
Subtotal	$3,982,000	$37,500	$1,828,000
General Conditions, Overhead, Profit @ 20%	$796,000	$8,000	$366,000
Total Construction Cost	**$4,778,000**	**$46,000**	**$2,194,000**
Engineering, Admin, Environmental @ 25%	$1,195,000	$12,000	$549,000
Incremental Capital Cost	$5,973,000	$58,000	$2,743,000
Total Capital Cost	**$5,973,000**	**$6,031,000**	**$8,774,000**
O&M COST			
Annual Aeration Cost	$149,000	$151,000	$181,000
Annual Pond Cleaning and Sludge Hauling Cost	$40,000	$60,000	$80,000
Total Annual Cost	**$189,000**	**$211,000**	**$261,000**
Present Worth of O&M Cost	**$2,812,000**	**$3,139,000**	**$3,883,000**
TOTAL LIFE CYCLE COST	**$8,785,000**	**$9,170,000**	**$12,657,000**

6.2.5 Improvement of Existing WWTRF and Separate Treatment System for the Long-Term Flows – Alternative 5

This alternative would include three stages: (1) Minimum improvements to the existing system for the existing flows; (2) creating a new Aeration Pond #3 (BASIN-3) within the oxidation pond to serve up to the near-term conditions, and (3) constructing new ponds for the future users beyond the near-term flow.

6.2.5.1 WWTRF Improvement for Existing Conditions

As indicated in Section 2, although BASIN-1 was designed to be fully aerobic with 280 HP surface aerators, it is currently operated with much less horsepower and it is operating as an anaerobic pond. This fact has been acknowledged in Order R5-2018-0024. Except for where the surface aerators are located, a thick crust of scum layer is formed on the surface which helps in containing odors and maintaining the temperature in the pond.

Even though not originally engineered as an anaerobic pond, BASIN-1 seems to be efficiently reducing the load on the downstream ponds. To understand how BASIN-1 is operating and to examine its efficiency in removing BOD load, special testing was performed by H&S Environmental in March 2017 (**Appendix A**). The testing shows that BASIN-1 is operating as an anaerobic treatment process with an average BOD removal efficiency of 68%. This pond has been operated in the same manner for years and has been effectively treating the City's wastewater. BASIN-1 has been effectively acting as an anaerobic pretreatment prior to aerobic treatment implemented in BASIN-2.

The effluent weir from BASIN-1 is located in close proximity to the influent pipe. This creates a short-circuiting phenomenon and dead zones within the pond. This is not desirable. In order to remedy the short-circuiting problem, it is suggested to install floating baffles as shown in **Figure 16**. It should not be necessary to drain the pond to install the baffles.

Every few years, some of the digested sludge within BASIN-1 would need to be removed. Since it would be difficult to take the pond out of service, vactor trucks would have to be employed to withdraw the sludge from the pond while in operation. Alternatively, the City may elect to install a permanent sludge removal system. This is not desired at this time. The City is currently treating the sludge biologically and planning to inject "maintenance" doses to control the sludge level and delay the frequency of sludge removal.

Figure 16
Suggested Location for BASIN-1 Baffles – Alternative 5

6.2.5.2 WWTRF Improvements for Near-Term Conditions: Adding BASIN-3 within the Oxidation Pond

For flows greater than 1.25 Mgal/d, but less than 1.5 Mgal/d, more aeration ponds are required. The preferred approach is for the City to create a third aeration basin (BASIN-3) by baffling approximately five acres of the existing 50-acre Oxidation Pond and adding aeration equipment to this baffled area. Effluent from BASIN-1 would continue to flow to BASIN-2. Effluent from BASIN-2 would flow to the newly partitioned BASIN-3. The oxidation pond would receive effluent from BASIN-3. It is recommended to construct a flow diversion structure with flow splitting/diversion capabilities directly after the existing headworks for operational flexibility. **Figure 17** shows the approximately 5-acre area of proposed BASIN-3 within the Oxidation Pond, as currently envisioned.

6.2.5.3 WWTRF Improvements for Long-Term Conditions: Adding Separate Treatment System for Future Flows

For flows greater than 1.5 Mgal/d, future connections will either be treated separately in a new pond system, or in additional baffled basins within the Oxidation Pond (if this is feasible). A new headworks and four 4.5 MG partially mixed ponds will need to be constructed. A tentative location for the new pond system (if additional aeration within the Oxidation Pond is not feasible) is shown in **Figure 17.** A schematic diagram of this alternative is shown in **Figure 18** and the opinion of probable cost for this alternative is summarized in **Table 18.**

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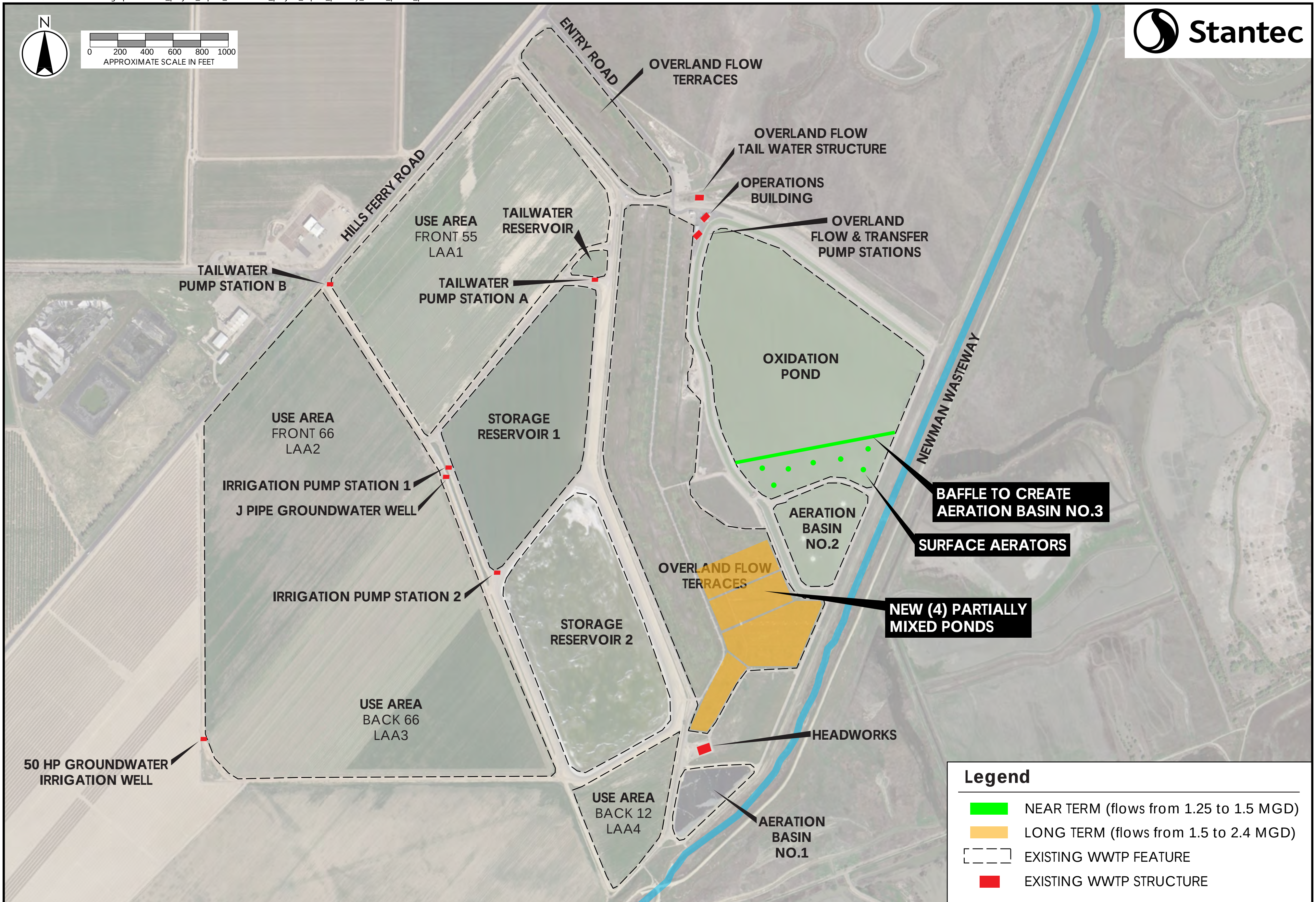

Figure 17
Treatment Alternative 5, Separate Treatment with Partially Mixed Ponds

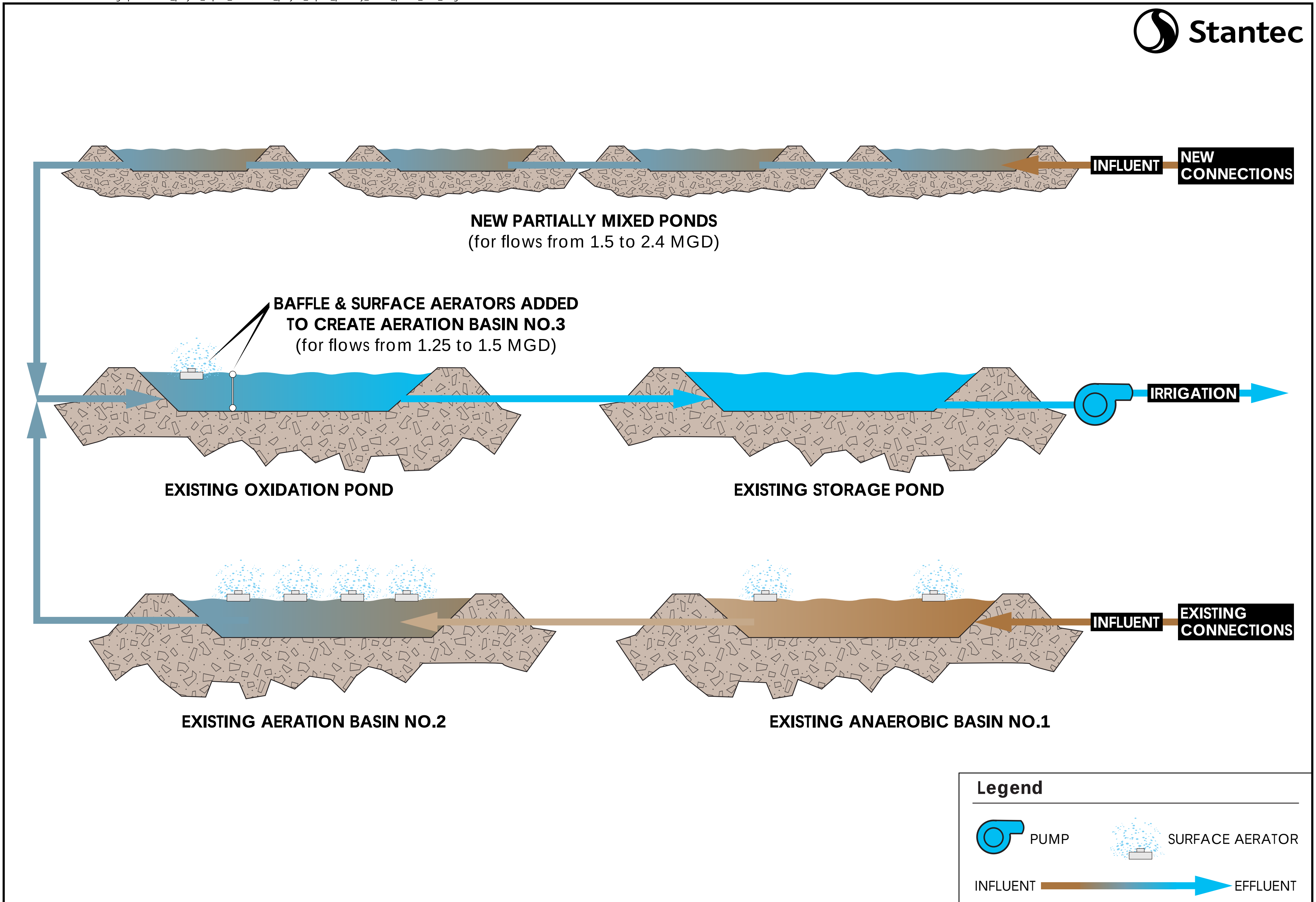

Figure 18
Treatment Alternative 5, Separate Treatment with Partially Mixed Ponds – Flow Diagram

Table 18 Opinion of Probable Cost – Separate Treatment with Partially Mixed Ponds, Alternative 5

	Existing Conditions	Near Term	Long Term
CAPITAL COST			
Headworks	**$650,000**		**$650,000**
Anaerobic Pond 1			
Sludge Removal/Treatment	$50,000		
Baffles	$150,000		
Piping	$75,000		
Subtotal	**$275,000**	**$0**	**$0**
Creating AB #3 within Ox Pond			
Baffles		$300,000	
Surface Aerators		$150,000	
Subtotal		**$450,000**	**$0**
Separate Treatment For Near and Long Term			
Clear and Grub			$19,000
Excavation			$200,000
Backfill			$224,000
Pond Liner			$444,000
Levee Road Surface (Ag Base)			$65,000
Aerators			$170,000
Piping			$40,000
Fencing			$140,000
Subtotal	**$0**	**$0**	**$1,302,000**
Electrical	**$46,250**	**$22,500**	**$97,600**
Total Base Construction Cost	**$971,250**	**$472,500**	**$2,049,600**
Contingencies 20%	$194,000	$95,000	$410,000
Subtotal	$1,165,250	$567,500	$2,459,600
General Conditions, Overhead, Profit @ 20%	$233,000	$114,000	$492,000
Total Construction Cost	**$1,398,000**	**$682,000**	**$2,952,000**
Engineering, Admin, Environmental @ 25%	$350,000	$171,000	$738,000
Incremental Capital Cost	$1,748,000	$853,000	$3,690,000
Total Capital Cost	**$1,748,000**	**$2,601,000**	**$6,291,000**
O&M COST			
Annual Aeration Cost	$163,000	$196,000	$294,000
Annual Pond Leaning and Sludge Hauling Cost	$40,000	$60,000	$80,000
Total Annual Cost	**$203,000**	**$256,000**	**$374,000**
Present Worth of O&M Cost	**$3,020,000**	**$3,809,000**	**$5,564,000**
TOTAL LIFE CYCLE COST	**$4,768,000**	**$6,410,000**	**$11,855,000**

7.0 ALTERNATIVES EVALUATION AND RECOMMENDED ALTERNATIVES

The alternatives presented above were evaluated based on the criteria presented in Section 4 and Section 5. A recommended alternative has been selected for upgrade of the treatment and reclamation facilities at the WWTRF. This section compares the alternatives based on the overall opinions of capital cost, life cycle costs, their ability to meet the project objectives, their ability to meet the state planning priorities, and water and energy efficiency.

7.1 EVALUATION OF RECLAMATION ALTERNATIVES

7.1.1 Cost Comparison

A cost comparison of the reclamations alternatives is presented in **Table 19**. The present worth value of the projects has been calculated based on a useful life of 25 years, and a discount rate of 3%. All costs are presented at ENR CCI of 11,116, July 2018. Alternative B is estimated to be the lowest cost solution.

Table 19 Reclamation Alternatives Cost Comparison[a]

		CCID	GW	RO
Cost Item	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
Total Capital Cost	-	$20,768,000	$27,498,000	$39,986,000
O&M Present Worth[b]	-	$3,757,000	$8,031,000	$11,633,000
Total Present Worth	-	$17,386,000	$27,652,000	$26,655,000

(a) All costs are at an ENR CCI cost basis of 11,116, July 2018
(b) All O&M costs presented represent costs beyond what is being spent on the existing facilities.

7.1.2 State Planning Priorities

The state planning priorities identified in Government Code 65041.1 are intended to promote equity, strengthen economy, protect the environment, and promote public health and safety in the state, including urban, suburban, and rural communities. These priorities are described below:

- **Promoting infill development and equity** by rehabilitating, maintaining, and improving existing infrastructure that supports infill development and appropriate reuse and redevelopment of previously developed, underutilized land that is presently served by transit, streets, water, sewer, and other essential services, particularly in underserved areas, and to preserve cultural and historic resources.

- **Protecting the Environment and agricultural resources** by protecting, preserving, and enhancing the state's most valuable natural resources, including landscapes such as farms, range, and forest lands, natural lands such as wetlands, watersheds, wildlife habitats, and other wildlands, recreation lands such as parks, trails, greenbelts, and other open space, and landscapes with locally unique features and areas identified by the state as deserving special protection.

- **Encouraging efficient development patterns** by ensuring that any infrastructure associated with the development, other than infill development supports new development that does all of the following:

    - Uses land efficiently
    - Is built adjacent to existing developed areas to the extent consistent with the priorities specified pursuant to subdivision (b).
    - Is located in an area appropriately planned for growth.
    - Is served by adequate transportation and other essential utilities and services.
    - Minimizes ongoing costs to tax payers.

The Alternatives considered in this evaluation and presented in this project report address various of the state planning priorities identified in California Code 65041.1.

7.1.2.1 Promoting Infill Development:

Alternatives B and C promote infill development by increasing the total reclamation capacity in phases. As this is likely to lead to providing additional capacity to the vacant parcels within the City limits prior to providing additional capacity for the PSI development area these alternatives will support the infill development. Alternative A (Do Nothing), and Alternative D (Reverse Osmosis) will not explicitly promote infill development. Alternative A will prevent the City from providing any additional capacity for the vacant parcels within City limits. Alternative D will provide all the capacity for the vacant parcels and the PSI development at once.

7.1.2.2 Protecting the Environment:

All of the feasible alternatives would protect environmental and agricultural resources by protecting, preserving, and enhancing valuable natural resources in the project area, including working farmland, nearby wetlands, and the associated wetland wildlife habitats. Alternatives that expand the reclamation area of the WWRTF (Alternative B and Alternative C) are considered to meet this planning priority most fully as the expansion will preserve the existing farming operation occurring currently on those properties. All of the alternatives will maintain the current status of the facility as a no discharge facility, which protects the wetlands and the River adjacent to the facility where discharge used to occur.

7.1.2.3 Efficient Development Patterns:

None of the Alternatives directly address this State Planning Priority, however the City has planning guidelines and ordinances in place to encourage efficient development patterns.

7.1.3 Climate Change, Energy Efficiency, and Water Efficiency

The proposed alternatives address climate change through reuse of treated effluent. California climate change models predict a reduced snowpack and increased annual average temperature. This will likely lead to increased water scarcity and drought which is already experienced in California. Alternatives that increase water efficiency and reuse are preferable when considering climate change.

7.1.4 Recommended Reclamation Alternative

Based on the evaluation of all reclamation alternatives, Alternative B is the preferred alternative for the WWTRF reclamation improvements. Alternative B meets the project objectives, addresses two of the three state planning priorities, increases the overall water and energy efficiency of the region, and is effective in addressing climate change. Through build-out of the PSI, this alternative has the lowest O&M cost as well as the least capital investment required. This alternative requires the least amount of land and requires the least amount of supplemental irrigation water.

The City is in the process of negotiating an agreement with CCID to secure additional water for irrigation. The agreement will allow the City access to CCID water from the Miller Ditch on the McPike 2 property. It appears CCID appears to be willing to enter into an agreement of this nature, but a formal agreement cannot be put in place until the City is prepared to commit the financial resources necessary to execute and sustain the agreement. At this time the City is still in the process of planning for the improvements required to develop the infrastructure required receive CCID water. As such there is currently no agreement in place. It is the City's plan to continue to use groundwater until it is economically feasible to enter into an agreement to receive water from CCID.

The City will continue with LAA improvements on City owned land and continue to use groundwater for all supplemental irrigation until it becomes cost prohibitive to do so. Once CCID water is available its use will be maximized to the extent feasible. Based on ongoing discussions between the City and CCID it is anticipated that CCID water will be available for irrigation use approximately 60% of the time. Access to lower salinity CCID water will increase reclamation capacity of the LAAs. **Table 20** presents some estimated interim reclamation capacities if CCID water is utilized. It is unlikely that the City will commit to funding the improvements required to receive CCID water until the WWTRF is prepared to increase total capacity to an ADWF of at least 1.5 Mgal/d. Additional cost and feasibility analysis will be required to determine the most appropriate timing for acquiring CCID water. For the purposes of this analysis it has been assumed that acquisition of CCID water will be implemented after (or

Now

complete now

during) the improvements to the McPike2 property (LAA6). The anticipated phases of construction for the preferred alternative, along with associated opinions of probable costs are presented below. **Figure 19** shows the specific planned improvements required for the proposed alternative.

Table 20 Estimated Reclamation Capacities with CCID Water

Estimated ADWF Reclamation Capacity (Mgal/d)	Lands in Production	Total Irrigated Reclamation Area (acres)	Estimated CCID Irrigation (MG)	Estimated Groundwater Irrigation (MG)
1.5	LAA1, LAA2, LAA3, LAA4, and LAA5	337	253	125
2.0	LAA1, LAA2, LAA3, LAA4, LAA5 and LAA6	531 add 194 ac	355 add 102 mg	235
2.4	LAA1, LAA2, LAA3, LAA4, LAA5, LAA6, and LAA7	607	410	275

It is also possible that as the City implements the initial phases of improvement to the WWTRF and they have assessed performance under the new Order, that the need for CCID water becomes less apparent. The City should revisit these conclusions regarding the preferred approach to reclamation to serve the PSI after a reasonable period of time, perhaps 3 to 5 years.

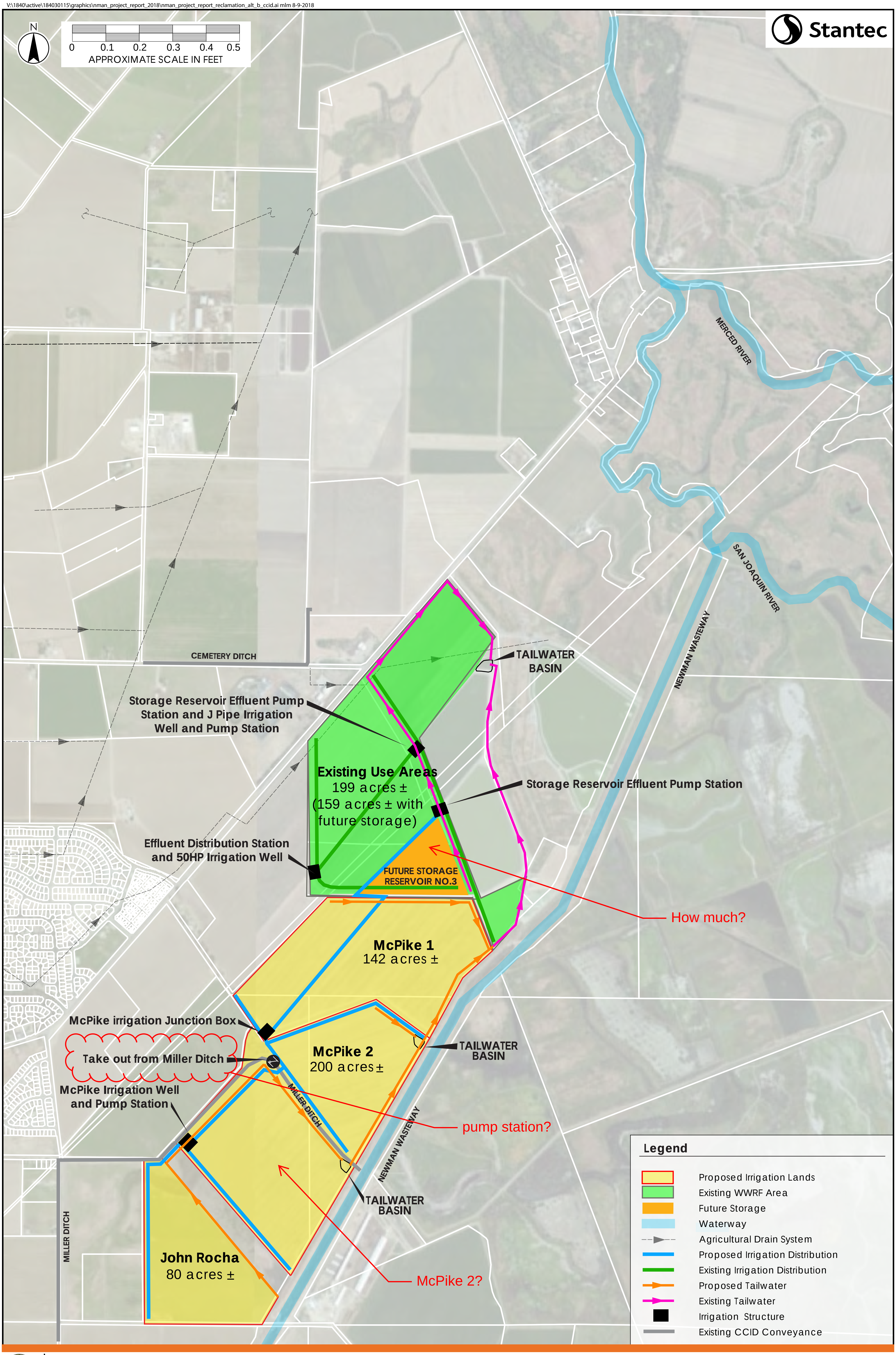

Figure 19
Recommended Alternative

7.1.5 Phasing

The City plans to implement the proposed reclamation alternative in a phased manner. This will allow the City to increase reclamation capacity as needed to keep pace with WWTRF influent flow and treatment capacity. The WDR requirements for the WWTRF recognized the planned phases for increasing the capacity of the WWTRF. The phasing of reclamation improvements for Alternative B is presented in **Table 21**. An opinion of the probable costs for the phased improvements are presented in **Table 22**.

Table 21 Reclamation Improvement Phasing

WWTRF Expansion Phase	ADWF (Mgal/d)	Land in Production	Total Irrigated Reclamation Area (acres)	Users Served	Reclamation Improvements
Existing	1.25	LAA1, LAA2, LAA3, LAA4, and LAA5	337	All existing users and a portion of vacant parcels within the City limits	McPike 1 Property done!
Phase 1	1.5	LAA1, LAA2, LAA3, LAA4, LAA5 and LAA6	531	Build out of the City limits	McPike 2 Property, CCID Improvements, Additional Storage [(a)]
Phase 2	2.4	LAA1, LAA2, LAA3, LAA4, LAA5, LAA6, and Private Lands (Borba and/or Rocha)	607	Buildout of the PSI	Improvements on Borba Farms and/or Rocha Farms, CCID Improvements, Additional Storage [(a)]

(a) The exact timing of the CCID and storage improvements has not been determined.

Table 22 Opinion of Probable Costs – Recommended Alternative with Phased Improvements [(a)]

McPike

Capital Improvements	Existing[(b)]	Phase 1	Phase 2
Effluent Pump Station Upgrade	$165,000		
Use Area Improvements	$1,452,000	$2,642,000	$1,404,000
CCID take out		P1	$56,000[(c)]
CCID Transfer Well Construction			$2,267,000[(c)]
Additional Storage			$4,995,000[(c)]
Construction Subtotal	$1,617,000	$2,642,000	$8,722,000
Engineering 20%	$323,400	$528,400	$1,744,400
Environmental 10%	[(d)]	$264,200	$872,200
Contingency 30%	$485,100	$792,600	$2,616,600
Total Capital Cost	$2,426,000	$4,227,000	$13,955,000
Annual O&M[(e)]			**Cost**
Annual Irrigation Pumping Costs	$4,000	$11,000	$13,000
Groundwater Pumping Costs	$9,000	$18,000	$15,000
Operations Personal/Labor Costs	$64,000	$153,000	$184,000
Estimated Repair and Maintenance	$2,000	$5,000	$6,000
O&M subtotal	$79,000	$187,000	$218,000
O&M Present Worth	$1,362,000	$3,223,000	$3,757,000
Total Present Worth	$3,062,000	$6,129,000	$17,010,000

(a) All costs are at an ENR CCI cost basis of 11,116, July 2018
(b) Existing costs are based on a 1.25 Mgal/d ADWF rate including the use of LAA1, LAA2, LAA3, LAA4, and LAA5.
(c) These costs assume all CCID and storage improvements will be constructed in Phase 2, however, many factors affect the timing of these improvements and they may be constructed earlier or later than expected.
(d) There are no additional anticipated environmental costs for existing conditions.
(e) All O&M costs presented represent costs beyond what is being spent on the existing facilities.

7.1.5.1 Improvements for Existing Conditions

The City is currently using groundwater for supplemental irrigation on the existing reclamation lands at their current ADWF of 1.25 Mgal/d. To accommodate the irrigation volumes required to meet the salinity and BOD loading targets in the order using groundwater to supplement effluent, the McPike 1 property will be improved to receive effluent for irrigation. The required LAA improvements and associated opinions of probable costs for the existing capacity conditions are shown in **Table 22**. No new irrigation wells will be required in order to provide supplemental water to the irrigation operation under existing flow (capacity 1.25 Mgal/d) conditions. Operations and maintenance costs are not anticipated to change dramatically from existing levels although there will likely be a small increase in pumping costs due to the increase in irrigation volume, as well as additional operational costs for the expanded irrigation and farming operations.

7.1.5.2 Improvements for Near Term Conditions

For reclamation of WWTRF effluent beyond existing flows, additional City owned land will need to be developed for reclamation. The City currently owns the McPike 2 property, and once it is developed for reclamation, it is estimated the WWTRF will have adequate reclamation capacity to manage, using the existing groundwater wells for supplemental irrigation water, build-out of the City Limits, corresponding to WWTRF influent ADWF flows of up to 1.5 Mgal/d. The required incremental improvements and associated opinions of probable costs for these flows were presented in **Table 22**.

7.1.5.3 Improvements for Long Term Conditions

This phase of development will complete the improvements required to reclaim WWTRF effluent flows for Long Term development conditions, 2.4 Mgal/d ADWF, using a combination of groundwater irrigation wells and CCID water to supplement irrigation on 607 irrigated acres. The required incremental improvements and associated costs for the Long-Term development flows assuming use of CCID water are shown in **Table 22.**

The improvements described here will likely be completed on an as needed basis as flows increase and approach the capacity of Near Term improvements. The costs shown here include the addition of the CCID takeout in the miller ditch assuming that CCID water will not be used for irrigation until flows increase beyond 1.5 Mgal/d.

Again, the City may implement the initial phases of improvement to the WWTRF, assess performance under the new Order, and determine that the need for CCID water becomes less compelling. The City should revisit these conclusions regarding the preferred approach to reclamation to serve the PSI after a reasonable period of time, perhaps 3 to 5 years, or as development conditions and servicing needs dictate.

7.2 RECOMMENDED TREATMENT ALTERNATIVE

A side by side comparison of the above evaluated alternatives reveals that Treatment Alternative 5 is the most economically feasible alternative (see **Table 23**). The advantages and disadvantages of each alternative are summarized in **Table 24**. The advantage of Alternative 5, in addition to being the least costly alternative, the simplicity of this phasing approach when it comes to apportioning the capital cost of additional treatment to serve future users. Operational and maintenance costs associated with the WWTRF will be shared by all users.

Table 23 Alternatives Comparison – Life Cycle Cost

CAPITAL COST (2017 US$)

	Alternative 1 Aerated Ponds[1]	Alternative 2 Anaerobic Pretreatment of Dairy Waste[2]	Alternative 3 Activated Sludge with Nitrogent Removal	Alternative 4 AIWSP Type II	Alternative 5 Minimum Improvement to the Existing System and Construct a New System for Future Growth[3]
Existing Conditions	**$5,019,000**	**$11,673,000**	**$23,868,000**	**$5,973,000**	**$1,748,000**
Near Term	**$7,212,000**	**$11,907,000**	**$26,568,000**	**$6,031,000**	**$2,601,000**
Long Term	**$7,590,000**	**$14,050,000**	**$37,801,000**	**$8,774,000**	**$6,291,000**
Rank	**2**	**4**	**5**	**3**	**1**

do these match previous tables?

PRESENT WORTH OF O&M

	Alternative 1 Aerated Ponds	Alternative 2 Anaerobic Pretreatment of Dairy Waste	Alternative 3 Activated Sludge with Nitrogent Removal	Alternative 4 AIWSP Type II	Alternative 5 Minimum Improvement to the Existing System and Construct a New System for Future Growth[3]
Existing Conditions	**$5,267,000**	**$3,585,000**	**$2,871,000**	**$2,812,000**	**$3,020,000**
Near Term	**$5,847,000**	**$4,553,000**	**$3,288,000**	**$3,139,000**	**$3,809,000**
Long Term	**$8,093,000**	**$6,844,000**	**$4,672,000**	**$3,883,000**	**$5,564,000**
Rank	**5**	**4**	**2**	**1**	**3**

TOTAL PRESENT WORTH

	Alternative 1 Aerated Ponds	Alternative 2 Anaerobic Pretreatment of Dairy Waste	Alternative 3 Activated Sludge with Nitrogent Removal	Alternative 4 AIWSP Type II	Alternative 5 Minimum Improvement to the Existing System and Construct a New System for Future Growth[3]
Existing Conditions	**$10,286,000**	**$15,258,000**	**$26,739,000**	**$8,785,000**	**$4,768,000**
Near Term	**$13,059,000**	**$16,460,000**	**$29,856,000**	**$9,170,000**	**$6,410,000**
Long Term	**$15,683,000**	**$20,894,000**	**$42,473,000**	**$12,657,000**	**$11,855,000**
Rank	**3**	**4**	**5**	**2**	**1**

(1) Dual Power Pond Design
(2) Pretreatment at the WWTP site. Requires about 2.5 miles of separate gravity sewer
(3) Future users (Influent flows between 1.5 Mgal/d and 2.4 Mgal/d) will send wastewater to the WWTP by a separate line

Table 24 Advantages & Disadvantages of Treatment Alternatives

Alternative	Advantages	Disadvantages
Alternative 1. Aerated ponds	• Simple to operate	• High O&M cost
Alternative 2. Anaerobic Pre-treatment of Dairy Waste	• Less O&M cost than Alternative 1	• Operation of two systems • Requires 2.5 miles of separate gravity sewer
Alternative 3. Activated Sludge with Nitrogen Removal	• Nitrogen removal	• More complicated mechanical plant • High capital cost
Alternative 4. Advanced Integrated Waste Stabilization Ponds (AIWSP)	• Least O&M cost	• May produce odor • Potential sludge rise in the summer
Alternative 5. Minimum Improvement to the Existing System and Construct a New System for Future Growth	• Least capital cost • Simple cost split between existing users and future users	• Requires separate sewer line • Operate two systems

No

7.3 ENVIRONMENTAL RESOURCES BY PROJECT ALTERNATIVE

Please see Table 2 below for an analysis of potential impacts to environmental resources by project alternative.

Resource	Proposed Project (Preferred Alternative)	Reclamation Alternatives				Treatment Alternatives				
		Alternative A: Do Nothing	Alternative B: CCID	Alternative C: Groundwater	Alternative D: Reverse Osmosis	Alternative 1: Aerated Ponds	Alternative 2: Saputo Pretreatment	Alternative 3: Activated Sludge	Alternative 4: Advanced Facultative Ponds	Alternative 5: Separate Treatment System for Future Flows
Aesthetics	No Impact	No Impact	No Impact	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	No Impact	No Impact	Less than significant with Mitigation	No Impact
Agricultural & Forestry Resources	Less than significant	No Impact	Less than significant	Less than significant	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant	Less than significant	Less than significant with Mitigation	Less than significant
Air Quality & Greenhouse Gas Emissions	Less than significant with Mitigation	No Impact	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation
Biological Resources	No Impact	No Impact	No Impact	No Impact	Potential for significant Impacts	Less than significant with Mitigation	No Impact	No Impact	Less than significant with Mitigation	No Impact
Cultural & Tribal Cultural Resources	Less than significant with Mitigation	No Impact	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation
Geology & Soils	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Hazards & Hazardous Materials	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Hydrology & Water Quality	No Impact	Less than significant.	No Impact	Less than significant with Mitigation	Potential for significant Impacts	Less than significant with Mitigation	No Impact	No Impact	Less than significant with Mitigation	No Impact
Land Use & Planning	No Impact	No Impact	No Impact	No Impact	Potential for significant Impacts	Less than significant with Mitigation	No Impact	No Impact	Less than significant with Mitigation	No Impact
Mineral Resources	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Noise	Less than significant.	No Impact	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.

Resource	Proposed Project (Preferred Alternative)	Reclamation Alternatives				Treatment Alternatives				
		Alternative A: Do Nothing	Alternative B: CCID	Alternative C: Groundwater	Alternative D: Reverse Osmosis	Alternative 1: Aerated Ponds	Alternative 2: Saputo Pretreatment	Alternative 3: Activated Sludge	Alternative 4: Advanced Facultative Ponds	Alternative 5: Separate Treatment System for Future Flows
Population & Housing	No Impact	No Impact	No Impact	No Impact	Less than significant.	Less than significant.	No Impact	No Impact	Less than significant.	No Impact
Public Services & Utilities	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.	Less than significant.
Recreation	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Transportation & Traffic	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Mandatory Findings of Significance	No Impact	No Impact	Less than significant with Mitigation	Less than significant with Mitigation	Potential for significant Impacts	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	No Impact

8.0 RECOMMENDED PROJECT FOR WHICH FUNDING IS REQUESTED

Due to the limited availability of grant funds and the status of the City of Newman as a Disadvantaged Community (DAC), the City has been advised by DFA that the application which they submit, and this Project Report, should be consistent and request only those additional funds for which the City is currently eligible. As a result, this section summarizes the possible project construction components which the City requests be funded by DFA at this time.

The recommended alternatives described in the previous section identify the WWTRF improvements required to meet the project objectives identified in this report. However, it is recognized that the City may not be eligible to receive funding for all the components of the preferred project. The City does not have adequate budget to complete all the recommended improvements at this time and has decided to complete the improvements in phases. The City has determined that the improvements required to treat sewage from new development in the primary sphere of influence will be funded by that development. Currently, increasing the reclamation land capacity to meet existing user needs is the most pressing need for the WWTRF operation. As a result, the City is requesting funding to complete the improvements to the McPike 1 (LAA5) property identified in Section 7.0.

8.1 PROJECT DESCRIPTION

The selected project includes all of the improvements required to reclaim effluent on the City owned McPike 1 property. These improvements will provide flexibility for the WWTRF to meet the objectives of its new Order under existing conditions as well as providing some of the capacity required to serve the buildout of the existing city limits. The recommended improvements for which funding is requested are shown in **Figure 20**. The improvements required to complete this project include:

- Installation of new pumps in the existing irrigation Pump Station 2 (IPS2) structure to deliver water to McPike 1 (LAA5)
- Installation of approximately 5,000 linear feet of new 18" pipe
- Installation of a new irrigation distribution box for the McPike 1 property
- Installation of new flood irrigation valves to serve the McPike 1 property
- Installation of approximately 4,000 linear feet of irrigation pipe to distribute water to the irrigation valves

8.1.1 Water and Energy Efficiencies

Reclamation inherently saves water by reusing water (and thus energy by avoiding treatment, pumping and transport of raw water). An increase in reclamation will likely result in an increase in water and energy savings for the region.

8.1.2 Design Criteria

The criteria used for selecting the recommended or preferred project are 1) overall life cycle cost and 2) ability to meet the project objectives introduced in Section 4.0. General reclamation design criteria for the WWTRF improvements were described in greater detail in Section 5.4. The expansion of the WWTRF reclamation land for the existing users is primarily driven by the need to reduce the impact of irrigation salinity on local shallow groundwater. A target annual average salinity (as measured by EC) of 2,100 has been used to determine the volumes of supplemental irrigation water and land requirements needed to protect groundwater from degradation. LAA5 (McPike1) is needed to allow the City to consistently meet this target. A water balance used to estimate annual effluent and supplemental water irrigation rates for the permitted ADWF of 1.25 Mgal/d is included in **Appendix C**. A summary of the water balance presented in **Table 25** shows that the 337 acres which would be available for reclamation irrigation with improvement to McPike 1 are estimated to provide enough reclamation land to reduce the annual average irrigation salinity below the 2,100 target. It is estimated that the expansion to LAA5 will increase reclamation land capacity to a total ADWF of approximately 1.3 Mgal/d.

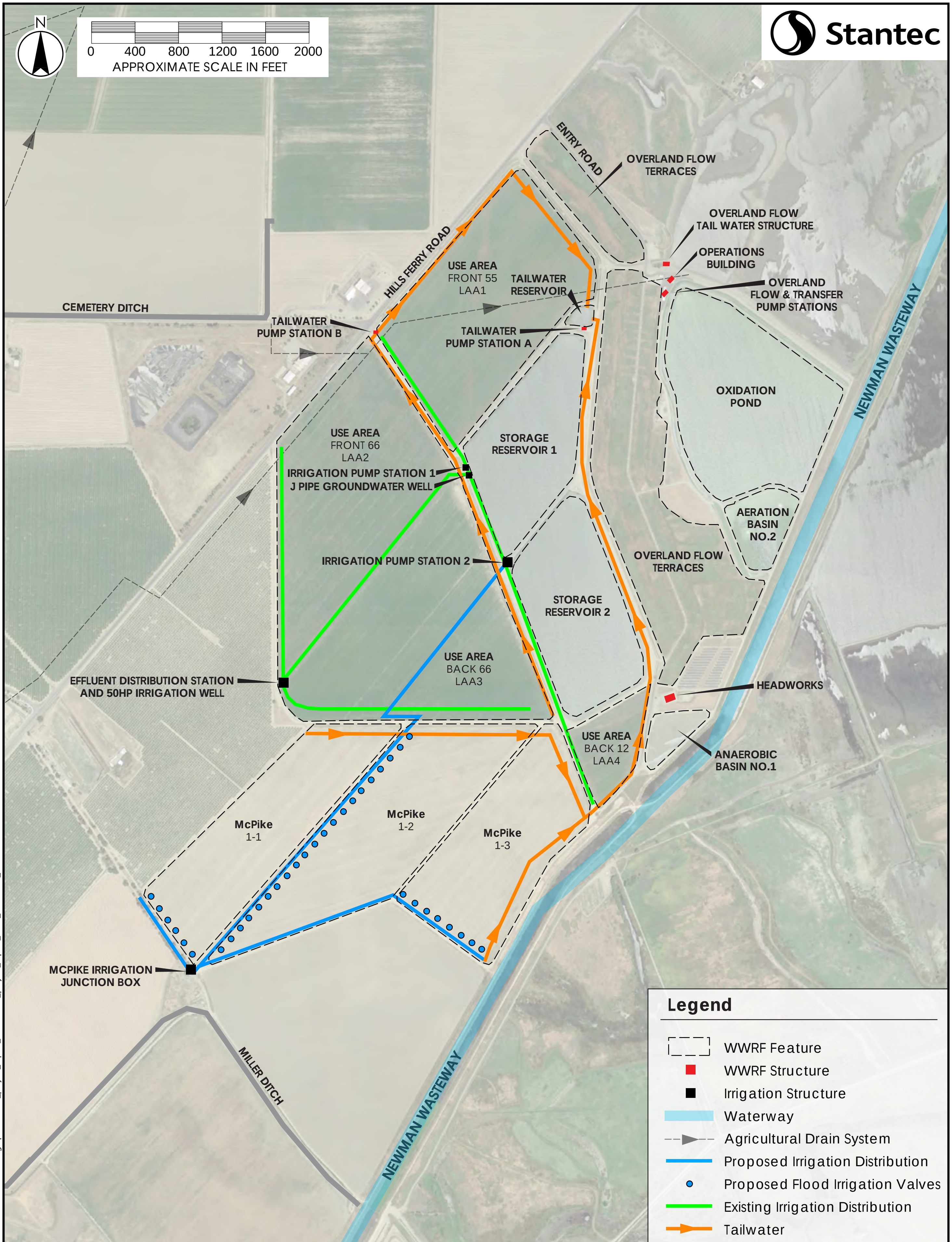

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Figure 20
Recommended Project For Which Funding Is Requested

Table 25 Water Balance Summary

Influent ADWF (Mgal/d)	Irrigation Land (Acres)	Typical Supplemental Irrigation Water (MG)	Typical Annual Average Salinity (EC)	100 Year Rainfall Storage Required (MG)
1.25	337	472	2,040	202

8.2 COST ESTIMATE AND LIFECYCLE COSTS

A cost estimate and estimated lifecycle cost is presented in **Table 26** below for the recommended project. The total estimated capital cost of the project is approximately $2,426,000 and the total estimated present worth of the project is $3,273,000. The present worth value of the project has been calculated based on a useful life of 25 years, and a discount rate of 3%. The components of the project that have an expected useful life of more than 25 years have been included in the total present value shown.

Table 26 Project Components Identified for DFA Construction Funding Costs[(a)]

Capital Improvements	Unit Cost	Cost
Effluent Pump Station Upgrade	LS	$165,000
Irrigation Distribution Lines	$140/lf	$1,234,000
Irrigation Distribution Box	LS	$14,000
Flood Irrigation Valves	$6000/each	$204,000
Construction Subtotal		**$1,617,000**
Engineering 20%		$323,400
Environmental 10%		$32,340
Contingency 30%		$485,100
Total Capital Cost		**$2,458,000**
Annual O&M[(b)]	**Unit Cost**	**Cost**
Annual Irrigation Pumping Costs	$5/acre-foot	$4,000
Groundwater Pumping Costs	$10/acre-foot	$9,000
Operations Personal/Labor Costs	$450/acre	$64,000
Estimated Repair and Maintenance	$15/acre	$2,000
O&M subtotal		$79,000
O&M Present Worth		$1,362,000
Total Salvage Value[(c)]		$726,000
Total Present Worth		**$3,094,000**

(a) All costs are at an ENR CCI cost basis of 11,116, July 2018
(b) All O&M costs presented represent costs beyond what is being spent on the existing facilities.
(c) Salvage value is based on a project useful life of 25 years.

8.3 SCHEDULE

- Submittal the Technical Package to DFA by end of September 2018.
- Completion of necessary environmental documents by the end of September 2018, certification of those documents by November 30, 2018.
- Completion of permit applications, including a biological assessment to address ESA requirements, by the end of November 2018.
- Completion of DFA construction funding application packages (General, Technical, Environmental and Financial) by the end of January 2019.
- Project Plans and Specifications completed by the end of April 2019.
- Advertise bids May 2019.
- Estimated construction Notice to Proceed date of June 2019.
- Construction completed and system operational near the end of November 2019.

8.4 REQUIRED PERMITS

- Construction SWPPP: The project is anticipated to disturb over an acre, this will require completion of a construction SWPPP prior to construction and application for coverage under the Construction General Stormwater Permit Order No. 2009-0009-DWQ.
- A Mitigated Negative Declaration was certified by the City of Newman on 11 April 2017 in accordance with the California Environmental Quality Act
- The SRF Environmental Package which includes the Environmental Review and Federal Coordination attachments.

APPENDICES

Appendix A H&S ENVIRONMENTAL, MARCH 2017 TESTING

H&S Environmental, LLC.

- Performance Evaluations
- Troubleshooting & Optimization
- Hydraulics Optimization
- Training

2122 East Leland Circle Mesa, AZ 85213 1 (480) 274-8410

March 28, 2017

Lance Perry
Wastewater Supervisor
City of Newman, CA
2600 Hills Ferry Road
Newman, CA 95360

RE: Total and Volatile Solids Report with Field Sampling Ammonia Results

Lance,

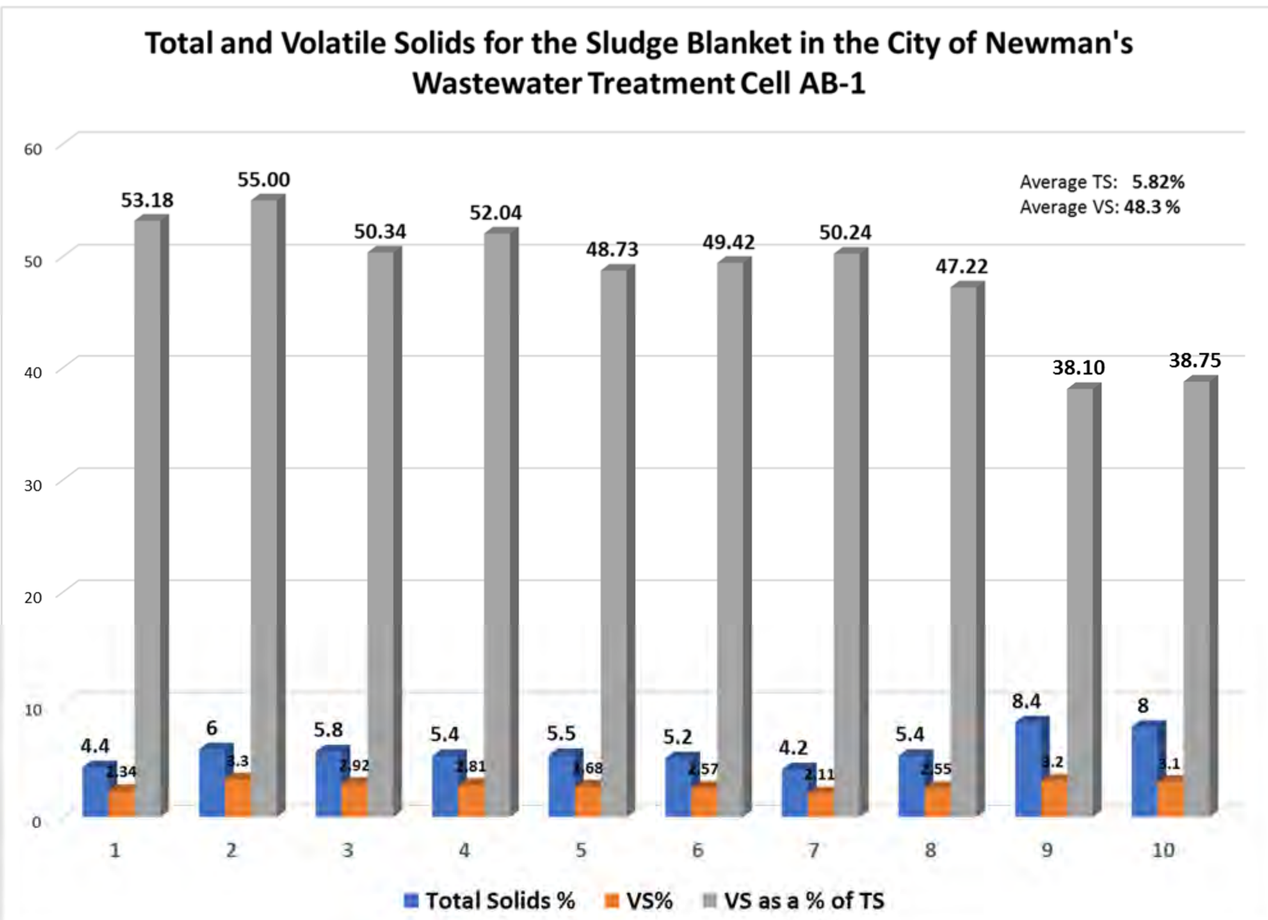


Figure 1. Almost Half of AB-1's Sludge Blanket is Potentially all Gas

Reagent Used	Influent to AB-1	Effluent to AB-1	SR-1
TNT 832 NH_4 (mg/l) 2-47 mg/l range	29.58	>47	7.7
TNT 832 NH_4 (mg/l) # 2	26.69	>47	
TNT835 NO_3 (mg/l) .02 - 13.5 range	1.84	0.6	9.63
TNT 836 NO_3 (mg/l 5 - 35 range	<5	<5	11.28
TNT 870 Alkalinity range 25-400 mg/l	> 400	> 400	

Figure 2. Field Results for Ammonia, Nitrate, and Alkalinity

It can be clearly seen from this data that the Newman wastewater lagoon system removes ammonia through the nitrification process. Treatment cells following AB-1 are removing tons of ammonia by converting it to nitrate.

Intra-pond testing can identify which ponds are most actively involved in converting ammonia to nitrate.

Thank you for the opportunity to serve the good people of Newman, CA.

Sincerely,

Steve Harris
President
H&S Environmental, LLC

hssenvironmental@earthlink.net WWW.Lagoonops.com

H&S Environmental, LLC.

- Performance Evaluations
- Troubleshooting & Optimization
- Hydraulics Optimization
- Training

2122 East Leland Circle   Mesa, AZ 85213   1 (480) 274-8410

Date: March 28, 2017

Lance Perry
Wastewater Supervisor
City of Newman, CA
2600 Hills Ferry Road
Newman, CA 95360

Re: Sludge Volume and Mass Measurements for treatment Cell # AB-1 at the Newman Wastewater Treatment Plant

Lance,

Enclosed is the March 28, 2017 report for H&S Environmental's (H&S) sludge depth and mass profiling of the City of Newman's treatment cell AB-1.

The purpose of this report is to estimate sludge volume and mass in treatment cell AB-1.

All water and sludge depth data used in this report were compiled by H&S Environmental, LLC (H&S), with assistance from Environmental Techniques of Phoenix Arizona. The conclusions reached in this report are based on 114 sludge and water depth measurements and 30 core samples making 10 composite core samples for Total Solids Analysis.

Thank you.

Sincerely,

Steve Harris
President
H&S Environmental, LLC

WATER VOLUME AND SLUDGE PROFILE REPORT

Facility Name: Newman Wastewater Treatment System

Client: City of Newman, CA
2600 Hills Ferry Road
Newman, CA 95360

Date of Measurements: March 7, 2017

Inspection Participants:

Environmental Techniques, International:

Jason Bentz
Kevin Bentz

H&S Environmental, LLC:

Steven M. Harris

Report Prepared By:
Steve Harris,
President
H&S Environmental, LLC
March 28, 2017

Section 1

Introduction and Background

1.0 Scope and Purpose

In February 2017 H&S Environmental, LLC began discussions with Lance Perry about determining the treatment capacity of Cell AB-1 at the Newman wastewater treatment facility. After discussions about measuring protocol and a site visit to core sample and measure the water cap and sludge levels, Steve Harris of H&S Environmental, LLC (H&S) prepared this report on the water and sludge depths, and mass as they existed on March 7, 2017.

The information used in this report is based on the following:

- 114 individual measurements of water depth and sludge blanket thickness from the bottom to the top of treatment Cell AB-1 and 10 composite core samples across the cell for mass estimation.
- As-built elevations and treatment cell dimensions from the city of Newman
- Previous sludge and water depth measurement reports from 2009 to present

The purpose of this report is to quantify the sludge blanket volume and mass in treatment cell AB-1.

This report covers the pond water depth, sludge volume, and mass of the Newman's AB-1 system as it existed on March 7, 2017.

Section 2 – Findings

2.0 Findings

Based on the results of one hundred and fourteen (114) separate measurements taken on March 7, 2017, and ten (10) composite core samples, the following conclusions can be made about the mass and volume of accumulated sludge in AB-1:

1. Cell # AB-1 has accumulated a sludge blanket that averages 3.498 feet in thickness. Most of AB-1's sludge has accumulated fairly evenly across the bottom of the treatment cell. Sludge occupies about 49% of AB-1's treatment capacity based on current water depths. The remaining water cap depth averages 3.67 feet. Total Solids average 5.83%. Sludge is accumulating at a rate of .984 inches a year in treatment Cell AB-1 based on comparison with a sludge blanket profile conducted back in January 22, 2009.

2. Odors were at a minimum and the sludge blanket did not stink when piercing and stirring the sludge. Good gas activity in the sludge blanket at the north end of AB-1 revealed a healthy biomass in the process of oxidizing existing sludge.

Data Analysis

Sludge Accumulation and Water Cap Volume in Cell # 1

Aside from occupying valuable capacity and lowering a treatment cell's retention time, sludge releases nutrients and soluble BOD back into the water column to feed algae. Based on recent BOD removal efficiencies, the sludge blanket does not appear to be affecting the water quality of AB-1. Seen below are sludge blanket profiles of Newman's AB-1 compiled from field data collected on March 7, 2017.

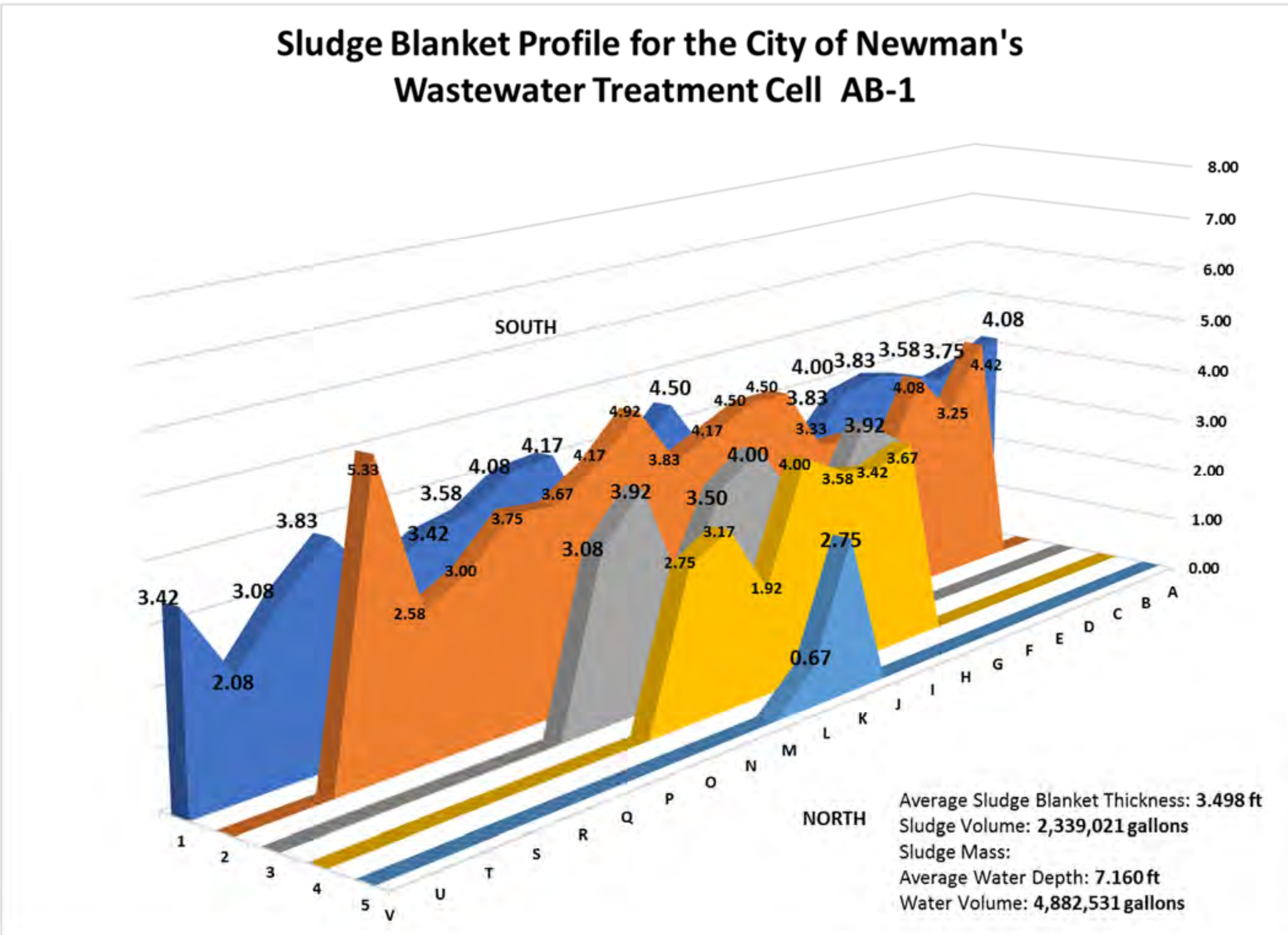


Figure 1. Cell # 1 Sludge Blanket Profile

Procedure for Determining Sludge Depth and Remaining Water Cap Volume

Water depth measurements were made using a survey rod to measure the bottom of the treatment cell to the top of the water. Sludge thickness was determined by then measuring the distance from the top of the water column to the top of the sludge blanket then subtracting the top of the sludge blanket from the total water depth. In treatment cells with thicker blankets this is the most accurate method for determining sludge blanket thickness.

Section 4 – Data Analysis

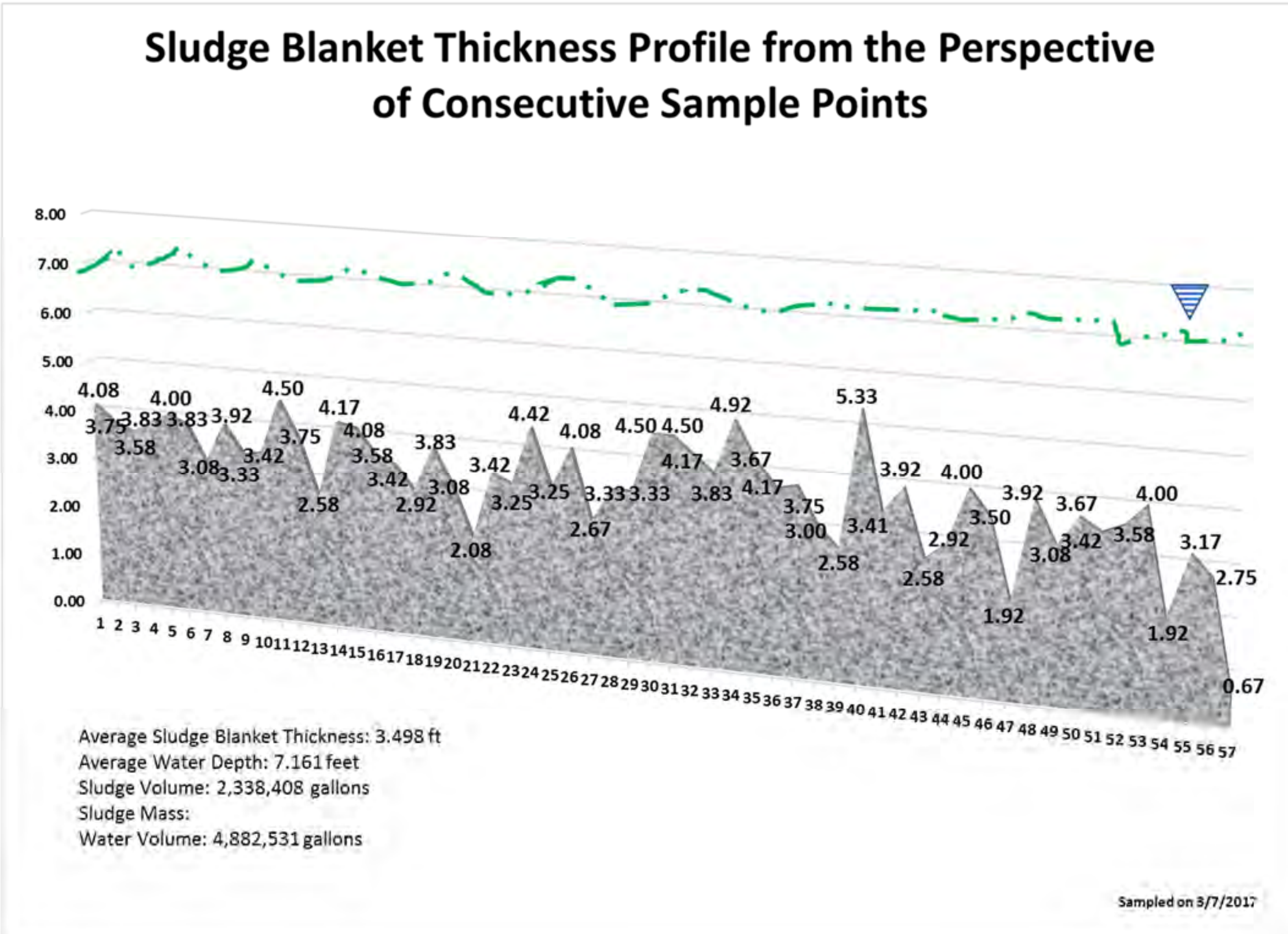


Figure 2. Cell # 2 Sludge Blanket Profile

A total of 114 separate samples of sludge depth and water depth were made to determine remaining water cap volume and sludge blanket thickness. About 2.5 million gallons of water remain in Cell AB-1 to stabilize the daily influent load.

Lab analysis shows an average of 5.83 percent solids based on ten (10) composite core samples.

Section 4 – Data Analysis Cont-

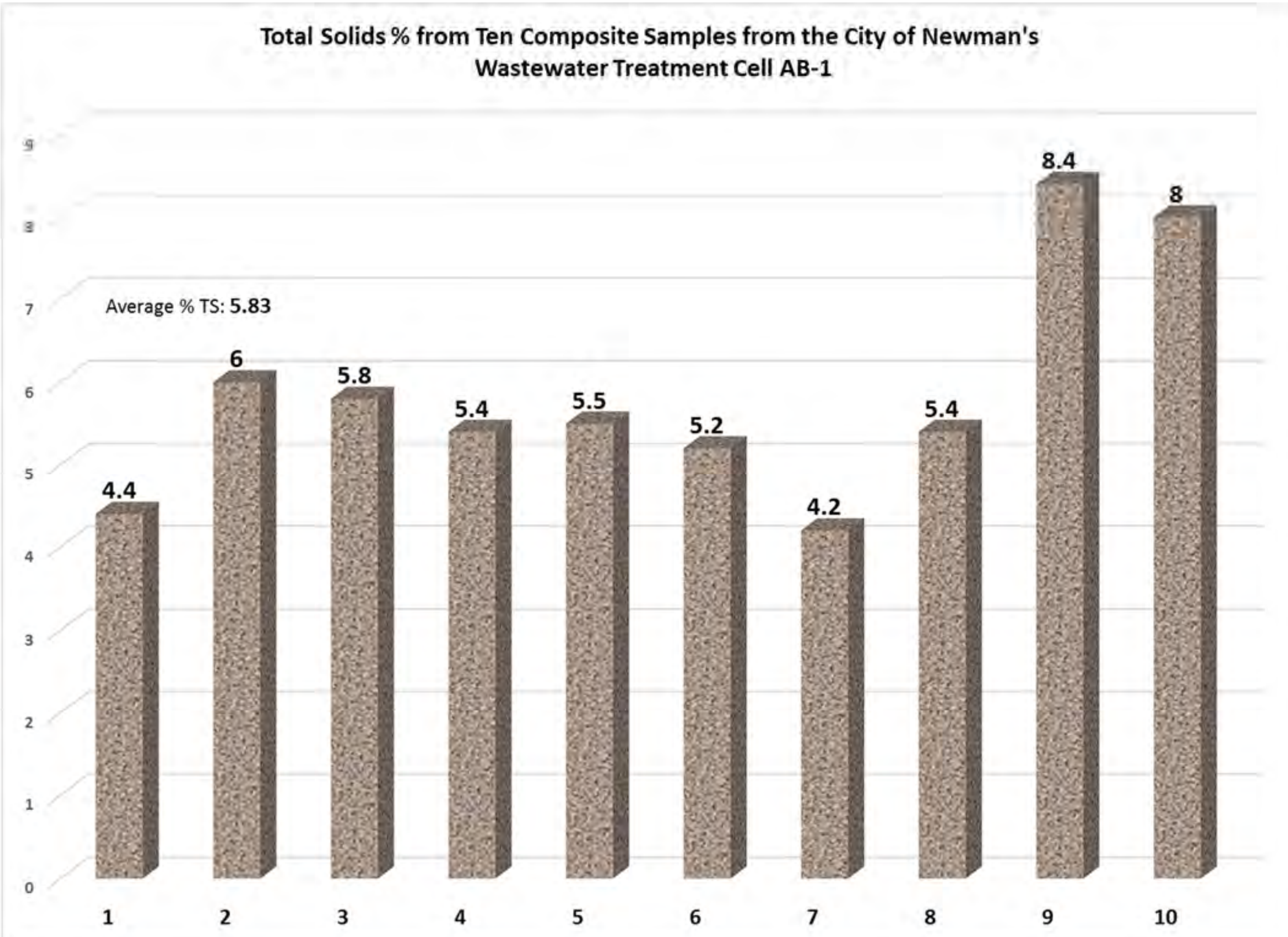


Figure 3. Average Percent Solids from Ten Composite Core Samples from AB-1

Section 4 – Data Analysis Cont-

AB-1 influent BOD_5 averages 1,465 mg/l of BOD. AB-1 effluent averages 460 mg/l, achieving an average AB-1 removal efficiency of 68.6%.

The purpose of AB-1 is to knock down the BOD of the high strength waste coming from Saputo Cheese. AB-1 needs to operate at a BOD removal efficiency of between 60 and 80% to allow the aerobic portion of the Newman system to stabilize a lighter load and more efficiently remove nutrients. Currently the average BOD removal efficiency for AB-1 is 68% despite the high probability that short-circuiting exists.

The need for baffling in AB-1 is apparent and would likely increase AB-1's removal efficiency as a greater portion of AB-1's volume would be used.

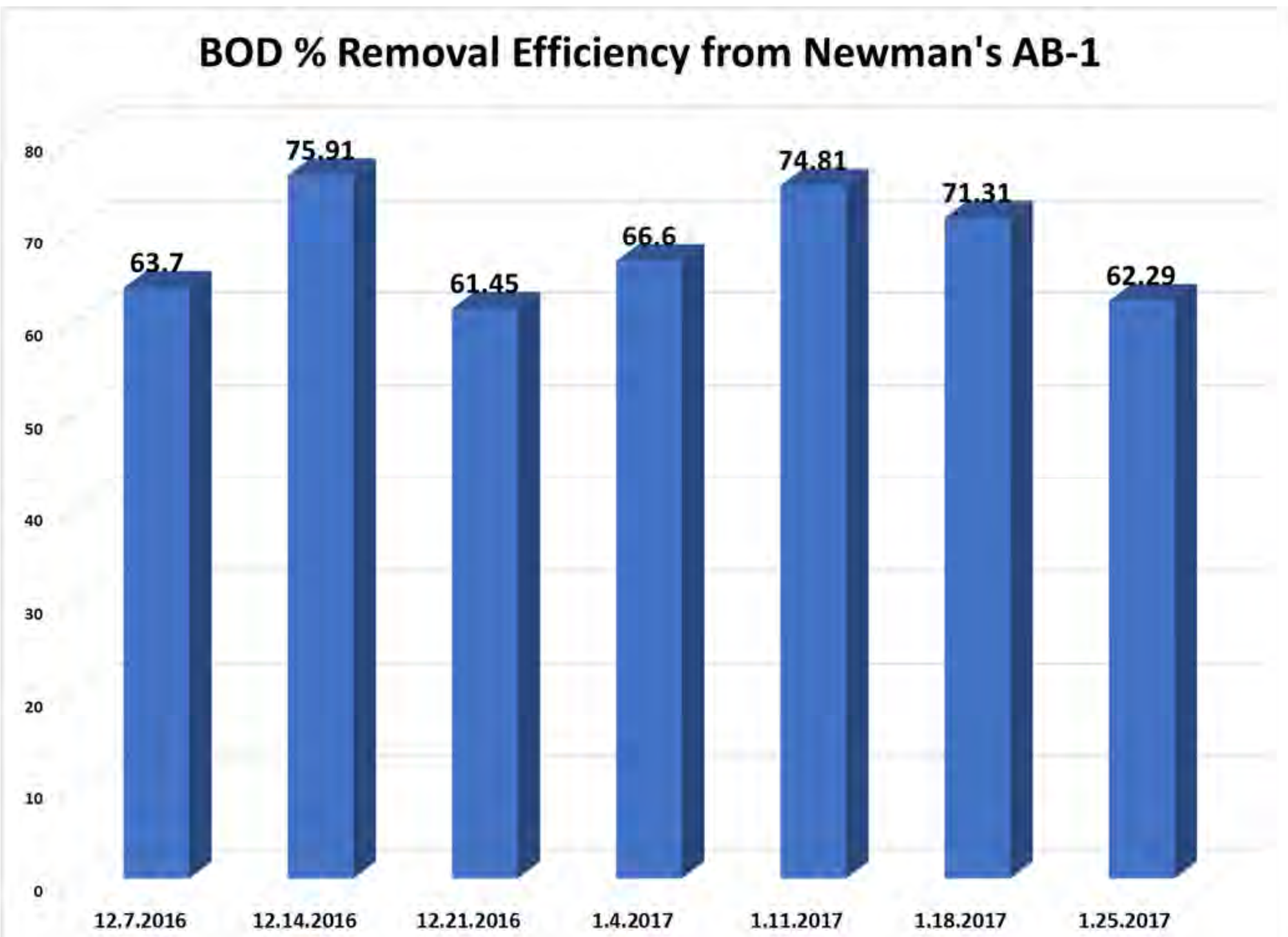


Figure 4. AB-1 BOD_5 Removal Efficiency

Anaerobic systems can generate sulfide odors. AB-1 is followed up by a highly aerobic system that can be used to suppress odors as they arise. The Newman wastewater system is currently able to suppress odors by recirculating highly oxygenated water from off the top of Cell # 4 back to the surface of AB-1 to provide an aerated water cap to suppress odors.

Section 4 – Data Analysis Cont-

The net sludge yield from anaerobic systems is relatively low (generally one fifth to one tenth of aerobic treatment processes). Anaerobic systems typically use less energy and fewer chemicals than aerobic treatment systems to stabilize high strength loads. Because of this, anaerobic treatment is the most economical and efficient method for treating high-strength organic waste using a lagoon system. Aerobic treatment typically follows anaerobic treatment. If the City of Newman were to rely on energy intensive aerobic treatment alone, the system requirements would be two (2) to three (3) times larger than currently exist.

The Saupto Cheese Newman, CA plant adds:

.287 mgd x 2,083 mg/l BOD x 8.34 lbs./gallon = **4,985 lbs. BOD / day** of cheese plant waste. Annualized this amounts to over **1.8 million pounds** of waste generated by this cheese plant each year. Keeping AB-1 anaerobic is critical to the success of the Newman system performing efficiently. Less than one (1) inch a year of sludge accumulation and a 68 % BOD removal efficiency is evidence of the efficiency of AB-1 as an anaerobic component to the system and shows the need to keep it operating as such.

If treated aerobically, the Newman plant would generate much more solids and require larger amounts of electrical power and a larger foot-print to stabilize the Saputo load.

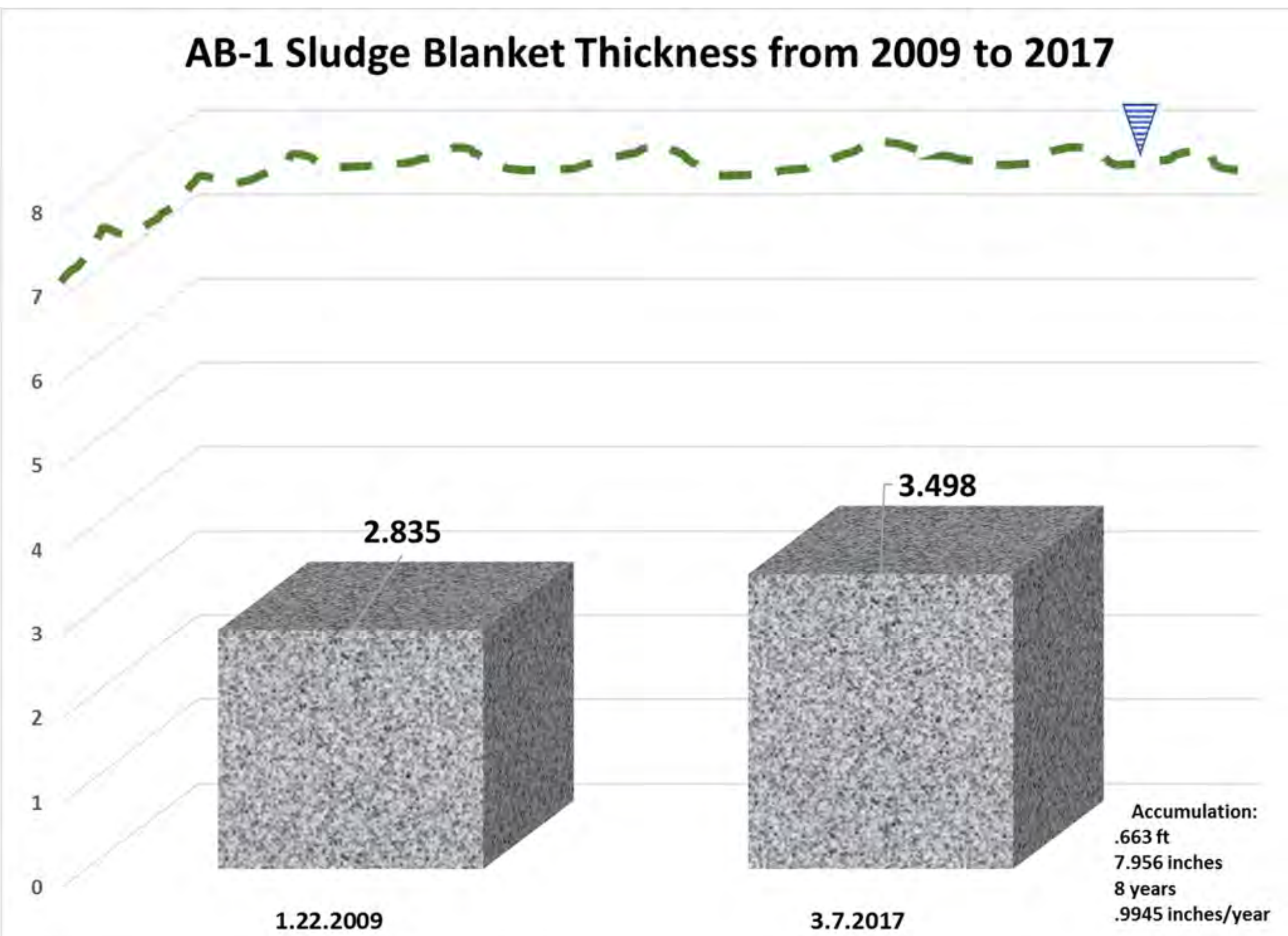


Figure 5. Sludge Accumulation Rate Figured over Eight Years

Section 4 – Data Analysis Cont-

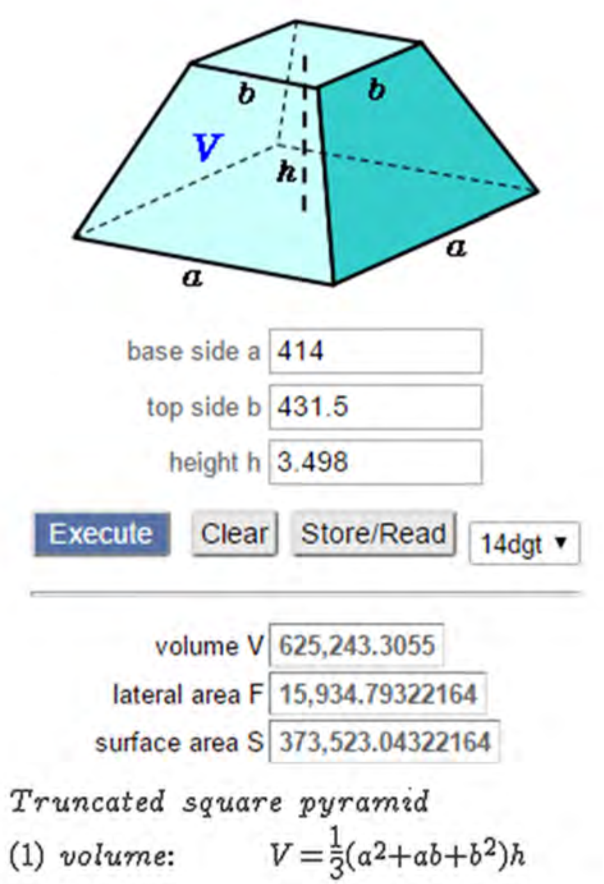
Supporting Calculation and Formula:

Formula for Calculating Sludge Volume

$$\text{Sludge Volume (ft}^3) = \left[\frac{W \times L + (W-2SH) \times (L-2SH)}{2}\right] \times H$$

W = width of lagoon (ft)
L = length of lagoon (ft)
S = slope (ratio of horizontal to vertical distances on the interior sides of lagoon).
3:1, slope is taken as 3.
H= height of liquid or depth of liquid in lagoon. (ft)

Result: $$\left[\frac{414 \times 414 + (414 - 2(2.5)\ (3.498)) \times (414 - 2(2.5)(3.498))}{2}\right] \times\ 3.498 \times 7.48\ \text{gal/ft}^3 / 2 =$$ **2,149,564 gallons**



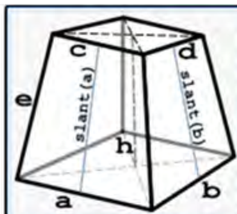
625.243 x 7.48 gal/2 = **2,338,409 gallons**

Section 4 – Data Analysis Cont-

Volume Calculator

Calculate volume of a truncated rectangular pyramid

and surface areas, surface to volume ratio, lengths of slunts and length of edge for right truncated rectangular pyramids



Truncated pyramid or frustum of a pyramid is a pyramid whose vertex is cut away by a plane parallel to the base. The distance between the bottom and the top bases is the truncated pyramid height **h**. This page calculates volume of any truncated pyramid whose bottom and top bases are rectangles with sides **a**, **b** and **c**, **d** respectively. The calculation formulas refer to the top base as simply *top*, and the bottom base as *base* for brevity's sake. This truncated pyramid has 6 faces, i.e. base, top and 4 lateral faces. The selection of measurement **Unit** is optional.

[*] denotes calculations that are valid for *right* rectangular truncated pyramids only.

a: 431.5 b: 431.5 c: 414 d: 414 h: 3.498 foot

precision: 2 Calculate ×

Formulas | Surface to volume | Reference

Volume to Weight: material food gravel

show all units

Volume
V = 1 / 6×h× (B + (a + c)×(b + d) +T) = 1 / 6×h× (a×b + (a + c)×(b + d) +c×d) = 625 243.31

centimeter³	17 704 918 764.52	meter³	17 704.92
foot³	**625 243.31**	micron³	$1.77 \times 10^{+22}$
Imperial gallon	3 894 536.06	mile³	4.25×10^{-6}
inch³	1 080 420 431.9	millimeter³	17 704 918 764 519
kilometer³	1.77×10^{-5}	oil barrel	111 360.59
liter	17 704 918.76	US gallon	4 677 144.73

[*] Surface to volume ratio
R = SA÷V = 0.6

Surface area to volume ratio is also known as *surface to volume ratio* and denoted as **sa/vol** or **SA÷V**, where SA÷V = surface area ÷ volume

625,243 x 7.48 / 2 = **<u>2,338,408 gallons</u>**

<u>Sludge Mass</u>

Sludge mass for AB-1 is calculated as follows:

2,338,408 gallons of sludge x .0583 percent solids x 8.34 lbs/gallon of water x 1 ton/2000 lbs =

568.5 dry tons

Section 5 – Summary

In Summary, AB-1 BOD removal efficiency is operating at an average of 68% despite the demands of the heavy load placed on it. AB-1should remain anaerobic because fewer solids will be generated by operating AB-1 as an anaerobic unit. Anaerobic systems require a smaller foot-print and require less electrical energy to stabilize high strength waste compared to aerobic systems. Because it is followed by a highly aerobic treatment system, the potential for odors is minimized by the Newman system's inherent ability to recirculate highly oxygenated water to the surface of AB-1 if needed.

The efficiency of AB-1 can be further increased by the placement of baffles to direct more of the flow to the southwest corner of the treatment cell, using more of the cell's volume.

Thank you for the opportunity to serve the good people of Newman, CA.

Sincerely,

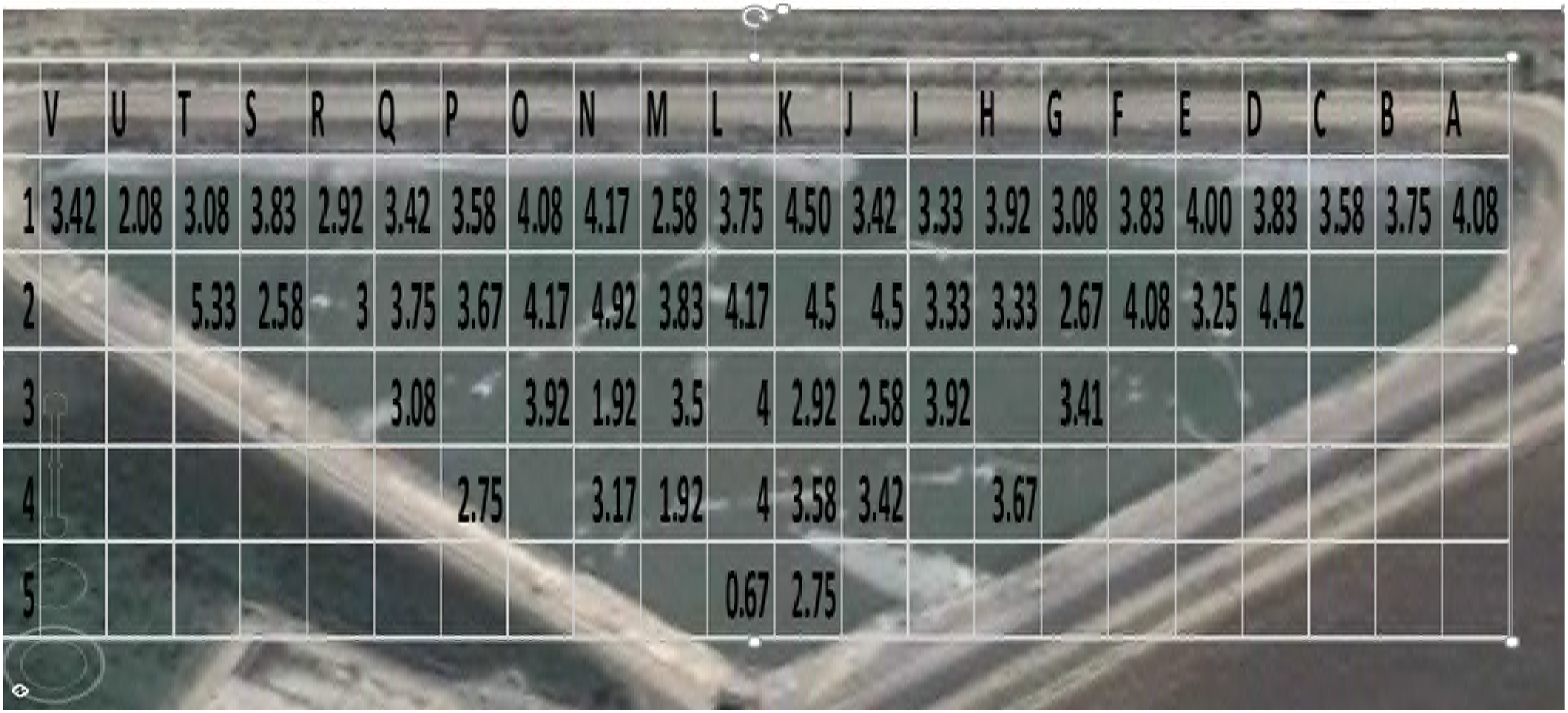
Steve Harris
President
H&S Environmental, LLC

Appendix A

Sludge and Treatment Cell Volume Data

AB-1 Sludge Volume			
The City of Newman, AB-1			
Shape is triangular with rounded edges			
Item	**Units**	**Quantity**	**Volumes Using a Triangular Trapezoidal Pyramid (.5 x Quantity)**
Bottom Length	feet	**414**	
Bottom Width	feet	**414**	
Side Slopes	1 to	**2.5**	
Average Sludge Depth	feet	**3.498**	
As-Built Bottom Elevation	feet	**55.00**	
As-Built Top-of-Bank Elevatic	feet	**70.00**	
Bottom Area	sq ft	171,396	
Top of Sludge Length	feet	431.49	
Top of Sludge Width	feet	431.49	
Top of Sludge Area	sq ft	186,184	
Sludge Volume	cu ft	625,407	**312,703**
Sludge Volume	gallons	4,678,043	**2,339,021**
Embankment Height	feet	15.00	
Freeboard Required	feet	**8**	
Useable Lagoon Depth	feet	7.00	
Top of Water Max Length	feet	449	
Top of Water Max Width	feet	449	
Top of Water Max Area	sq ft	201,601	
Lagoon Volume	cu ft	1,305,490	**652,745**
Lagoon Volume	gallons	9,765,061	**4,882,531**
Mass	dry tons		

Sludge Blanket Thickness Locations in Newman's AB-1Marked in Feet



	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
1	3.42	2.08	3.08	3.83	2.92	3.42	3.58	4.08	4.17	2.58	3.75	4.50	3.42	3.33	3.92	3.08	3.83	4.00	3.83	3.58	3.75	4.08
2			5.33	2.58	3	3.75	3.67	4.17	4.92	3.83	4.17	4.5	4.5	3.33	3.33	2.67	4.08	3.25	4.42			
3						3.08		3.92	1.92	3.5	4	2.92	2.58	3.92		3.41						
4							2.75		3.17	1.92	4	3.58	3.42		3.67							
5											0.67	2.75										

Appendix B WASTE DISCHARGE REQUIREMENTS FOR CITY OF NEWMAN WASTEWATER TREATMENT FACILITY

Stantec

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION
ORDER R5-2018-0024

WASTE DISCHARGE REQUIREMENTS
FOR
CITY OF NEWMAN
WASTEWATER TREATMENT FACILITY
STANISLAUS COUNTY

The California Regional Water Quality Control Board, Central Valley Region, (Central Valley Water Board or Board) finds that:

1. On 12 February 2015, the City of Newman (Discharger) submitted a Report of Waste Discharge (RWD) to apply for revised Waste Discharge Requirements (WDRs) for the City of Newman Wastewater Treatment Facility (WWTF). Additional information was submitted on 13 January 2016, 27 May 2016, 6 September 2016, 13 January 2017, and 16 March 2017. On 27 April 2017, the Discharger submitted a revised RWD. On 28 August 2017, the Discharger submitted a memo providing an updated summary of management practices to reduce salinity in the effluent and minimize impacts to groundwater.

2. The WWTF is located at 2600 Hills Ferry Road, Newman, in Sections 16 and 17, T7S, R9E, MDB&M. The WWTF property is located within Stanislaus and Merced Counties. The Assessor's Parcel Numbers (APNs) for the WWTF in Stanislaus County are 049-043-005, 049-043-007, 049-043-008, and 049-043-009. The APNs for the WWTF in Merced County are 054-004-002, 054-004-009, 054-004-012, and 054-004-013. The location of the facility is shown on Attachment A, which is attached hereto and made part of this Order by reference.

3. The City of Newman owns and operates the WWTF and is responsible for compliance with these WDRs. WDRs Order 98-163, adopted by the Central Valley Water Board on 24 July 1998, currently prescribes requirements for the WWTF. This Order rescinds and replaces Order 98-163.

4. Order 98-163 sets an influent flow limit of 1.69 million gallons per day (MGD) as a monthly average dry weather flow (ADWF). However, the current design influent ADWF rate for the WWTF is only 1.25 MGD, because the treatment capacity of the WWTF is limited by high-strength organic matter in the influent and by the oxygen capacity of the treatment basins.

5. The Discharger is proposing to modify the facility in two phases. This Order will allow the Discharger to increase in the influent ADWF limit from 1.25 MGD to 1.5 MGD in Phase I, and then to 2.4 MGD in Phase 2, provided that the Discharger has demonstrated to the Central Valley Water Board that the proposed WWTF modifications have been successfully completed.

Existing Facility and Discharge

6. The WWTF receives wastewater from residential, commercial, and industrial sources. The current estimated population in the city is 10,224 residents with 5,210 equivalent

dwelling units (EDUs) including 3,007 residential EDUs, 259 commercial EDUs, and 1,373 industrial EDUs. The WWTF accepts wastewater from three local industries: a cheese manufacturer, a turkey hatchery, and a tomato processor.

7. Based on City of Newman 2011-2015 Consumer Confidence Reports, the characterization of potable groundwater supply is summarized below.

Constituent	Units	2011	2012	2013	2014	2015	2016
Electrical Conductivity	µmhos/cm	1,597	1,335	1,425	1,415	1,415	1,383
Total Dissolved Solids	mg/L	1,033	878	960	934	934	814
Chloride	mg/L	231	231	179	177	177	177
Sodium	mg/L	129	129	124	120	120	108
Hardness	mg/L	425	425	440	458	458	417
Nitrate as N	mg/L	5.13	5.76	5.30	5.93	5.78	5.11
Sulfate	mg/L	169	169	161	165	165	170
Total Chromium	µg/L	22.5	22.5	12	10.3	10.3	10.3
Lead	µg/L	3	0.005	0.005	<0.005	<0.005	<0.005

8. The WWTF includes a bar screen, two unlined earth basins BASIN-1 and BASIN-2, an unlined Oxidation Pond, two unlined effluent storage reservoirs with a total capacity of 230 million gallons (MG), 60 acres of overland flow terraces, and 199 acres of land application areas (LAAs). Based on two feet of freeboard, BASIN-1, BASIN-2, and Oxidation Pond have capacities of 7MG, 9 MG and 90 MG respectively.

9. In general, influent wastewater flows in series through BASIN-1, BASIN-2, and the Oxidation Pond. The Oxidation Pond has a recirculation channel which allows recirculation of treated effluent to the head of BASIN-2. The undisinfected secondary effluent is discharged to the storage reservoirs and then applied to the LAAs during the dry season (generally April through October) by flood irrigation of crops including alfalfa, corn and oats. Excess tailwater from the LAAs is collected in a tailwater pond of approximately one acre and returned to the effluent storage reservoir. The site plan and the treatment process flow schematic are shown on Attachment B and C, respectively, which are attached hereto and made part of this Order by reference.

10. The influent ADWF ranged from 1.08 to 1.32 MGD from 2010 through 2015. Based on the Discharger's monitoring reports, the water supply, influent and effluent quality is summarized below. The effluent quality is monitored from the storage reservoirs:

Constituent	Unit	Source Water Average	Influent Average	Effluent Average
Biological Oxygen Demand[1]	mg/L	--	1,030	50
Electrical Conductivity	µmhos/cm	1,380[2]	2,690[1]	3,780[1]
Total Dissolved Solids	mg/L	820[2]	1,820[2]	2,920[1]
Chloride[2]	mg/L	200	520	810
Sodium[3]	mg/L	150	470	880

Constituent	Unit	Source Water Average	Influent Average	Effluent Average
Nitrate Nitrogen	mg/L	3.3[2]	2.0[2]	2.2[1]
Total Kjeldahl Nitrogen[4]	mg/L	--	44	11
Arsenic[5]	µg/L	2	<2	3
Manganese[6]	µg/L	<10	60	10

1. Average of monthly monitoring data from 2014 through 2016
2. Average of quarterly monitoring data from 2014 through 2016
3. Average of annual monitoring data from 2011 through 2016
4. Average of quarterly monitoring data from 2nd Quarter 2008 through 1st Quarter 2010
5. Average of quarterly monitoring data from 2nd Quarter 2008 through 4th Quarter 2016
6. Average of quarterly monitoring data from 2nd Quarter 2008 through 1st Quarter 2010 and annual monitoring data starting in 4th quarter 2010 through 2016 (15 samples total)

-- Data not available

Based on the above data, the influent BOD concentration indicates high strength organic matter in the waste streams. The influent TDS and EC are approximately double that of the source water, indicating considerable salinity contributions from community sewer and industry. The average effluent TDS concentration is 1,100 mg/L greater than that in the influent, indicating considerable amounts of evaporation occur during the treatment and storage of wastewater. The Discharger states that the salinity of the effluent is lowest at the end of the wet season and increases through the summer until the start of next wet season.

11. The WWTF does not have a grit removal system and sludge accumulates on the bottom of the treatment basins. Since January 2010, sludge in the basins has been removed in-place using a biological treatment process. The 2015 RWD states that as of 2013, the depth of 4.25 feet of sludge had been removed from BASIN-2. Based on the Discharger's 28 March 2017 *Sludge Mass and Mass Measurements* report (included as Appendix D of the 2017 RWD), BASIN-1 was found to be 50% full of sludge. The Discharger states that the sludge in BASIN-1 is being reduced in-place by microbial treatment and expects to maintain the sludge layer at less than 20% of AB-1's capacity.

12. As a means of preventing objectionable odors, Discharge Specification B.3 of WDRs 98-163 requires that the dissolved oxygen (DO) concentration in the upper zone (1 foot) of wastewater in ponds shall not be less than 1.0 mg/L. Based on the Discharger's monthly monitoring reports from January 2015 through December 2016, the average DO concentration in BASIN-1 was 0.2 mg/L. This indicates that the WWTF does not have an adequate treatment capacity to aerobically treat the high strength wastewater.

While BASIN-1 was originally designed to function as an aerobic treatment basin, the Discharger submitted a letter dated 13 January 2017 stating that BASIN-1 is operating as an anaerobic treatment basin. The letter states that converting BASIN-1 to operate as an aerobic basin would be cost prohibitive. The Discharger's 28 March 2017 *Sludge Mass and Mass Measurements* report describes BASIN-1 as removing roughly 70 percent of the influent BOD concentration and that operating BASIN-1 as an anaerobic basin is critical to the WWTF operating efficiently.

The low DO concentration has the potential to cause odors and may be contributing to reducing conditions in underlying groundwater that can mobilize metals that occur naturally in soil, such as arsenic, iron, and manganese.

13. The City of Newman Code 11.06.070, Industrial Wastewater Discharges requires that all industrial users obtain discharge permits. Based on the Discharger's 1 February 2016 *Commercial Salinity Reduction Study,* there are three industrial users in the city. The City set numerical limits in the cheese manufacturer's permit at 0.3 MGD for monthly average flow rate, 4,000 µmhos/cm for EC as a daily maximum, 4,010 lbs/day for BOD as a monthly average, and 8,000 lbs/day for BOD as a daily maximum.

    Based on the cheese manufacturer's wastewater data, collected from January 2014 through December 2016, the discharge averaged 0.26 MGD and the average EC and BOD concentrations were approximately 3,240 µmhos/cm and 1,910 mg/L, respectively. The cheese manufacture's discharge accounts for approximately 25 percent of influent flow to the WWTF, a third of the EC[1], and half of the BOD concentration to the overall WWTF's influent.

14. Based on the *Commercial Salinity Reduction Study* and the 28 August 2017 salinity reduction memo, the Discharger has: 1) reduced the cheese manufacturer's industrial discharge EC limit from 6,000 µmhos/cm to 4,000 µmhos/cm, 2) required that water softener regeneration water be diverted from the sewer for off-site disposal, 3) required the cheese manufacturer's clean-in-place (CIP) processes to be optimized to reduce the amount of caustic used in the cleaning process, and 4) required that the timing of CIP activities be adjusted from a schedule which had all CIP processes occurring at once to a staggered schedule to prevent spikes in salinity. According to the study, these measures had minimal effect on reducing the salinity concentration in the discharge, so the cheese manufacturer constructed an equalization tank in November 2014 to stabilize discharge flow and characteristics. The equalization tank reduced the average EC concentration from approximately 4,000 µmhos/cm to 3,240 µmhos/cm. The salt load to the WWTF remains the same. The feasibility analysis of the study states the cheese manufacturer has completed all economically feasible salinity control. Further salinity reduction would require considerable economic investment, such as improving the source water quality by constructing a reverse osmosis system or using low salinity surface water.

    In July 2016, the Discharger set a daily maximum FDS industrial discharge limit of 2,000 mg/L. It is not clear if the FDS limit will require the cheese manufacturer to implement additional salinity source control to reduce the salinity concentrations. The Discharger did not propose requiring the cheese manufacturer to implement pretreatment to reduce BOD concentrations of the high-strength industrial wastewater.

15. The City submitted a *Salinity Impact Assessment and Mitigation Plan* dated 13 August 2012 for the planned expansion of the City's sphere of influence. The report states that the use of water softeners is common due to the potable water supply's high hardness and contributes to the high salinity of the WWTF influent wastewater.

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[1] The EC ratio was calculated by dividing the flow-weighted EC in the cheese facility discharge by the flow-weighted EC in the WWTF influent.

Planned Changes in the Facility and Discharge

16. The City plans to increase the existing ADWF capacity from 1.25 MGD to 1.5 MGD in Phase 1 and then to 2.4 MGD in Phase 2. The proposed modifications include:

Phase 1 (Proposed ADWF limit: 1.5 MGD)

a) Creating a new unlined 9 MG aeration basin (BASIN-3) by baffling a five-acre area of the Oxidation Pond. After installation of BASIN-3, the surface area of Oxidation Pond will be reduced from 50 acres to 45 acres and the capacity of Oxidation Pond will be reduced from 90 MG to 81 MG;

b) Modifying the headworks to improve influent flow-splitting capabilities. The flow splitting structure will allow the influent to be directed to BASIN-1, BASIN-2 and BASIN-3 at varying ratios as required for optimal treatment under seasonally varying climatic conditions;

c) Improve BASIN-1 by adding baffling, prevent short circuiting, and improve mixing to treat the high-strength BOD influent.

d) Irrigating with relatively saline effluent and relatively low salinity groundwater, such that the resulting salinity load to shallow groundwater is similar to the salinity load of historical agricultural practices, and

e) Adding LAA5 (142 acres) and LAA6 (200 acres), which were purchased by the City in 2011 and 2014, respectively. The total LAA will be 541 acres after completion of - Phase 1.

Phase 2[1]: (Proposed AWDF limit: 2.4 MGD)

a) Expanding BASIN-3 from 9 MG to 20 MG by increasing baffling area from five acres to ten acres in the Oxidation Pond. After expansion of BASIN-3, the surface area of Oxidation Pond will be reduced from 45 acres to 40 acres and the capacity of Oxidation Pond will be reduced from 81 MG to 70 MG;

b) Adding new aerators to BASIN-3;

c) Installing effluent Storage Basin 3 with a capacity of 130 MG in the existing LAA3. The area of LAA3 will be reduced from 66 acres to 22 acres;

d) Improving the influent distributing system. Improvements planned by the City would allow recirculation to all aerations basins and piping and diversion facilities to allow influent to be distributed to any, or all, of the three aeration basins.

e) Irrigating with effluent and relatively low salinity groundwater and/or surface water to reduce salinity loading. Currently the surface water from CCID is not available but the Discharger plans to use surface water as supplemental water in the future.

f) Increasing LAAs from 541 acres in Phase 1 to 1,077 acres in Phase 2.

[1] Phase 2 will be completed in sub-phases on an as-needed basis to meet the City's growth.

17. The following table summarizes the pond design data provided in the April 2017 RWD. Values refer to existing conditions unless otherwise indicated.

Pond	Surface Area (acres)	Depth (feet)[3]	Volume (MG)[3]	Invert Elevation (feet, NGVD 29)
BASIN-1	2.7	8	7	59.5
BASIN-2	5	9	14.7	52
Proposed BASIN-3	5[1], 10[2]	>5.5	9[1], 20[2]	52
Oxidation Pond	50, 45[1], 40[2]	9	147, 138[1], 127[2]	52
Effluent Storage Reservoir 1	29	12	95	63.75
Effluent Storage Reservoir 2	39	12	135	63.75
Proposed Effluent Storage Basin 3	40[2]	12[2]	130[2]	63.75
Tailwater Return Storage	1	5	1.6	Not available

1. Phase 1 value
2. Phase 2 value.
3. Based on two feet of freeboard.

18. The following table summarizes the current LAA acreage and the expected acreage after

Existing LAAs (1.25 MGD)		Phase 1 LAAs (1.5 MGD)		Phase 2 LAAs (2.4 MGD)	
Name	Acres	Name	Acres	Name	Acres
LAA1	55	LAA1	55	LAA1	55
LAA2	66	LAA2	66	LAA2	66
LAA3	66	LAA3	66	LAA3	22
LAA4	12	LAA4	12	LAA4	12
-	-	LAA5	142	LAA5	142
-	-	LAA6	200	LAA6	200
-	-	-	-	John Rocha[1]	80
-	-	-	-	Borba Dairy Farm[1]	500
Total	199	Total	541	Total	1,077

completion of each phase.

1. Regulated under the General Order WQ-2016-0068-DDW

19. Fodder crops will be planted on all LAAs and irrigated with WWTF effluent and supplemental irrigation water. All LAAs will have tailwater collection systems similar to the existing ones.

20. City-owned LAAs (LAA1 through LAA6) are regulated under this Order. The proposed LAAs of John Rocha and Borba Dairy Farms are owned and operated by the individual farms. All discharges to individually-owned farms, including those added after the adoption of this Order, will be regulated under General Order WQ-2016-0068-DDW, *Water Reclamation Requirements for Recycled Water Use*.

21. The April 2017 RWD provides a water balance based on a 100-year annual precipitation storm event. Based on the water balance, the Discharger owns sufficient LAA acreage (LAA1 through LAA6) to accommodate the Phase 1 flow limit of 1.5 MGD. After completion of all proposed changes in Finding 16, the WWTF will have adequate storage and disposal capacities for the proposed flow limits. This Order requires that the Discharger maintain a minimum amount of LAA acreage to be allowed to discharge effluent at proposed flows of 1.5 MGD or greater.

Industrial Discharge Pretreatment

22. Industrial discharges to publicly-owned wastewater treatment facilities (WWTFs) can cause one or more of the following problems, if not adequately controlled:

    a. *Interference or Upset.* Discharges of high volumes or concentrations of certain pollutants can inhibit or interfere with the proper operation of the WWTF, causing it to do an inadequate job of treating wastes. As a result, the facility could be prevented from meeting its permit requirements.

    b. *Sludge Management.* Industrial pollutants, particularly metals and other toxic pollutants, can limit the sludge management alternatives available to the Discharger and increase the cost of sludge management and disposal. Additionally, biosolids contaminated with toxic pollutants could be rendered unsuitable for as a soil amendment.

    c. *Pass-through.* Some industrial pollutants may not receive adequate treatment and pass through the treatment system in concentrations that can could unreasonably degrade groundwater quality and/or prevent recycling of domestic wastewater.

    Additionally, the discharge of explosive, reactive, or corrosive wastes can cause damage to the wastewater collection system or the treatment works, and may also pose a threat to worker or public safety.

23. The Discharger has implemented an industrial pretreatment program to regulate the discharge of industrial wastes into the wastewater collection system or treatment works to prevent damage to the sewer system or treatment works, inhibit or disrupt the treatment process, or cause violation of the effluent or groundwater limits of this Order. The City of Newman Code 11.06.070, entitled "Industrial Wastewater Discharges," requires that all industrial wastewater discharged to the sewer system obtain discharge permits. City code section 11.06.004.C.22 states that discharges with EC concentrations greater than 4,000 µmhos/cm are prohibited unless it is demonstrated not to be harmful to the sewer system. The City code does not specify a BOD concentration limit but states that a BOD limit may be set after review of the industrial discharge permit application. The Discharger's 1 February 2016 *Commercial Salinity Reduction Study* states that there are three industrial users in the City: a cheese manufacturer, a tomato

processor, and a turkey hatchery. The cheese manufacturer contributes approximately 25% of the influent flow as discussed in Finding 13. The tomato processor is permitted for a maximum monthly average of 6,666 gallons per day and the turkey hatchery is permitted for a maximum monthly average of 21,050 gallons per day; these discharges contribute approximately a combined 2% of the influent flow. The salinity reduction study provides a description of implemented measures to reduce salinity and did not propose any additional measures. The Central Valley Water Board may require that the Discharger reevaluate its industrial pretreatment program if industrial wastewater results in non-compliance with the conditions imposed by these WDRs.

Site-Specific Conditions

24. California Department of Water Resources (DWR) reports annual precipitation in Newman to be approximately 10.65 inches; the 100-year return total is 19.26 inches. The mean evapotranspiration rate is approximately 56.1 inches per year.

25. The site is generally flat, with a slight slope to the northeast towards the San Joaquin River. The WWTF is located within the Federal Emergency Management Agency (FEMA) 100-year flood plain protected by flood prevention levees. The entire WWTF site and all current LAAs are surrounded by containment berms with an elevation of 72 feet NGVD 29. The WWTF has a 0.2 percent annual chance of flooding as a result of constructed flood prevention levees.

26. The City of Newman's *Anti-degradation Analysis and Groundwater Conditions* (Anti-Degradation Analysis) dated 13 January 2016 indicates that the WWTF is divided by two Quaternary deposits, including the San Luis Ranch (Qsl) and Dos Palos (Qdp) Alluvium according to the California Division of Mines and Geology geologic map of the San Francisco-San Jose Quadrangle (1991). The dividing line between these two geologic units occurs as an approximate north-south trend, with Qsl occurring on the western portion of the WWTF property and Qdp present on the east. The Qsl is described as being comprised of fine to coarse grained fan, mudflow, terrace, and floodplain deposits, while Qdp is described as being limited to floodplain deposits. Locally, wetlands are noted as also being present outside of the eastern portion of the WWTF property (separated by the canal) and within Qdp deposits, indicating that this area has a very shallow groundwater table and likely serves as a region of groundwater discharge.

27. Based on information provided by Brown and Caldwell in a 1975 Environmental Impact Report, the soils at the LAAs consist primarily of Orestimba clay loam with some areas containing Camarillo loam. The infiltration rate of Orestimba clay loam is estimated to be slowly permeable at 0.06 to 0.63 inches per hour (in/hr). Camarillo loam is estimated to be moderately permeable at 0.63 to 2.0 in/hr.

28. Surrounding land uses are agriculture and residential.

Groundwater Conditions

29. The Discharger's Anti-Degradation Analysis states that, according to the California DWR Bulletin 118 (Bulletin 118), the City of Newman lies within the San Joaquin Valley Groundwater Basin, Delta Mendota Subbasin. Groundwater-bearing formations within the subbasin are reported to include the Tulare Formation, terrace deposits, alluvium,

and flood-basin deposits. Groundwater principally occurs in three water-bearing strata, including: (1) a lower confined zone containing fresh water in the lower section of the Tulare Formation; (2) an upper zone containing confined, semi-confined, and unconfined water in the upper section of the Tulare Formation and younger deposits; and, (3) a shallow zone, which contains unconfined water within about 25 feet of land surface.

30. Bulletin 118 identifies a shallow saline groundwater zone within about 10 feet of ground surface covering large portions of the subbasin. This water is reported to contain elevated concentrations of iron, fluoride, nitrate, and boron. This is the same first recoverable shallow groundwater monitored at the City's WWTF. Due to the shallow groundwater, subsurface agricultural drain pipes are in use throughout the area to protect the root zone of local agricultural parcels. Shallow groundwater collected in these drains is discharged to the San Joaquin River. An agricultural drain called the A-line passes under LAA1, as shown in Attachment B. Recharge to this zone is expected to be dominated by agricultural return and wastewater reclamation.

31. The Corcoran Clay or "E Clay" is a member of the Tulare Formation and constitutes a regional confining layer that is generally demarked as the dividing line between the upper and lower Tulare Formation aquifers. Locally within the City of Neman area, the Corcoran Clay is present at depths of around 220 to 260 ft. below ground surface (bgs). Water-bearing strata above and below the Corcoran Clay is also highly channelized and may be further subdivided by significant clay and silt aquitards.

32. Available shallow groundwater monitoring data from DWR water quality reports prior to 1968 show EC ranged from 740 to 1,260 µmhos/cm upgradient of the WWTF. Monitoring stations within 3 miles southeast of the WWTF show EC ranged from 2,000 to 12,600 µmhos/cm increasing east toward the San Joaquin River. Groundwater monitoring station NEWMAN WY, previously located near Storage Reservoir 2's current location, was sampled ten times from June 1975 through August 1976. Sampling data show that EC results varied from 1,060 to 1,970 µmhos/cm, increasing over time.

33. The Discharger has been monitoring groundwater since 1998. Seven shallow groundwater monitoring wells MW-1 through MW-7 were installed at the WWTF as shown on Attachment A and B. The depths of these wells ranged from 19 to 32 feet below ground surface (bgs) as shown below.

Wells	Top of Casing Elevation (ft, NGVD)	Depth (ft, bgs)	Screen Interval (ft, bgs)
MW-1	74.02	19	9 - 19
MW-2	72.45	19	9 - 19
MW-3	72.83	19	9 - 19
MW-4	74.16	20	10 - 20
MW-5	68.99	32	23 - 32
MW-6	76.28	26.5	11.5 - 26.5
MW-7	73.38	29	14 - 29

34. The Discharger's Anti-Degradation Analysis states that "*groundwater flow typically varies from being toward a northerly and easterly direction, and temporally, radial from a central mound originating near MW-3 and the storage reservoir. The groundwater mound, that is sometimes present at MW-3, is likely controlled in part by percolation of water from the unlined reservoir".* Based on the quarterly monitoring reports from January 2015 through November 2016, the horizontal gradient ranged from 0.0014 to 0.007 feet/foot.

35. The monitoring wells MW-2 and MW-5 typically have the lowest groundwater elevations, while groundwater at the remaining wells has a comparably higher elevation. Well MW-3 is located adjacent to the storage reservoir No.1 and has higher groundwater elevations due to percolation from the effluent reservoir. The RWD states that MW-2, MW-3, and MW-5 are at locations most likely influenced by effluent storage and/or reclamation activities. The Discharger's Anti-Degradation Analysis states that monitoring wells MW-2, MW-3, and MW-5 are comprised of a large fraction of percolated wastewater ranging from approximately 45 to 50% at MW-2, 80% at MW-5, and more than 90% at MW-3 and are considered compliance wells. The Anti-Degradation Analysis states that monitoring wells MW-1, MW-4, MW-6, and MW-7 did not indicate a large fraction of wastewater and represent up-gradient groundwater quality.

36. A summary of groundwater historical monitoring data is presented in the table below based on data collected during April 2008 through December 2016.

Groundwater Average Concentration									
		EC (µmhos/cm)	TDS (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Nitrate as N (mg/L)	Arsenic (µg/L)	Iron (µg/L)	Manganese (µg/L)
Potential Water Quality Objective		900-2,200[1]	500-1,500[2]	250-600[3]	69[4]	10[5]	10[5]	300[6]	50[6]
Upgradient Wells	MW-1[7]	2,910	1,790	510	380	3.9	6	660	510
	MW-4[7]	3,820	2,470	620	450	5.0	3	110	190
	MW-6[8]	3,760	2,390	610	620	8.0	4	<50	50
	MW-7[8]	1,520	900	180	230	5.6	3	<50	<10
Compliance Wells	MW-2[7]	8,750	5,850	1,990	1,220	6.0	5	80	30
	MW-3[7]	3,630	2,080	700	560	2.9	10	500	170
	MW-5[7]	8,970	5,460	2,150	1,670	<0.5	15	370	2,320

1. Secondary Maximum Contaminant Level range: Recommended level = 900; Upper level = 1,600 mg/L; Short-term level = 2,200 mg/L.
2. Secondary Maximum Contaminant Level range: Recommended level = 500; Upper level = 1,000 mg/L; Short-term level = 1,500 mg/L.
3. Secondary Maximum Contaminant Level range: Recommended level = 250; Upper level = 500 mg/L; Short term level = 600 mg/L.
4. Lowest Agricultural Water Quality Goal.
5. Primary Maximum Contaminant Level.
6. Secondary Maximum Contaminant Level
7. Data collected quarterly from 2nd Quarter 2008 through 4th Quarter 2016.
8. Data collected quarterly from 1st Quarter 2012 through 4th Quarter 2016.

37. Groundwater monitoring data indicate that upgradient groundwater is of poor quality, except for nitrate and arsenic. In comparison to the other upgradient groundwater

monitoring wells, MW-7 has the best groundwater quality regarding constituents representative of salinity (EC, TDS, sodium, and chloride). MW-7 is located within the land area of proposed LAA5 and LAA6.

38. Compliance groundwater monitoring wells MW-2 and MW-5 have concentrations of salinity significantly greater than the concentrations in the up-gradient monitoring wells. This indicates that the discharge may have further degraded groundwater quality with regards to salinity. However, the Discharger's *Salinity Impact Assessment and Mitigation Plan* dated 13 August 2012, provides evidence that salinity concentrations in shallow groundwater tend to increase with groundwater gradient direction toward the San Joaquin River. The mitigation plan references DWR maps showing shallow groundwater monitoring data for EC in 2001 and 2005. The maps show that the salinity of shallow groundwater under the City is less than 2,000 µmhos/cm EC and increases in the easterly to northeasterly direction to 2,000 to 4,000 µmhos/cm EC. The maps also show that a portion of the easterly and northeasterly areas closest to the San Joaquin River increased to 4,000 to 10,000 µmhos/cm in 2005. However, the submitted maps do not provide sufficient resolution of EC concentrations to determine whether the elevated concentrations observed in the WWTF compliance monitoring wells are naturally occurring.

39. Although the average nitrate nitrogen concentrations in all wells are less than the Primary MCL of 10 mg/L for nitrate as nitrogen, quarterly sampling results of upgradient groundwater began exceeding 10 mg/L starting in 2012. Upgradient monitoring well MW4 shows a statistically significant increasing trend from 2008 through 2016. A statistically significant increasing trend is also apparent in downgradient monitoring wells MW-2 and MW-3. The nitrate exceedances in the up-gradient monitoring wells may be a result of long term agricultural practices in the area and may begin affecting nitrate concentrations in compliance wells. The Discharger states that around 2013 the neighboring agricultural practices have changed from flood irrigation of fodder crops to micro-sprinkler irrigation of almonds, which may have an impact on MW-4.

40. Compliance groundwater monitoring well MW-5 has concentrations of arsenic and manganese significantly greater than the potential water quality objective and the concentration of up-gradient monitoring wells. This indicates that the WWTF may have further degraded groundwater with regards to arsenic and manganese. Since the effluent has a low concentration of arsenic and manganese, the source of degradation may be a result of anaerobic conditions created by the WWTF's unlined ponds. The high strength BOD influent and operation of BASIN-1 as an anaerobic pond may create redox conditions that mobilize metals. The Discharger states that the Oxidation Pond and effluent storage basins may create conditions that facilitate the elevated concentrations in MW-5. The Discharger also states that the neighboring land area is a marsh and the observed concentrations may be a natural occurrence. However, the Discharger did not provide supporting groundwater data to indicate that the increased arsenic and manganese concentrations downgradient are naturally occurring. This Order requires the Discharger to evaluate whether the elevated concentrations are naturally occurring, and, if not, to implement additional management practices.

41. The proposed LAA expansion will encompass the location of up-gradient monitoring well MW-7. This Order requires the Discharger to reevaluate the WWTF's monitoring well

network and install additional upgradient and/or compliance monitoring wells if necessary.

Basin Plan, Beneficial Uses, and Regulatory Considerations

42. The *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins,* Fourth Edition (Basin Plan) designates beneficial uses, establishes water quality objectives, contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Board. Pursuant to Water Code section 13263(a), waste discharge requirements must implement the Basin Plan.

43. Local drainage is to the San Joaquin River. The beneficial uses of the San Joaquin River are municipal and domestic supply; agricultural supply; stock watering; process water supply; water contact recreation; non-contact water recreation; warm freshwater habitat; cold freshwater habitat; migration of aquatic organisms; spawning, reproduction, and/or early development; and wildlife habitat.

44. The beneficial uses of underlying groundwater as set forth in the Basin Plan are municipal and domestic supply, agricultural supply, industrial service supply and industrial process supply.

45. The Basin Plan establishes narrative water quality objectives for chemical constituents, tastes and odors, and toxicity in groundwater. It also sets forth a numeric objective for total coliform organisms.

46. The Basin Plan’s numeric water quality objective for bacteria requires that the most probable number (MPN) of coliform organisms over any seven-day period shall be less than 2.2 per 100 mL in MUN groundwater.

47. The Basin Plan’s narrative water quality objectives for chemical constituents, at a minimum, require waters designated as domestic or municipal supply to meet the MCLs specified in Title 22 of the California Code of Regulations (Title 22). The Basin Plan recognizes that the Central Valley Water Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.

48. The narrative toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, animal, plant, or aquatic life associated with designated beneficial uses.

49. Quantifying a narrative water quality objective requires a site-specific evaluation of those constituents that have the potential to impact water quality and beneficial uses. The Basin Plan states that when compliance with a narrative objective is required to protect specific beneficial uses, the Central Valley Water Board will, on a case-by-case basis, adopt numerical limitations in order to implement the narrative objective.

50. In the absence of specific numeric water quality limits, the Basin Plan methodology is to consider any relevant published criteria. General salt tolerance guidelines, such as *Water Quality for Agriculture* by Ayers and Westcot and similar references indicate that

yield reductions in nearly all crops are not evident when irrigation water has an EC less than 700 µmhos/cm. There is, however, an eight to ten-fold range in salt tolerance for agricultural crops and the appropriate salinity values to protect agriculture in the Central Valley are considered on a case-by-case basis. It is possible to achieve full yield potential with waters having EC up to 3,000 µmhos/cm if the proper leaching fraction is provided to maintain soil salinity within the tolerance of the crop.

51. The stakeholder-led Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative has been coordinating efforts to implement new salt and nitrate management strategies. The Board expects dischargers that may be affected by new salt and nitrate management policies, including the Discharger, to coordinate their long-term salt and nitrate planning with the CV-SALTS initiative.

52. In conjunction with the CV-SALTS initiative, the Central Valley Water Board is developing amendments to the Basin Plan to incorporate new strategies for addressing ongoing salt and nitrate accumulation in the waters and soils of the Central Valley. The Salinity Control Program currently being developed would subject dischargers that do not meet stringent salinity numeric values (700 µS/cm EC as a monthly average to protect the AGR beneficial use and 900 µS/cm EC as an annual average to protect the MUN beneficial use) to performance-based salinity requirements and would require these dischargers to participate in a basin-wide Prioritization and Optimization Study. The conditions imposed by these WDRs impose performance-based salinity requirements and are intended to be compatible with new requirements currently under consideration. However, should the Central Valley Water Board incorporate the Salinity Control Program into the Basin Plan as currently contemplated, the Discharger will likely be required to participate in a basin-wide Prioritization and Optimization Study during Phase 1 of this Program (anticipated to last 10-15 years).

Antidegradation Analysis

53. State Water Board Resolution 68-16, the Statement of Policy with Respect to Maintaining High Quality of Waters in California (*State Antidegradation Policy*) prohibits the Board from authorizing the degradation of high-quality water unless it has been shown that:

    a. The degradation will not unreasonably affect present and anticipated beneficial uses;

    b. The degradation does not result in water quality less than that prescribed in state and regional policies, including violation of one or more water quality objectives;

    c. The discharger employs best practicable treatment or control (BPTC) to minimize degradation; and

    d. The degradation is consistent with the maximum benefit to the people of the state.

54. The Discharger has been monitoring groundwater quality at the site since 1998. Although limited groundwater quality data from as far back as 1945 is available, existing information is not sufficient to allow the Board to determine pre-1968 groundwater quality with certainty. Determination of compliance with the *State Antidegradation Policy* is based on the Discharger's groundwater monitoring data since 2008 when the Discharger began monitoring additional constituents in all wells.

55. Constituents of concern that have the potential to degrade groundwater include salts, nutrients, and metals as discussed below.

Constituent	Average Concentrations			
	Effluent	Upgradient Groundwater[6]	Compliance Well Groundwater[7]	Potential Water Quality Objective
EC (µmhos/cm)	3,780[1]	1,520 to 3,820	3,630 to 8,970	900 - 2,200[8]
TDS (mg/L)	2,920[1]	900 to 2,440	2,080 to 5,850	500 - 1,500[9]
Chloride (mg/L)	810[2]	180 to 620	700 to 2,150	106[10] - 600[11]
Sodium (mg/L)	880[1]	230 to 620	560 to 1,670	69[10]
Nitrate Nitrogen (mg/L)	2.2[1]	3.9 to 8.0	< 0.5 to 6.0	10[12]
Arsenic (µg/L)	3[4]	3 to 6	5 to 15	10[12]
Manganese (µg/L)	10[5]	<10 to 510	30 to 2,320	50[13]

[1] Average of monthly monitoring data from 2014 through 2016
[2] Average of quarterly monitoring data from 2014 through 2016
[3] Average of annual monitoring data from 2011 through 2016
[4] Average of quarterly monitoring data from 2nd Quarter 2008 through 4th Quarter 2016
[5] Average of quarterly monitoring data from 2nd Quarter 2008 through 1st Quarter 2010 and annual monitoring data starting in 4th quarter 2010 through 2016 (15 samples total)
[6] Range of average concentrations from MW-1, MW-4, MW-6 and MW-7; data for MW-1, MW-4 collected quarterly from 2nd Quarter 2008 through 4th Quarter 2016; data for MW-6 and MW-7 collected 1st Quarter 2012 through 4th Quarter 2016.
[7] Range of average concentrations from MW-2, MW-3, and MW-5; data collected from 2nd Quarter 2008 through 4th Quarter 2016.
[8] EC Secondary Maximum Contaminant Level range, Recommended level = 900; Upper level = 1,600 mg/L; Short term level = 2,200 mg/L.
[9] TDS Secondary Maximum Contaminant Level range, Recommended level = 500; Upper level = 1,000 mg/L; Short term level = 1,500 mg/L.
[10] Lowest Agricultural Water Quality Goal.
[11] Secondary Maximum Contaminant Level range, Recommended level = 250; Upper level = 500 mg/L; Short term level = 600 mg/L.
[12] Primary Maximum Contaminant Level.
[13] Secondary Maximum Contaminant Level

a. **Salinity (EC, TDS, chloride, and sodium):** Groundwater in the area of the discharge is highly variable with respect to salinity. However, concentrations of EC, TDS, chloride, and sodium, even in upgradient groundwater, all exceed numeric values that would protect salt-sensitive crops (700 µS/cm EC as a monthly average) and that reflect the established “recommended” (900 µS/cm EC as an annual average), “upper” (1,600 µS/cm EC as an annual average) and “short-term” (2,200 µS/cm EC as an annual average) drinking water secondary maximum contaminant levels for consumer acceptance in Title 22. Further, the Discharger has also provided evidence that the salinity of shallow groundwater increases in the easterly to northeasterly direction and can range from 2,000 to 10,000 µmhos/cm. Nonetheless, the concentration of salinity constituents in compliance wells MW-2 and MW-5 are two to three times the concentration observed in upgradient groundwater monitoring wells, indicating impacts to groundwater as a result of discharges associated with the WWTF. These impacts are presumably the combined product of poor quality source water, residential and industrial salinity discharge contributions, and the effects of evapoconcentration during wastewater treatment and land application. Since the discharge is expected to continue to degrade groundwater with respect to salinity, the Board will require that the Discharger implement "best efforts" to reduce impacts to groundwater caused by the salinity in its discharges.

These "best efforts" must include:

i. Continued implementation of an industrial program to regulate salinity inputs from significant industrial users.

ii. Compliance with performance-based EC limits (the 4,200 µS/cm EC as an annual average limit established by this order).

iii. The use of supplemental irrigation groundwater to mitigate EC, TDS, and chloride concentrations applied to the LAAs.

iv. Efforts to develop a lower-salinity potable groundwater well for the City of Newman to reduce the salinity of the WWTF influent.

v. Implementation of a ban on the installation of new self-regenerating water softeners to reduce the salinity of the WWTF influent.

vi. Participation in long-term planning efforts currently underway under the CV-SALTS initiative to develop comprehensive valley-wide solutions to the problem of salinity accumulation in the valley's soils and groundwater.

This Order also requires the Discharger to submit and implement a *Salinity Evaluation and Minimization Plan*.

b. **Nitrate:** The average nitrate concentration in all wells is less than the Primary MCL of 10 mg/L, which means that groundwater is considered "high quality" with respect to nitrate. However, the upgradient wells have each had one exceedance from 2012 through 2016; MW-1 had the highest nitrate nitrogen concentration in the 1st Quarter of 2016 at 29 mg/L, and MW-4 shows a statistically significant increasing concentration trend from 2008 through 2016, which may be a result of neighboring agricultural practices. Because groundwater beneath the facility is considered high-quality with respect to nitrate, these WDRs require the Discharger to implement BPTC to limit degradation caused by nitrates in the discharge.

For nutrients such as nitrate, the potential for groundwater degradation depends on wastewater quality; crop uptake, and the ability of the vadose zone below the LAAs to support nitrification and denitrification to convert the nitrogen to nitrogen gas before it reaches the water table. Most of the nitrogen in the process wastewater is present as Total Kjeldahl Nitrogen (TKN), which can readily mineralize and convert to nitrate (with some loss via ammonia volatilization) during treatment and application to the LAAs.

Effective treatment or control of nitrate depends in large part on ensuring that nitrate applied in wastewater is applied at agronomic rates. These WDRs set a narrative total nitrogen loading limit to the land application areas based off of crop uptake.

c. **Arsenic:** For arsenic, dissolved concentrations in upgradient groundwater are statistically less than the primary MCL, so groundwater is considered a high-quality water for arsenic. However, the annual average dissolved concentration of arsenic in

MW-5 indicates that discharges from the WWTF may be causing degradation of groundwater.

Since the effluent does not contain elevated concentrations of arsenic, the groundwater degradation may be a result of redox conditions created by the WWTF, such as the high strength BOD in the influent and operation of BASIN-1 as an anaerobic basin. The resulting redox conditions in groundwater may be creating the potential to mobilize naturally occurring arsenic and manganese in the soil. The Discharger also states that the neighboring land area is a marsh and the observed concentrations may be a natural occurrence.

These WDRs require the Discharger to implement BPTC, analyze groundwater data, and determine whether downgradient elevated concentrations of arsenic are naturally occurring. If the groundwater data indicate that the elevated concentrations are due to discharges from the WWTF, the Discharger will be required to submit a workplan to the Central Valley Water Board with a proposal for addressing the arsenic impacts.

d. **Manganese:** For manganese, upgradient concentrations are significantly higher than the Secondary MCL for manganese, indicating that groundwater is not a high-quality water for manganese. However, monitoring results indicate that the discharges from the WWTF may be causing further degradation of this groundwater for the same reason that discharges from the WWTF may be causing arsenic degradation (reducing conditions potentially mobilize naturally-occurring manganese in the soil). Since the discharge may degrade non-high quality groundwater with respect to manganese, the Board will require that the Discharger implement “best efforts” to reduce impacts to groundwater caused by the salinity in its discharges.

Incorporating a discussion of potential manganese impacts into the analysis that the Discharger will perform to address potential arsenic degradation, and incorporating a discussion of arsenic in any workplan required (should the elevated downgradient concentrations be found to be due to discharges from the WWTF) would be sufficient to constitute “best efforts” to address potential manganese degradation.

56. Degradation with respect to salinity, nitrate, arsenic and manganese could occur as a result of discharges from the WWTF. The Board finds that the underlying groundwater is considered “high quality” for nitrate and arsenic. The beneficial use potentially affected by discharges of nitrate and arsenic from the WWTF is the MUN beneficial use. By establishing permit terms that limit discharges of nitrate to agronomic rates, the Board is ensuring that the degradation will not unreasonably affect present and anticipated beneficial uses with respect to nitrate. By requiring the Discharger to investigate whether elevated concentrations of arsenic are attributable to discharges from the WWTF and to develop a workplan if they are, the Board is ensuring that the degradation will not unreasonably affect present and anticipated beneficial uses with respect to arsenic. By establishing these requirements, the degradation potentially caused by nitrate and arsenic is not expected to result in water quality less than that prescribed in state and regional policies.

57. The Discharger will employ treatment or control of the wastes in its discharge that will incorporate:

a. Irrigating with the effluent and with relatively low salinity groundwater and/or surface water that will reduce the effluent salinity and loading rates.

b. Additional LAAs to reduce nutrient loading rates.

c. Use of effluent to irrigate crops and landscaped areas using water and nutrient application rates consistent with plant needs.

d. The blending of collected storm water with effluent to reduce salinity.

e. Reducing irrigation with effluent in late summer when the effluent is most saline, and increasing the use of lower salinity supplemental irrigation water.

f. Enforcing limits on industrial wastewater discharges into the Discharger's collection system.

g. The investigation of elevated concentrations of arsenic and manganese downgradient of discharges to determine whether increased concentrations are due to reducing conditions caused by the discharges, and the development of workplans to address those increased concentrations, if the discharges are the cause.

h. The employment of certified wastewater treatment operators.

The Central Valley Water Board finds that the Discharger's implementation of these practices is considered BPTC for the wastes in the discharge. This Order requires the discharger to implement these practices consistent with the *State Antidegradation Policy*.

58. Degradation of groundwater by some of the typical waste constituents associated with discharges from a municipal wastewater utility, after effective source control, treatment, and control measures are implemented, is consistent with the maximum benefit to the people of the state. The technology, energy, water recycling, and waste management advantages of municipal utility service far exceed any benefits derived from reliance on numerous, concentrated individual wastewater systems, and the impact on water quality will be substantially less. The economic prosperity of valley communities and associated industry is of maximum benefit to the people of the State, and provides sufficient justification for allowing the limited groundwater degradation that may occur pursuant to this Order.

59. This Order is consistent with the *State Antidegradation Policy* since the limited degradation allowed by this Order will not result in water quality less than water quality objectives or unreasonably affect present and anticipated beneficial uses, the Discharger will implement BPTC of the wastes in its discharge to minimize degradation that may occur as a result of its discharge, and the limited degradation is of maximum benefit to people of the State.

Water Recycling Regulatory Considerations

60. Undisinfected domestic wastewater contains human pathogens that are typically measured using total or fecal coliform organism as indicator organisms. The State Water

Resources Control Board Division of Drinking Water, which has primary statewide responsibility for protecting water quality and the public health, has established statewide criteria in Title 22, section 60301 et seq. for the use of recycled water.

61. On 3 February 2009, the State Water Board adopted Resolution 2009-0011, Adoption of a Policy for Water Quality Control for Recycled Water (Recycled Water Policy). The Recycled Water Policy promotes the use of recycled water to achieve sustainable local water supplies and reduce greenhouse gases.

62. On 23 April 2009, the Central Valley Water Board adopted Resolution R5-2009-0028, In Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants. Resolution R5-2009-0028 encourages water recycling, water conservation, and regionalization of wastewater treatment facilities. It requires the municipal wastewater treatment agencies to document:

    a. Efforts to promote new or expanded wastewater recycling opportunities and programs;

    b. Water conservation measures; and

    c. Regional wastewater management opportunities and solutions (e.g., regionalization).

    The distribution of undisinfected recycled water by the Discharger is consistent with the intent of State Board Resolution 2009-0011 and Central Valley Water Board Resolution R5-2009-0028.

63. The Discharger submitted a *Title 22 Engineering Report*, dated 11 February 2015 to DDW pursuant to Title 22 for water recycling of undisinfected secondary recycled water. On 27 March 2015, DDW commented on the *Title 22 Engineering Report* and required the City to revise the report to address several concerns. On 21 September 2015, the Discharger submitted the revised *Title 22 Engineering Report* and DDW approved the report on 12 October 2015.

Other Regulatory Considerations

64. In compliance with Water Code section 106.3, it is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This order promotes that policy by requiring discharges to meet maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

65. Based on the threat and complexity of the discharge, the facility is determined to be classified as 2B as defined below:

    a. Category 2 threat to water quality: “Those discharges of waste that could impair the designated beneficial uses of the receiving water, cause short-term violations of water quality objectives, cause secondary drinking water standards to be violated, or cause a nuisance.”

b. Category B complexity, defined as: "Any discharger not included [as Category A] that has physical, chemical, or biological treatment systems (except for septic systems with subsurface disposal) or any Class 2 or Class 3 waste management units."

66. Title 27 of the California Code of Regulations (Title 27) contains regulatory requirements for the treatment, storage, processing, and disposal of solid waste that generally require all wastes that have the potential to degrade water quality be placed in lined landfills. However, Title 27 exempts certain activities from its provisions. Discharges regulated by this Order are exempt from Title 27 pursuant to provisions that exempt domestic sewage, wastewater, and reuse. Title 27, section 20090 states, in relevant part:

> The following activities shall be exempt from the SWRCB-promulgated provisions of this subdivision, so long as the activity meets, and continues to meet, all preconditions listed:
>
> (a) Sewage - Discharges of domestic sewage or treated effluent which are regulated by WDRs issued pursuant to Chapter 9, Division 3, Title 23 of this code, or for which WDRs have been waived, and which are consistent with applicable water quality objectives, and treatment or storage facilities associated with municipal wastewater treatment plants, provided that residual sludges or solid waste from wastewater treatment facilities shall be discharged only in accordance with the applicable SWRCB-promulgated provisions of this division.
>
> (b) Wastewater - Discharges of wastewater to land, including but not limited to evaporation ponds, percolation ponds, or subsurface leachfields if the following conditions are met:
>
> (1) the applicable RWQCB has issued WDRs, reclamation requirements, or waived such issuance;
>
> (2) the discharge is in compliance with the applicable water quality control plan; and
>
> (3) the wastewater does not need to be managed according to Chapter 11, Division 4.5, Title 22 of this code as a hazardous waste.

67. The discharge authorized herein and the treatment and storage facilities associated with the discharge, are exempt from the requirements of Title 27 as follows:

a. The treatment basins BASIN-1, BASIN-2, proposed BASIN-3, oxidation pond and two effluent storage reservoirs are exempt pursuant to Title 27, section 20090(a) because they are treatment and storage facilities associated with a municipal domestic wastewater treatment plant.

b. The LAAs are exempt pursuant to Title 27, section 20090(b) because:

i. The Central Valley Water Board is issuing WDRs.

ii. Following completion of the modifications required by this Order, the discharge will be in compliance with the Basin Plan, and;

iii. The treated effluent discharged to the LAAs does not need to be managed as hazardous waste.

68. The U.S. EPA published *Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities, Unified Guidance* (Unified Guidance) in 2009. As stated in the Unified Guidance, the document:

> …is tailored to the context of the RCRA groundwater monitoring regulations
> …
>
> [however, t]here are enough commonalities with other regulatory groundwater monitoring programs … to allow for more general use of the tests and methods in the Unified Guidance… Groundwater detection monitoring involves either a comparison between different monitoring stations … or a contrast between past and present data within a given station… The Unified Guidance also details methods to compare background data against measurements from regulatory compliance points … [as well as] techniques for comparing datasets against fixed numerical standards … [such as those] encountered in many regulatory programs.

The statistical data analysis methods in the Unified Guidance are appropriate for determining whether the discharge complies with Groundwater Limitations of this Order.

69. On 2 May 2006, the State Water Board adopted Statewide General Waste Discharge Requirements for Sanitary Sewer Systems General Order 2006-0003-DWQ. This General Order requires all public agencies that own or operate sanitary sewer systems greater than one mile in length to comply with the Order. The Discharger's collection system exceeds one mile in length, and the Discharger's collection system is regulated under Order 2006-0003-DWQ.

70. Water Code section 13267(b)(1) states:

> In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of discharging, or who proposes to discharge within its region … shall furnish, under penalty of perjury, technical or monitoring program reports which the board requires. The burden, including costs of these reports, shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.

The technical reports required by this Order and the attached Monitoring and Reporting Program R5-2018-0024 are necessary to ensure compliance with these waste discharge requirements. The Discharger owns and operates the facility that discharges the waste subject to this Order.

71. DWR sets standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 74-81* (December 1981). These standards, and any more stringent standards adopted by the state or county pursuant to Water Code section 13801, apply to all monitoring wells used to monitor the impacts of wastewater storage or disposal governed by this Order.

72. A Mitigated Negative Declaration was certified by the City of Newman on 11 April 2017 in accordance with the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). The Mitigated Negative Declaration describes the project as expanding the existing WWTF and reducing salinity impacts to groundwater by reducing the salinity of the City's potable water supply, reducing salinity to the wastewater stream, using supplemental irrigation water with a lower salinity, upgrading the headworks, building additional aeration basins, removing accumulated sludge from existing basins, improving the aeration of treatment basins, improving flow splitting capabilities of wastewater between treatment basins, expanding the land application area for effluent reclamation, and constructing an additional effluent storage reservoir.

73. Pursuant to Water Code section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

Public Notice

74. All the above, including attachments incorporated herein by reference, were considered in establishing the following conditions of discharge.

75. The Discharger and interested agencies and persons have been notified of the Central Valley Water Board's intent to prescribe waste discharge requirements for this discharge, and they have been provided an opportunity to submit written comments and an opportunity for a public hearing.

76. All comments pertaining to the discharge were heard and considered in a public hearing.

IT IS HEREBY ORDERED that Order 98-163 is rescinded and, pursuant to Water Code sections 13263 and 13267, the City of Newman, its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the Water Code and regulations adopted thereunder, shall comply with the following:

A. Discharge Prohibitions

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. Discharge of waste classified as 'hazardous', as defined in the California Code of Regulations, title 22, section 66261.1 et seq., is prohibited.

3. Treatment system bypass of untreated or partially treated waste is prohibited, except as allowed by Standard Provision E.2 of the *Standard Provisions and Reporting Requirements for Waste Discharge Requirements*.

4. Discharge of waste at a location or in a manner different from that described in the Findings is prohibited.

5. The Discharger shall not allow toxic substances to be discharged into the wastewater treatment system such that biological treatment mechanisms are disrupted.

B. Flow Limitations

1. **Effectively immediately**, the influent flows to the WWTF shall not exceed the following limits:

Measurement	Limit
Total Annual Flow [1]	490 MG
Average Dry Weather Flow [2]	1.25 MGD

[1] As determined by the total flow for the calendar year.
[2] As determined by the total flow for the months of August through October, inclusive, divided by 92 days.

2. Effective on the date of Executive Officer approval of each successive *Wastewater Treatment Facility Phase Completion Report* submitted pursuant to Provision H.1.e, influent flows shall not exceed the limits specified in the following table. Approval is dependent on submittal of a water balance capacity analysis demonstrating that the as-built hydraulic capacity of the WWTF is consistent with the flow limits.

Measurement	Limit
Maximum Total Influent Annual Flow [1]	up to 940 MG
Maximum Average Influent Dry Weather Flow [2]	up to 2.4 MGD
Minimum Land Application Area	varies [3]

[1] As determined by the total flow for the calendar year.
[2] As determined by the total flow for the months of August through October, inclusive, divided by 92 days.
[3] Dependent on approved water balance capacity analysis and determined by the land application area owned by the Discharger, plus the land application area regulated by General Order WQ 2016 0068-DDW, or other equivalent water reclamation general order.

C. Effluent and Mass Loading Limitations

1. **Effective immediately,** the treated wastewater applied to the LAAs shall not exceed the following concentration limits:

Constituent	Units	Quarterly Average	Annual Average
Effluent Flow-Weighted Average EC	µmhos/cm	--	4,200
Effluent Flow-Weighted Average BOD	mg/L	100	80

Compliance with these requirements shall be determined as specified in the Monitoring and Reporting Program.

2. **Effective immediately**, the irrigation with treated wastewater and supplemental water applied to the LAAs shall not exceed the following mass loading limits:

Constituent	Units	Daily Maximum	Irrigation Cycle Average	Annual Maximum
BOD Mass Loading	lb/ac/day	300	100	--
Total Nitrogen Mass Loading	lb/ac/year	--	--	Crop Demand[1]

[1] As determined using published nitrogen uptake rates for the grown vegetation/crops.

Compliance with these requirements shall be determined as specified in the Monitoring and Reporting Program.

D. Discharge Specifications

1. No waste constituent shall be released, discharged, or placed where it will cause a violation of the Groundwater Limitations of this Order.

2. Wastewater treatment, storage, and disposal shall not cause pollution or a nuisance as defined by Water Code section 13050.

3. The discharge shall remain within the permitted waste treatment/containment structures and land application areas at all times.

4. The Discharger shall operate all systems and equipment to optimize the quality of the discharge.

5. All conveyance, treatment, storage, and disposal systems shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

6. Public contact with wastewater at the WWTF shall be prevented through such means as fences, signs, or acceptable alternatives.

7. Objectionable odors shall not be perceivable beyond the limits of the WWTF property at an intensity that creates or threatens to create nuisance conditions.

8. As a means of discerning compliance with Discharge Specification 7, the dissolved oxygen (DO) content in the upper one foot of any wastewater pond, excluding BASIN-1, shall not be less than 1.0 mg/L for three consecutive sampling events. If the DO in any single pond is below 1.0 mg/L for three consecutive sampling events, the Discharger shall report the findings to the Regional Water Board in writing within 10 days and shall include a specific plan to resolve the low DO results within 30 days.

9. The Discharger shall operate and maintain all ponds sufficiently to protect the integrity of containment dams and berms and prevent overtopping and/or structural failure.

Unless a California-registered civil engineer certifies (based on design, construction, and conditions of operation and maintenance) that less freeboard is adequate, the operating freeboard in any treatment pond shall never be less than two feet (measured vertically from the lowest possible point of overflow). As a means of management and to discern compliance with this requirement, the Discharger shall install and maintain in each pond a permanent staff gauge with calibration marks that clearly show the water level at design capacity and enable determination of available operational freeboard.

10. Wastewater treatment, storage, and disposal ponds or structures shall have sufficient capacity to accommodate allowable wastewater flow, design seasonal precipitation, and ancillary inflow and infiltration during the winter while ensuring continuous compliance with all requirements of this Order. Design seasonal precipitation shall be based on total annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns.

11. On or about **1 October** of each year, available capacity shall at least equal the volume necessary to comply with Discharge Specifications 9 and 10.

12. All ponds, basins, and open containment structures shall be managed to prevent breeding of mosquitoes. Specifically:

    a. An erosion control program shall be implemented to ensure that small coves and irregularities are not created around the perimeter of the water surface.

    b. Weeds shall be minimized through control of water depth, harvesting, or herbicides.

    c. Dead algae, vegetation, and debris shall not accumulate on the water surface.

    d. The Discharger shall consult and coordinate with the local Mosquito Abatement District to minimize the potential for mosquito breeding as needed to supplement the above measures.

13. Newly constructed or rehabilitated berms or levees (excluding internal berms that separate ponds or control the flow of water within a pond) shall be designed and constructed under the supervision of a California Registered Civil Engineer.

14. Wastewater contained in any unlined pond shall not have a pH less than 6.0 or greater than 10 as an annual average.

15. The Discharger shall monitor sludge accumulation in the wastewater treatment/storage basins at least every five years beginning in 2018, and shall periodically remove sludge as necessary to maintain adequate storage capacity. Specifically, if the estimated volume of sludge in the basin exceeds ten percent of the volume listed in Finding 17, the Discharger shall complete sludge cleanout within 12 months after the date of the estimate.

16. In order to minimize salinity discharges, the Discharger shall undertake the following actions:

 a. By **31 December 2018**, Discharger shall submit and implement a *Salinity Evaluation and Minimization Plan* (SEMP) to address the sources of salinity discharged from the wastewater treatment system. The SEMP shall provide a comprehensive strategy to minimize WWTF salinity impacts to groundwater and may be compiled from results of previous studies. At a minimum, the plan shall include the following:

  i. Estimate of all pollutant sources contributing, or potentially contributing, to the loadings of salinity in the treatment plant influent including water supply, water softeners, and other residential, commercial and industrial salinity sources.

  ii. Analyze methods that could be used to prevent the discharge of salinity into the facility, including application of local limits to industrial or commercial dischargers regarding pollution prevention techniques, public education and outreach, or other innovative and alternative approaches to reduce discharges of the pollutant to the facility. The analysis shall also identify sources, or potential sources, not within the ability or authority of the Discharger to control.

  iii. An estimate of salinity load reductions that may be identified through the methods identified in Water Code section 13263.3(d)(3)(ii) [discussing POTW pollution prevention planning].

  iv. A plan for monitoring the results of the salinity pollution prevention program.

  v. A description of the tasks, costs, and time required to investigate and implement various elements in the salinity pollution prevention plan.

  vi. A statement of the Discharger's salinity pollution prevention goals and strategies, including priorities for short-term and long-term action, and a description of the Discharger's intended pollution prevention activities for the immediate future.

  vii. A description of the Discharger's existing salinity pollution prevention programs.

  viii. An analysis, to the extent feasible, of any adverse environmental impacts, including cross-media impacts or substitute chemicals that may result from the implementation of the pollution prevention program.

  ix. An analysis, to the extent feasible, of the costs and benefits that may be incurred to implement the pollution prevention program.

  x. Progress to date in reducing the concentration and/or mass of salinity in the discharge.

  xi. Progress in implementation of the plan shall be reported each year in the Annual Monitoring Report required pursuant to the Monitoring and Reporting Program.

b. Continue to implement City of Newman Code 11.06.070, requiring that all industrial users must obtain discharge permits to minimize salinity in the WWTF's effluent.

c. Continue to pursue supplemental irrigation groundwater to mitigate EC, TDS, and chloride concentrations applied to the LAAs.

d. By **2 December 2019**, the Discharger shall submit a copy of the adopted Ordinance prohibiting the installation of new residential water softening or conditioning appliances that discharge sodium, chloride, or other saline substances to the community sewer system (self-regenerating water softeners).

e. By **5 December 2022**, the Discharger shall submit a copy of the adopted Ordinance prohibiting the installation of self-regenerating water softeners to replace failing units.

E. Groundwater Limitations

Effective immediately through 31 December 2022 release of waste constituents from any portion of the facility shall not cause groundwater to exhibit a statistically significant increasing trend. Compliance with this limitation shall be determined annually using compliance groundwater monitoring wells as specified in the Monitoring and Reporting Program using statistical methods defined in the approved *Groundwater Limitations Compliance Assessment Plan*. Salinity constituents EC, TDS, chloride, and sodium are excluded from this limitation.

Effective 1 January 2023, release of waste constituents from any portion of the facility shall not cause groundwater to:

1. Contain concentrations that exceed either the associated Primary or Secondary MCLs established in Title 22 or the background groundwater quality, whichever is greater.

2. Exceed a total coliform organism level of 2.2 MPN/100 mL over any seven-day period.

3. Contain taste or odor-producing constituents, toxic substances, or any other constituents in concentrations that cause nuisance or adversely affect beneficial uses.

The wells to which the above requirements apply are specified in the Monitoring and Reporting Program. Compliance with these limitations shall be determined annually as specified in the Monitoring and Reporting Program using approved statistical methods.

F. Water Recycling Specifications

1. For the purpose of this Order, “use area" means an area with defined boundaries where recycled water is used or discharged.

2. Notwithstanding the following requirements, the production, distribution, and use of recycled water shall conform to an Engineering Report prepared pursuant to Title 22, section 60323 and approved by the Division of Drinking Water.

3. The recycled water shall be at least undisinfected secondary recycled water as defined in Title 22, section 60301.

4. Recycled water shall be used in compliance with Title 22, section 60304. Specifically, uses of recycled water shall be limited to those set forth in Title 22, section 60304(d).

5. Tailwater runoff and spray of recycled water shall not be discharged outside of the use areas.

6. Application rates of recycled water to the use area shall be reasonable and shall consider soil, climate, and plant demand. In addition, application of recycled water and use of fertilizers shall be at a rate that takes into consideration nutrient levels in recycled water and nutrient demand by plants. As a means of discerning compliance with this requirement:

   a. Crops or landscape vegetation shall be grown on the use areas, and cropping activities shall maximize the uptake of applied nitrogen, including any fertilizers and manure.

   b. Hydraulic loading of recycled water and supplemental irrigation water (if any) shall be managed to:

      i. Provide water only when water is needed and in amounts consistent with that need;

      ii. Maximize crop nutrient uptake;

      iii. Maximize breakdown of organic waste constituents in the root zone; and

      iv. Minimize the concentration of waste constituents percolating below the root zone.

   The Board recognizes that some leaching of salts is necessary to manage salt in the root zone of crops for production. Leaching shall be managed to minimize degradation of groundwater, maintain compliance with the groundwater limitations of this Order, and prevent pollution.

7. No recycled water used for irrigation, or soil that has been irrigated with recycled water, shall come into contact with the edible portion of food crops that may be eaten raw by humans.

8. Irrigation of the use areas shall occur only when appropriately trained personnel are on duty or when other methods are implemented to ensure that recycled water remains within the use areas.

9. The Discharger shall conduct periodic inspections of the recycled water use areas to determine compliance with the requirements of this Order. If an inspection reveals noncompliance or threat of noncompliance with this Order, the Discharger shall temporarily stop recycled water use immediately and implement corrective actions to ensure compliance with this Order.

10. Grazing of milking animals within the use areas is prohibited.

11. Discharge of storm water runoff from the use areas to off-site land or surface water drainage courses is prohibited.

12. All storm water runoff from the use areas shall be captured and recycled for irrigation or allowed to percolate within the use areas.

13. The irrigation with recycled water shall be managed to minimize erosion within the use areas.

14. The use areas shall be managed to prevent breeding of mosquitoes or other vectors.

15. Use areas and recycled water impoundments shall be designed, maintained, and operated to comply with the following setback requirements:

Setback Definition	**Minimum Irrigation Setback (feet)**
Edge of use area to property boundary	25
Edge of use area to public road right of way	25
Edge of use area to manmade water drainage course	25
Edge of use area to natural surface water drainage course	50
Edge of use area to domestic water supply well	150
Toe of recycled water impoundment berm to domestic water supply well	150
Edge of use area to residence	100
Edge of use area using spray irrigation to public park, playground, school yard, or similar place of potential public exposure	100

16. At the time of adoption of this Order, the Discharger does not spray irrigate. This Order does not prevent the Discharger from spray irrigating in the future provided spray irrigation complies with the following specifications:

    a. Spray irrigation with recycled water is prohibited when wind speed (including gusts) exceeds 30 mph.

    b. Spray, mist, or runoff shall not enter dwellings, designated outdoor eating areas, or food handling facilities.

17. Drinking water fountains shall be protected against contact with recycled water spray, mist, or runoff.

18. Public contact with recycled water shall be controlled using fences, signs, and other appropriate means.

19. Use areas that are accessible to the public shall be posted with signs that are visible to the public and no less than four inches high by eight inches wide. Signs shall be placed at all areas of public access and around the perimeter of all use areas and at above-ground

portions of recycled water conveyances to alert the public of the use of recycled water. All signs shall display an international symbol similar to that shown in Attachment D, which is attached and forms part of this Order, and shall include the following wording:

"RECYCLED WATER – DO NOT DRINK"

"AGUA DE DESPERDICIO RECLAMADA – NO TOME"

20. All recycling equipment, pumps, piping, valves, and outlets shall be marked to differentiate them from potable water facilities. Quick couplers, if used, shall be different than those used in potable water systems.

21. Recycled water controllers, valves, and similar appurtenances shall be equipped with removable handles or locking mechanisms to prevent public access or tampering.

22. Hose bibs and unlocked valves, if used, shall not be accessible to the public.

23. No physical connection shall exist between recycled water piping and any potable water supply system (including domestic wells), or between recycled water piping and any irrigation well that does not have an approved air gap or reduced pressure principle device.

24. Horizontal and vertical separation between pipelines transporting recycled water and those transporting potable water shall comply with Title 22, section 64572, except to the extent that DDW has specifically approved a variance.

25. No physical connection shall be made or allowed to exist between any recycled water system and any separate system conveying potable water or auxiliary water source system.

26. A public water supply shall not be used as backup or supplemental source of water for a recycled water system unless the connection between the two systems is protected by an air gap separation which complies with the requirements of California Code of Regulations, title 17 (Title 17), sections 7602(a) and 7603(a).

27. All recycled water piping and appurtenances in new installations and appurtenances in retrofit installations shall be colored purple or distinctively wrapped with purple tape in accordance with California Health and Safety Code section 116815.

28. Any backflow prevention device installed to protect a public water system shall be inspected and maintained in accordance with Title 17, section 7605.

G. Solids Disposal Specifications

Sludge, as used in this document, means the solid, semisolid, and liquid residues removed during primary, secondary, or advanced wastewater treatment processes. Solid waste refers to grit and screenings generated during preliminary treatment. Residual sludge means sludge that will not be subject to further treatment at the WWTF. Biosolids refers to sludge that has been treated and tested and shown to be capable of being beneficially used as a soil amendment for agriculture, silviculture, horticulture, and land reclamation activities pursuant to federal and state regulations.

1. Sludge and solid waste shall be removed from screens, sumps, ponds, and clarifiers as needed to ensure optimal plant operation.

2. Any handling and storage of residual sludge, solid waste, and biosolids at the WWTF shall be temporary (i.e., no longer than six months) and controlled and contained in a manner that minimizes leachate formation and precludes infiltration of waste constituents into soils in a mass or concentration that will violate the groundwater limitations of this Order.

3. Residual sludge, biosolids, and solid waste shall be disposed of in a manner approved by the Executive Officer and consistent with Division 2 of Title 27. Removal for further treatment, disposal, or reuse at disposal sites (i.e., landfills, WWTFs, composting sites, soil amendment sites) operated in accordance with valid waste discharge requirements issued by a Regional Water Board will satisfy this specification.

4. Use of biosolids as a soil amendment shall comply with valid waste discharge requirements issued by a regional water board or the State Water Board except in cases where a local (e.g., county) program has been authorized by a regional water board. In most cases, this will mean the General Biosolids Order (State Water Resources Control Board Water Quality Order 2004-12-DWQ, “General Waste Discharge Requirements for the Discharge of Biosolids to Land for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities”). For a biosolids use project to be covered by Order 2004-12-DWQ, the Discharger must file a complete Notice of Intent and receive a Notice of Applicability for each project.

5. Use and disposal of biosolids shall comply with the self-implementing federal regulations of 40 Code of Federal Regulations part 503, which are subject to enforcement by the U.S. EPA, not the Central Valley Water Board. If during the life of this Order, the State accepts primacy for implementation of part 503, the Central Valley Water Board may also initiate enforcement where appropriate.

6. Any proposed change in sludge use or disposal practice shall be reported in writing to the Executive Officer at least 90 days in advance of the change

H. Provisions

1. The following reports shall be submitted pursuant to Water Code section 13267 and shall be prepared as described in Provision H.4:

    a. By **1 February 2019**, the Discharger shall submit a *Groundwater Monitoring Well Installation Workplan* that evaluates the adequacy of the existing monitoring well network and, if necessary, proposes additional upgradient and compliance monitoring wells to verify compliance with the Groundwater Limitations. Compliance monitoring wells may be installed within or downgradient of the LAA expansion areas. The workplan shall be prepared in accordance with, and include the items listed in, the first section of Attachment E, which is attached hereto and made part of this Order by reference. The groundwater monitoring wells shall be designed to yield samples representative of the uppermost portion of the first encountered aquifer. The workplan shall also describe the proposed monitoring wells or other methods that will be used to complete the *Arsenic and Manganese Groundwater Impact Evaluation Report* described below.

b. By **1 February 2019**, the Discharger shall submit a *Groundwater Limitations Compliance Assessment Plan*. The plan shall describe and justify the statistical methods that are proposed to determine compliance with the Groundwater Limitations, which require that release of waste constituents from any portion of the facility shall not cause groundwater to exhibit a statistically significant increasing trend. The plan shall discuss proposed changes to the monitoring well network per the *Groundwater Monitoring Well Installation Workplan* and which groundwater monitoring wells are proposed to be compliance and background monitoring wells. The plan shall evaluate whether compliance should be based on an interwell or intrawell analysis on a per constituent basis for all the constituents listed in the Groundwater Monitoring section of the MRP. Compliance shall be determined annually based on methods prescribed in Title 27, section 20415(e)(7 and 8) and as described in the MRP. As a result of any proposed changes, the MRP may need to be revised. The plan shall also describe the proposed statistical methods to complete the *Arsenic and Manganese Groundwater Impact Evaluation Report* described below.

c. By **3 September 2019,** the Discharger shall submit a *Groundwater Monitoring Well Installation Report* for any new groundwater monitoring wells constructed to comply with Provision H.1.a. The report shall be prepared in accordance with, and including the items listed in, the second section of Attachment E. The report shall describe the installation and development of all new monitoring wells, and explain any deviation from the approved workplan.

d. By **1 February 2021**, the Discharger shall submit an *Arsenic and Manganese Groundwater Impact Evaluation Report* that evaluates whether the concentrations observed in MW-5 are naturally occurring or a result of the discharge. This evaluation may utilize sampling tools that can collect a representative ground water sample without requiring the installation of a ground water monitoring well.

   The report shall provide all collected data in a tabular format and a description of the analysis method used to develop a conclusion. If the unlined ponds are determined to be causing unallowable groundwater degradation, the report shall provide a feasibility study of at least the following alternatives: (1) more stringent EC and BOD_5 pretreatment requirements, (2) operating BASIN-1 as an aerobic basin, (3) lining the treatment ponds, and (4) alternative wastewater treatment technologies, such as concrete lined oxidation ditches and clarifiers. The evaluation shall also provide a schedule for implementing the feasible alternative(s).

e. At least **60 days** prior to a planned flow limit increase, the Discharger shall submit a *Wastewater System Improvements & Expansion Report* that documents the construction of new treatment basins and/or storage reservoirs. The report shall certify that the structures are fully functional and ready to receive wastewater in compliance with the requirements of this Order. The report shall include as-built drawings, final dimensions, and storage capacity of the new treatment basins and/or storage reservoirs.

The report shall include a scaled map that depicts the location and boundary of new LAAs and associated tailwater collection systems. The report shall certify that the LAAs and tailwater collection systems are fully functional and ready to receive wastewater in compliance with the requirements of this Order.

The report shall include a revised water balance based on a 100-year annual precipitation storm event that demonstrates the wastewater storage capacity of the WWTF and minimum acres of LAA required for disposal.

The report shall be approved by the Executive Officer before the Discharger increases the WWTF influent or effluent flow.

2. At least **180 days** prior to any sludge removal and disposal from the wastewater treatment ponds, the Discharger shall submit a *Sludge Monitoring and Cleanout Plan*. The plan shall include a detailed plan for sludge removal, drying, and disposal. The plan shall specifically describe the phasing of the project, measures to be used to control runoff or percolate from the sludge as it is drying, and a schedule that shows how all dried sludge will be land applied to the LAAs or removed from the site prior to the onset of the rainy season (1 October).

3. A discharger whose waste flow has been increasing, or is projected to increase, shall estimate when flows will reach hydraulic and treatment capacities of its treatment, collection, and disposal facilities. The projections shall be made in January, based on the last three years' average dry weather flows, peak wet weather flows and total annual flows, as appropriate. When any projection shows that capacity of any part of the facilities may be exceeded in four years, the discharger shall notify the Central Valley Water Board by **31 January**.

4. In accordance with California Business and Professions Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain workplans for investigations and studies, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), even if not explicitly stated. Each technical report submitted by the Discharger shall bear the professional's signature and stamp.

5. The Discharger shall submit the technical reports and work plans required by this Order for consideration by the Executive Officer, and incorporate comments the Executive Officer may have in a timely manner, as appropriate. Unless expressly stated otherwise in this Order, the Discharger shall proceed with all work required by the foregoing provisions by the due dates specified.

6. The Discharger shall comply with Monitoring and Reporting Program R5-2018-0024, which is part of this Order, and any revisions thereto as ordered by the Executive Officer. The submittal dates of Discharger self-monitoring reports shall be no later than the submittal date specified in the MRP.

7. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated 1 March 1991, which are attached hereto and made part of this Order by reference. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."

8. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports. On or before each report due date, the Discharger shall submit the specified document to the Central Valley Water Board or, if appropriate, a written report detailing compliance or noncompliance with the specific schedule date and task. If noncompliance is being reported, then the Discharger shall state the reasons for such noncompliance and provide an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Central Valley Water Board in writing when it returns to compliance with the time schedule. Violations may result in enforcement action, including Central Valley Water Board or court orders requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.

9. The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by the Discharger when the operation is necessary to achieve compliance with the conditions of this Order.

10. The Discharger shall use the best practicable cost-effective control technique(s) including proper operation and maintenance, to comply with this Order.

11. As described in the Standard Provisions, the Discharger shall report promptly to the Central Valley Water Board any material change or proposed change in the character, location, or volume of the discharge.

12. The Discharger shall report to the Central Valley Water Board any toxic chemical release data it reports to the State Emergency Response Commission within 15 days of reporting the data to the Commission pursuant to section 313 of the "Emergency Planning and Community Right to Know Act of 1986."

13. At least **90 days** prior to termination or expiration of any lease, contract, or agreement involving disposal or recycling areas or off-site reuse of effluent, used to justify the capacity authorized herein and assure compliance with this Order, the Discharger shall notify the Central Valley Water Board in writing of the situation and of what measures have been taken or are being taken to assure full compliance with this Order.

14. In the event of any change in control or ownership of the facility, the Discharger must notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to the Central Valley Water Board.

15. To assume operation as Discharger under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the state of

incorporation if a corporation, the name and address and telephone number of the persons responsible for contact with the Central Valley Water Board, and a statement. The statement shall comply with the signatory paragraph of Standard Provision B.3 and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the Water Code. If approved by the Executive Officer, the transfer request will be submitted to the Central Valley Water Board for its consideration of transferring the ownership of this Order at one of its regularly scheduled meetings.

16. A copy of this Order including the MRP, Information Sheet, Attachments, and Standard Provisions, shall be kept at the discharge facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.

17. The Central Valley Water Board will review this Order periodically and will revise requirements when necessary.

If, in the opinion of the Executive Officer, the Discharger fails to comply with the provisions of this Order, the Executive Officer may refer this matter to the Attorney General for judicial enforcement, may issue a complaint for administrative civil liability, or may take other enforcement actions. Failure to comply with this Order may result in the assessment of Administrative Civil Liability of up to $10,000 per violation, per day, depending on the violation, pursuant to the Water Code, including sections 13268, 13350 and 13385. The Central Valley Water Board reserves its right to take any enforcement actions authorized by law.

Any person aggrieved by this action of the Central Valley Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at:

http://www.waterboards.ca.gov/public_notices/petitions/water_quality

or will be provided upon request.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify that the foregoing is a full true, and correct copy of an Order adopted by the California Regional Water Quality Control Board on 6 April 2018.

Original signed by

PAMELA C. CREEDON, Executive Officer

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM R5-2018-0024

FOR

CITY OF NEWMAN
NEWMAN WASTEWATER TREATMENT PLANT
STANISLAUS COUNTY

This monitoring and reporting program (MRP) incorporates requirements for monitoring of the wastewater influent, wastewater effluent, wastewater treatment and storage ponds, land application areas, solid waste, and groundwater. This MRP is issued pursuant to Water Code Section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer.

All wastewater samples should be representative of the volume and nature of the discharge. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form. Wastewater flow monitoring shall be conducted continuously using a flow meter and shall be reported in cumulative gallons per day.

Field test instruments (such as pH and dissolved oxygen) may be used if:

1. The operator is trained in the proper use of the instrument;
2. The instruments are field calibrated prior to each use;
3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are submitted as described in the “Reporting” section of this MRP.

Analytical procedures shall comply with the methods and holding times specified in the following: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA); Test Methods for Evaluating Solid Waste (EPA); Methods for Chemical Analysis of Water and Wastes (EPA); Methods for Determination of Inorganic Substances in Environmental Samples (EPA); Standard Methods for the Examination of Water and Wastewater (APHA/AWWA/WEF); and Soil, Plant and Water Reference Methods for the Western Region (WREP 125). Approved editions shall be those that are approved for use by the United States Environmental Protection Agency or the California Department of Public Health’s Environmental Laboratory Accreditation Program. The Discharger may propose alternative methods for approval by the Executive Officer. Where technically feasible, laboratory reporting limits shall be lower than the applicable water quality objectives for the constituents to be analyzed.

INFLUENT FLOW MONITORING

The monitoring shall be performed at the headworks. Influent monitoring shall include the following:

Constituents	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Daily Flow	gallons	Continuous[1]	Daily	Quarterly
Total Monthly Flow	MG	Calculated	Monthly	Quarterly
Average Monthly Flow	gpd	Calculated	Monthly	Quarterly
BOD [3]	mg/L	24-hr Composite[2]	Weekly	Quarterly
Total Suspended Solid	mg/L	24-hr Composite[2]	Weekly	Quarterly
Total Dissolved Solids	mg/L	24-hr Composite[2]	Monthly	Quarterly
Electrical Conductivity	µmhos/cm	24-hr Composite[2]	Twice Monthly	Quarterly

[1] Continuous monitoring requires daily meter reading or automated data collection.
[2] Samples shall be a flow-proportioned composite consisting of at least eight aliquots over a 24-hour period.
[3] 5-day biochemical oxygen demand.
MG – million gallons

Influent Trigger Concentration
The following trigger concentration is intended to serve as a means of assessing whether the Dischargers salinity source control BMPs are effective and whether additional salinity source control is necessary.

Constituent	Trigger
Electrical Conductivity	Increasing concentration trend for 3 consecutive years

If the annual evaluation of the influent EC concentration performed pursuant to the Annual Monitoring Report section of this MRP shows a statistically significant increasing trend for three consecutive years, the Discharger shall submit one or both of the following technical reports, as applicable, by **1 May of the following calendar year** (e.g., if the influent EC concentration shows an increasing trend during compliance years 2020, 2021, and 2022, the appropriate report is due by 1 May 2023):

1. A technical evaluation of the reason[s] for the concentration increase and a technical demonstration that although the concentration has increased more than expected, the source control BMPs are effective at reducing overall salinity loading.
2. A *Salinity Evaluation and Implementation Plan* that addresses the sources of salinity discharged to the wastewater treatment system, determines whether additional source control is feasible, and proposes a schedule to complete feasible additional source control. The plan shall meet the requirements outlined in Water Code section 13263.3(d)(3).

POND MONITORING

Freeboard shall be measured vertically from the surface of the pond water to the lowest elevation of the surrounding berm and shall be measured to the nearest 0.1 foot.
The Discharger shall monitor each of the basins, ponds, or reservoirs as specified below:

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Dissolved Oxygen[1]	mg/L	Grab	Weekly	Quarterly
Oxygen Reduction Potential[1]	mV	Grab	Weekly	Quarterly
Freeboard	feet (±0.1)	Measurement	Weekly	Quarterly
pH	Std.	Grab	Weekly	Quarterly
Berm Condition[2]	--	Observation	Weekly	Quarterly
Odors	--	Observation	Weekly	Quarterly

1 Samples shall be collected at a depth of one foot, opposite the inlet.
2 Pond berms shall be observed for signs of seepage or surfacing water along the exterior toe.

EFFLUENT MONITORING

Effluent samples should be representative of the volume and nature of the discharge. Effluent monitoring shall include at least the following:

The following constituent samples shall be collected immediately prior to effluent being discharged to a storage reservoir.

Constituents	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Electrical Conductivity	µmhos/cm	Grab	Twice Monthly	Quarterly
Total Dissolved Solids	mg/L	Grab	Monthly	Quarterly

The following constituent samples shall be collected from the storage pond just prior to discharge to the land application areas.

Constituents	Units	Type of Sample	Sampling Frequency	Reporting Frequency
pH	Std.	Grab	Weekly	Quarterly
BOD_5 [1]	mg/L	Grab	Weekly	Quarterly
Electrical Conductivity	µmhos/cm	Grab	Twice Monthly	Quarterly
Total Dissolved Solids	mg/L	Grab	Monthly	Quarterly
Chloride	mg/L	Grab	Monthly	Quarterly
Sodium	mg/L	Grab	Monthly	Quarterly
Nitrate as Nitrogen	mg/L	Grab	Monthly	Quarterly
Total Kjeldahl Nitrogen	mg/L	Grab	Monthly	Quarterly
Total Nitrogen	mg/L	Calculated	Monthly	Quarterly
Standard Minerals [2,3]	mg/L	Grab	Annually	Annually

1 Five-day, 20° Celsius Biochemical Oxygen Demand.
2 Standard Minerals shall include at least the following compounds: arsenic, boron, calcium, iron, manganese, magnesium, potassium, sulfate, total alkalinity (including alkalinity series), and hardness.
3 Samples shall be filtered prior to preservation using a 0.45µ filter.

WATER SUPPLY MONITORING

The Discharger shall establish a sampling station where a representative sample of the municipal water supply can be obtained. Monitoring shall include, at a minimum, the following. As an alternative to sampling for standard metals, the Discharger may submit a copy of the most current Department of Public Health Consumer Confidence Report or analytical results submitted to the County Environmental Health Department or California Department of Public Health, as applicable.

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Total Dissolved Solids	mg/L	Grab	Quarterly	Quarterly
Electrical Conductivity	µmhos/cm	Grab	Quarterly	Quarterly
Nitrate as Nitrogen	mg/L	Grab	Quarterly	Quarterly
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly	Quarterly
Total Nitrogen	mg/L	Calculated	Quarterly	Quarterly
Standard Minerals [1]	mg/L	Grab	Annually	Annually

[1] If the Discharger samples for Standard Minerals, sampling shall include, at a minimum, the following: boron, calcium, chloride, iron, magnesium, manganese, potassium, sodium, sulfate, total alkalinity (including alkalinity series), and hardness.

SUPPLEMENTAL IRRIGATION WATER MONITORING

The Discharger shall monitor the supplemental water used to irrigate LAAs. Monitoring shall include, at a minimum, the following:

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Total Dissolved Solids	mg/L	Grab	Monthly	Quarterly
Electrical Conductivity	µmhos/cm	Grab	Monthly	Quarterly
Nitrate as Nitrogen	mg/L	Grab	Monthly	Quarterly
Total Kjeldahl Nitrogen	mg/L	Grab	Monthly	Quarterly
Total Nitrogen	mg/L	Calculated	Monthly	Quarterly

LAND APPLICATION AREA MONITORING

Daily Pre-Application Inspections

The Discharger shall inspect LAA1 through LAA6 at least once within 2 days prior to irrigation events and then daily during irrigation. Observations from those inspections shall be documented for inclusion in the monthly monitoring reports. The following items shall be documented for each check or field to be irrigated on that day:

a. Evidence of erosion;
b. Containment berm condition;
c. Condition of above-ground pipes, flow control valves, sprinklers, and/or drip emitters (as applicable);
d. Proper use of valves;

e. Ponding;
f. Irrigation supply and tailwater ditch condition and potential for runoff to off-site areas;
g. Potential and actual discharge of waste to surface water;
h. Odors that have the potential to be objectionable at or beyond the property boundary; and
i. Insects (e.g., flies, mosquitoes).
j. Any corrective actions taken based on observations made.

A copy of entries made in the log during each month shall be submitted as part of the Quarterly Monitoring Report. If no irrigation with wastewater takes place during a given month, then the monitoring report shall so state.

Land Application Monitoring

The Discharger shall perform the following routine monitoring and loading calculations for LAA1 through LAA6 each day when water is applied.

Constituent	Units	Type of Sample	Sampling Frequency	Reporting Frequency
Precipitation	0.1 in.	Rain Gauge [1]	Daily	Quarterly
LAAs and individual checks receiving effluent	--	Observation	Daily	Quarterly
Hydraulic loading rate				
Effluent	in.	Calculated	Daily	Quarterly
Supplemental irrigation water	in.	Calculated	Daily	Quarterly
Total	in.	Calculated	Daily	Quarterly
Daily BOD loading rate	lb/ac/day	Calculated [2]	Daily	Quarterly
Cycle average BOD loading rate	lb/ac/day	Calculated [2]	Cycle	Quarterly
Nitrogen loading rate	lb/ac/year	Calculated [2]	Monthly	Quarterly
Total dissolved solids loading rate (effluent plus irrigation water)	lb/ac/year	Calculated [2]	Monthly	Quarterly

[1] Data obtained from the nearest National Weather Service rain gauge is acceptable.
[2] Loading rates shall be calculated using the method specified in the Reporting Section of this MRP.

GROUNDWATER MONITORING

Prior to construction and/or sampling of any groundwater monitoring wells, the Discharger shall submit plans and specifications to the Board for review and approval. Once installed, all new wells shall be added to the MRP and shall be sampled and analyzed according to the schedule below. All samples shall be collected using EPA approved methods and water table elevations shall be calculated and used to determine groundwater gradient and direction of flow. Compliance groundwater monitoring wells are designated as follows until the *Groundwater Limitations Compliance Assessment Plan* is approved, at which time this MRP may be revised.

Prior to land application of wastewater to the proposed LAA5, compliance wells are designated as follows:

MW-2, MW-3, MW-5

After land application of wastewater to the proposed LAA5, compliance wells are designated as follows:

MW-2, MW-3, MW-5, MW-7

The Groundwater Limitations set forth in Section E of the WDRs shall apply to the compliance monitoring wells as specified above.

Prior to sampling, depth to groundwater elevations shall be measure and the wells shall be purged at least three well volumes until temperature, pH, and electrical conductivity have stabilized. Low or no-purge sampling methods are acceptable, if described in an approved Sampling and Analysis Plan. Depth to groundwater shall be measured to the nearest 0.01 feet. Groundwater monitoring for all monitoring wells shall include, at a minimum, the following:

Constituent	Units	Type of Sample	Sampling and Reporting Frequency
Depth to Groundwater	±0.01 feet	Measurement	Quarterly
Groundwater Elevation [1]	±0.01 feet	Calculated	Quarterly
Gradient	feet/feet	Calculated	Quarterly
Electrical Conductivity	µmhos/cm	Grab	Quarterly
Total Dissolved Solids	mg/L	Grab	Quarterly
Nitrate as Nitrogen	mg/L	Grab	Quarterly
pH	mg/L	Grab	Quarterly
Chloride	mg/L	Grab	Quarterly
Sodium	mg/L	Grab	Quarterly
Dissolved Iron [2]	µg/L	Grab	Quarterly
Dissolved Manganese [2]	µg/L	Grab	Quarterly
Standard Minerals [2,3]	mg/L	Grab	Annually

[1] Groundwater elevation shall be determined based on depth-to-water measurements from a surveyed measuring point elevation on the well.

[2] Samples shall be filtered prior to preservation using a 0.45µm or less filter.

[3] Standard Minerals shall include at least the following compounds: arsenic, boron, calcium, magnesium, potassium, sulfate, total alkalinity (including alkalinity series), and hardness.

SLUDGE AND/OR BIOSOLIDS MONITORING

Sludge and/or biosolids samples shall be analyzed to determine the total concentration in mg/Kg for the following constituents each time sludge is removed from any pond:

Arsenic	Lead	Nickel
Cadmium	Mercury	Selenium
Copper	Molybdenum	Zinc
Total Nitrogen	Total Solids	

Sludge and/or biosolids monitoring records shall be retained for a minimum of five years in accordance with 40 CFR, Part 503.17. A log shall be kept of sludge quantities generated and of handling, application, and disposal activities. The frequency of entries is discretionary; however, the log should be complete enough to serve as a basis to report sludge monitoring.

REPORTING

The Central Valley Water Board has gone to a paperless office system. All regulatory documents, submissions, materials, data, monitoring reports, and correspondence should be converted to a searchable Portable Document Format (PDF) and submitted electronically. Documents that are less than 50MB should be emailed to:
centralvalleysacramento@waterboards.ca.gov

Documents that are 50 MB or larger should be transferred to a CD, DVD, or flash drive and mailed to the following address:

Central Valley Regional Water Quality Control Board
ECM Mailroom
11020 Sun Center Drive, Suite 200
Rancho Cordova, California 95670

To ensure that your submittal is routed to the appropriate staff person, the following information should be included in the body of the email or transmittal sheet:

Attention: Compliance/Enforcement Section
City of Newman WWTF
Stanislaus County
Place ID: 244250

A transmittal letter shall accompany each monitoring report. The letter shall include a discussion of all violations of the WDRs and this MRP during the reporting period and actions taken or planned for correcting each violation. If the Discharger has previously submitted a report describing corrective actions taken and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. Pursuant to Section B.3 of the Standard Provisions and General Reporting Requirements, the transmittal letter shall contain a statement by the Discharger or the Discharger's authorized agent certifying under penalty of perjury that the report is true, accurate and complete to the best of the signer's knowledge.

In reporting monitoring data, the Discharger shall arrange the data in tabular form so that the date, sample type (e.g., effluent, pond, etc.), and reported analytical result for each sample are readily discernible. The data shall be summarized in such a manner to clearly illustrate compliance with waste discharge requirements and spatial or temporal trends, as applicable. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall be reported in the next scheduled monitoring report.

Laboratory analysis reports do not need to be included in the monitoring reports; however, all laboratory reports must be retained for a minimum of three years in accordance with Standard Provision C.3. For a Discharger conducting any of its own analyses, reports must also be signed and certified by the chief of the laboratory.

In addition to the requirements of Standard Provision C.3, monitoring information shall include the method detection limit (MDL) and the Reporting limit (RL) or practical quantitation limit (PQL). If the regulatory limit for a given constituent is less than the RL (or PQL), then any analytical results for that constituent that are below the RL (or PQL) but above the MDL shall be reported and flagged as estimated.

All monitoring reports that involve planning, investigation, evaluation or design, or other work requiring interpretation and proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code sections 6735, 7835, and 7835.1.

In the future, the State Water Board or Central Valley Regional Water Board may require electronic submittal of monitoring reports using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site (*http://www.waterboards.ca.gov/ciwqs/index.html*) or similar system. Electronic submittal to CIWQS, when implemented, will meet the requirements of our Paperless Office System.

A. Quarterly Monitoring Reports

Quarterly monitoring reports shall be submitted to the Central Valley Water Board by the **1st day of the second month after the quarter** (e.g. the January-March quarterly report is due by **May 1st**). Each Quarterly Monitoring Report shall include the following:

1. Results of Influent Monitoring, including calculated values for total annual flow to date.
2. Results of Pond Monitoring.
3. Results of Effluent Monitoring, including the flow-weighted annual average concentration for EC (µmhos/cm) and flow-weighted annual and quarterly average concentration for BOD (mg/L), as collected from the storage pond just prior to discharge, shall be calculated using the following formula. The cumulative flow-weighted annual average concentration of EC and BOD shall be calculated from the start of the year through the current reporting quarter.

$$C_a = \frac{\sum_{i=1}^{n}(C_i \cdot V_i)}{\sum_{i=1}^{n}(V_i)}$$

Where: C_a = Flow-weighted average annual (µmhos/cm or mg/L) or quarterly (mg/L) concentration
n = Total number of samples to be averaged for month or calendar year
i = The sample number out of *n* total samples taken during the month or year
C_i = Concentration of i^{th} EC or BOD sample in µmhos/cm or mg/L, respectively
Vi = Volume of wastewater applied to the LAA during i^{th} sample in million gallons

4. Results of Water Supply Monitoring.
5. Results of Supplemental Irrigation Watering.
6. Results of Land Application Area Monitoring, including:
   a. The mass loading rate of BOD applied to each LAA on a daily basis shall be calculated using the following formula:

$$M = \frac{8.345(C \cdot V)}{A}$$

Where M = Mass of BOD applied to an LAA in lb/ac/day

C = Concentration of BOD in mg/L based on the most recent monitoring result
V = Daily volume of wastewater applied to the LAA in million gallons
A = Area of the LAA irrigated in acres
8.345 = Unit conversion factor

   b. The mass loading rate of BOD applied to each LAA as an irrigation cycle average shall be calculated using the following formula:

$$M = \frac{8.345(C \cdot V)}{A \cdot T}$$

Where M = Mass of BOD applied to an LAA in lb/ac/day

C = Concentration of BOD in mg/L based on the most recent monitoring result
V = Total volume of wastewater applied to the LAA during the irrigation cycle in million gallons
A = Area of the LAA irrigated in acres
T = Cycle time (i.e., irrigation cycle length from start of irrigation to start of next irrigation event, in days)
8.345 = Unit conversion factor

c. The cumulative mass loading rate of total nitrogen applied to each LAA from the start of the year through the current reporting quarter shall be calculated using the following formula and compared to published crop demand for the crops actually grown.

$$M = \sum_{i=1}^{12} \frac{(8.345(C_i \cdot V_i) + M_x)}{A}$$

Where M = Mass of total nitrogen applied to an LAA in lb/ac/year

i = The number of the month (e.g., January = 1, February = 2, etc.)
C_i = Monthly average concentration of total nitrogen for month *i* in mg/L
V_i = Volume of wastewater applied to the LAA during calendar month *i* in million gallons
A = Area of the LAA irrigated in acres
M_x = Nitrogen mass from other sources (e.g., fertilizer and compost) in pounds
8.345 = Unit conversion factor

d. For each discrete LAA, a comparison of monitoring data to the loading rate limitations and discharge specifications and an explanation of any violation of those requirements.

7. Results of Groundwater Monitoring including:

   a. A narrative description of all preparatory, monitoring, sampling, and sample handling for groundwater monitoring.

   b. A field log for each well documenting depth to groundwater; method of purging; parameters measured before, during, and after purging; sample preparation (e.g., filtering); and sample preservation.

   c. Summary data tables of historical and current water table elevations and analytical results.

   d. A scaled map showing relevant structures and features of the facility, the locations of monitoring wells, surface waters, groundwater elevation contours referenced to an appropriate datum (e.g., NGVD), and indicating direction of the groundwater gradient.

   e. Copies of laboratory analytical report(s) for groundwater monitoring.

8. Results of Sludge/Biosolids Monitoring completed during the quarter, and (if applicable) verification of classification of biosolids as nonhazardous per 22 CCR, Article 11, Criteria for Identification of Hazardous and Extremely Hazardous Waste (California Assessment Manual procedures).

9. A narrative evaluation of compliance comparing monitoring data to the prohibitions, specifications, and limitations of the WDRs with an explanation of any violation of those requirements.

10. A scaled map showing relevant structures and features of the facility, the locations of monitoring wells, surface water monitoring locations, and any other sampling stations, and groundwater elevation contours referenced to mean sea level datum.
11. A discussion of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program.
12. A copy of equipment maintenance and calibration records verifying calibration of all hand-held monitoring instruments performed during the quarter, as described in Standard Provision No. C.4.

B. Annual Monitoring Report

The Annual Monitoring Report shall be submitted to the Central Valley Water Board by **1 February** each year. The Annual Monitoring Report shall include the following:

1. The calculated average influent dry weather flow, total influent annual volume of wastewater generated during the year, and comparison to the currently approved influent flow limitations. If the approved influent flow limitations have been changed since the adoption of the WDRs, the report shall specify the new limitations. The report shall reference the date of the *Wastewater System Improvements & Expansion Report* that proposed the flow limit increase and date of the Executive Officer letter that approved the flow limit increase.
2. A year-end summary of quarterly monitoring results for influent, pond, effluent, water supply, supplemental irrigation water, and groundwater. Summaries shall include tabular and concentration versus time graphs representations of all data collected for at least the last two years. Graphs shall show a horizontal line indicating the WDR specified limitation when applicable. Data collected through observation does not need to be graphed (e.g., levee condition and odor).
3. A digital database (e.g., Microsoft Excel workbooks) of historic influent, pond, effluent, water supply, supplemental irrigation water, groundwater, and sludge/biosolids monitoring to date.
4. An evaluation of the influent EC concentration trend using influent monitoring data starting from January 2017 through the current compliance year. The evaluation shall use a statistical trend analysis trend such as the Mann-Kendall test, describe whether the data set satisfies the assumptions of the test (e.g., normality, if applicable), describe the results of the test, and explain whether the Influent Trigger Concentration has been triggered. If the data set does not meet all the assumptions of the test, an explanation of why the test is more appropriate than another statistical trend test shall be provided.
5. A statistical evaluation of groundwater quality and compliance with the Groundwater Limitations of the WDRs in accordance with the approved *Groundwater Limitations Compliance Assessment Plan* submitted pursuant to Provision H.1.a of the WDRs.
6. A narrative annual evaluation summary of compliance comparing monitoring data to the prohibitions, specifications, and limitations of the WDRs with an explanation of any violation of those requirements that occurred during the year. The summary shall include a discussion of the corrective actions taken, as well as any planned or proposed actions needed to bring the discharge into full compliance with the waste discharge requirements.

7. An evaluation of the effectiveness of the year's WWTF operation and wastewater application operation in terms of odor control and groundwater protection, including consideration of application management practices (e.g., waste constituent and hydraulic loadings, application cycles, drying times, and cropping practices), and groundwater monitoring data.
8. A summary of the crops removed from each LAA (ton per acre). The summary shall include planting and harvest dates and crop type.
9. Estimated flows for the next calendar year.
10. A scaled map showing relevant structures and features of the facility, the locations of monitoring wells, surface water monitoring locations, and any other sampling stations, and groundwater elevation contours referenced to mean sea level datum.
11. Copies of laboratory analytical report(s) for groundwater monitoring, if requested by staff.

A transmittal letter shall accompany each self-monitoring report. The letter shall include a discussion of all violations of the WDRs or this MRP during the reporting period and actions taken or planned for correcting each violation. If the Discharger has previously submitted a report describing corrective actions taken and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. Pursuant to Section B.3 of the Standard Provisions and General Reporting Requirements, the transmittal letter shall contain a statement by the Discharger or the Discharger' authorized agent certifying under penalty of perjury that the report is true, accurate and complete to the best of the signer's knowledge.

The Discharger shall implement the above monitoring program as of the date of this Order.

Ordered by: *Original signed by*
PAMELA C. CREEDON, Executive Officer

6 April 2018
(Date)

INFORMATION SHEET

ORDER R5-2018-0024
CITY OF NEWMAN
WASTEWATER TREATMENT FACILITY
STANISLAUS COUNTY

Facility Description

The City of Newman (Discharger) owns and operates a wastewater treatment facility (WWTF). The WWTF treats wastewater from residential, commercial, and industrial sources: a cheese manufacturer, a turkey hatchery, and a tomato processor. As of 2016, the estimated population of the City is approximately 11,000 residents. The WWTF discharge is currently regulated by Order 98-163, which set an influent flow limit of 1.69 million gallons per day (MGD) as a monthly average dry weather flow (ADWF).

The WWTF includes a bar screen, two unlined earth basins BASIN-1 and BASIN-2, an unlined Oxidation Pond , two unlined effluent storage reservoirs with a total capacity of 230 million gallons (MG), 60 acres of overland flow terraces, and 199 acres of land application areas (LAAs). Based on two feet of freeboard, BASIN-1, BASIN-2, and Oxidation Pond have capacities of 7MG, 9 MG and 90 MG respectively.

On 23 January 2017, the Discharger submitted a letter stating that BASIN-1 is operating as an anaerobic treatment basin rather than an aerobic treatment basin as originally designed. From September 2014 through December 2016, the dissolved oxygen (DO) in BASIN-1 averaged approximately 0.2 mg/L, with a maximum of 0.28 mg/L. WDRs 98-163 set a minimum DO limit of 1.0 mg/L for all ponds to prevent objectionable odors beyond the boundary limits of the WWTF. While BASIN-1 has not met the minimum DO limit, the Discharger reports that no objectionable odors are apparent at the boundary of the WWTF because BASIN-1 effluent is further treated by aerobic basins and odors are minimized. An inspection by Board staff on 17 August 2017 confirmed that objectionable odors were not noticeable on the WWTF property boundary.
The Discharger submitted a sludge volume report for BASIN-1 as part of the April 2017 RWD, which states that operating BASIN-1 as an anaerobic treatment basin reduces high strength BOD influent by sixty to eighty percent and is necessary to stabilize the BOD for aerobic treatment. The Discharger states that converting BASIN-1 to a conventional aeration basin by installing additional aerators, as originally proposed in the February 2015 RWD, is cost prohibitive. The anaerobic operation of BASIN-1 may be contributing to conditions that mobilize naturally occurring metals in groundwater

Groundwater monitoring data indicate that groundwater upgradient of the WWTF is of poor quality. Salinity concentrations in compliance groundwater monitoring wells surrounding the WWTF are approximately double of the up-gradient monitoring wells. Average nitrate nitrogen concentrations in all monitoring wells are less than the Title 22 Primary Maximum Contaminant Level (Primary MCL) of 10 mg/L for nitrate. Monitoring data indicate an increasing trend for nitrate that may be a result of long-term agricultural practices in the area.

The Discharger’s 2015 *Urban Water Management Plan* indicated that nitrate and hexavalent chromium are the primary concerns in the potable groundwater supply. Three active supply wells have nitrate concentrations above 50 percent of the Primary MCL. The City has stopped using one supply water well where hexavalent chromium concentrations almost double the Primary MCL, while three other supply wells have hexavalent chromium concentrations that are either close to or in excess of the Primary MCL. Salinity constituent concentrations measured as electrical conductivity (EC) and total dissolved solids (TDS) are also high in the city's water supply.

Influent BOD concentrations to the WWTF indicate high-strength organic matter in the community waste stream. Influent TDS and EC are approximately double that of the source water, indicating considerable salinity contributions from community sewer and industry.

A private residence is located approximately 0.4 miles northwest and downgradient of the WWTF. The residence is not identified in the RWD. Two wells are located on the residential property, a 200-foot agricultural well used for growing fodder crops and a 100-foot domestic well that is used for general home uses but not as a source of potable water. The Discharger collected groundwater samples from the two wells in late 2017. In a letter dated 17 November 2017, the Discharger's consultant submitted an analysis report of the well samples. The agricultural well was reported to have a TDS concentration of 6,490 mg/L and the domestic well a TDS concentration of 3,700 mg/L). Both wells were reported to have an arsenic concentration of 0.004 mg/L. Based on general mineral and isotopic data, the Discharger's consultant states that these wells are not impacted from Newman WWTF wastewater discharge.

Regulatory Background

In March 2008, the Discharger submitted a Report of Waste Discharge (RWD) for the construction of an additional storage reservoir to ensure adequate capacity for permitted influent flow. Revised WDRs have not yet been adopted because groundwater degradation concerns with regard to salinity, arsenic, manganese, and iron were not addressed in the RWD.

As early as 2006, the Discharger proposed converting the potable groundwater supply to higher quality surface water as a means of salinity source reduction, but no significant progress has yet been made to acquire a surface water supply. From 2008 through 2017, the Discharger and Central Valley Water Board staff worked to develop economically feasible source control measures and wastewater treatment and disposal methods that would allow the City to increase permitted wastewater flows.

In August 2012, the Discharger submitted a *Salinity Impact Assessment* that determined the cost and financing of the surface water potable water supply project would be infeasible until the City population had doubled. The initially-proposed alternative approach would use infiltration basins to percolate Central California Irrigation District (CCID) surface water into groundwater upgradient of the City with the intent of generally improving groundwater quality in the area. In May 2013, the Central Valley Water Board's Executive Officer notified the Discharger that this would not be an appropriate use of high-quality surface water. It was then suggested that CCID water with an average EC of 800 µmhos/cm be blended with effluent water with an average EC of 3,800 µmhos/cm to be used for irrigation. The Executive Officer also required the City to begin taking immediate actions to reduce salinity sources, such as maximizing use of low salinity groundwater supply wells and banning installation of new self-regenerating water softeners.

In February 2015, the Discharger submitted a Notice of Intent (NOI) for State Water Resources Control Board Recycled Water Use Order WQ 2016-0068-DDW (Recycled Water Use General Order). The NOI proposed that farmer-owned land application areas will be enrolled in the City's recycled water use program, which would be regulated under the Recycled Water Use General Order. The Discharger also submitted an updated RWD, which proposed using irrigation wells, rather than CCID water, for blending with effluent as irrigation water. The average EC of the irrigation well water was estimated to be 1,800 µmhos/cm. In July 2015, Central Valley Water Board staff issued a letter stating the RWD and NOI were incomplete. The RWD did not include an evaluation of groundwater quality at the wastewater treatment facility, an Antidegradation Analysis, or a project schedule to achieve compliance.

In March 2017, the Discharger submitted a letter stating that they completed the actions, to the extent feasible, required by the Executive Officer in May 2013. In April 2017, the Discharger submitted a revised RWD, which contained sufficient information to develop these WDRs.

Planned Facility Changes

The Discharger is proposing to modify the facility in two phases. This Order will allow the Discharger to increase the influent ADWF limit from 1.25 MGD to 1.5 MGD in Phase 1, and then to 2.4 MGD in Phase 2, provided that the Discharger has demonstrated to the Central Valley Water Board that the proposed WWTF modifications have been successfully completed.

CV-SALTS Regulatory Considerations

The Central Valley Water Board is developing amendments to the Basin Plan to incorporate new strategies for addressing ongoing salt and nitrate accumulation in the waters and soils of the Central Valley as part of the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative. The Salinity Control Program currently being developed would subject dischargers that do not meet stringent salinity numeric values (700 µS/cm EC as a monthly average) to protect the AGR beneficial use and 900 µS/cm EC as an annual average to protect the MUN beneficial use) to performance-based salinity requirements and would require these dischargers to participate in a basin-wide Prioritization and Optimization Study to develop a long-term strategy for addressing salinity accumulation in the Central Valley.

The level of participation required of dischargers whose discharges do not meet stringent salinity requirements will vary based on factors such as the amount of salinity in the discharge, local conditions, and type of discharge. The Board anticipates that the CV-SALTS initiative will result in regulatory changes that will be implemented through conditional prohibitions and modifications to many WDRs region-wide, including the WDRs that regulate discharges from the Newman WWTF. More information regarding this regulatory planning process can be found at the following link*: https://www.waterboards.ca.gov/centralvalley/water_issues/salinity/*

Legal Effect of Rescission of Prior WDRs or Orders on Existing Violations

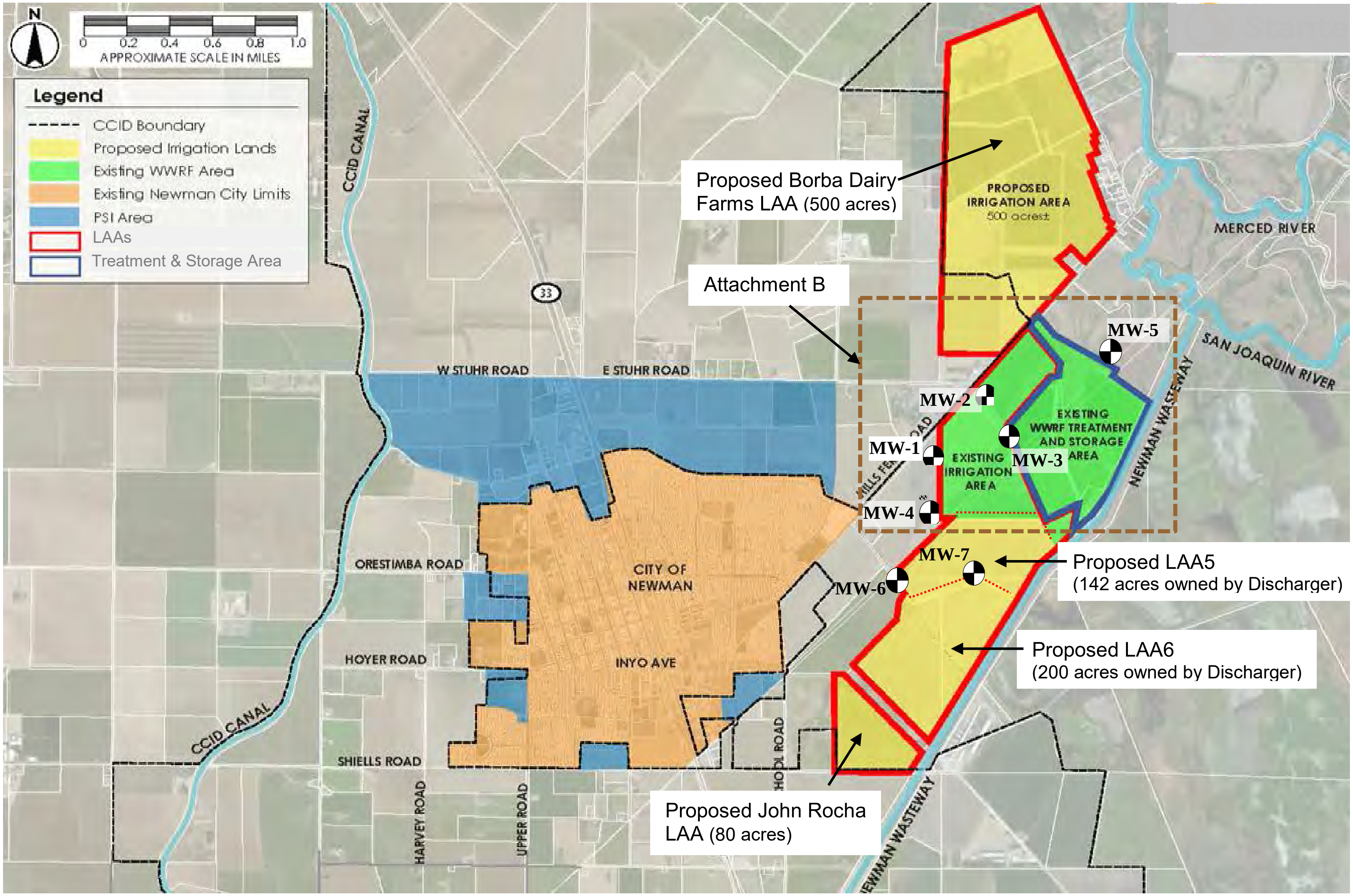
The Board's rescission of prior waste discharge requirements and/or monitoring and reporting orders does not extinguish any violations that may have occurred during the time those waste discharge requirements or orders were in effect. The Central Valley Water Board reserves the right to take enforcement actions to address violations of prior prohibitions, limitations, specifications, requirements, or provisions of rescinded waste discharge requirements or orders as allowed by law.

Discharge Limitations and Provisions

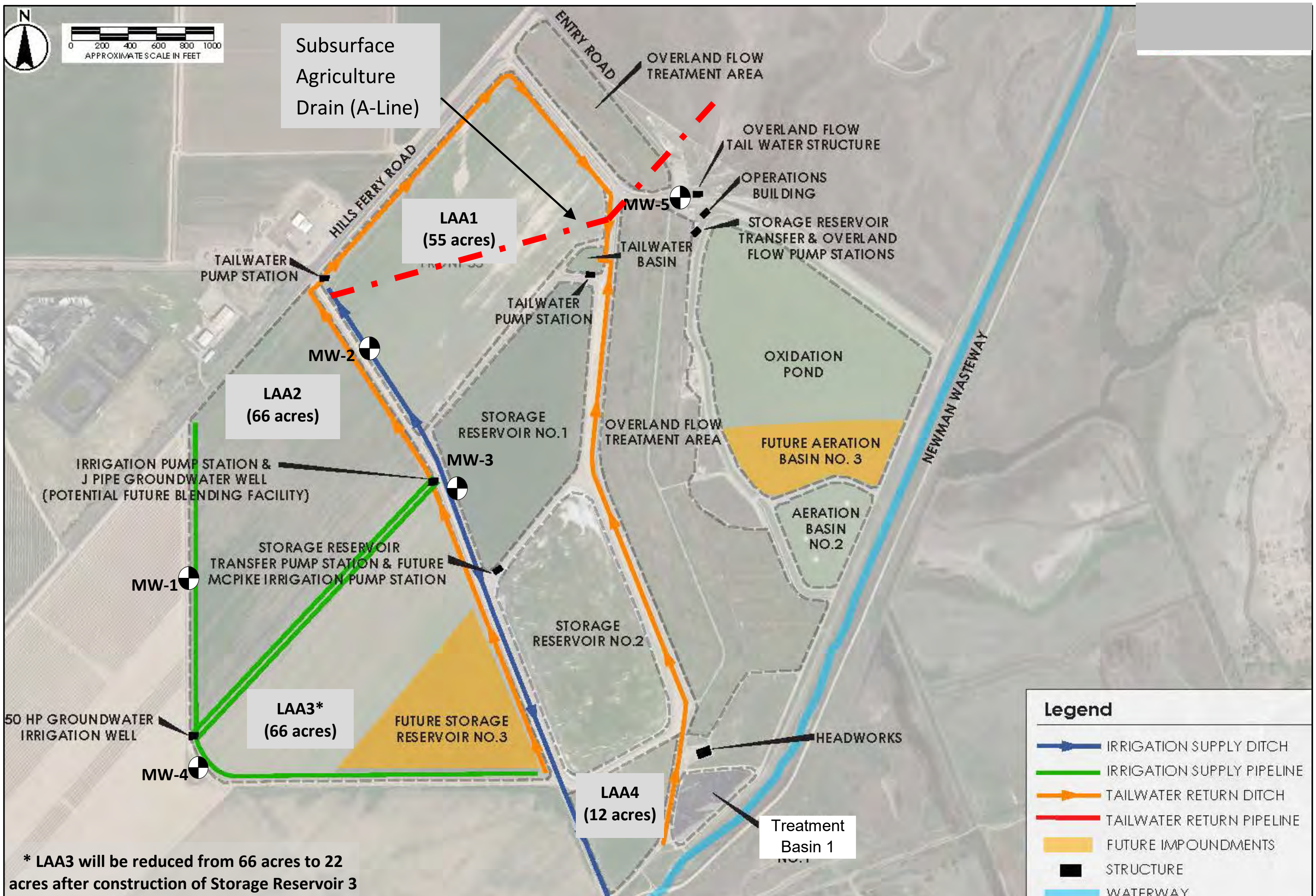
This Order establishes flow limits to the WWTF and a schedule to increase flow limits based on completing proposed work. This Order establishes a performance based annual average effluent limit for EC. This limit was determined using the reported monthly average EC from storage reservoir 1 collected from January 2014 through December 2017 (47 samples) and applying a bootstrap approach to calculate the prediction limit on a mean with a sample size of 24 (representing an annual compliance evaluation of EC effluent data based on the twice monthly sampling frequency required in the MRP) and a one-sided confidence level of 0.99 (i.e., the 99th percentile of the bootstrap distribution). This Order establishes effluent BOD limits based on typical wastewater pond treatment performance.

This Order also sets a time schedule for groundwater limitations for the Discharger to come into compliance with the Basin Plan. Under the time schedule waste constituents in groundwater are not allowed to exhibit a statistically significant increasing trend. Salinity constituents EC, TDS, chloride, and sodium are excluded from this limitation because salinity concentrations in groundwater may increase even though the Discharger has implemented “best efforts” to reduce salinity in the discharge.

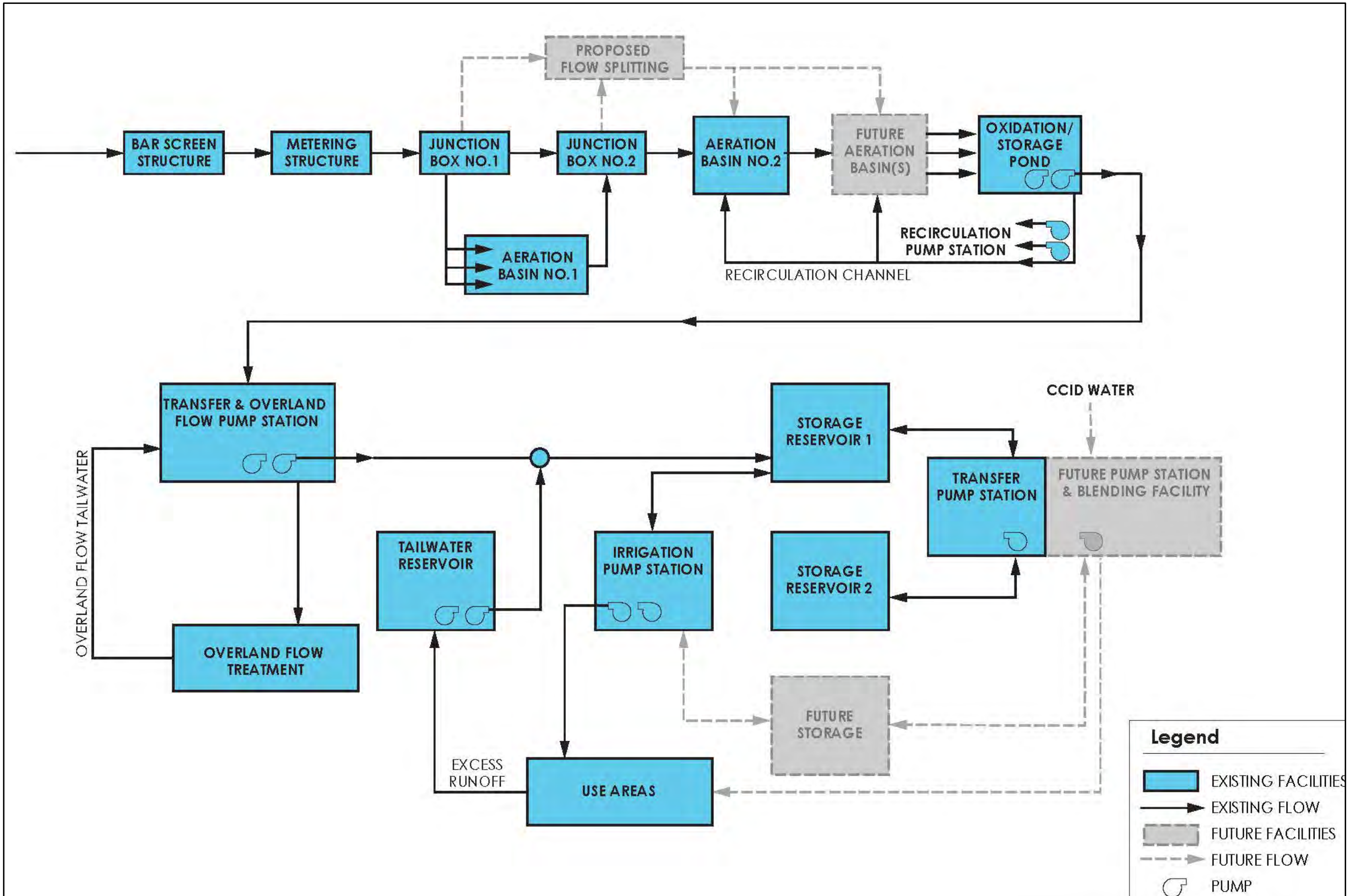
The Provisions section of this Order requires submittal of technical and monitoring reports by the specified dates.



Drawing Reference:	**SITE LOCATION MAP**
Stantec, Inc Report of Waste Discharge February 2015	CITY OF NEWMAN WWTF STANISLAUS COUNTY



Drawing Reference:	**SITE PLAN**
Stantec, Inc. Report of Waste Discharge February 2015	CITY OF NEWMAN WWTF STANISLAUS COUNTY



Drawing Reference:
Stantec, Inc
Report of Waste Discharge
February 2015

EXISTING AND PROPOSED FLOW SCHEMATIC

CITY OF NEWMAN WWTF
STANISLAUS COUNTY

Drawing Reference:	**RECYCLED WATER SYMBOL**
TITLE 22 , CALIFORNIA CODE OF REGULATIONS	CITY OF NEWMAN WWTF STANISLAUS COUNTY

ATTACHMENT E
REQUIREMENTS FOR MONITORING WELL INSTALLATION WORKPLANS AND MONITORING WELL INSTALLATION REPORTS

Prior to installation of groundwater monitoring wells, the Discharger shall submit a workplan containing, at a minimum, the information listed in Section 1, below. Wells may be installed after staff approves the workplan. Upon installation of the monitoring wells, the Discharger shall submit a well installation report which includes the information contained in Section 2, below. All workplans and reports must be prepared under the direction of, and signed by, a registered geologist or civil engineer licensed by the State of California.

SECTION 1 - Monitoring Well Installation Workplan and Groundwater Sampling and Analysis Plan

The monitoring well installation workplan shall contain the following minimum information:

A. General Information:
   Purpose of the well installation project
   Brief description of local geologic and hydrogeologic conditions
   Proposed monitoring well locations and rationale for well locations
   Topographic map showing facility location, roads, and surface water bodies
   Large scaled site map showing all existing on-site wells, proposed wells, surface drainage courses, surface water bodies, buildings, waste handling facilities, utilities, and major physical and man-made features

B. Drilling Details:
   On-site supervision of drilling and well installation activities
   Description of drilling equipment and techniques
   Equipment decontamination procedures
   Soil sampling intervals (if appropriate) and logging methods

C. Monitoring Well Design (in narrative and/or graphic form):
   Diagram of proposed well construction details
   - Borehole diameter
   - Casing and screen material, diameter, and centralizer spacing (if needed)
   - Type of well caps (bottom cap either screw on or secured with stainless steel screws)
   - Anticipated depth of well, length of well casing, and length and position of perforated interval
   - Thickness, position and composition of surface seal, sanitary seal, and sand pack
   - Anticipated screen slot size and filter pack

D. Well Development (not to be performed until at least 48 hours after sanitary seal placement):
   Method of development to be used (i.e., surge, bail, pump, etc.)
   Parameters to be monitored during development and record keeping technique
   Method of determining when development is complete
   Disposal of development water

E. Well Survey (precision of vertical survey data shall be at least 0.01 foot):
   Identify the Licensed Land Surveyor or Civil Engineer that will perform the survey
   Datum for survey measurements
   List well features to be surveyed (i.e. top of casing, horizontal and vertical coordinates, etc.)

F. Schedule for Completion of Work

G. Appendix: Groundwater Sampling and Analysis Plan (SAP)
The Groundwater SAP shall be included as an appendix to the workplan, and shall be utilized as a guidance document that is referred to by individuals responsible for conducting groundwater monitoring and sampling activities.

H. Provide a detailed written description of standard operating procedures for the following:

- Equipment to be used during sampling
- Equipment decontamination procedures
- Water level measurement procedures
- Well purging (include a discussion of procedures to follow if three casing volumes cannot be purged)
- Monitoring and record keeping during water level measurement and well purging (include copies of record keeping logs to be used)
- Purge water disposal
- Analytical methods and required reporting limits
- Sample containers and preservatives
- Sampling
    - General sampling techniques
    - Record keeping during sampling (include copies of record keeping logs to be used)
    - QA/QC samples
- Chain of Custody
- Sample handling and transport

SECTION 2 - Monitoring Well Installation Report

The monitoring well installation report must provide the information listed below. In addition, the report must also clearly identify, describe, and justify any deviations from the approved workplan.

A. General Information:

Purpose of the well installation project
Brief description of local geologic and hydrogeologic conditions encountered during installation of the wells
Number of monitoring wells installed and copies of County Well Construction Permits
Topographic map showing facility location, roads, surface water bodies
Scaled site map showing all previously existing wells, newly installed wells, surface water bodies, buildings, waste handling facilities, utilities, and other major physical and man-made features.

B. Drilling Details (in narrative and/or graphic form):

On-site supervision of drilling and well installation activities
Drilling contractor and driller's name
Description of drilling equipment and techniques
Equipment decontamination procedures
Soil sampling intervals and logging methods
Well boring log

- Well boring number and date drilled
- Borehole diameter and total depth
- Total depth of open hole (same as total depth drilled if no caving or back-grouting occurs)
- Depth to first encountered groundwater and stabilized groundwater depth
- Detailed description of soils encountered, using the Unified Soil Classification System

C. Well Construction Details (in narrative and/or graphic form):

Well construction diagram, including:

- Monitoring well number and date constructed
- Casing and screen material, diameter, and centralizer spacing (if needed)
- Length of well casing, and length and position of perforated interval
- Thickness, position and composition of surface seal, sanitary seal, and sand pack
- Type of well caps (bottom cap either screw on or secured with stainless steel screws)

E. Well Development:

Date(s) and method of development
How well development completion was determined
Volume of water purged from well and method of development water disposal
Field notes from well development should be included in report

F. Well Survey (survey the top rim of the well casing with the cap removed):

Identify the coordinate system and datum for survey measurements
Describe the measuring points (i.e. ground surface, top of casing, etc.)
Present the well survey report data in a table
Include the Registered Engineer or Licensed Surveyor's report and field notes in appendix.

Appendix C WATER BALANCES

City of Newman WWTRF

SALINITY BALANCE - 1.13 MGD INFLUENT FLOW - TYPICAL ANNUAL PRECIPITATION - EXISTING CONDITIONS

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)		OXIDATION POND		STORAGE BASINS		IRRIGATION AREA CHARACTERISTICS		IRRIGATION WATER SALINITY (μS/cm)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.13	GROSS STORAGE AREA (AC)	53.0	GROSS STORAGE AREA (AC)	77.0	AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	531	J PIPE	2000
ANNUAL I/I (%)	3	WATER SURFACE (AC)	50.0	WATER SURFACE (AC)	68.0	ACTUAL AREA BEING IRRIGATED (AC) [2]	199	50 HP	1560
CLIMATOLOGICAL FACTORS		BOTTOM SURFACE (AC)	49.0	BOTTOM SURFACE (AC)	58.0	LEACHING FRACTION	0.37	McPike	
PRECIP/AVG PRECIP RATIO	1.00	WATER DEPTH (FT)	2.5	WATER DEPTH (FT)	12.0	OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58	WELLS VOLUME WEIGHTED AVG.	1623
OCT-APR EVAP/AVG EVAP RATIO	1.00	STORAGE AVAILABLE (MG)	40	STORAGE AVAILABLE (MG)	230.0	ALFALFA AREA (% OF LAND IRRIGATED)	75%	APPLIED EFFLUENT	3800
MAY-SEP EVAP/AVG EVAP RATIO	1.00	INFILTRATION RATE (IN/DAY)	0.069	INFILTRATION RATE (IN/DAY)	0.115	ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%	RAINWATER	10
PAN COEFFICIENT	1.00					PRECIP IRR. EFFICIENCY	0.85		
LAND PRECIP COLLECTED (FRAC)	0.9								

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.13	1.13	1.15	1.19	1.24	1.23	1.21	1.17	1.13	1.13	1.13	1.13	
WASTEWATER VOLUME (MG)	35	34	36	37	35	38	36	36	34	35	35	34	425
APPLIED EFFLUENT (MG)	13	7	0	0	5	23	20	25	27	27	21	14	181
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	13	0	0	0	0	3	16	38	50	49	38	25	233
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	2	7	9	13	11	9	5	2	0	0	0	1	60
TOTAL WATER APPLIED (MG)	29	14	9	13	16	35	40	64	78	76	59	41	474
AVERAGE FLOW WEIGHTED EC (μS/cm)	2471	1948	10	10	1167	2630	2498	2415	2389	2387	2388	2341	2253
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	5.62	5.44	5.62	5.62	5.08	5.62	5.44	5.62	5.44	5.62	5.62	5.44	66.2
EVAP. VOLUME (MG)	6.93	3.31	1.58	2.05	3.63	6.62	9.30	13.08	15.13	15.76	13.40	9.93	100.7
PRECIP. VOLUME (MG)	0.95	2.67	3.58	5.00	4.22	3.35	1.78	0.72	0.08	0.02	0.04	0.43	22.9
NET DISPOSAL POTENTIAL (MG)	11.60	6.08	3.62	2.66	4.48	8.89	12.96	17.98	20.49	21.36	18.97	14.93	144.0
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	26.0	7.3	0.0	0.0	4.8	26.0	35.7	62.5	77.4	75.5	58.9	39.7	414.1
IRRIGATION APPLIED (MG)	26.0	7.3	0.0	0.0	4.8	26.0	35.7	62.5	77.4	75.5	58.9	39.7	414.1
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	1.4	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	2	19	51	86	109	109	104	84	54	25	6	
STORAGE GAIN (MG) [6]	2	17	32	35	23	1	-6	-20	-30	-29	-19	-6	
FINAL STORAGE (MG)	2	19	51	86	109	109	104	84	54	25	6	0	

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		STORAGE (MG)		SALINITY	
WASTEWATER	412	EVAP. FROM PONDS/BASINS	186	STORAGE AVAILABLE	270	ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2253
INFLOW AND INFILTRATION	12	PERC. FROM PONDS/BASINS	100	STORAGE REQUIRED	109	SALINITY TARGET [7]	2100
PRECIP. INTO PONDS/BASINS	42	IRRIGATION DEMAND	414			TOTAL VOLUME OF WATER APPLIED TO LAND	474
SUPPLEMENTAL BLEND WATER	233					EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	6120
						EC OF WATER REACHING SHALLOW GROUNDWATER	5276
TOTAL	700	TOTAL	700	SURPLUS STORAGE	161	SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as efflunet is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - TYPICAL ANNUAL PRECIPITATION - ALTERNATIVE A DO NOTHING

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.25
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	77.0
WATER SURFACE (AC)	68.0
BOTTOM SURFACE (AC)	58.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	230.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	199
ACTUAL AREA BEING IRRIGATED (AC) [2]	199
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
McPike	
WELLS VOLUME WEIGHTED AVG.	1623
APPLIED EFFLUENT	3800
RAINWATER	10

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.25	1.25	1.27	1.32	1.37	1.36	1.34	1.29	1.25	1.25	1.25	1.25	
WASTEWATER VOLUME (MG)	39	38	39	41	38	42	40	40	38	39	39	38	470
APPLIED EFFLUENT (MG)	17	7	0	0	5	26	25	32	35	34	27	19	226
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	9	0	0	0	0	0	11	31	42	41	32	21	188
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	2	7	9	13	11	9	5	2	0	0	0	1	60
TOTAL WATER APPLIED (MG)	29	14	9	13	16	35	40	64	78	76	59	41	474
AVERAGE FLOW WEIGHTED EC (μS/cm)	2749	1948	10	10	1167	2845	2796	2651	2606	2602	2604	2579	2460
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	5.62	5.44	5.62	5.62	5.08	5.62	5.44	5.62	5.44	5.62	5.62	5.44	66.2
EVAP. VOLUME (MG)	6.93	3.31	1.58	2.05	3.63	6.62	9.30	13.08	15.13	15.76	13.40	9.93	100.7
PRECIP. VOLUME (MG)	0.95	2.67	3.58	5.00	4.22	3.35	1.78	0.72	0.08	0.02	0.04	0.43	22.9
NET DISPOSAL POTENTIAL (MG)	11.60	6.08	3.62	2.66	4.48	8.89	12.96	17.98	20.49	21.36	18.97	14.93	144.0
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	26.0	7.3	0.0	0.0	4.8	26.0	35.7	62.5	77.4	75.5	58.9	39.7	414.1
IRRIGATION APPLIED (MG)	26.0	7.3	0.0	0.0	4.8	26.0	35.7	62.5	77.4	75.5	58.9	39.7	414.1
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	1.4	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	3	23	58	97	124	125	118	95	61	28	7	
STORAGE GAIN (MG) [6]	3	20	36	39	26	1	-7	-23	-34	-33	-21	-7	
FINAL STORAGE (MG)	3	23	58	97	124	125	118	95	61	28	7	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	456
INFLOW AND INFILTRATION	14
PRECIP. INTO PONDS/BASINS	42
SUPPLEMENTAL BLEND WATER	188
TOTAL	700

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	186
PERC. FROM PONDS/BASINS	100
IRRIGATION DEMAND	414
TOTAL	700

STORAGE (MG)	
STORAGE AVAILABLE	270
STORAGE REQUIRED	125
SURPLUS STORAGE	145

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2460
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	474
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	6683
EC OF WATER REACHING SHALLOW GROUNDWATER	5635
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 1-100 YEAR RETURN PERIOD FOR PRECIPITATION - ALTERNATIVE A DO NOTHING

10-Aug-18

10-Aug-18

FLOWS AND INFILTRATION/INFLOWS (I/I)		OXIDATION POND		STORAGE BASINS (Some storage in Oxidation Pond)		IRRIGATION AREA CHARACTERISTICS	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.25	GROSS STORAGE AREA (AC)	53.0	GROSS STORAGE AREA (AC)	77.0	ACTUAL AREA BEING IRRIGATED (AC) [1]	199
ANNUAL I/I (%)	7	WATER SURFACE (AC)	50.0	WATER SURFACE (AC)	68.0	LEACHING FRACTION	0.4
CLIMATOLOGICAL FACTORS		BOTTOM SURFACE (AC)	49.0	BOTTOM SURFACE (AC)	58.0	OVERALL IRR. EFFICIENCY	0.57
PRECIP/AVG PRECIP RATIO	1.81	WATER DEPTH (FT)	2.5	WATER DEPTH OF STORAGE COMPONENT (FT)	12.0	ALFALFA AREA (% OF LAND IRRIGATED)	75%
OCT-APR EVAP/AVG EVAP RATIO	0.82	STORAGE AVAILABLE (MG)	40	STORAGE AVAILABLE (MG)	230.0	ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
MAY-SEP EVAP/AVG EVAP RATIO	1.00	INFILTRATION RATE (IN/DAY)	0.069	INFILTRATION RATE (IN/DAY)	0.115	PRECIP IRR. EFFICIENCY	0.85
PAN COEFFICIENT	0.80						
LAND PRECIP COLLECTED (FRAC)	0.9						

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [2]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5	15	25	25	20	10	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.25	1.25	1.30	1.40	1.54	1.51	1.46	1.35	1.25	1.25	1.25	1.25	
WASTEWATER VOLUME (MG)	39	38	40	44	43	47	44	42	38	39	39	38	488
APPLIED EFFLUENT (MG)	24	0	0	0	0	26	36	48	62	65	42	34	336
SUPPLEMENTAL IRRIGATION WATER (MG) [3]	0	0	0	0	0	0	1	16	17	21	22	11	89
DESIGN EVAPORATION (IN)	2.9	1.4	0.7	0.9	1.5	2.8	3.9	6.6	7.7	8.0	6.8	5.0	48
DESIGN PRECIPITATION (IN)	0.8	2.3	3.1	4.4	3.7	2.9	1.6	0.6	0.1	0.0	0.0	0.4	20
PRECIPITATION VOLUME (MG) [5]	5	13	17	24	20	16	8	3	0	0	0	2	108
OXIDATION POND													
PERCOLATION (IN)	2.1	2.1	2.1	2.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25
PERC VOLUME (MG)	3	3	3	3	3	3	3	3	3	3	3	3	34
EVAP. VOLUME (MG)	4	2	1	1	2	4	5	9	10	11	9	7	64
PRECIP. VOLUME (MG)	1	3	4	6	5	4	2	1	0	0	0	1	29
NET DISPOSAL POTENTIAL (MG)	5	1	-1	-2	-1	2	6	11	13	13	12	9	69
STORAGE BASINS													
PERCOLATION (IN)	3.6	3.5	3.6	3.6	3.2	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42
PERC VOLUME (MG)	6	5	6	6	5	6	5	6	5	6	6	5	66
EVAP. VOLUME (MG)	5	2	1	1	2	4	6	10	12	13	11	8	76
PRECIP. VOLUME (MG)	2	5	6	9	8	6	3	1	0	0	0	1	41
NET DISPOSAL POTENTIAL (MG)	8	3	0	-2	0	4	8	15	17	18	16	13	101
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.2	1.9	1.4	1.3	2.3	4.2	4.6	7.0	8.4	8.1	6.4	4.5	53
TOTAL IRRIG DEMAND (IN)	4.4	0.0	0.0	0.0	0.0	3.0	5.7	11.4	14.6	14.3	11.1	7.3	72
IRRIGATION DEMAND (MG)	24	0	0	0	0	16	31	62	79	77	60	39	388
IRRIGATION APPLIED (MG)	24	0	0	0	0	26	37	63	79	87	64	45	425
SITE STORMWATER RUNOFF (IN)	0	0.4	0.5	0.7	0.6	0	0	0	0	0	0	0	2
SITE STORMWATER RUNOFF (MG)	0	3	4	6	5	0	0	0	0	0	0	0	17
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	1	38	83	136	185	199	193	162	107	49	18	
STORAGE GAIN (MG) [4]	1	36	45	54	49	15	-6	-31	-55	-58	-31	-18	
FINAL STORAGE (MG)	1	38	83	136	185	199	193	162	107	49	18	0	

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		STORAGE (MG)		DISPOSAL (MG)	
WASTEWATER	456	EVAP. FROM PONDS/BASINS	140	STORAGE AVAILABLE	270	DISPOSAL AVAILABLE	628
INFLOW AND INFILTRATION	32	PERC. FROM PONDS/BASINS	100	STORAGE REQUIRED	199	DISPOSAL REQUIRED	576
PRECIP. INTO PONDS/BASINS	87	IRRIGATION DEMAND	388				
				SURPLUS STORAGE CAPACITY	71	SURPLUS DISPOSAL CAPACITY (MG)	52
TOTAL	576	TOTAL	628	(NEGATIVE INDICATES STORAGE REQUIRED)		(NEGATIVE INDICATES ADDITIONAL LAND IS REQUIRED)	

Notes:

Manual Input

1 Includes irrigated portions of City Owned Land

2 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15

3 Additional supplemental water required to meet salinity requirements in a typical year less vloume of additional rainwater falling on fields during a wet year

4 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water

5 Volume of precipitaion falling on City owned land where effluent is applied

City of Newman WWTRF

WATER BALANCE - 1.25 MGD INFLUENT FLOW - TYPICAL ANNUAL PRECIPITATION - PERMITTED FLOW W/ MCPIKE1

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.25
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	77.0
WATER SURFACE (AC)	68.0
BOTTOM SURFACE (AC)	58.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	230.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	531
ACTUAL AREA BEING IRRIGATED (AC) [2]	337
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
McPike	
WELLS VOLUME WEIGHTED AVG.	1623
APPLIED EFFLUENT	3800
RAINWATER	10

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.25	1.25	1.27	1.32	1.37	1.36	1.34	1.29	1.25	1.25	1.25	1.25	
WASTEWATER VOLUME (MG)	39	38	39	41	38	42	40	40	38	39	39	38	470
APPLIED EFFLUENT (MG)	16	12	0	0	8	28	24	30	34	33	26	18	229
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	28	0	0	0	0	16	36	75	97	95	74	49	472
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	4	12	16	22	19	15	8	3	0	0	0	2	101
TOTAL WATER APPLIED (MG)	48	24	16	22	27	59	68	109	132	128	100	69	802
AVERAGE FLOW WEIGHTED EC (μS/cm)	2199	1948	10	10	1167	2241	2206	2184	2177	2177	2177	2146	2040
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	5.62	5.44	5.62	5.62	5.08	5.62	5.44	5.62	5.44	5.62	5.62	5.44	66.2
EVAP. VOLUME (MG)	6.93	3.31	1.58	2.05	3.63	6.62	9.30	13.08	15.13	15.76	13.40	9.93	100.7
PRECIP. VOLUME (MG)	0.95	2.67	3.58	5.00	4.22	3.35	1.78	0.72	0.08	0.02	0.04	0.43	22.9
NET DISPOSAL POTENTIAL (MG)	11.60	6.08	3.62	2.66	4.48	8.89	12.96	17.98	20.49	21.36	18.97	14.93	144.0
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	44.1	12.4	0.0	0.0	8.2	44.0	60.5	105.8	131.2	127.9	99.8	67.3	701.2
IRRIGATION APPLIED (MG)	44.1	12.4	0.0	0.0	8.2	44.0	60.5	105.8	131.2	127.9	99.8	67.3	701.2
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	2.4	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	3	19	55	95	118	118	112	90	58	26	6	
STORAGE GAIN (MG) [6]	3	15	36	40	23	-1	-6	-22	-32	-31	-20	-6	
FINAL STORAGE (MG)	3	19	55	95	118	118	112	90	58	26	6	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	456
INFLOW AND INFILTRATION	14
PRECIP. INTO PONDS/BASINS	44
SUPPLEMENTAL BLEND WATER	472
TOTAL	987

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	186
PERC. FROM PONDS/BASINS	100
IRRIGATION DEMAND	701
TOTAL	987

STORAGE (MG)	
STORAGE AVAILABLE	270
STORAGE REQUIRED	118
SURPLUS STORAGE	152

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2040
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	802
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	5543
EC OF WATER REACHING SHALLOW GROUNDWATER	5103
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 1-100 YEAR RETURN PERIOD FOR PRECIPITATION - PERMITTED FLOW W/ MCPIKE1

10-Aug-18

10-Aug-18

FLOWS AND INFILTRATION/INFLOWS (I/I)		OXIDATION POND		STORAGE BASINS (Some storage in Oxidation Pond)		IRRIGATION AREA CHARACTERISTICS	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.25	GROSS STORAGE AREA (AC)	53.0	GROSS STORAGE AREA (AC)	77.0	ACTUAL AREA BEING IRRIGATED (AC) [1]	337
ANNUAL I/I (%)	7	WATER SURFACE (AC)	50.0	WATER SURFACE (AC)	68.0	LEACHING FRACTION	0.4
CLIMATOLOGICAL FACTORS		BOTTOM SURFACE (AC)	49.0	BOTTOM SURFACE (AC)	58.0	OVERALL IRR. EFFICIENCY	0.57
PRECIP/AVG PRECIP RATIO	1.81	WATER DEPTH (FT)	2.5	WATER DEPTH OF STORAGE COMPONENT (FT)	12.0	ALFALFA AREA (% OF LAND IRRIGATED)	75%
OCT-APR EVAP/AVG EVAP RATIO	0.82	STORAGE AVAILABLE (MG)	40	STORAGE AVAILABLE (MG)	230.0	ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
MAY-SEP EVAP/AVG EVAP RATIO	1.00	INFILTRATION RATE (IN/DAY)	0.069	INFILTRATION RATE (IN/DAY)	0.115	PRECIP IRR. EFFICIENCY	0.85
PAN COEFFICIENT	0.80						
LAND PRECIP COLLECTED (FRAC)	0.9						

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [2]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5	15	25	25	20	10	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.25	1.25	1.30	1.40	1.54	1.51	1.46	1.35	1.25	1.25	1.25	1.25	
WASTEWATER VOLUME (MG)	39	38	40	44	43	47	44	42	38	39	39	38	488
APPLIED EFFLUENT (MG)	25	0	0	0	0	30	42	62	60	50	45	32	346
SUPPLEMENTAL IRRIGATION WATER (MG) [3]	22	0	0	0	0	13	33	76	101	98	74	47	464
DESIGN EVAPORATION (IN)	2.9	1.4	0.7	0.9	1.5	2.8	3.9	6.6	7.7	8.0	6.8	5.0	48
DESIGN PRECIPITATION (IN)	0.8	2.3	3.1	4.4	3.7	2.9	1.6	0.6	0.1	0.0	0.0	0.4	20
PRECIPITATION VOLUME (MG) [5]	8	21	29	40	34	27	14	6	1	0	0	3	183
OXIDATION POND													
PERCOLATION (IN)	2.1	2.1	2.1	2.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25
PERC VOLUME (MG)	3	3	3	3	3	3	3	3	3	3	3	3	34
EVAP. VOLUME (MG)	4	2	1	1	2	4	5	9	10	11	9	7	64
PRECIP. VOLUME (MG)	1	3	4	6	5	4	2	1	0	0	0	1	29
NET DISPOSAL POTENTIAL (MG)	5	1	-1	-2	-1	2	6	11	13	13	12	9	69
STORAGE BASINS													
PERCOLATION (IN)	3.6	3.5	3.6	3.6	3.2	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42
PERC VOLUME (MG)	6	5	6	6	5	6	5	6	5	6	6	5	66
EVAP. VOLUME (MG)	5	2	1	1	2	4	6	10	12	13	11	8	76
PRECIP. VOLUME (MG)	2	5	6	9	8	6	3	1	0	0	0	1	41
NET DISPOSAL POTENTIAL (MG)	8	3	0	-2	0	4	8	15	17	18	16	13	101
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.2	1.9	1.4	1.3	2.3	4.2	4.6	7.0	8.4	8.1	6.4	4.5	53
TOTAL IRRIG DEMAND (IN)	4.4	0.0	0.0	0.0	0.0	3.0	5.7	11.4	14.6	14.3	11.1	7.3	72
IRRIGATION DEMAND (MG)	40	0	0	0	0	27	52	104	134	131	102	67	657
IRRIGATION APPLIED (MG)	47	0	0	0	0	43	75	138	161	148	119	79	810
SITE STORMWATER RUNOFF (IN)	0	0.4	0.5	0.7	0.6	0	0	0	0	0	0	0	2
SITE STORMWATER RUNOFF (MG)	0	4	6	8	7	0	0	0	0	0	0	0	25
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	0	38	85	141	191	202	190	144	91	48	14	
STORAGE GAIN (MG) [4]	0	38	47	56	51	11	-12	-46	-53	-43	-34	-16	
FINAL STORAGE (MG)	0	38	85	141	191	202	190	144	91	48	14	0	

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		STORAGE (MG)		DISPOSAL (MG)	
WASTEWATER	456	EVAP. FROM PONDS/BASINS	140	STORAGE AVAILABLE	270	DISPOSAL AVAILABLE	897
INFLOW AND INFILTRATION	32	PERC. FROM PONDS/BASINS	100	STORAGE REQUIRED	202	DISPOSAL REQUIRED	583
PRECIP. INTO PONDS/BASINS	95	IRRIGATION DEMAND	657				
				SURPLUS STORAGE CAPACITY	68	SURPLUS DISPOSAL CAPACITY (MG)	314
TOTAL	583	TOTAL	897	(NEGATIVE INDICATES STORAGE REQUIRED)		(NEGATIVE INDICATES ADDITIONAL LAND IS REQUIRED)	

Notes:

Manual Input

1 Includes irrigated portions of City Owned Land

2 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15

3 Additional supplemental water required to meet salinity requirements in a typical year less vloume of additional rainwater falling on fields during a wet year

4 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as efflunet is withdrawn for use as irrigation water

5 Volume of precipitaion falling on City owned land where effluent is applied

City of Newman WWTRF

WATER BALANCE - 1.5 MGD INFLUENT FLOW - TYPICAL ANNUAL PRECIPITATION - PHASE1 W/ MCPIKE1 & MCPIKE2

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.50
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	77.0
WATER SURFACE (AC)	68.0
BOTTOM SURFACE (AC)	58.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	230.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	531
ACTUAL AREA BEING IRRIGATED (AC) [2]	531
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
McPike	1340
WELLS VOLUME WEIGHTED AVG.	1529
APPLIED EFFLUENT	3800
RAINWATER	10

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.50	1.50	1.53	1.58	1.65	1.63	1.61	1.55	1.50	1.50	1.50	1.50	
WASTEWATER VOLUME (MG)	47	45	47	49	46	51	48	48	45	47	47	45	564
APPLIED EFFLUENT (MG)	22	19	0	0	13	36	33	43	49	47	37	26	326
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	48	0	0	0	0	33	62	123	158	154	120	80	779
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	7	19	25	35	29	23	12	5	1	0	0	3	159
TOTAL WATER APPLIED (MG)	76	38	25	35	42	93	108	172	207	202	158	109	1264
AVERAGE FLOW WEIGHTED EC (μS/cm)	2051	1948	10	10	1167	2033	2048	2057	2060	2060	2060	2030	1923
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	5.62	5.44	5.62	5.62	5.08	5.62	5.44	5.62	5.44	5.62	5.62	5.44	66.2
EVAP. VOLUME (MG)	6.93	3.31	1.58	2.05	3.63	6.62	9.30	13.08	15.13	15.76	13.40	9.93	100.7
PRECIP. VOLUME (MG)	0.95	2.67	3.58	5.00	4.22	3.35	1.78	0.72	0.08	0.02	0.04	0.43	22.9
NET DISPOSAL POTENTIAL (MG)	11.60	6.08	3.62	2.66	4.48	8.89	12.96	17.98	20.49	21.36	18.97	14.93	144.0
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	69.5	19.5	0.0	0.0	12.9	69.4	95.4	166.7	206.7	201.6	157.3	106.0	1104.8
IRRIGATION APPLIED (MG)	69.5	19.5	0.0	0.0	12.9	69.4	95.4	166.7	206.7	201.6	157.3	106.0	1104.8
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	3.7	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	5	21	66	117	143	142	135	109	69	31	7	
STORAGE GAIN (MG) [6]	5	16	46	50	26	-1	-7	-27	-40	-38	-24	-7	
FINAL STORAGE (MG)	5	21	66	117	143	142	135	109	69	31	7	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	548
INFLOW AND INFILTRATION	16
PRECIP. INTO PONDS/BASINS	48
SUPPLEMENTAL BLEND WATER	779
TOTAL	1390

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	186
PERC. FROM PONDS/BASINS	100
IRRIGATION DEMAND	1105
TOTAL	1390

STORAGE (MG)	
STORAGE AVAILABLE	270
STORAGE REQUIRED	143
SURPLUS STORAGE	127

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	1923
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	1264
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	5224
EC OF WATER REACHING SHALLOW GROUNDWATER	4973
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 1.5 MGD INFLUENT FLOW - TYPICAL ANNUAL PRECIPITATION - PHASE1 W/ MCPIKE1 AND CCID WATER

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	1.50
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	77.0
WATER SURFACE (AC)	68.0
BOTTOM SURFACE (AC)	58.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	230.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	337
ACTUAL AREA BEING IRRIGATED (AC) [2]	337
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
McPike	1340
WELLS VOLUME WEIGHTED AVG.	1137
APPLIED EFFLUENT	3800
RAINWATER	10
CCID	800

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	1.50	1.50	1.53	1.58	1.65	1.63	1.61	1.55	1.50	1.50	1.50	1.50	
WASTEWATER VOLUME (MG)	47	45	47	49	46	51	48	48	45	47	47	45	564
APPLIED EFFLUENT (MG)	22	12	0	0	8	31	31	46	53	52	41	27	323
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	23	0	0	0	0	13	29	60	78	76	59	40	378
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	4	12	16	22	19	15	8	3	0	0	0	2	101
TOTAL WATER APPLIED (MG)	48	24	16	22	27	59	68	109	132	128	100	69	802
AVERAGE FLOW WEIGHTED EC (μS/cm)	2227	1948	10	10	1167	2250	2231	2219	2216	2216	2216	2138	2066
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	5.62	5.44	5.62	5.62	5.08	5.62	5.44	5.62	5.44	5.62	5.62	5.44	66.2
EVAP. VOLUME (MG)	6.93	3.31	1.58	2.05	3.63	6.62	9.30	13.08	15.13	15.76	13.40	9.93	100.7
PRECIP. VOLUME (MG)	0.95	2.67	3.58	5.00	4.22	3.35	1.78	0.72	0.08	0.02	0.04	0.43	22.9
NET DISPOSAL POTENTIAL (MG)	11.60	6.08	3.62	2.66	4.48	8.89	12.96	17.98	20.49	21.36	18.97	14.93	144.0
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	44.1	12.4	0.0	0.0	8.2	44.0	60.5	105.8	131.2	127.9	99.8	67.3	701.2
IRRIGATION APPLIED (MG)	44.1	12.4	0.0	0.0	8.2	44.0	60.5	105.8	131.2	127.9	99.8	67.3	701.2
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	2.4	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	5	28	73	121	152	156	151	122	78	35	8	
STORAGE GAIN (MG) [6]	5	23	44	49	31	5	-5	-29	-44	-43	-27	-8	
FINAL STORAGE (MG)	5	28	73	121	152	156	151	122	78	35	8	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	548
INFLOW AND INFILTRATION	16
PRECIP. INTO PONDS/BASINS	44
SUPPLEMENTAL BLEND WATER	378
TOTAL	987

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	186
PERC. FROM PONDS/BASINS	100
IRRIGATION DEMAND	701
TOTAL	987

STORAGE (MG)	
STORAGE AVAILABLE	270
STORAGE REQUIRED	156
SURPLUS STORAGE	114

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2066
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	802
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	5614
EC OF WATER REACHING SHALLOW GROUNDWATER	5156
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as efflunet is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 2.0 MGD INFLUENT FLOW - TYPICAL ANNUAL PRECIPITATION - MCPIKE1 & MCPIKE2 W/ CCID

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)		OXIDATION POND		STORAGE BASINS	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.00	GROSS STORAGE AREA (AC)	53.0	GROSS STORAGE AREA (AC)	77.0
ANNUAL I/I (%)	3	WATER SURFACE (AC)	50.0	WATER SURFACE (AC)	68.0
CLIMATOLOGICAL FACTORS		BOTTOM SURFACE (AC)	49.0	BOTTOM SURFACE (AC)	58.0
PRECIP/AVG PRECIP RATIO	1.00	WATER DEPTH (FT)	2.5	WATER DEPTH (FT)	12.0
OCT-APR EVAP/AVG EVAP RATIO	1.00	STORAGE AVAILABLE (MG)	40	STORAGE AVAILABLE (MG)	230.0
MAY-SEP EVAP/AVG EVAP RATIO	1.00	INFILTRATION RATE (IN/DAY)	0.069	INFILTRATION RATE (IN/DAY)	0.115
PAN COEFFICIENT	1.00				
LAND PRECIP COLLECTED (FRAC)	0.9				

IRRIGATION AREA CHARACTERISTICS		IRRIGATION WATER SALINITY (μS/cm)	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	531	J PIPE	2000
ACTUAL AREA BEING IRRIGATED (AC) [2]	531	50 HP	1560
LEACHING FRACTION	0.37	McPike	1340
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58	WELLS VOLUME WEIGHTED AVG.	1112
ALFALFA AREA (% OF LAND IRRIGATED)	75%	APPLIED EFFLUENT	3800
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%	RAINWATER	10
PRECIP IRR. EFFICIENCY	0.85	CCID	800

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.00	2.00	2.04	2.11	2.20	2.18	2.15	2.07	2.00	2.00	2.00	2.00	
WASTEWATER VOLUME (MG)	62	60	63	65	61	67	64	64	60	62	62	60	752
APPLIED EFFLUENT (MG)	34	19	0	0	13	48	50	72	85	82	64	46	514
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	35	0	0	0	0	21	46	94	122	119	93	60	591
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	7	19	25	35	29	23	12	5	1	0	0	3	159
TOTAL WATER APPLIED (MG)	76	38	25	35	42	93	108	172	207	202	158	109	1264
AVERAGE FLOW WEIGHTED EC (μS/cm)	2219	1948	10	10	1167	2239	2223	2212	2209	2209	2209	2205	2066
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	5.62	5.44	5.62	5.62	5.08	5.62	5.44	5.62	5.44	5.62	5.62	5.44	66.2
EVAP. VOLUME (MG)	6.93	3.31	1.58	2.05	3.63	6.62	9.30	13.08	15.13	15.76	13.40	9.93	100.7
PRECIP. VOLUME (MG)	0.95	2.67	3.58	5.00	4.22	3.35	1.78	0.72	0.08	0.02	0.04	0.43	22.9
NET DISPOSAL POTENTIAL (MG)	11.60	6.08	3.62	2.66	4.48	8.89	12.96	17.98	20.49	21.36	18.97	14.93	144.0
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	69.5	19.5	0.0	0.0	12.9	69.4	95.4	166.7	206.7	201.6	157.3	106.0	1104.8
IRRIGATION APPLIED (MG)	69.5	19.5	0.0	0.0	12.9	69.4	95.4	166.7	206.7	201.6	157.3	106.0	1104.8
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	3.7	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	8	39	101	167	209	213	205	165	105	47	11	
STORAGE GAIN (MG) [6]	8	31	62	67	41	4	-8	-40	-61	-58	-36	-11	
FINAL STORAGE (MG)	8	39	101	167	209	213	205	165	105	47	11	0	

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		STORAGE (MG)		SALINITY	
WASTEWATER	730	EVAP. FROM PONDS/BASINS	186	STORAGE AVAILABLE	270	ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2066
INFLOW AND INFILTRATION	22	PERC. FROM PONDS/BASINS	100	STORAGE REQUIRED	213	SALINITY TARGET [7]	2100
PRECIP. INTO PONDS/BASINS	48	IRRIGATION DEMAND	1105			TOTAL VOLUME OF WATER APPLIED TO LAND	1264
SUPPLEMENTAL BLEND WATER	591					EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	5613
						EC OF WATER REACHING SHALLOW GROUNDWATER	5293
TOTAL	1390	TOTAL	1390	SURPLUS STORAGE	57	SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF	WATER BALANCE - TYPICAL ANNUAL PRECIPITATION - ALTERNATIVE B CCID	10-Aug-18
		10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.40
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	125.0
WATER SURFACE (AC)	112.0
BOTTOM SURFACE (AC)	93.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	365.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	607
ACTUAL AREA BEING IRRIGATED (AC) [2]	607
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
McPike	1340
WELLS VOLUME WEIGHTED AVG.	1113
APPLIED EFFLUENT	3800
RAINWATER	10
CCID	800

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.40	2.40	2.44	2.53	2.63	2.61	2.58	2.48	2.40	2.40	2.40	2.40	
WASTEWATER VOLUME (MG)	74	72	76	78	74	81	77	77	72	74	74	72	902
APPLIED EFFLUENT (MG)	39	22	0	0	15	55	57	83	97	94	74	44	579
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	40	0	0	0	0	24	52	108	139	136	106	77	684
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	8	21	29	40	34	27	14	6	1	0	0	3	182
TOTAL WATER APPLIED (MG)	87	44	29	40	48	106	123	196	237	231	180	125	1445
AVERAGE FLOW WEIGHTED EC (μS/cm)	2219	1948	10	10	1167	2239	2223	2212	2209	2209	2209	2030	2051
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	9.01	8.72	9.01	9.01	8.14	9.01	8.72	9.01	8.72	9.01	9.01	8.72	106.1
EVAP. VOLUME (MG)	11.12	5.31	2.53	3.29	5.81	10.61	14.91	20.98	24.26	25.27	21.48	15.92	161.5
PRECIP. VOLUME (MG)	1.55	4.34	5.82	8.13	6.86	5.45	2.89	1.18	0.13	0.03	0.07	0.71	37.1
NET DISPOSAL POTENTIAL (MG)	18.58	9.69	5.72	4.16	7.09	14.18	20.74	28.81	32.85	34.25	30.42	23.93	230.4
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	79.4	22.3	0.0	0.0	14.8	79.3	109.0	190.6	236.2	230.4	179.8	121.2	1263.0
IRRIGATION APPLIED (MG)	79.4	22.3	0.0	0.0	14.8	79.3	109.0	190.6	236.2	230.4	179.8	121.2	1263.0
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	4.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	9	45	118	197	246	251	242	194	121	51	7	
STORAGE GAIN (MG) [6]	9	36	73	79	49	5	-10	-48	-73	-70	-44	-7	
FINAL STORAGE (MG)	9	45	118	197	246	251	242	194	121	51	7	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	876
INFLOW AND INFILTRATION	26
PRECIP. INTO PONDS/BASINS	63
SUPPLEMENTAL BLEND WATER	684
TOTAL	1649

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	247
PERC. FROM PONDS/BASINS	140
IRRIGATION DEMAND	1263
TOTAL	1649

STORAGE (MG)	
STORAGE AVAILABLE	405
STORAGE REQUIRED	251
SURPLUS STORAGE	154

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2051
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	1445
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	5572
EC OF WATER REACHING SHALLOW GROUNDWATER	5203
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as efflunet is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 1-100 YEAR RETURN PERIOD FOR PRECIPITATION - ALTERNATIVE B CCID

10-Aug-18

10-Aug-18

FLOWS AND INFILTRATION/INFLOWS (I/I)		OXIDATION POND		STORAGE BASINS (Some storage in Oxidation Pond)		IRRIGATION AREA CHARACTERISTICS	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.40	GROSS STORAGE AREA (AC)	53.0	GROSS STORAGE AREA (AC)	77.0	ACTUAL AREA BEING IRRIGATED (AC) [1]	607
ANNUAL I/I (%)	7	WATER SURFACE (AC)	50.0	WATER SURFACE (AC)	68.0	LEACHING FRACTION	0.38
CLIMATOLOGICAL FACTORS		BOTTOM SURFACE (AC)	49.0	BOTTOM SURFACE (AC)	58.0	OVERALL IRR. EFFICIENCY	0.57
PRECIP/AVG PRECIP RATIO	1.81	WATER DEPTH (FT)	2.5	WATER DEPTH OF STORAGE COMPONENT (FT)	12.0	ALFALFA AREA (% OF LAND IRRIGATED)	75%
OCT-APR EVAP/AVG EVAP RATIO	0.82	STORAGE AVAILABLE (MG)	40	STORAGE AVAILABLE (MG)	365.0	ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
MAY-SEP EVAP/AVG EVAP RATIO	1.00	INFILTRATION RATE (IN/DAY)	0.069	INFILTRATION RATE (IN/DAY)	0.115	PRECIP IRR. EFFICIENCY	0.85
PAN COEFFICIENT	0.80						
LAND PRECIP COLLECTED (FRAC)	0.9						

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [2]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.40	2.40	2.50	2.70	2.95	2.89	2.81	2.60	2.40	2.40	2.40	2.40	
WASTEWATER VOLUME (MG)	74	72	77	84	83	90	84	81	72	74	74	72	937
APPLIED EFFLUENT (MG)	74	0	0	0	0	50	92	158	132	129	109	79	822
SUPPLEMENTAL IRRIGATION WATER (MG) [3]	-2	0	0	0	0	0	3	30	109	107	75	41	363
DESIGN EVAPORATION (IN)	2.9	1.4	0.7	0.9	1.5	2.8	3.9	6.6	7.7	8.0	6.8	5.0	48
DESIGN PRECIPITATION (IN)	0.8	2.3	3.1	4.4	3.7	2.9	1.6	0.6	0.1	0.0	0.0	0.4	20
PRECIPITATION VOLUME (MG) [5]	14	39	52	72	61	48	26	10	1	0	1	6	330
OXIDATION POND													
PERCOLATION (IN)	2.1	2.1	2.1	2.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25
PERC VOLUME (MG)	2.8	2.8	2.8	2.8	2.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	34
EVAP. VOLUME (MG)	4	2	1	1	2	4	5	9	10	11	9	7	64
PRECIP. VOLUME (MG)	1	3	4	6	5	4	2	1	0	0	0	1	29
NET DISPOSAL POTENTIAL (MG)	5	1	-1	-2	-1	2	6	11	13	13	12	9	69
STORAGE BASINS													
PERCOLATION (IN)	3.6	3.5	3.6	3.6	3.2	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42
PERC VOLUME (MG)	6	5	6	6	5	6	5	6	5	6	6	5	66
EVAP. VOLUME (MG)	5	2	1	1	2	4	6	10	12	13	11	8	76
PRECIP. VOLUME (MG)	2	5	6	9	8	6	3	1	0	0	0	1	41
NET DISPOSAL POTENTIAL (MG)	8	3	0	-2	0	4	8	15	17	18	16	13	101
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.2	1.9	1.4	1.3	2.3	4.2	4.6	7.0	8.4	8.1	6.4	4.5	53
TOTAL IRRIG DEMAND (IN)	4.4	0.0	0.0	0.0	0.0	3.0	5.7	11.4	14.6	14.3	11.1	7.3	71.8
IRRIGATION DEMAND (MG)	72	0	0	0	0	49	94	188	241	236	184	120	1184
IRRIGATION APPLIED (MG)	72	0	0	0	0	50	94	188	241	236	184	120	1185
SITE STORMWATER RUNOFF (IN)	0.0	0.4	0.5	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2
SITE STORMWATER RUNOFF (MG)	0	7	9	13	11	0	0	0	0	0	0	0	40
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	0	75	162	263	357	391	370	267	177	90	28	
STORAGE GAIN (MG) [4]	-13	75	87	101	94	34	-21	-103	-90	-86	-62	-28	
FINAL STORAGE (MG)	0	75	162	263	357	391	370	267	177	90	28	0	

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		STORAGE (MG)		DISPOSAL (MG)	
WASTEWATER	876	EVAP. FROM PONDS/BASINS	140	STORAGE AVAILABLE	405	DISPOSAL AVAILABLE	1424
INFLOW AND INFILTRATION	61	PERC. FROM PONDS/BASINS	100	STORAGE REQUIRED	391	DISPOSAL REQUIRED	1007
PRECIP. INTO PONDS/BASINS	70	IRRIGATION DEMAND	1184				
				SURPLUS STORAGE CAPACITY	14	SURPLUS DISPOSAL CAPACITY (MG)	416
TOTAL	1007	TOTAL	1424	(NEGATIVE INDICATES STORAGE REQUIRED)		(NEGATIVE INDICATES ADDITIONAL LAND IS REQUIRED)	

Notes:

Manual Input

1 Includes irrigated portions of City Owned Land

2 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15

3 Additional supplemental water required to meet salinity requirements in a typical year less vloume of additional rainwater falling on fields during a wet year

4 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water

City of Newman WWTRF

WATER BALANCE - TYPICAL ANNUAL PRECIPITATION - ALTERNATIVE C GROUNDWATER

10-Aug-18

10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.40
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	125.0
WATER SURFACE (AC)	112.0
BOTTOM SURFACE (AC)	93.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	365.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	1050
ACTUAL AREA BEING IRRIGATED (AC) [2]	1050
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
McPike	1340
Additional Irrigation Wells	2000
WELLS VOLUME WEIGHTED AVG.	1845
APPLIED EFFLUENT	3800
RAINWATER	10

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.40	2.40	2.44	2.53	2.63	2.61	2.58	2.48	2.40	2.40	2.40	2.40	
WASTEWATER VOLUME (MG)	74	72	76	78	74	81	77	77	72	74	74	72	902
APPLIED EFFLUENT (MG)	43	39	0	0	26	92	69	73	74	71	56	45	587
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	94	0	0	0	0	46	119	257	335	328	255	165	1598
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	13	37	49	69	58	46	25	10	1	0	1	6	315
TOTAL WATER APPLIED (MG)	151	75	49	69	84	183	213	340	410	399	312	216	2500
AVERAGE FLOW WEIGHTED EC (μS/cm)	2249	1948	10	10	1167	2358	2268	2211	2194	2192	2193	2199	2073
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	9.01	8.72	9.01	9.01	8.14	9.01	8.72	9.01	8.72	9.01	9.01	8.72	106.1
EVAP. VOLUME (MG)	11.12	5.31	2.53	3.29	5.81	10.61	14.91	20.98	24.26	25.27	21.48	15.92	161.5
PRECIP. VOLUME (MG)	1.55	4.34	5.82	8.13	6.86	5.45	2.89	1.18	0.13	0.03	0.07	0.71	37.1
NET DISPOSAL POTENTIAL (MG)	18.58	9.69	5.72	4.16	7.09	14.18	20.74	28.81	32.85	34.25	30.42	23.93	230.4
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	137.4	38.5	0.0	0.0	25.6	137.2	188.6	329.7	408.6	398.6	310.9	209.6	2184.7
IRRIGATION APPLIED (MG)	137.4	38.5	0.0	0.0	25.6	137.2	188.6	329.7	408.6	398.6	310.9	209.6	2184.7
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	7.4	10.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.8
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	4	24	100	184	222	191	169	131	81	34	7	
STORAGE GAIN (MG) [6]	4	20	76	83	38	-31	-22	-38	-50	-47	-26	-7	
FINAL STORAGE (MG)	4	24	100	184	222	191	169	131	81	34	7	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	876
INFLOW AND INFILTRATION	26
PRECIP. INTO PONDS/BASINS	71
SUPPLEMENTAL BLEND WATER	1598
TOTAL	2571

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	247
PERC. FROM PONDS/BASINS	140
IRRIGATION DEMAND	2185
TOTAL	2571

STORAGE (MG)	
STORAGE AVAILABLE	405
STORAGE REQUIRED	222
SURPLUS STORAGE	183

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	2073
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	2500
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	5631
EC OF WATER REACHING SHALLOW GROUNDWATER	5390
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming

2 Acres of land receiving effluent

3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15

4 Additional water applied to satisfy irrigation demand and salinity requirements

5 Volume of precipitaion falling on City owned land where effluent is applied

6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water

7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 1-100 YEAR RETURN PERIOD FOR PRECIPITATION - ALTERNATIVE C GROUNDWATER

10-Aug-18
10-Aug-18

FLOWS AND INFILTRATION/INFLOWS (I/I)		OXIDATION POND		STORAGE BASINS (Some storage in Oxidation Pond)		IRRIGATION AREA CHARACTERISTICS	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.40	GROSS STORAGE AREA (AC)	53.0	GROSS STORAGE AREA (AC)	125.0	ACTUAL AREA BEING IRRIGATED (AC) [1]	1050
ANNUAL I/I (%)	7	WATER SURFACE (AC)	50.0	WATER SURFACE (AC)	112.0	LEACHING FRACTION	0.38
CLIMATOLOGICAL FACTORS		BOTTOM SURFACE (AC)	49.0	BOTTOM SURFACE (AC)	93.0	OVERALL IRR. EFFICIENCY	0.57
PRECIP/AVG PRECIP RATIO	1.81	WATER DEPTH (FT)	2.5	WATER DEPTH OF STORAGE COMPONENT (FT)	12.0	ALFALFA AREA (% OF LAND IRRIGATED)	75%
OCT-APR EVAP/AVG EVAP RATIO	0.82	STORAGE AVAILABLE (MG)	40	STORAGE AVAILABLE (MG)	365.0	ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
MAY-SEP EVAP/AVG EVAP RATIO	1.00	INFILTRATION RATE (IN/DAY)	0.069	INFILTRATION RATE (IN/DAY)	0.115	PRECIP IRR. EFFICIENCY	0.85
PAN COEFFICIENT	0.80						
LAND PRECIP COLLECTED (FRAC)	0.9						

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [2]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.40	2.40	2.50	2.70	2.95	2.89	2.81	2.60	2.40	2.40	2.40	2.40	
WASTEWATER VOLUME (MG)	74	72	77	84	83	90	84	81	72	74	74	72	937
APPLIED EFFLUENT (MG)	56	0	0	0	0	81	140	125	114	108	86	64	774
SUPPLEMENTAL IRRIGATION WATER (MG) [3]	69	0	0	0	0	5	98	230	303	317	240	146	1407
DESIGN EVAPORATION (IN)	2.9	1.4	0.7	0.9	1.5	2.8	3.9	6.6	7.7	8.0	6.8	5.0	48
DESIGN PRECIPITATION (IN)	0.8	2.3	3.1	4.4	3.7	2.9	1.6	0.6	0.1	0.0	0.0	0.4	20
PRECIPITATION VOLUME (MG) [5]	24	67	89	125	105	84	44	18	2	1	1	11	571
OXIDATION POND													
PERCOLATION (IN)	2.1	2.1	2.1	2.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25
PERC VOLUME (MG)	2.8	2.8	2.8	2.8	2.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	34
EVAP. VOLUME (MG)	4	2	1	1	2	4	5	9	10	11	9	7	64
PRECIP. VOLUME (MG)	1	3	4	6	5	4	2	1	0	0	0	1	29
NET DISPOSAL POTENTIAL (MG)	5	1	-1	-2	-1	2	6	11	13	13	12	9	69
STORAGE BASINS													
PERCOLATION (IN)	3.6	3.5	3.6	3.6	3.2	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42
PERC VOLUME (MG)	9	9	9	9	8	9	9	9	9	9	9	9	106
EVAP. VOLUME (MG)	7	3	2	2	4	7	10	17	19	20	17	13	121
PRECIP. VOLUME (MG)	3	8	11	15	12	10	5	2	0	0	0	1	67
NET DISPOSAL POTENTIAL (MG)	14	4	0	-4	0	6	13	24	28	29	26	20	160
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.2	1.9	1.4	1.3	2.3	4.2	4.6	7.0	8.4	8.1	6.4	4.5	53
TOTAL IRRIG DEMAND (IN)	4.4	0.0	0.0	0.0	0.0	3.0	5.7	11.4	14.6	14.3	11.1	7.3	71.8
IRRIGATION DEMAND (MG)	125	0	0	0	0	84	163	326	417	408	318	207	2048
IRRIGATION APPLIED (MG)	125	0	0	0	0	86	238	355	417	425	325	210	2181
SITE STORMWATER RUNOFF (IN)	0.0	0.4	0.5	0.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2
SITE STORMWATER RUNOFF (MG)	0	11	15	21	18	0	0	0	0	0	0	0	64
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	0	78	171	281	382	383	308	229	146	70	21	
STORAGE GAIN (MG) [4]	-1	78	93	110	101	0	-75	-79	-82	-76	-49	-22	
FINAL STORAGE (MG)	0	78	171	281	382	383	308	229	146	70	21	0	

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		STORAGE (MG)		DISPOSAL (MG)	
WASTEWATER	876	EVAP. FROM PONDS/BASINS	185	STORAGE AVAILABLE	405	DISPOSAL AVAILABLE	2373
INFLOW AND INFILTRATION	61	PERC. FROM PONDS/BASINS	140	STORAGE REQUIRED	383	DISPOSAL REQUIRED	1033
PRECIP. INTO PONDS/BASINS	96	IRRIGATION DEMAND	2048				
				SURPLUS STORAGE CAPACITY	22	SURPLUS DISPOSAL CAPACITY (MG)	1340
TOTAL	1033	TOTAL	2373	(NEGATIVE INDICATES STORAGE REQUIRED)		(NEGATIVE INDICATES ADDITIONAL LAND IS REQUIRED)	

Notes:

Manual Input

1 Includes irrigated portions of City Owned Land

2 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15

3 Additional supplemental water required to meet salinity requirements in a typical year less vloume of additional rainwater falling on fields during a wet year

4 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effulnet is withdrawn for use as irrigation water

City of Newman WWTRF	WATER BALANCE - TYPICAL ANNUAL PRECIPITATION - ALTERNATIVE D REVERSE OSMOSIS	10-Aug-18
		10-Aug-18

INPUT DATA

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.40
ANNUAL I/I (%)	3
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.00
OCT-APR EVAP/AVG EVAP RATIO	1.00
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	1.00
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS	
GROSS STORAGE AREA (AC)	125.0
WATER SURFACE (AC)	112.0
BOTTOM SURFACE (AC)	93.0
WATER DEPTH (FT)	12.0
STORAGE AVAILABLE (MG)	365.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
AVAILABLE AGRICULTURAL LAND AREA (AC) [1]	531
ACTUAL AREA BEING IRRIGATED (AC) [2]	531
LEACHING FRACTION	0.37
OVERALL IRR. EFFICIENCY (ACCOUNTING FOR EVAPORATION)	0.58
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

IRRIGATION WATER SALINITY (μS/cm)	
J PIPE	2000
50 HP	1560
WELLS VOLUME WEIGHTED AVG.	1571
APPLIED EFFLUENT	2000
RAINWATER	10
CCID	10-Mar-02

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [3]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	2.80
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5.0	15.0	25.0	25.0	20.0	10.0	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.40	2.40	2.44	2.53	2.63	2.61	2.58	2.48	2.40	2.40	2.40	2.40	
WASTEWATER VOLUME (MG)	74	72	76	78	74	81	77	77	72	74	74	72	902
APPLIED EFFLUENT (MG)	41	19	0	0	13	69	62	81	90	87	68	46	578
SUPPLEMENTAL IRRIGATION WATER (MG) [4]	28	0	0	0	0	0	33	86	116	114	89	60	527
DESIGN EVAPORATION (IN)	4.4	2.1	1.0	1.3	2.3	4.2	5.9	8.3	9.6	10.0	8.5	6.3	63.9
DESIGN PRECIPITATION (IN)	0.5	1.3	1.7	2.4	2.0	1.6	0.9	0.4	0.0	0.0	0.0	0.2	11.1
PRECIPITATION VOLUME (MG) [5]	7	19	25	35	29	23	12	5	1	0	0	3	159
TOTAL WATER APPLIED (MG)	76	38	25	35	42	93	108	172	207	202	158	109	1264
AVERAGE FLOW WEIGHTED EC (μS/cm)	1668	1028	10	10	617	1498	1639	1726	1753	1755	1754	1710	1570
OXIDATION POND													
PERCOLATION (IN)	2.14	2.07	2.14	2.14	1.93	2.14	2.07	2.14	2.07	2.14	2.14	2.07	25.2
PERC VOLUME (MG)	2.85	2.76	2.85	2.85	2.57	2.85	2.76	2.85	2.76	2.85	2.85	2.76	33.5
EVAP. VOLUME (MG)	5.86	2.80	1.33	1.73	3.06	5.59	7.86	11.05	12.78	13.32	11.32	8.39	85.1
PRECIP. VOLUME (MG)	0.66	1.85	2.48	3.47	2.92	2.32	1.23	0.50	0.06	0.01	0.03	0.30	15.8
NET DISPOSAL POTENTIAL (MG)	8.05	3.71	1.70	1.11	2.71	6.12	9.38	13.40	15.48	16.15	14.14	10.84	102.8
STORAGE BASINS													
PERCOLATION (IN)	3.57	3.45	3.57	3.57	3.22	3.57	3.45	3.57	3.45	3.57	3.57	3.45	42.0
PERC VOLUME (MG)	9.01	8.72	9.01	9.01	8.14	9.01	8.72	9.01	8.72	9.01	9.01	8.72	106.1
EVAP. VOLUME (MG)	11.12	5.31	2.53	3.29	5.81	10.61	14.91	20.98	24.26	25.27	21.48	15.92	161.5
PRECIP. VOLUME (MG)	1.55	4.34	5.82	8.13	6.86	5.45	2.89	1.18	0.13	0.03	0.07	0.71	37.1
NET DISPOSAL POTENTIAL (MG)	18.58	9.69	5.72	4.16	7.09	14.18	20.74	28.81	32.85	34.25	30.42	23.93	230.4
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.19	1.88	1.42	1.33	2.26	4.17	4.57	7.01	8.36	8.13	6.35	4.45	53.1
TOTAL IRRIG DEMAND (IN)	4.81	1.35	0.00	0.00	0.90	4.81	6.61	11.55	14.32	13.97	10.90	7.35	76.6
IRRIGATION DEMAND (MG)	69.5	19.5	0.0	0.0	12.9	69.4	95.4	166.7	206.7	201.6	157.3	106.0	1104.8
IRRIGATION APPLIED (MG)	69.5	19.5	0.0	0.0	12.9	69.4	95.4	166.7	206.7	201.6	157.3	106.0	1104.8
SITE STORMWATER RUNOFF (IN)	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
SITE STORMWATER RUNOFF (MG)	0.0	0.0	3.7	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	6	46	118	196	247	238	223	177	111	48	9	
STORAGE GAIN (MG) [6]	6	39	72	78	51	-9	-15	-46	-67	-63	-39	-9	
FINAL STORAGE (MG)	6	46	118	196	247	238	223	177	111	48	9	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	876
INFLOW AND INFILTRATION	26
PRECIP. INTO PONDS/BASINS	62
SUPPLEMENTAL BLEND WATER	527
TOTAL	1491

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	247
PERC. FROM PONDS/BASINS	140
IRRIGATION DEMAND	1105
TOTAL	1491

STORAGE (MG)	
STORAGE AVAILABLE	405
STORAGE REQUIRED	247
SURPLUS STORAGE	158

SALINITY	
ANNUAL FLOW WEIGHTED AVERAGE (μS/cm)	1570
SALINITY TARGET [7]	2100
TOTAL VOLUME OF WATER APPLIED TO LAND	1264
EC OF APPLIED WATER REACHING SHALLOW GROUNDWATER	4266
EC OF WATER REACHING SHALLOW GROUNDWATER	3743
SSGG	5180

Notes:

Manual Input

1 Acres of City owned land available for farming
2 Acres of land receiving effluent
3 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15
4 Additional water applied to satisfy irrigation demand and salinity requirements
5 Volume of precipitaion falling on City owned land where effluent is applied
6 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water
7 Salinity compliance target for applied irrigation water to meet the site specific groundwater goal of 5200 uS/cm identified in the Antidegradation Analysis

City of Newman WWTRF

WATER BALANCE - 1-100 YEAR RETURN PERIOD FOR PRECIPITATION - ALTERNATIVE D REVERSE OSMOSIS

10-Aug-18

10-Aug-18

FLOWS AND INFILTRATION/INFLOWS (I/I)	
3-MONTH AVG. DRY WEATHER INFLUENT FLOW (ADWF), MGD	2.40
ANNUAL I/I (%)	7
CLIMATOLOGICAL FACTORS	
PRECIP/AVG PRECIP RATIO	1.81
OCT-APR EVAP/AVG EVAP RATIO	0.82
MAY-SEP EVAP/AVG EVAP RATIO	1.00
PAN COEFFICIENT	0.80
LAND PRECIP COLLECTED (FRAC)	0.9

OXIDATION POND	
GROSS STORAGE AREA (AC)	53.0
WATER SURFACE (AC)	50.0
BOTTOM SURFACE (AC)	49.0
WATER DEPTH (FT)	2.5
STORAGE AVAILABLE (MG)	40
INFILTRATION RATE (IN/DAY)	0.069

STORAGE BASINS (Some storage in Oxidation Pond)	
GROSS STORAGE AREA (AC)	125.0
WATER SURFACE (AC)	112.0
BOTTOM SURFACE (AC)	93.0
WATER DEPTH OF STORAGE COMPONENT (FT)	12.0
STORAGE AVAILABLE (MG)	365.0
INFILTRATION RATE (IN/DAY)	0.115

IRRIGATION AREA CHARACTERISTICS	
ACTUAL AREA BEING IRRIGATED (AC) [1]	531
LEACHING FRACTION	0.4
OVERALL IRR. EFFICIENCY	0.57
ALFALFA AREA (% OF LAND IRRIGATED)	75%
ROTATION CROPS AREA (% OF LAND IRRIGATED)	25%
PRECIP IRR. EFFICIENCY	0.85

PARAMETERS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
DAYS IN MONTH	31	30	31	31	28	31	30	31	30	31	31	30	365
AVG PAN EVAP (IN)	4.40	2.10	1.00	1.30	2.30	4.20	5.90	8.30	9.60	10.00	8.50	6.30	63.90
AVG PRECIP (IN)	0.46	1.29	1.73	2.42	2.04	1.62	0.86	0.35	0.04	0.01	0.02	0.21	11.05
Eto [2]	4.02	2.05	1.39	1.30	2.20	4.07	5.40	7.78	8.36	8.14	7.16	5.70	57.57
Kc (Rotation Crops)	0.00	0.33	1.10	1.10	1.10	1.10	0.39	0.56	1.00	1.00	0.50	0.00	
BARE SOIL ET (IN)	0.70	0.70						0.35			0.35	0.70	
Kc1 (Alfalfa)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
PERCENT OF ANNUAL I/I OCCURRING IN MONTH	0.0	0.0	5	15	25	25	20	10	0.0	0.0	0.0	0.0	100.0
INFLUENT- EXCLUDING I/I (MGD)	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	

CALCULATIONS	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
MONTHLY AVERAGE WASTEWATER FLOW RATE (MGD)	2.40	2.40	2.50	2.70	2.95	2.89	2.81	2.60	2.40	2.40	2.40	2.40	
WASTEWATER VOLUME (MG)	74	72	77	84	83	90	84	81	72	74	74	72	937
APPLIED EFFLUENT (MG)	55	0	0	0	0	43	83	165	150	100	80	68	744
SUPPLEMENTAL IRRIGATION WATER (MG) [3]	8	0	0	0	0	0	0	0	61	106	81	37	292
DESIGN EVAPORATION (IN)	2.9	1.4	0.7	0.9	1.5	2.8	3.9	6.6	7.7	8.0	6.8	5.0	48
DESIGN PRECIPITATION (IN)	0.8	2.3	3.1	4.4	3.7	2.9	1.6	0.6	0.1	0.0	0.0	0.4	20
PRECIPITATION VOLUME (MG) [5]	12	34	45	63	53	42	22	9	1	0	1	5	289
OXIDATION POND													
PERCOLATION (IN)	2.1	2.1	2.1	2.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	25
PERC VOLUME (MG)	3	3	3	3	3	3	3	3	3	3	3	3	34
EVAP. VOLUME (MG)	4	2	1	1	2	4	5	9	10	11	9	7	64
PRECIP. VOLUME (MG)	1	3	4	6	5	4	2	1	0	0	0	1	29
NET DISPOSAL POTENTIAL (MG)	5	1	-1	-2	-1	2	6	11	13	13	12	9	69
STORAGE BASINS													
PERCOLATION (IN)	3.6	3.5	3.6	3.6	3.2	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42
PERC VOLUME (MG)	9	9	9	9	8	9	9	9	9	9	9	9	106
EVAP. VOLUME (MG)	7	3	2	2	4	7	10	17	19	20	17	13	121
PRECIP. VOLUME (MG)	3	8	11	15	12	10	5	2	0	0	0	1	67
NET DISPOSAL POTENTIAL (MG)	14	4	0	-4	0	6	13	24	28	29	26	20	160
IRRIGATION													
EVAPOTRANSPIRATION (IN)	3.2	1.9	1.4	1.3	2.3	4.2	4.6	7.0	8.4	8.1	6.4	4.5	53
TOTAL IRRIG DEMAND (IN)	4.4	0.0	0.0	0.0	0.0	3.0	5.7	11.4	14.6	14.3	11.1	7.3	72
IRRIGATION DEMAND (MG)	63	0	0	0	0	43	83	165	211	206	161	105	1036
IRRIGATION APPLIED (MG)	63	0	0	0	0	43	83	165	211	206	161	105	1036
SITE STORMWATER RUNOFF (IN)	0	0.4	0.5	0.7	0.6	0	0	0	0	0	0	0	2
SITE STORMWATER RUNOFF (MG)	0	6	8	12	10	0	0	0	0	0	0	0	36
COMBINED STORAGE													
BEGINNING STORAGE (MG)	0	0	73	159	260	354	392	374	256	137	69	25	
STORAGE GAIN (MG) [4]	0	73	86	101	93	38	-18	-119	-119	-68	-44	-25	
FINAL STORAGE (MG)	0	73	159	260	354	392	374	256	137	69	25	0	

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	876
INFLOW AND INFILTRATION	61
PRECIP. INTO PONDS/BASINS	132
TOTAL	1069

ANNUAL OUTFLOW POTENTIAL (MG)	
EVAP. FROM PONDS/BASINS	185
PERC. FROM PONDS/BASINS	140
IRRIGATION DEMAND	1036
TOTAL	1361

STORAGE (MG)	
STORAGE AVAILABLE	405
STORAGE REQUIRED	392
SURPLUS STORAGE CAPACITY (NEGATIVE INDICATES STORAGE REQUIRED)	13

DISPOSAL (MG)	
DISPOSAL AVAILABLE	1361
DISPOSAL REQUIRED	1069
SURPLUS DISPOSAL CAPACITY (MG) (NEGATIVE INDICATES ADDITIONAL LAND IS REQUIRED)	292

Notes:

Manual Input

1 Includes irrigated portions of City Owned Land

2 Evapotranspiration from CIMIS 161 Patterson, intermediary between zone 14 and 15

3 Additional supplemental water required to meet salinity requirements in a typical year less vloume of additional rainwater falling on fields during a wet year

4 Storage volume increases with rainfall runoff and excess effluent not used for irrigation; storage decreases as effluent is withdrawn for use as irrigation water

5 Volume of precipitaion falling on City owned land where effluent is applied