Appendix C

Water and Wastewater Feasibility Study

Acorn Environmental

Water and Wastewater Feasibility Study

Prepared by HydroScience Engineers

February 2023

HydroScience
Strategic Water Solutions

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

AF	acre-feet
bgs	below ground surface
BOD	biochemical oxygen demand
CFR	Code of Federal Regulations
CT	product of chlorine residual and modal contact time measured at the same
DU	dwelling unit
DWR	Department of Water Resources
ET	evapotranspiration rate
Ft	feet
Ft^2	square feet
gal	gallons
gpd	gallons per day
gpm	gallons per minute
IHS	Indian Health Services
LS	lump sum
MBR	membrane bioreactor
MCL	Maximum Contaminant Level
MG	million gallons
mg/L	milligrams per liter
µg/L	micrograms per liter
MGD	million gallons per day
MPN	Most Probable Number
NPDES	National Pollution Discharge Elimination System
NTU	nephelometric turbidity units
PLC	programmable logic controller
RWQCB	Regional Water Quality Control Board
SWRCB	State Water Resources Control Board
SDS	Safety Data Sheets
sf	square feet
TSS	total suspended solids
UV	Ultraviolet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

WWTP	Wastewater Treatment Plant

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SECTION 1 – INTRODUCTION

HydroScience Engineers, Inc. (HydroScience) was retained by Acorn Environmental to prepare a feasibility study evaluating the regulatory, technical, and engineering issues associated with supplying water and handling wastewater from the Shiloh Resort and Casino Project (Project) proposed by the Koi Nation of Northern California. The objectives of this water and wastewater feasibility study are to:

- Estimate the proposed Project's water supply and wastewater disposal requirements;
- Describe the facilities that would be required to supply the required water, and treat the required amount of wastewater;
- Develop a strategy for disposing of wastewater generated by the Project; and
- Identify applicable water and wastewater permitting issues for the proposed Project.

This report evaluates these objectives for two development alternatives located at the project site. Alternative A – Proposed Resort and Casino Project consists of a resort hotel and casino, with event center and conference space, parking structure, and surface parking lots. Alternative B – Reduced Intensity Resort and Casino Project plan consists of a smaller resort hotel and casino without event center or large ballroom and no surface parking lots. A third development alternative (non-gaming) was also evaluated which consists of a resort hotel, winery production facility, tasting room, and dining area and is identified as Alternative C – Proposed Resort and Winery Facility Project. This document describes each alternative's water supply and wastewater requirements, identifies projected flows and demands, and evaluates alternative effluent disposal strategies.

Sections 5 and 6 present a plan summarizing the facilities required to meet the more conservative objectives for Alternative A.

1.1 Proposed Project Site Alternatives

The proposed Project would be constructed in an unincorporated area of Sonoma County just outside the Town of Windsor (Town) (**Figure 1-1**). The 68.6-acre (ac) parcel located at the intersection of East Shiloh Road and Old Redwood Highway would be brought into Trust as part of the proposed Project. A map showing the location of the site is shown in **Figure 1-2**.

The proposed land use on this parcel includes a new casino (excluded in Alternative C), hotel, parking, restaurants, and other associated facilities and are further described in **Section 2.1**. Three separate programs, each comprising of different densities and facilities, will be evaluated as part of this analysis: Alternative A – Proposed Resort and Casino Project, Alternative B – Reduced Intensity Resort and Casino Project and Alternative C – Proposed Resort and Winery Facility Project. See **Appendix A** for a full list of the proposed facilities.

1.2 Report Organization

This report is divided into eight sections as described below.

- Section 1 – Introduction
- Section 2 – Project Alternatives
- Section 3 – Local Hydrogeology
- Section 4 – Background and Regulatory Issues
- Section 5 – Water Facility Requirements
- Section 6 – Wastewater Facility Requirements
- Section 7 – Recommendations
- Section 8 – References

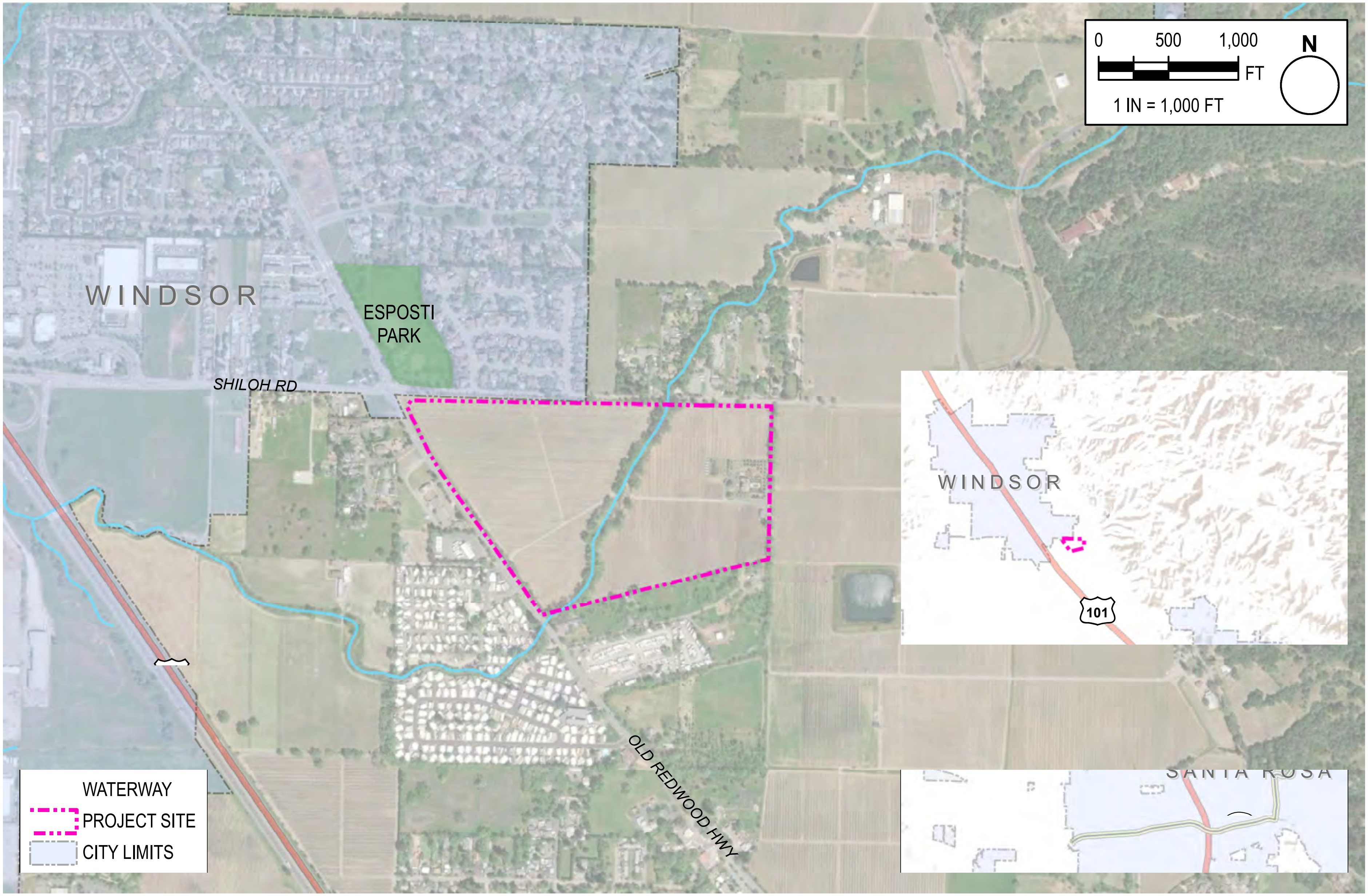

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Figure 1-1
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Vicinity and Project Location Map

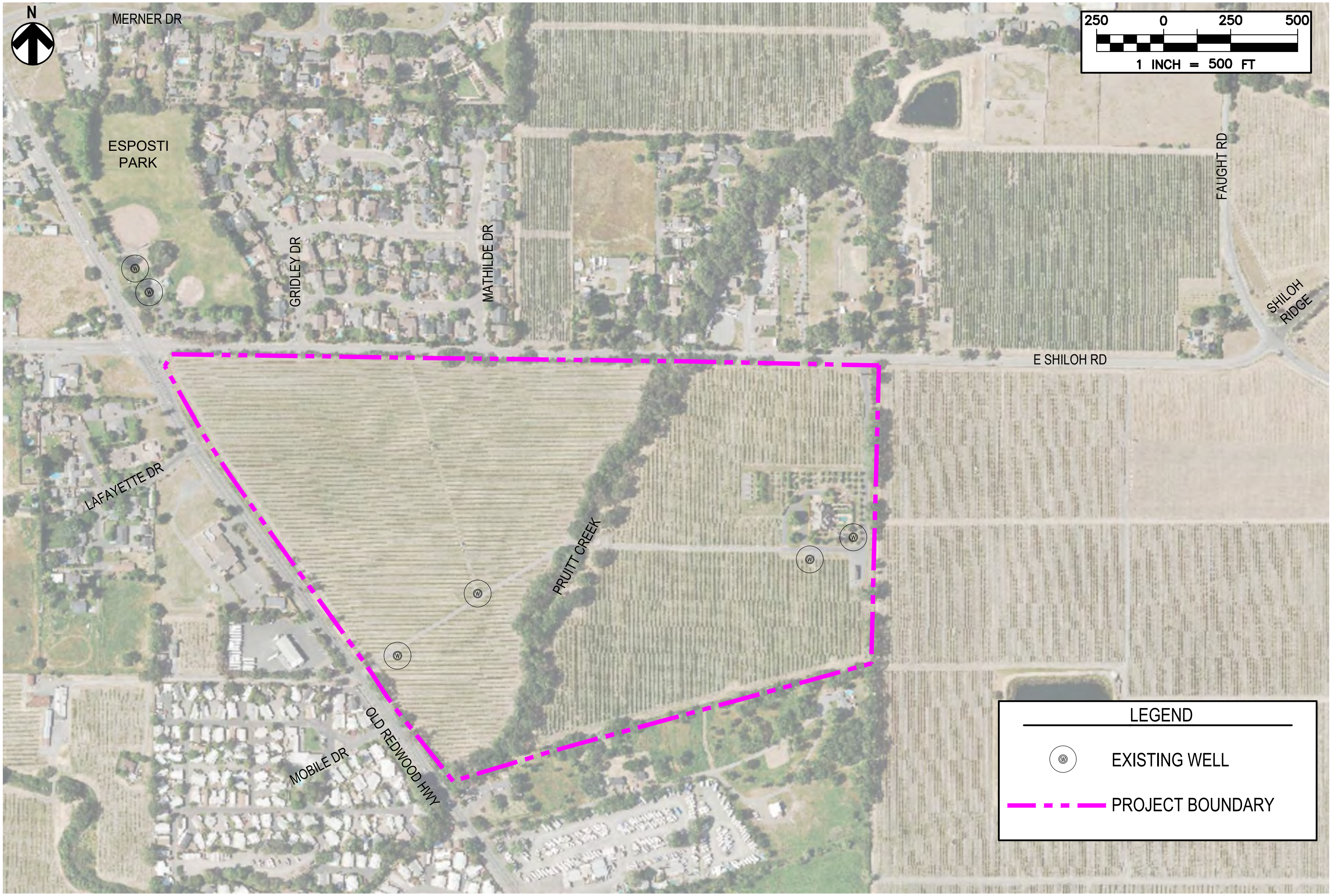

Figure 1-2
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Aerial Site Plan

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SECTION 2 – PROJECT ALTERNATIVES

This section provides a summary of each of the three program alternatives and the related water and wastewater facility requirements. For each program alternative, the following information is summarized:

- Water supply requirements;
- Wastewater generated, including discussions about influent water quality, treatment options, and effluent disposal options; and
- Recycled water.

Each alternative is individually described below.

2.1 Program Alternatives

There are two program alternatives that are considered in this feasibility study to understand the range of water and wastewater facility needs. Each program is summarized below:

- **Alternative A:** This program includes a total approximate footprint of 805,000 ft^2, including a casino, multiple restaurants and bars, meeting rooms, 44,900 ft^2 of ballrooms, a spa, and a 400-room hotel. Approximately 183,100 ft^2 of on-site parking spaces will be located on the site east of the gaming facility and would include a 3,692-count parking structure adjacent to paved surface parking. A map of the Alternative A program site plan is included as **Figure 2-1**.
- **Alternative B:** This program includes a total approximate footprint of 554,000 ft^2, including a casino, multiple restaurants and bars, meeting rooms, 12,400 ft^2 of ballrooms, a spa, and a 200-room hotel. This program would also include a 3,692-count parking structure adjacent to paved surface parking. A map of the Alternative B program site plan is included as **Figure 2-2**.
- **Alternative C:** This program includes a total approximate footprint of 212,400 ft^2, including a dining facility, hotel, spa, winery, and visitor center with a dedicated tasting area. Approximately 109,700 ft^2 of on-site parking will also be located east of the facilities. A map of the Alternative C program site plan is included as **Figure 2-3**.

2.2 Water Supply Requirements

Existing water demands for the proposed project site include vineyard irrigation and single-family home use. Water usage was estimated based on a demand rate of 0.317 AF per year/acre and 319 gpd/DU for vineyard irrigation and residential use, respectively. The demand rate for vineyard irrigation is discussed in **Section 2.3.4.1**. The residential water demand rate was based on the 2011 Town of Windsor Water Master Plan estimate for future residential demands. Actual billing/metered data was not available. **Table 2-1** compares the projected average annual demands for Alternatives A, B, and C with estimated existing usage for the proposed project site.

Table 2-1: Comparison of Alternatives and Existing Site Demands

Program Alternative	Average Annual Demand (AFY)
Existing Usage	20
Alternative A	315
Alternative B	215
Alternative C	55

The average water demand, supplemented with recycled water, for Alternatives A, B, and C is shown in **Table 2-2**. The average water demand is expected to be representative of typical daily water use. Peak water demands, which would typically occur on the weekends, were calculated using similar methodology.

Table 2-2: Projected Water Demands for Alternative A, B & C

Program Alternative	Parameter	Projected Water Demands (gpd)	Projected Water Demands with Recycled Water (gpd)
Alternative A	Average Daily Flow	278,000	170,000
	Peak Day Flow	402,000	294,000
Alternative B	Average Daily Flow	189,000	117,000
	Peak Day Flow	258,000	186,000
Alternative C	Average Daily Flow	48,000	19,000
	Peak Day Flow	64,000	35,000

The experience of other similarly sized gaming and entertainment facilities has shown that water demands can be significantly reduced when recycled water is introduced as an alternative water supply source. Water supply requirements, including the use of recycled water, were calculated assuming recycled water would be utilized for toilet flushing, landscape irrigation, vineyard irrigation, cooling tower make-up and other approved non-potable uses under Title 22 regulations. Although it doesn't apply to uses on Trust lands, the recycled water quality will be designed to produce the equivalent water quality to disinfected tertiary recycled water as defined by Title 22.

Preliminary projections of the water supply needed to reliably meet water demand for both programs are summarized in **Table 2-3**. These projections are based on estimated average wastewater flows (see **Table 2-5**) and include a 20% allowance for system losses as well as a safety factor to ensure adequate supply. These are preliminary and for planning purposes only.

Table 2-3: Projected Water Supply Design Flows

Program Alternative	Water Supply Requirement without Recycled Water (gpm)	Water Supply Requirement with Recycled Water (gpm)	Minimum Recommended Firm Water Supply (gpm)
Alternative A	300	225	300
Alternative B	200	150	200
Alternative C	50	30	50

Notes:
1. Units of gpm = gallons per minute.
2. Reduction in water supply requirement is higher for Alternative A than Alternative B alternative since dual plumbing use and cooling tower demands are greater for the larger facility.

A “firm” water source is considered that which can be supplied by the system with the single largest source out of service, in a redundant system. The “firm” water supply is required 24 hours a day, 365-day a year, and can meet the Maximum Day Demand for the project. Water system redundancy may be achieved in a variety of ways – in a groundwater system, multiple wells or another redundant source would normally be required. Diurnal peaks, fire flow, and other peak demands may be met with storage tanks.

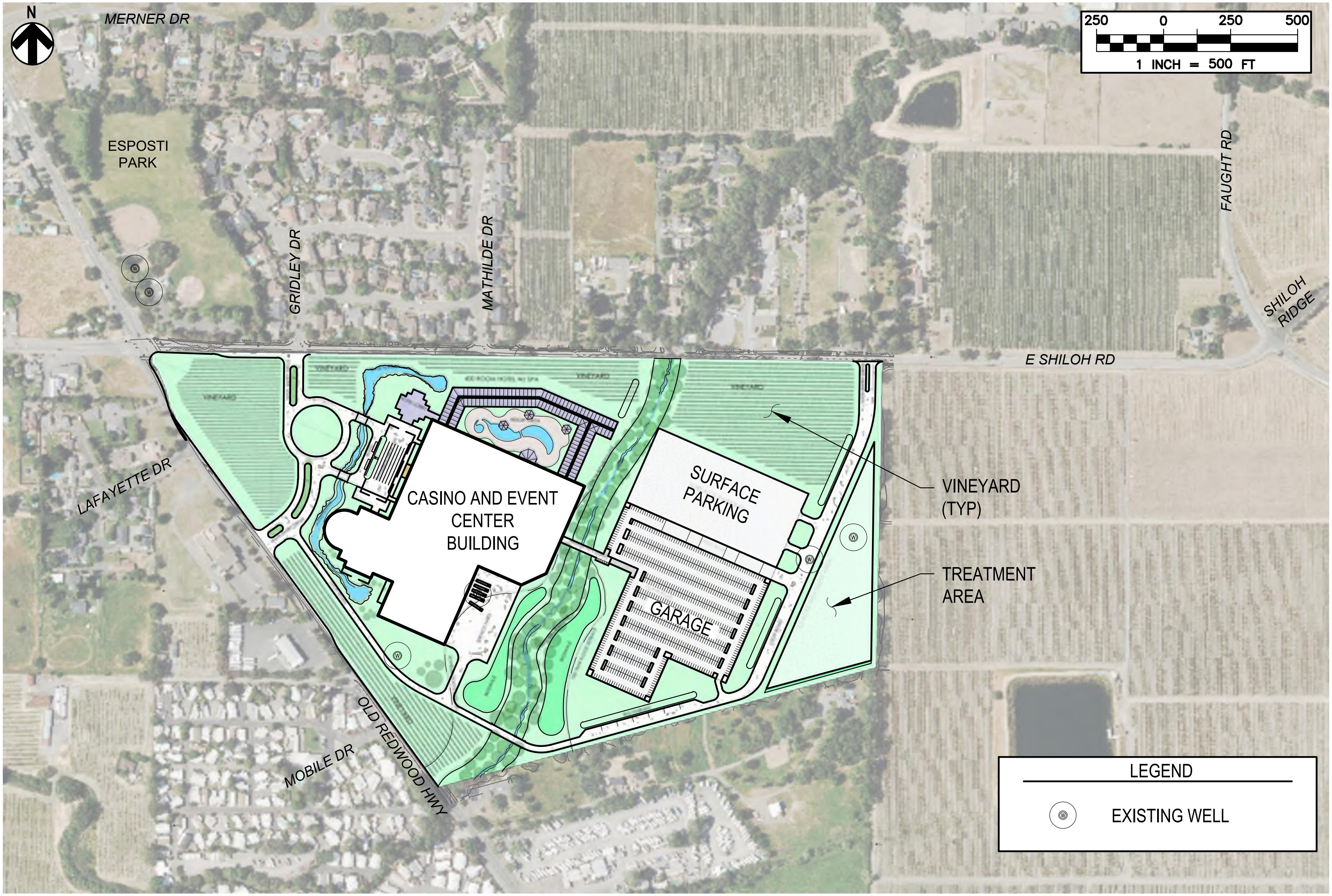

Figure 2-1
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Proposed Site Plan - Alternative A

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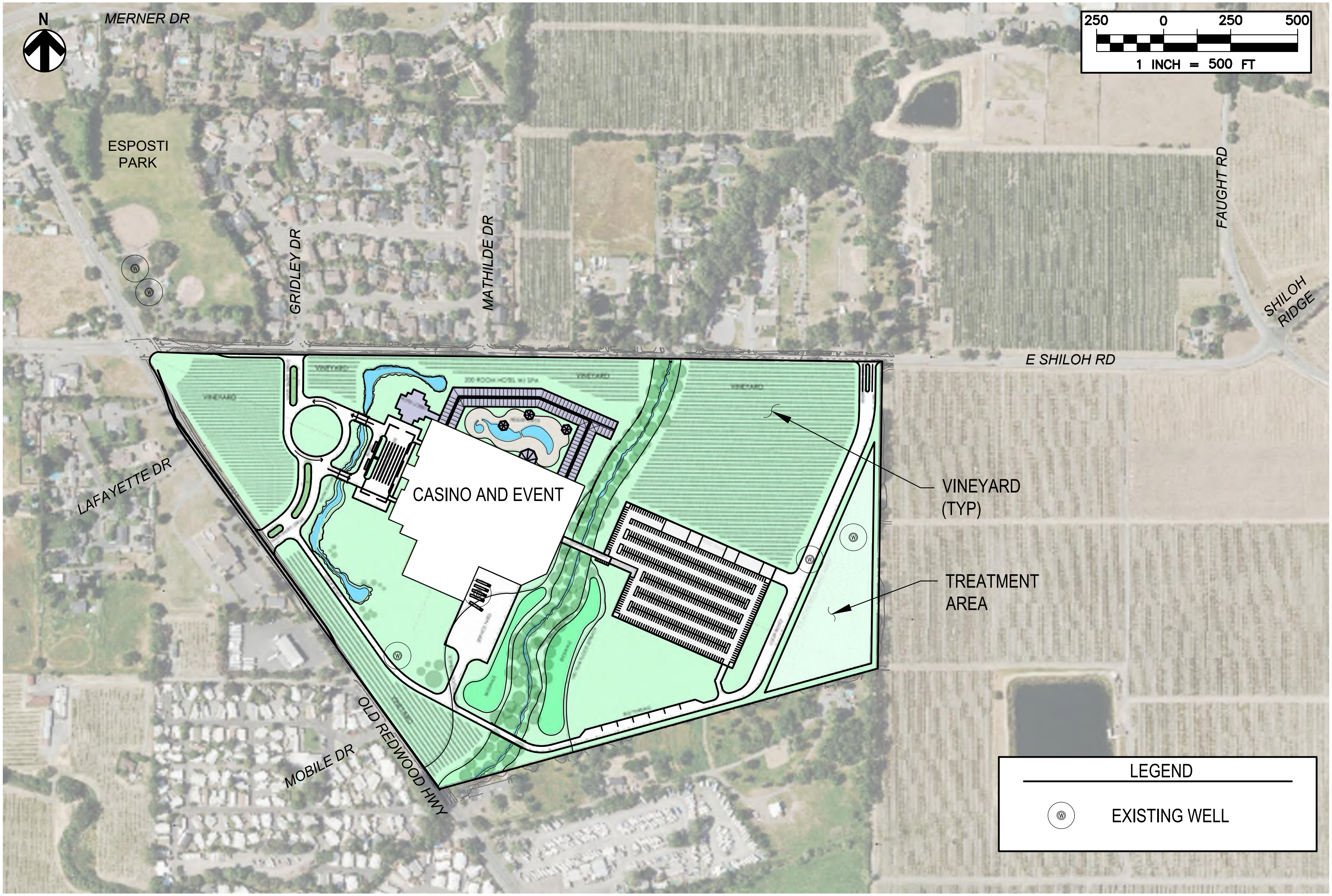

Figure 2-2
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Proposed Site Plan - Alternative B

HydroScience

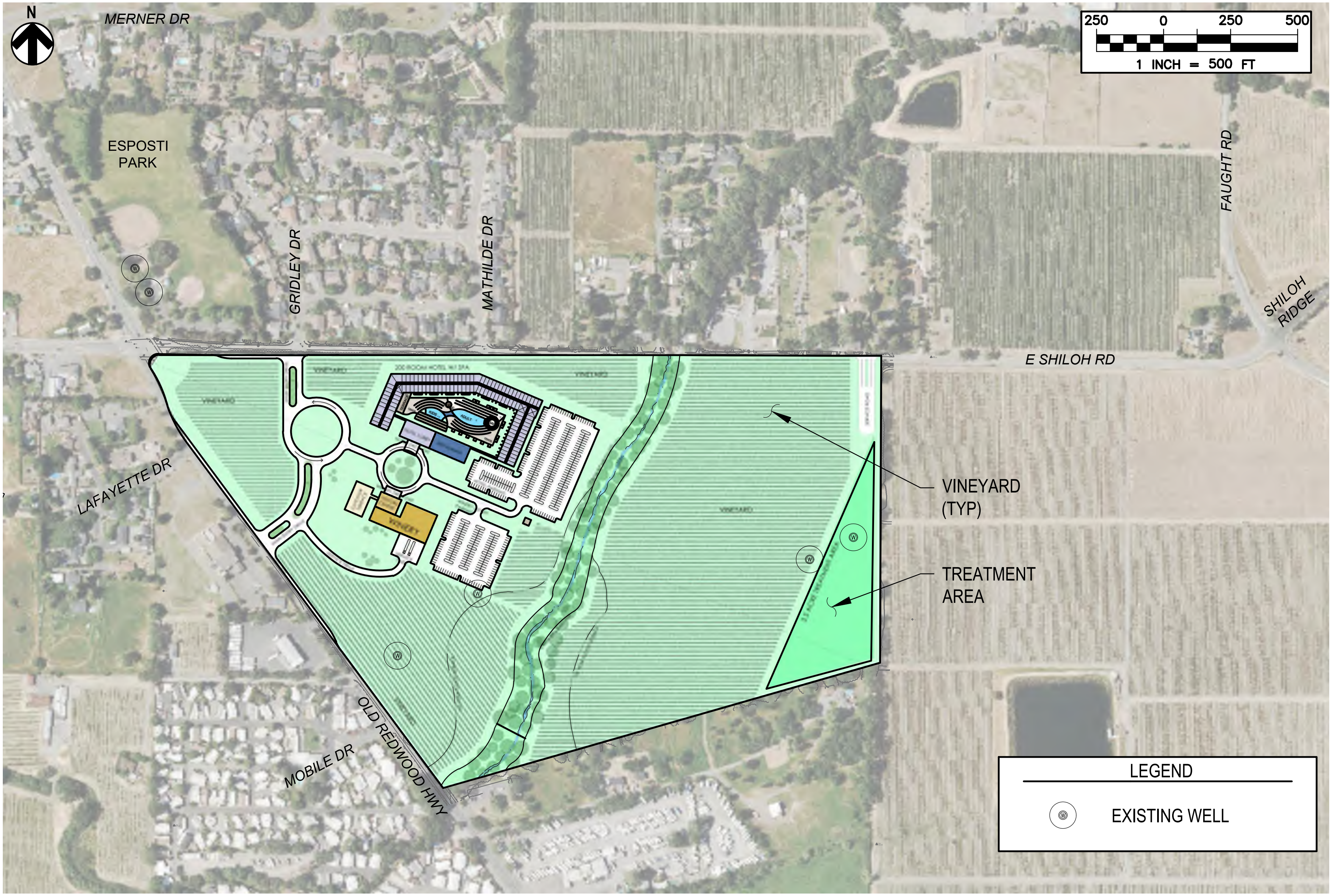

Figure 2-3
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Proposed Site Plan - Alternative C

HydroScience

In addition to the use of recycled water, the project alternatives are also expected to be designed and managed to minimize potable water usage. Recommended water conservation measures include low flow fixtures, voluntary towel re-use, central plant optimization, recirculating fountains or water features, high efficiency/water conserving appliances, etc. For restaurants, potable water can also be conserved, if only served to patrons who request it. To facilitate this, sub-metering of water for each of the uses within the Project will discourage waste and help identify areas where consumption can be reduced. Employee training and participation, regular maintenance, and customer education are all expected to also help reduce water use.

Fire flow requirements (or guidelines) are set by the local fire authorities, based on the building's use and classification. Storage requirements for casinos are generally controlled by fire protection requirements, and not by domestic peaking requirements. Storage requirements will be determined upon issuance of the fire flow and duration requirement from the local fire authority. Fireflow requirements for a large facility such as this can be as much as 8,000 gpm for 4 hours with up to 75% reduction (reduced to 2,000 gpm for 4 hours) for automatic fire sprinklers.

2.2.1 Water Supply

The Project will require both a potable and irrigation water supply for use within the Project. Potable water could be obtained through the construction of on-site groundwater wells. It was noted that there are already multiple on-site wells used for irrigation with capacities ranging up to over 600 gpm, though it is unclear whether these wells are suitable for use as a potable water supply well. Irrigation water could be obtained either through reuse of effluent from the proposed onsite wastewater treatment plant (WWTP) as recycled water, use of the existing onsite irrigation well, or use of potable water.

It is expected that groundwater is available within the Project site based on recent investigations at Esposti Park. Esposti Park has both an existing Town irrigation well as well as a standby potable water supply well. The potable water supply well is not currently active; however, the Town has evaluated the thickness and productivity of the deeper sedimentary units at the existing well location and documented those results in the *Windsor Groundwater Well Installation and Testing Report* prepared in September 2010 and included as **Appendix B** as well as the *Town of Windsor and Windsor Water District Esposti Supply Well Redevelopment, Pumping Test and Treatment Feasibility Study (October 3, 2017)*, included as **Appendix C**. Based on these evaluations, discussed further in **Section 3.3.1**, it is estimated that a new on-site potable water supply well can reliably produce 400 gpm.

For any onsite groundwater well, it is likely that groundwater treatment will be required to remove arsenic and manganese. The number of wells required would be dependent on the capacity of each new groundwater well. At a minimum, sufficient capacity would be required to meet the maximum day demand with the largest source out of service. One potential primary groundwater well location is shown on **Figure 2-4**. The anticipated well capacity, location and operating strategy would be developed further during the design phase. Additional information about groundwater supplies is included in **Section 4.1**.

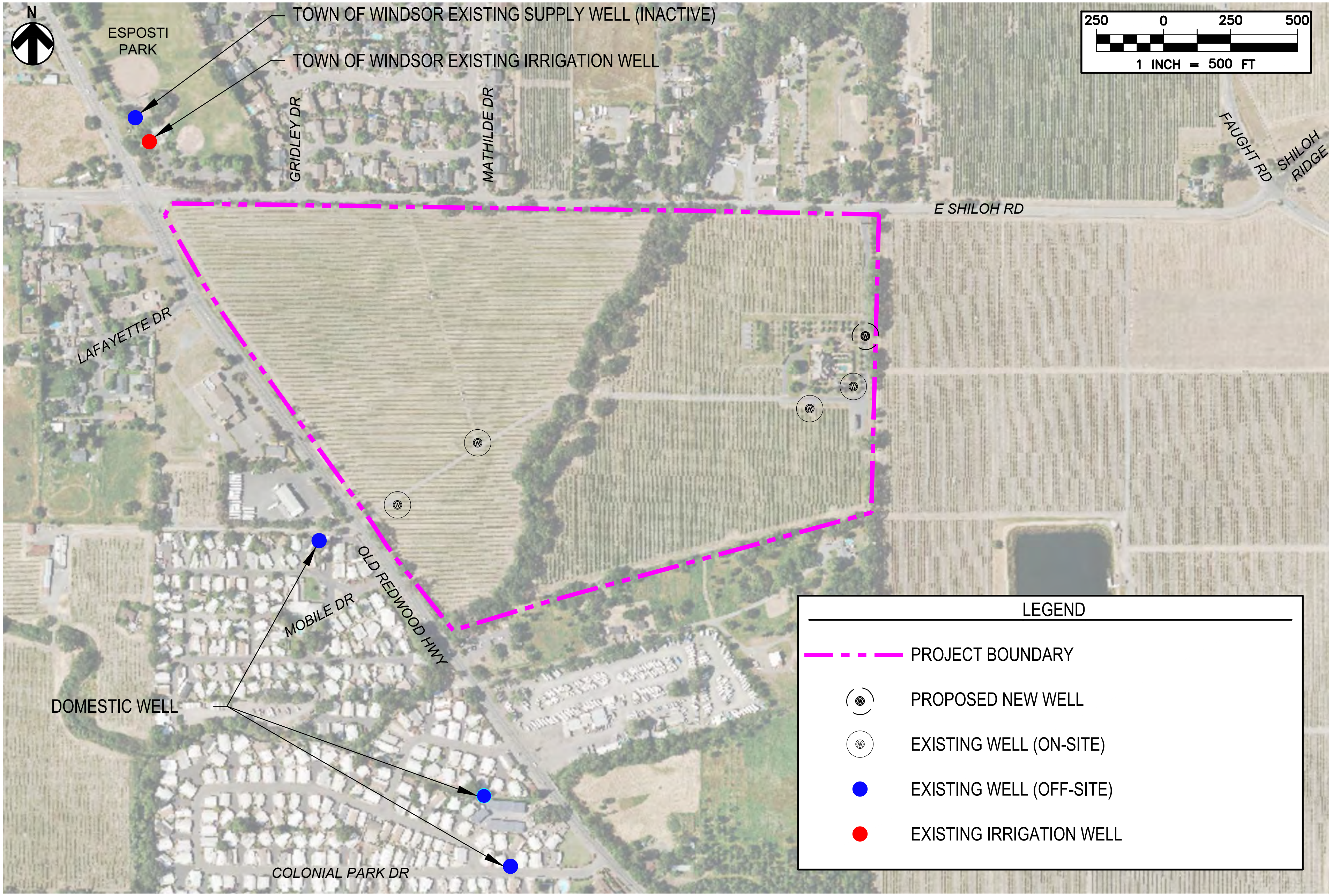

Figure 2-4
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Local Groundwater Well Site Map

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2.3 Wastewater

This section identifies the expected strength of influent wastewater, describes existing wastewater treatment facilities, and identifies the wastewater treatment options explored for Alternative A. Projected wastewater flows and the proposed WWTP process train are also identified.

2.3.1 Influent Water Quality

The quality of influent water for gaming facilities differs from the quality of domestic sewage. This section provides background on the typical quality of influent water at gaming facilities and identifies the facilities required to treat it.

Traditional wastewater treatment options, such as primary clarifiers, activated sludge, conventional filtration, and disinfection, were not considered as WWTP options due to the limited proposed treatment area layout.

Typical gaming facility wastes have higher BOD and TSS values compared to domestic wastewater, as identified in **Table 2-4**. Shock loadings are also typical of gaming facility wastewater. Weekend flows are much higher than weekday flows, and evening flows are higher than daytime flows. This assumption is based on the higher utilization of similar facilities outside of normal business hours. Other similar facilities also experience increased utilization of the casino facilities during evenings and on the weekend.

Table 2-4: Typical WWTP Influent Water Quality

Parameter	Units	Alternative A	Typical Domestic Sewage
BOD	mg/L	450-600	200-300
TSS	mg/L	450-600	200-300

Any wastewater treatment process selected for use must be able to handle the high strength waste and react well to wide variations in flow.

2.3.2 Capacity

Average weekday and peak weekend flows for Alternative A, B, and C were obtained from analysis of similar facilities.

2.3.2.1 Alternative A and B

Real-time data from similar facilities and previous project wastewater flow projections were compared and the most conservative was used to estimate the unit flows for the proposed Project. An occupancy level factor was used to estimate flows during daytime and evening hours for a typical weekday and weekend. The average day flow was estimated using the weighted average of the weekday and weekend estimated flow projections. These projections are based on the Alternative A and Alternative B space program provided by Acorn. **Table 2-5** summarizes the projections of wastewater volumes generated by Alternative A. **Table 2-6** summarizes the projections of wastewater volumes generated by Alternative B. For the full flow projection table see **Appendix A**.

Table 2-5: Projected Wastewater Flows for Alternative A

Area Description	Estimated Occupancy			Wastewater Flow (gpd)	
	Number	Units	gpd/Unit	Wt. Average	Weekend
Casino Gaming and Support Areas	114,345	SF	0.6	38,000	51,000
Retail	2,250	SF	0.05	60	80
Coffee Shop	2,750	SF	2.6	4,000	5,000
Food Hall	465	Seats	60	15,000	21,000
Restaurants (5)	1,240	Seats	70	48,000	65,000
Bars (2)	17,755	SF	0.7	6,000	8,000
Lounges (2)	29,285	SF	0.5	7,000	10,000
Service Bar/Unassigned	19,815	SF	0.1	1,000	1,000
Event Center	2,800	Seats	35	34,000	59,000
Ballroom (2)	44,900	SF	0.75	10,000	24,000
Spa	13,930	SF	0.1	1,000	1,000
Hotel	400	Rooms	250	53,000	70,000
Support Facilities[1]	1	LS		14,000	19,000
Total Wastewater Generated				**232,000**	**335,000**

Notes:
1. Support facilities are lump sum values for back-of-house for Casino and hotel combined.
2. All flows are rounded to the nearest 1,000 gpd.
3. Total wastewater generated sum may be off due to rounding of individual facility wastewater generated.
4. Weighted average is the sum of the weekday flows over four days plus the sum of the weekend flows over three days divided by seven days.

Based on the wastewater generation rates identified in **Table 2-5**, the WWTP must have the capability to treat and/or convey the Project's maximum weekend demand of approximately 335,000 gpd.

Table 2-6: Projected Wastewater Flows for Alternative B

Area Description	Estimated Occupancy			Wastewater Flow (gpd)	
	Number	Units	gpd/Unit	Wt. Average	Weekend
Casino Gaming and Support Areas	114,345	SF	0.6	38,000	51,000
Retail	2,250	SF	0.05	60	80
Coffee Shop	2,750	SF	2.6	5,000	6,000
Food Hall	465	Seats	60	15,000	21,000
Restaurants (5)	1,240	Seats	70	48,000	65,000
Bars (2)	17,755	SF	0.7	6,000	8,000
Lounges (2)	20,735	SF	0.5	5,000	7,000
Service Bar/Unassigned	19,815	SF	0.1	1,000	1,400
Ballroom	12,400	SF	0.75	3,000	7,000
Spa	13,930	SF	0.1	1,000	1,000
Hotel	200	Rooms	250	26,000	35,000
Support Facilities[1]	1	LS		10,000	13,000
Total Wastewater Generated				**158,000**	**215,000**

Notes:
1. Support facilities are lump sum values for back-of-house for Casino and hotel combined.
2. All flows are rounded to the nearest 1,000 gpd.
3. Total wastewater generated sum may be off due to rounding of individual facility wastewater generated.
4. Weighted average is the sum of the weekday flows over four days plus the sum of the weekend flows over three days divided by seven days.

Based on the wastewater generation rates identified in **Table 2-6**, the WWTP must have the capability to treat and/or convey the project's maximum weekend demand of approximately 215,000 gpd.

2.3.2.2 Alternative C

Wastewater flow projections for Alternative C were estimated using the same method as presented in **Section 2.3.2.1** for Alternative A and B, except for the winery. Alternative C projections are based on the space program provided by Acorn.

The estimation of wastewater flows generated by the wine-making process was based on real-time data and experienced personnel from similar facilities. The quantity of process wastewater generated is approximately proportional to the number of cases of wine produced annually. To calculate the total annual estimated wastewater flow, the number of cases is then multiplied by the efficiency of the processes; larger wineries tend to have more efficient processes. The approximate efficiencies are:

Small Wineries (less than 20,000 cases/year) – 7 gal/case

Medium Wineries (20,000-50,000 cases/year) – 4.8 gal/case

Large Wineries (greater than 50,000 cases/year) – 2.5 gal/case

Acorn has identified the proposed winery as a small facility with a proposed production of 15,000 cases per year. Since this would be a new facility, we would expect the efficiency of production to be better than an existing or older facility, thus the efficiency ratio used for the calculation of winery flows is 4.8 gallons per case.

Most of the water use, and wastewater generation, occurs during the crush season. Crush season is typically between September and November and is based on the climate, which varies from year to year – hotter weather typically results in an earlier crush season. For this analysis, it was assumed that the crush season occurred in October as the worst-case scenario for the facility since precipitation is beginning to increase thus irrigation demand is decreasing and seasonal surface water discharge is limited for this month. It was also assumed that 90% of the annual process wastewater flow for the winery occurs during the crush season, while the remaining 10% is distributed over the remainder of the year.

The length of the crush season also varies by winery size – smaller wineries have a shorter crush season because they are crushing a smaller quantity of grapes. Small wineries can spend one to two weeks crushing, while larger wineries can extend to two months. For this analysis, it was assumed that crush would occur within one month.

Anticipated crush flows were applied to the month of October and the average daily wastewater flow was calculated by dividing the total crush season flows by 31 days. Average daily wastewater flow for the remainder of the year (non-crush season) was calculated by dividing the remaining flow by the remaining number of days in the year – 11 months (334 days) for this analysis.

Alternative C projections for wastewater volumes generated are summarized in **Table 2-7**. Wastewater volumes for the winery represent typical flow during crush season.

Table 2-7: Projected Wastewater Flows for Alternative C

Area Description	Estimated Occupancy			Wastewater Flow (gpd)	
	Number	Units	gpd/Unit	Wt. Average	Weekend
Dining	4,700	SF	2.6	6,700	9,200
Winery[5]	20,000	SF		2,200	2,200
Visitor Center	2,500	SF	0.05	70	90
Tasting Room	2,500	SF	0.3	400	600
Spa	14,000	SF	0.1	1,000	1,300
Hotel	200	Rooms	250	26,400	35,000
Lobby	5,000	LS		3,300	5,000
Total Wastewater Generated				**40,100**	**53,400**

Notes:
1. All flows are rounded to the nearest 1,000 gpd.
2. Total wastewater generated sum may be off due to rounding of individual facility wastewater generated.
3. Weighted average is the sum of the weekday flows over four days plus the sum of the weekend flows over three days divided by seven days.
4. The visitor center (building area of 5,000 SF) includes a section for a tasting area. The tasting area is assumed to be 50% of the visitor center area building space.
5. The winery flow projections represent typical average daily flow during crush season for one month. The water balance reflects the wastewater flow variation by month.

Based on the wastewater generation rates identified in **Table 2-7**, the WWTP must have the capability to treat and/or convey the project's maximum weekend demand of approximately 53,400 gpd.

2.3.2.3 Summary of Alternative WWTP Design Flows

Based on the weekend capacity, **Table 2-8** identifies the proposed design flows for the WWTP for Alternative A, B, and C. The design flows are higher than the projected flows in order to provide a safety factor for design to account for the typical diurnal variation. Additional storage will also be provided for equalization of the peak daily flows.

Table 2-8: WWTP Design Flows for Alternative A, B & C

Program Alternative	Parameter	Projected Wastewater Flow (gpd)	Design flow (gpd)
Alternative A	Average Daily Flow	232,000	300,000
	Average Weekend Flow	335,000	400,000
Alternative B	Average Daily Flow	158,000	200,000
	Average Weekend Flow	215,000	300,000
Alternative C	Average Daily Flow	40,100	50,000
	Average Weekend Flow	53,400	75,000

The wastewater treatment facilities for Alternative A and Alternative B must be designed with a wastewater treatment capacity of 400,000 and 300,000 gpd, respectively. For Alternative C, wastewater treatment facilities must be designed with a treatment capacity of 75,000 gpd.

2.3.3 Wastewater Treatment Facilities

Treatment for wastewater from the proposed alternatives would require the construction of an on-site WWTP to provide primary, secondary, and tertiary treatment of on-site sewage for both reuse and discharge on-site. The proposed location for an on-site WWTP is in the southeast corner of the property. However, there are significant space limitations within the site that require any wastewater treatment process to provide high quality effluent on a small footprint.

A proposed on-site WWTP treatment process for Alternative A would include:

- Coarse Screening Facility
- Influent Pump Station
- Headworks
- Equalization
- Packaged Immersed Membrane Bioreactors (MBRs)
- UV Disinfection & Chlorination
- Sludge Storage and Dewatering Station
- Plant Drain and Supernatant Return Pump Station
- Effluent Pump Station, and
- Operations Building

This treatment process was selected for various reasons, including: 1) the desire for a small footprint for an on-site WWTP, 2) the proven effectiveness of this process at other similar facilities, and 3) the production of high-quality effluent suitable for reuse and discharge. The justification for selection of the MBR treatment process is summarized below. A proposed location for the different alternative wastewater facilities is shown in **Figure 2-1, Figure 2-2** and **Figure 2-3**.

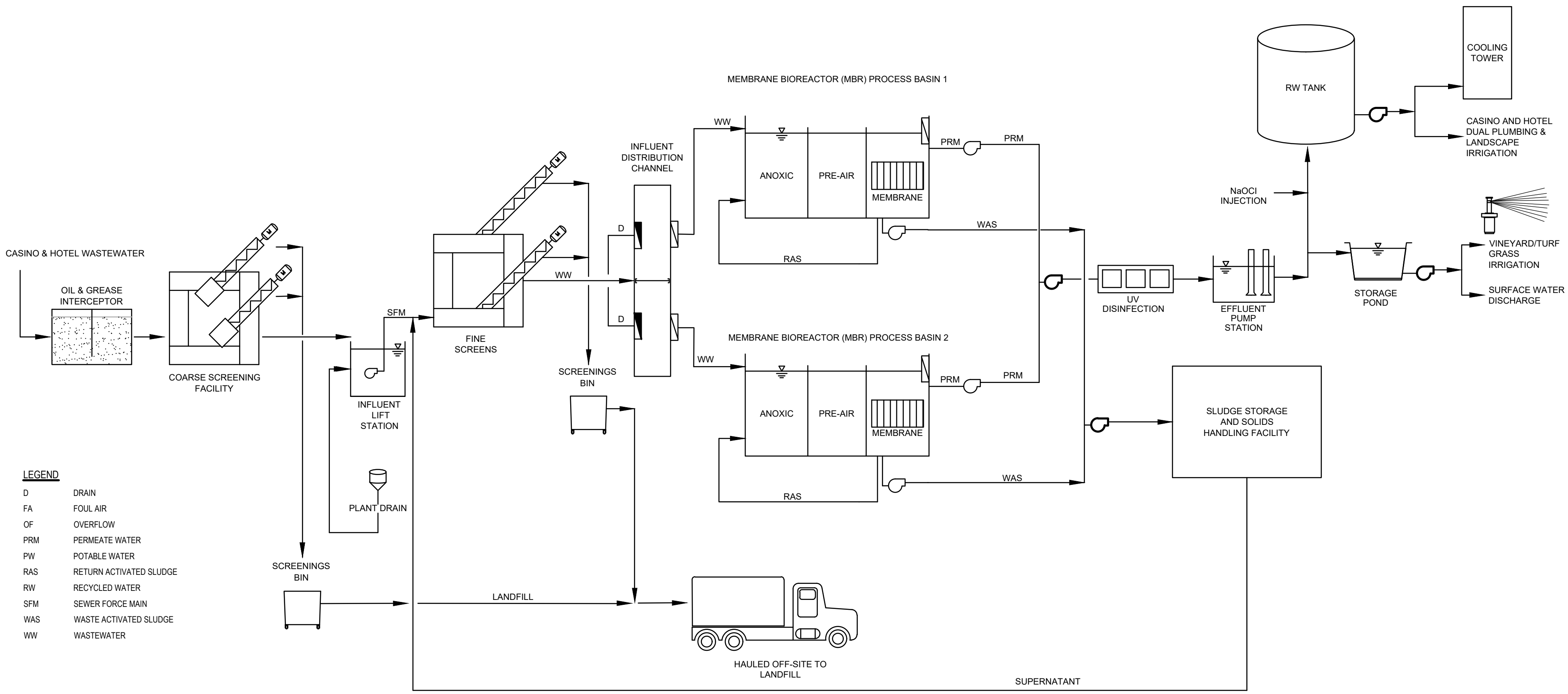
MBRs have successfully treated wastewater for similar-sized gaming facilities with discharge permits at other local gaming facility sites. The MBR treatment process is a tertiary treatment process similar to an activated sludge treatment plant, but with membranes immersed in an aeration basin. A typical MBR system consists of an anoxic tank for denitrification of the plant influent, followed by an aeration tank for oxidation of organic matter and nitrification. Membrane cartridges are suspended at the effluent end of the aeration tank. The membranes have a pore size in the sub-micron range, and are able to filter out most of the coliform bacteria and solids. Water is drawn through the membranes by blowers, which pull a slight vacuum and force this permeate into the center of the spaghetti-strand shaped membranes. Solids are left in the aeration tank for recirculation to the anoxic zone and/or wasting to solids handling process(es).

Effluent from these types of MBR plants typically contain no suspended solids and have a turbidity of less than 0.2 NTU. This treatment typically results in producing MBR effluent of excellent quality. The MBR process also provides aeration, nitrification, and denitrification processes within a compressed footprint. These processes have the effect of producing effluent with a neutral pH, lower nitrogen concentrations, and lower phosphorous concentrations than alternative tertiary treatment processes.

The MBR treatment process is capable of producing effluent meeting the Title 22 coliform bacteria effluent requirements without the use of chlorine or other common disinfectants. Other tertiary treatment systems typically require a disinfection process to meet the effluent coliform requirement. However, in order to comply with treatment and water reuse regulations, both a UV disinfection and chlorine disinfection processes will be provided downstream of the MBR processes.

Although the MBR treatment process is somewhat sophisticated, it is relatively simple to operate and maintain due to the absence of traditional WWTP components such as clarifier mechanisms or drives. In addition, there is a long history of effectiveness at similar facilities.

Operation: Typically, wastewater will flow by gravity from the facilities through a grease interceptor, coarse screening facility, and then into an influent pump station. The coarse screening facility would remove larger solids and debris that are typically found in Casino/hotel sewage. The influent pump station will lift the wastewater to the plant headworks facilities through a pressurized sewer main. After passing through the headworks, wastewater will flow by gravity to the influent distribution channel. The distribution channel will be used to distribute wastewater to the parallel MBR trains. Each train will be equipped with an anoxic basin and an aeration basin to provide oxidation, nitrification, and denitrification. Water will flow out of the aeration basin and into a membrane chamber that will be shared by both process trains. Permeate will be extracted through the membranes and conveyed to either the UV disinfection or chlorine disinfection processes. Water intended for reuse on-site for Title 22 purposes will be chlorinated with sodium hypochlorite. Water intended for discharge to the creek will be UV disinfected. The proposed wastewater flow diagram is shown in **Figure 2-5**.



LEGEND

D	DRAIN
FA	FOUL AIR
OF	OVERFLOW
PRM	PERMEATE WATER
PW	POTABLE WATER
RAS	RETURN ACTIVATED SLUDGE
RW	RECYCLED WATER
SFM	SEWER FORCE MAIN
WAS	WASTE ACTIVATED SLUDGE
WW	WASTEWATER

HydroScience

Figure 2-5
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Wastewater Treatment Process Flow Diagram

2.3.4 Effluent Disposal

The on-site WWTP will treat wastewater to a tertiary level and allow the Project to consider a wide range of effluent disposal options. Tertiary treatment is typically defined as a process that has undergone primary treatment consisting of a gravity settling process, secondary treatment consisting of a biological process, and tertiary treatment consisting of both a filtration and a disinfection process. These treatment processes can be combined into one process spanning the different types of treatment.

Recycled water will be used in the casino/hotel restrooms for toilet and urinal flushing that will meet Title 22 criteria. Although the use of recycled water in the restrooms of the casino/hotel is on Trust lands, the recycled water quality will be designed to produce the equivalent water quality to disinfected tertiary recycled water as defined by Title 22. In general, this quality of recycled water is approved for all approved non-potable uses in the state of California.

Recycled water will also be used for cooling tower makeup. Using treated effluent for cooling tower makeup will help reduce storage requirements through cooling tower drift, evaporation system leakage losses, and blowdown. The brine generated as a byproduct of the recycled water treatment will be hauled offsite. The East Bay Municipal Utility District (EBMUD) accepts and treats a variety of liquid and solid wastes and offers a convenient disposal location 24 hours a day, seven days a week, 365 days a year. Other common disposal alternatives include evaporative ponds, disposal to ocean, deep well injection, incineration, additional treatment to concentrate waste, etc. Given the limited area for additional treatment or evaporative ponds, it is anticipated that the brine will be disposed of off-site. Estimation for brine volume, concentration, and disposal will be determined based on source water quality, generated wastewater volume and quality, and specific treatment components.

In order to evaluate other wastewater disposal strategies, the following assumptions were made:

- Recycled water use on-site will be maximized.
- The Project must identify a reliable wet season disposal method.
- The Project must comply with all applicable regulatory requirements.

Permitting Requirements: The new on-site WWTP will be located on Trust lands. Thus, project permitting will be regulated by the United States Environmental Protection Agency (USEPA). The USEPA is expected to implement the equivalent standards that would be adopted by the Regional Water Quality Control Board for discharges onto state lands, as defined by the Basin Plan. For additional information on the expected permitting requirements, the reader is referred to **Section 4.2**.

The following three potential methods of wastewater discharge are further discussed in this section:

- Vineyard and landscape irrigation
- Seasonal surface water discharge
- Seasonal storage pond

The beneficial uses of the potential receiving waters will also be identified because these uses must be maintained and protected from potential pollutants.

2.3.4.1 Vineyard and Landscape Irrigation

The primary criteria used to determine the required landscape irrigated acreage are evapotranspiration (ET) rates and precipitation information. Water demands per acre of irrigated area are calculated for each month based on evapotranspiration (ET) rates and precipitation records with an additional factor to account for a very wet year. This monthly demand is then used to calculate an annual disposal capacity per acre in such a wet year.

ET Rates: ET is a measure of water usage by a particular plant or crop, and is a function of the net solar radiation, air temperature, wind speed, and vapor pressure in a particular location. Evapotranspiration rates for a specific crop in a specific location are calculated on a monthly basis by the following equation:

$$ET = ET_o * k_c$$

where:

ET_0 = *Normal year reference crop evapotranspiration rate for a given geographic location (California Department of Water Resources [DWR], California Irrigation Management Information System [CIMIS] database)*

k_c = *Crop coefficient for a given crop (DWR Leaflets)*

For this Project, reference crop normal year evapotranspiration rates (ET_0) for the CIMIS station closest to the area were obtained from the DWR CIMIS database. Crop coefficients for cool weather turf grasses were obtained from University of California, Division of Agriculture and Natural Resources Center for Landscape and Urban Horticulture. Calculated ET rates and irrigation demands are shown in **Table 2-9**.

Precipitation: Precipitation data was obtained from the National Oceanic and Atmospheric Administration's (NOAA) online database using the closest station to the Project site. Monthly rainfall values from 1999 through the present were averaged to obtain typical monthly rainfall data.

Estimated Unit Irrigation Demands: Typical monthly unit irrigation demands for turf grasses are summarized in **Table 2-9** and were calculated using the following formula:

$$ID = \frac{(ET - Pe_p)l_r}{e_i}$$

where:

ID = *Irrigation demand in inches*

ET = *Evapotranspiration for turf grasses*

P = *Average precipitation, NOAA*

e_p = *Precipitation irrigation efficiency, 0.95. Assumes 0.5% of rainfall during growing season is lost to evaporation, runoff, etc.*

l_r = *Loss Rate, equal to 1.05. This assumes that approximately 5% of the applied water passes through the grass root zone and is lost.*

e_i = Irrigation efficiency, varies throughout the year between 0.60 in the summer and 0.95 in the winter. This assumes that 5-40% of the applied irrigation water is lost to the environment. For planning purposes an irrigation efficiency of 0.80 was used.

Table 2-9: Typical Irrigation Demands for Regional Turf Grasses

Month	ET (Inches)	P (Inches)	ID (Inches)	ID (Feet)
January	0.78	5.35	0.00	0.00
February	1.24	5.61	0.00	0.00
March	2.17	3.92	0.00	0.00
April	4.01	1.88	2.79	0.23
May	5.15	0.92	5.55	0.46
June	6.04	0.24	7.61	0.63
July	6.04	0.01	7.91	0.66
August	5.27	0.01	6.91	0.58
September	4.11	0.14	5.21	0.43
October	2.20	2.00	0.27	0.02
November	1.07	3.16	0.00	0.00
December	0.72	6.75	0.00	0.00
Total	**38.81**	**30.00**	**36.26**	**3.02**

Notes:

1. The irrigation demand shown is for average rainfall. A lower irrigation demand was used in the 100-year annual precipitation event.

As shown, above, in **Table 2-9**, the typical annual unit irrigation demand for grasses is estimated at 36.3 inches or 3.02 feet.

Vineyards use much less water than turf grasses. To estimate irrigation demands for vineyards, local vineyard irrigation sources containing typical irrigation rates for Windsor, Carneros, Napa, and Sonoma County were consulted. For the purpose of this document, annual demands for vineyards were estimated to be 0.317 AF per acre.

Sizing: The irrigated areas are limited by the proposed Project site plan for Alternative A and Alternative B. The irrigated areas include on-site landscaping for the proposed Project and no capacity to expand or increase irrigation areas is available unless vineyard area is reduced (and replaced with a crop with a higher ET) or an off-site landscaped area alternative is identified.

2.3.4.2 Surface Water Discharge

For discharge of treated wastewater to the Russian River or its tributaries, a NPDES discharge permit is required. Any discharge to the Russian River and tributaries would be regulated by the RWQCB. Discharge to the creek would involve applying for a NPDES permit, which allows discharges to surface water in accordance with the Federal Clean Water Act and applicable provisions of the Water Quality Control Plan for the North Coast Region (Basin Plan). It is understood that the Basin Plan requirements do not apply to Tribal lands. However, the proposed effluent limitations identified in this Section are consistent with the Basin Plan.

The amount of effluent discharge allowed by the Basin Plan is typically limited to a percentage of the measured streamflow in the Russian River at the point of discharge. The initial permit point of the compliance would probably be granted based on conditions at the actual point of discharge. In all local discharge permits reviewed in this document, the existing USGS flow gauging station most representative of the flow in the receiving water was used for the purposes of complying with Basin Plan mandated limitations for flow. The most likely flow monitoring location would be at the USGS gauging station at Mark West Creek (USGS #11466800). The gauging station is shown on **Figure 2-6**. Gauging station #11466800 is the station closest to the Project site and directly downstream of the proposed discharge location near Mirabel Heights, CA. Historical flow data for gauging station #11466800 is shown in **Table 2-10**. This is the most practical site to determine flows, since data has been collected for over five years, and real-time data is available. This gauging station is located downstream of the confluence of Windsor Creek and Mark West Creek. Based on flow records obtained from this station, it is feasible to meet a 1% dilution requirement based on the project makeup and proposed wastewater treatment and disposal facilities using data from this station as the basis for the flow limitation in the Project's NPDES permit.

To comply with the surface water rate discharge flow limitation, it is expected that the WWTP will need to limit effluent discharge to Pruitt Creek to 1% of the measured flow in Mark West Creek at USGS Gauging Station #11466800 near Mirabel Heights, CA.

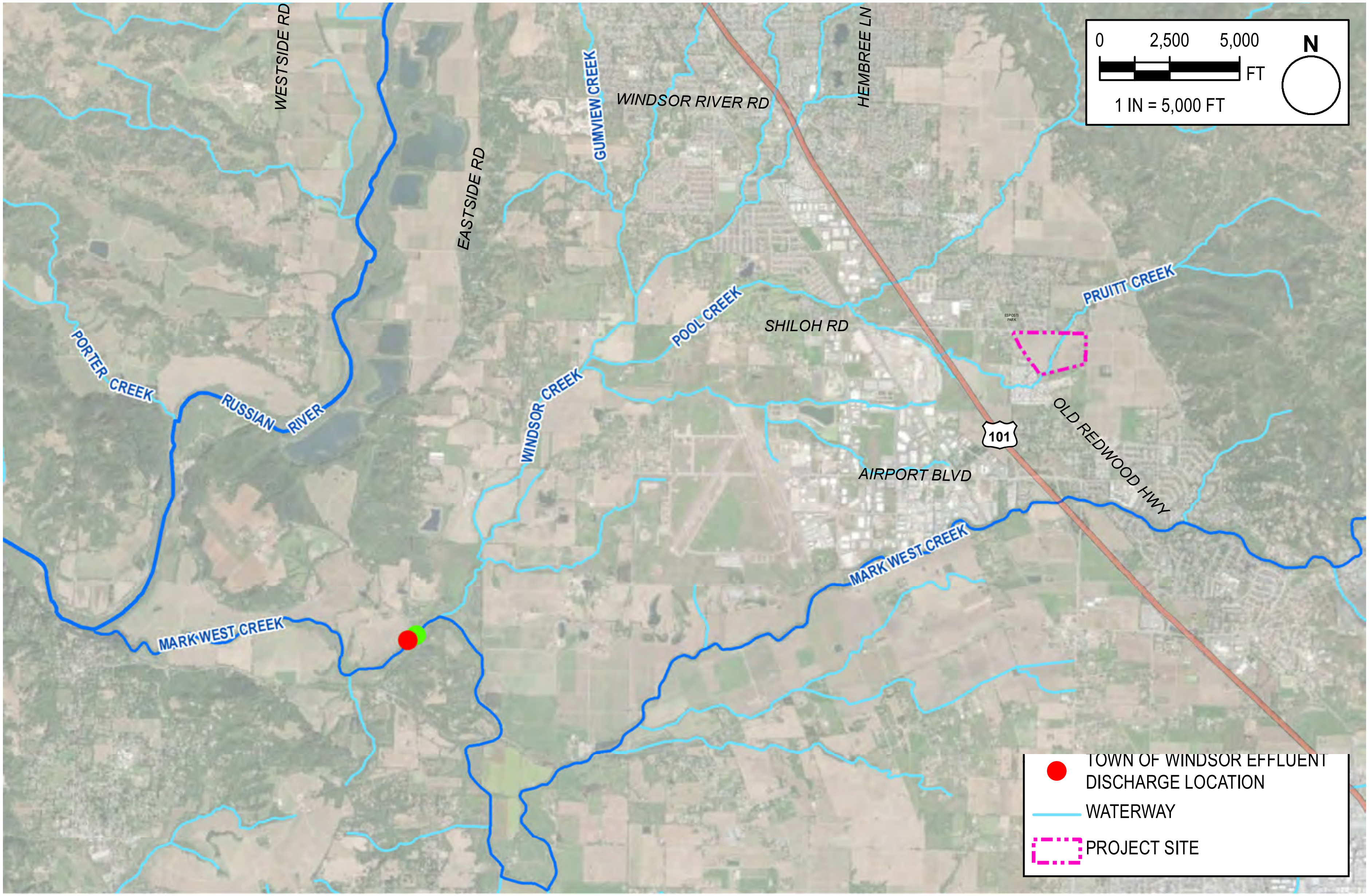


Figure 2-6
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
USGS Gauging Station Location

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Seasonal Surface Water Discharge

Seasonal surface water discharge means the utilization of different effluent disposal options during the dry and wet seasons to address local season-specific regulatory and environmental concerns. The use of different seasonal effluent disposal options is a common practice in the State of California. The disposal locations would be utilized only during the wet season. The wet season and dry season discharge methods are defined below.

- **Dry season (May 15 through September 30):** Disposal through a combination of on-site recycled water use for landscape irrigation, cooling towers, toilet flushing, and vineyard irrigation.
- **Wet season (October 1 through May 14):** Disposal through a combination of the dry season uses, and surface water discharge.

The RWQCB prohibits effluent discharges from WWTPs to the Russian River and its tributaries between May 15 and September 30 in their Basin Plan due to significant seasonal flow variations for the Russian River tributaries during the summer and winter months. Their goal was to ensure that these water bodies do not become effluent dominated streams. Discharges during the wetter winter months (October 1 to May 14) when flows are higher are typically allowed to be a certain percentage of the average daily streamflow. It is likely that any new WWTP discharge would be subject to similar seasonal discharge requirements. It is not expected that year-round discharges to a tributary of the Russian River would be permitted by the USEPA under any circumstances as the USEPA typically permits projects discharging onto trust lands in a similar manner as the RWQCB. The Basin Plan also limits discharges of wastewater effluent to a percentage of the streamflow at the point of discharge. Although the proposed discharge location is more than 5.5 miles from an active USGS gauging station, historical streamflows are known and can be used as a basis for streamflow data. However, the percentage of the total streamflow the USEPA will allow the Project to discharge is unknown.

The monthly streamflow statistics for the USGS gauging station at Mark West Creek are presented in **Table 2-10**. From this data, it is apparent that discharges immediately before and after the summertime months (May and October) may be limiting for the project, and that streamflow rates are highly variable from year to year. For conservatism, the water balance used for this Project utilizes the dry year averages (2012-2015) for projecting the allowable 1% discharge to Pruitt Creek. Thus, for any discharge scenario developed for the Project, backup contingency plans should be developed for low flow conditions. **Table 2-10** suggests that at a minimum, discharge of at least 72,000 gpd could be permitted in Pruitt Creek during the month of October, with more allowed during the wetter winter months.

Table 2-10: Daily Average Streamflow at USGS Gauging Station #11466800

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005										14	37	1,516
2006	1,317	487	1,585	1,282	83	29	12	7	4	10	52	315
2007	72	815	194	88	35	9	3	2	2	26	16	159
2008	1,369	719	101	35	14	5	2	0	0	2	36	
2009	29			39		11	3	1	0		13	56
2010						41	11	4	2			
2011										21	26	15
2012	360	73	841	353	41	11	3	1	1	5	164	1,497
2013	157	57	48	73	15	15	7	2	2	1	5	10
2014	5	807	343	308	19	6	1	0	4	3	22	1,368
2015	60	404	42	37	14	5	1	0	0	0	2	127
2016	964	141	1,461	78	30	8	1	0	0	64	193	794
2017	2,525	2,426	364	461	57	18	5	2	1	1	74	24
2018	305	53	653	491	38	12	3	2	1	7	62	175
2019	821	2,234	1,385	268	161	37	9	3	1	1	7	347
2020	241	81	35	61	29	5	1	0	0	0		
Avg. Monthly, cfs	633	691	588	275	45	15	4	2	1	11	51	493
Avg. Monthly, MGD	409	447	380	178	29	10	3	1	1	7	33	318
Calculated 1% Daily Flow Values (gpm)												
1% of Avg. Monthly	2,840	3,103	2,637	1,234	200	0	0	0	0	50	227	2,211

Notes:
Blank cells signify monthly flow data is incomplete. Blank readings are not counted in calculating average flows.

Beneficial Uses of Potential Receiving Waters

The receiving water, Pruitt Creek, is a tributary of the Russian River. The North Coast RWQCB assigned existing and potential beneficial uses to Mark West Creek and to the Russian River. Beneficial uses that are assigned to a surface water are applicable to its tributaries. Any surface water discharge by the Project to Mark West Creek would be designed to comply with the beneficial uses and water quality objectives of that water body, as well as the Russian River. It is understood that the Basin Plan requirements do not apply to Tribal lands.

Beneficial uses for both Mark West Creek and the Russian River are listed in **Table 2-11**.

Table 2-11: Beneficial Uses of Mark West Creek and Russian River

Beneficial Uses		Category
MUN	Municipal and Domestic Supply	E
AGR	Agricultural Supply	E
IND	Industrial Service Supply	E
PRO	Industrial Process Supply	P
GWR	Groundwater Recharge	E
FRSH	Freshwater Replenishment	E
NAV	Navigation	E
POW	Hydropower Generation	P
REC1	Water Contact Recreation	E
REC2	Non-Water Contact Recreation	E
COMM	Commercial and Sport Fishing	E
WARM	Warm Freshwater Habitat	E
COLD	Cold Freshwater Habitat	E
WILD	Wildlife Habitat	E
RARE	Rare, Threatened, or Endangered Species	E
MIGR	Migration of Aquatic Organisms	E
SPWN	Spawning, Reproduction, and/or Early Development	E
SHELL	Shellfish Harvesting	P
EST	Estuarine Habitat	E
AQUA	Aquaculture	P

Source: Basin Plan, updated June 2018, North Coast Region.
Notes:
E = Existing beneficial uses
P = Potential beneficial uses

Existing beneficial uses are uses as they exist at the present time, while potential uses are uses that:

- May have existed prior to November 1975;
- Are attainable via future plans;
- Conditions make future use likely;
- Have identified the water as a potential source of drinking water based on the quality and quantity available;
- May be classified as an existing use after future review; or
- Are listed as future water quality goals for possible use.

Beneficial uses of Waters of the United States are uses that must be protected against water quality degradation, and reflect the demands on the water resources for this stream. Water quality objectives for Mark West Creek are based on the identified beneficial uses. Some of these water quality objectives are summarized in **Table 2-12**.

Table 2-12: Water Quality Objectives of Receiving Waters

Parameter	Description
Color	Water shall be free of coloration that causes a nuisance or adversely affects beneficial uses.
Taste & Odor	Water shall not contain taste or odor producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that causes nuisance or adversely affect beneficial uses. For waters designated MUN, chemical constituents, radionuclides, and pesticides shall not be present at levels prohibited by the drinking water standards set forth in Title 22 of the California Code of Regulations.
Turbidity	Shall not be increased more than 20% above naturally occurring background levels.
Bacteria	In waters designated REC-1, the median fecal coliform concentration on a minimum of not less than five samples for any 30-day period shall not exceed 50 per 100 mL, nor shall more than ten percent of the total samples during any 30-day period exceed 400 per 100 mL. In waters designated SHELL, the fecal coliform concentration throughout the water column shall not exceed 43 per 100 mL for a 5-tube serial dilution, or 49 per 100 mL for a 3-tube serial dilution.
Temperature	At no time or place shall the temperature of any waters designated COLD or WARM be increased by more than five degrees Fahrenheit.
Chemical Constituents, Radioactivity, and Pesticides	For waters designated MUN, chemical constituents, radionuclides, and pesticides shall not be present at levels prohibited by the drinking water standards set forth in Title 22 of the California Code of Regulations.
Other Parameters	The following are prohibited in concentrations that cause nuisance to or adversely affect beneficial uses: floating material, suspended material, suspended sediment, settleable material, oil and grease, biostimulatory substances. Discharges containing toxic substances, pesticides, chemical constituents, or radioactivity in concentrations that impact beneficial uses are prohibited.

Source: Basin Plan, updated June 2018, North Coast Region.

2.3.4.3 Seasonal Storage Pond

The seasonal storage pond would be used to seasonally store WWTP effluent until it can be reused on-site or discharged to the surface water discharge. The regulatory requirements for the operation of seasonal storage ponds are typically minor, and the primary consideration is the disposition of the effluent contained therein. The ponds would need to be lined with a impermeable material such as clay or an impermeable plastic liner to minimize percolation into the groundwater. It is also suggested that any seasonal evaporation ponds be located downgradient from any proposed water supply well used for the Project and outside of the 100-year flood plain. There is expected to be sufficient area for pond(s) to be sited outside of the 100-year floodplain. If any pond were to be located within the 100-year floodplain, it would need to be bermed with adequate freeboard to bring the pond high water level above the 100-year flood level.

Seasonal storage ponds are sized according to the volume of disposal via all methods previously described (irrigation and surface water discharge) and the remaining carry-over volume required from month to month. Seasonal storage ponds would be significantly upsized if it were determined that the Project either could not or is limited in its ability to discharge wastewater effluent on-site.

2.3.4.4 Effluent Disposal Summary

The preferred methods for effluent disposal would include seasonal surface water discharge, maximizing on-site recycled water use including vineyard and landscape irrigation, and use of seasonal storage ponds. Provided is a description of each option under Alternative A and Alternative B:

Alternative A

- **Option 1:** During the dry season, effluent from the on-site WWTP would be recycled and used on-site for dual plumbed and cooling tower makeup, as well as for landscape and vineyard irrigation at agronomic rates. Effluent that could not be used for either purpose would be stored in the seasonal storage pond.

  During the wet season, effluent from the on-site WWTP would be recycled and used on-site for dual plumbed and cooling purposes, discharged on-site to Pruitt Creek, stored in on-site seasonal storage ponds, and used to irrigate the vineyards and landscaping at agronomic rates. The landscaped areas and vineyard would be irrigated by pumping effluent out of the seasonal storage pond. Effluent stored in the seasonal storage pond would be discharged to Pruitt Creek, tributary to the Russian River, in accordance with flow limitation requirements.
- **Option 2:** Similar to Option 1, except that seasonal storage would be accomplished with a closed tank. The primary objective is to reduce the storage footprint such that it may fit within the proposed water treatment site. A tank will have a smaller footprint but will be a taller facility. Since evaporation loss would not occur in a closed tank, this option means a larger storage volume required overall.
- **Option 3:** Similar to Option 1 with the addition of 11 acres of off-site irrigation for effluent disposal and consequently reduced seasonal storage volume required.
- **Option 4:** Similar to Options 2 and 3, which includes a seasonal storage tank, and the addition of 11 acres of off-site irrigation for effluent disposal and consequently reduced seasonal storage volume. Since evaporation loss would not occur in a closed tank, this option means a larger storage volume required over Option 3.

Option 1 and 2 strategy assumes that the Project will be able to dispose of effluent only within the project site. The second effluent disposal strategy (Option 3 and 4) assume that effluent will be disposed of to offsite turf irrigation (yet to be identified) in addition to all other disposal methods listed. Option 2 and 4 assume a closed tank will be used for seasonal storage versus an open storage pond. **Table 2-13** summarizes conceptual estimates of the seasonal storage requirements and disposal requirements for the four effluent disposal strategies for Alternative A. These estimates are preliminary and are for planning purposes only.

The Alternative A storage pond, closed tank option and disposal areas for the wet season discharge and wet season storage are shown in **Figure 2-7** through **Figure 2-10**. Portions of the areas identified for vineyards are within the 100-year flood zone. This, however, is not expected to be an issue, during periods of rain since it is assumed that the vineyards will not be irrigated during the wet season.

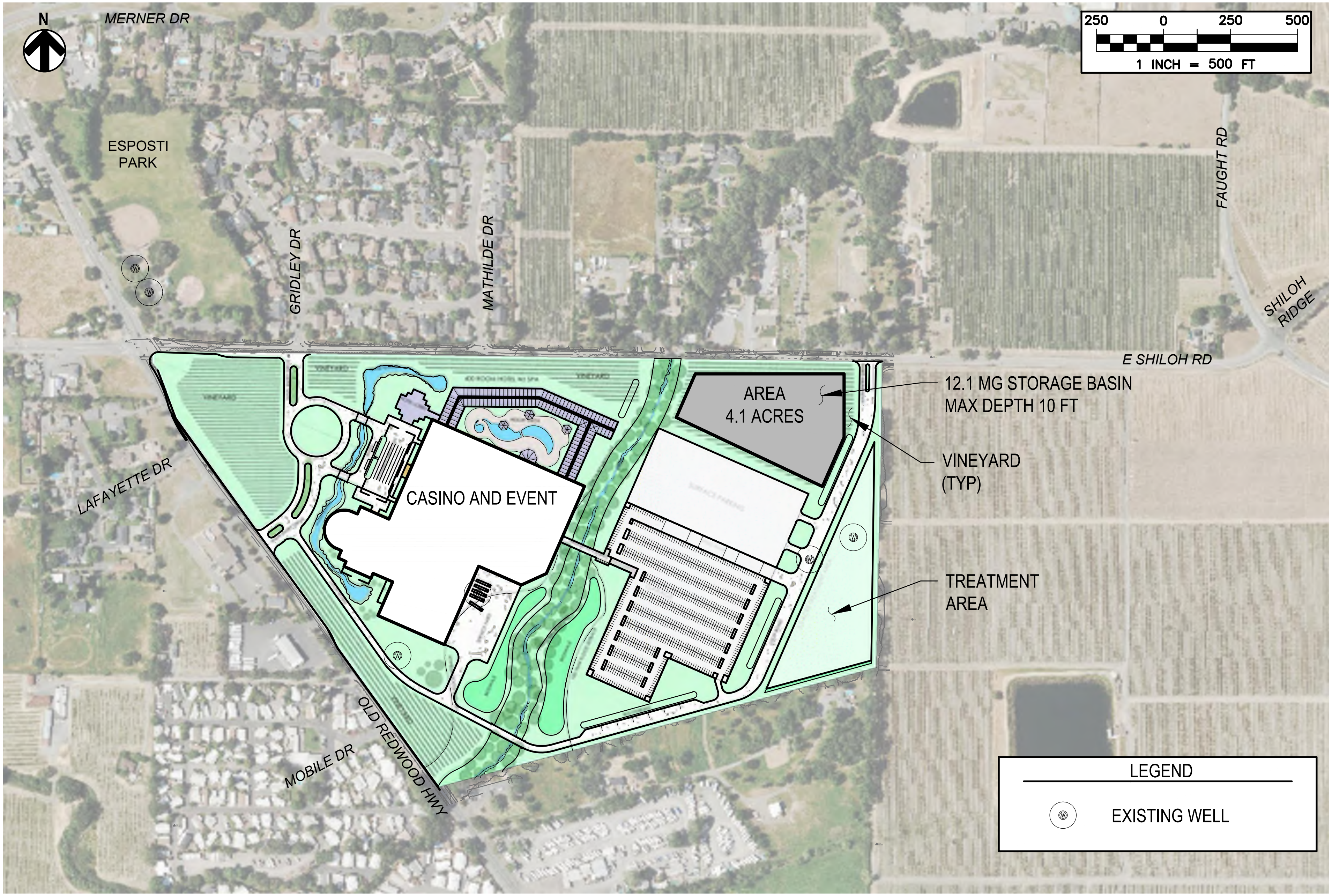

Figure 2-7
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 1 - Alternative A

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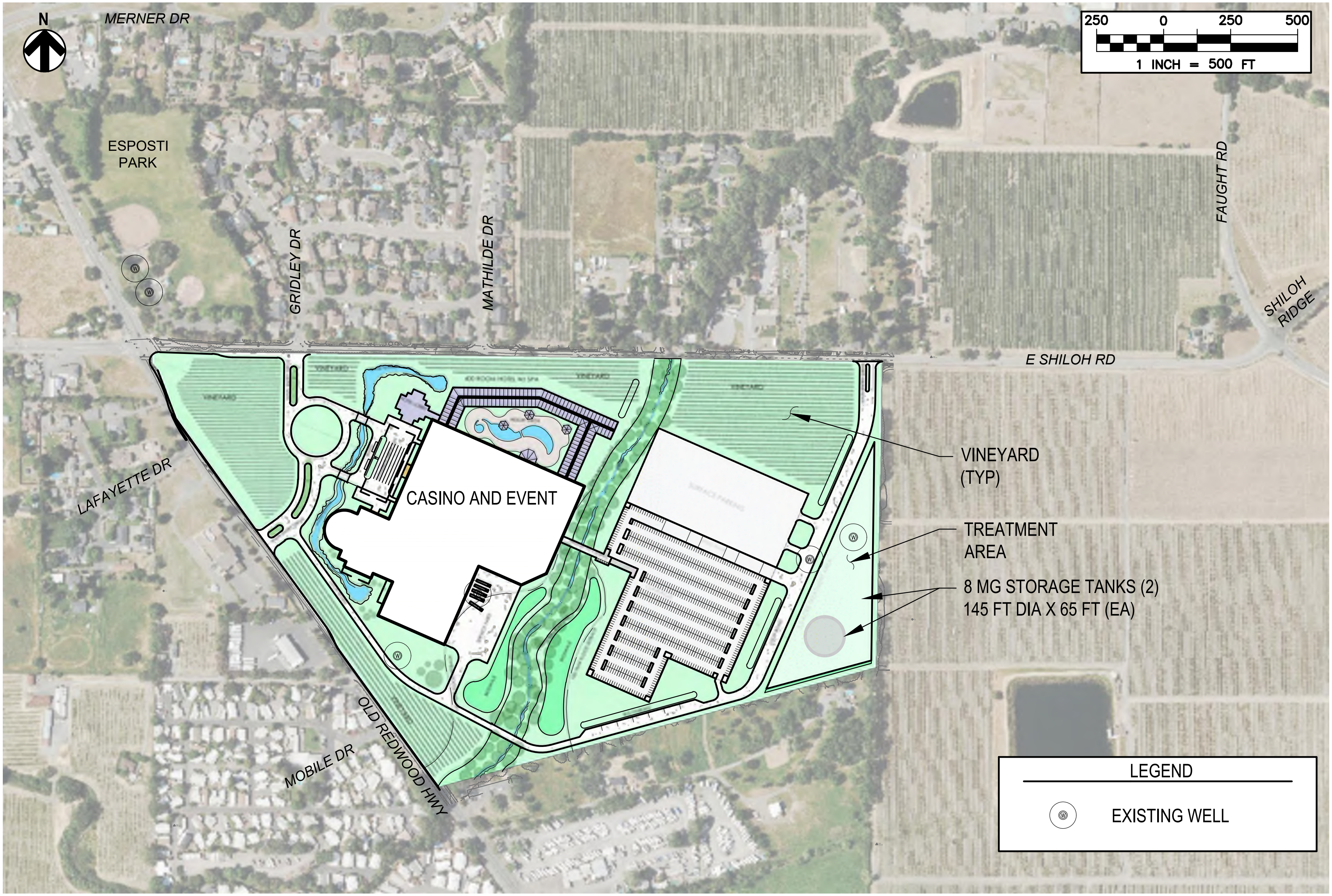

Figure 2-8
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 2 - Alternative A

HydroScience

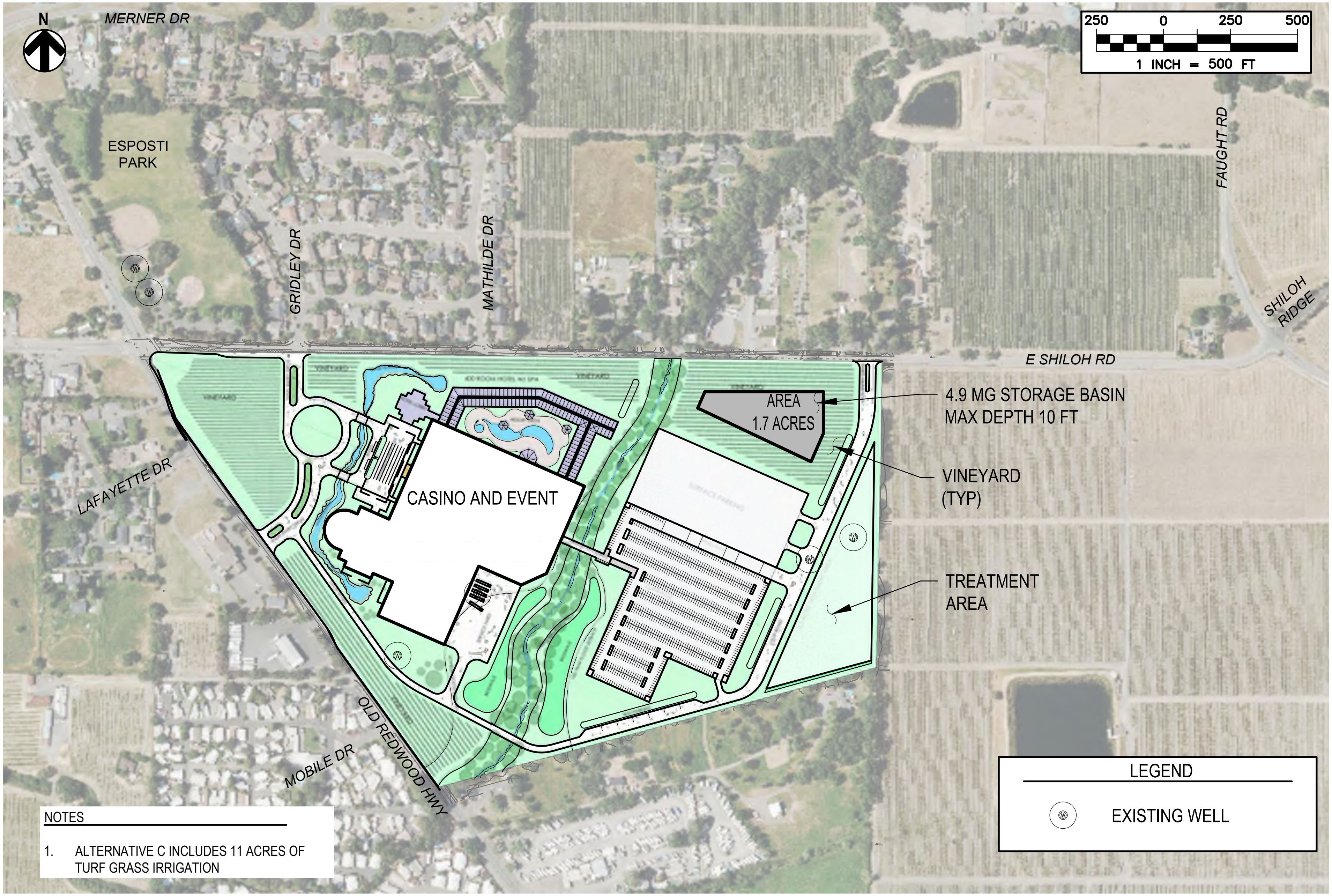

Figure 2-9
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 3 - Alternative A

HydroScience

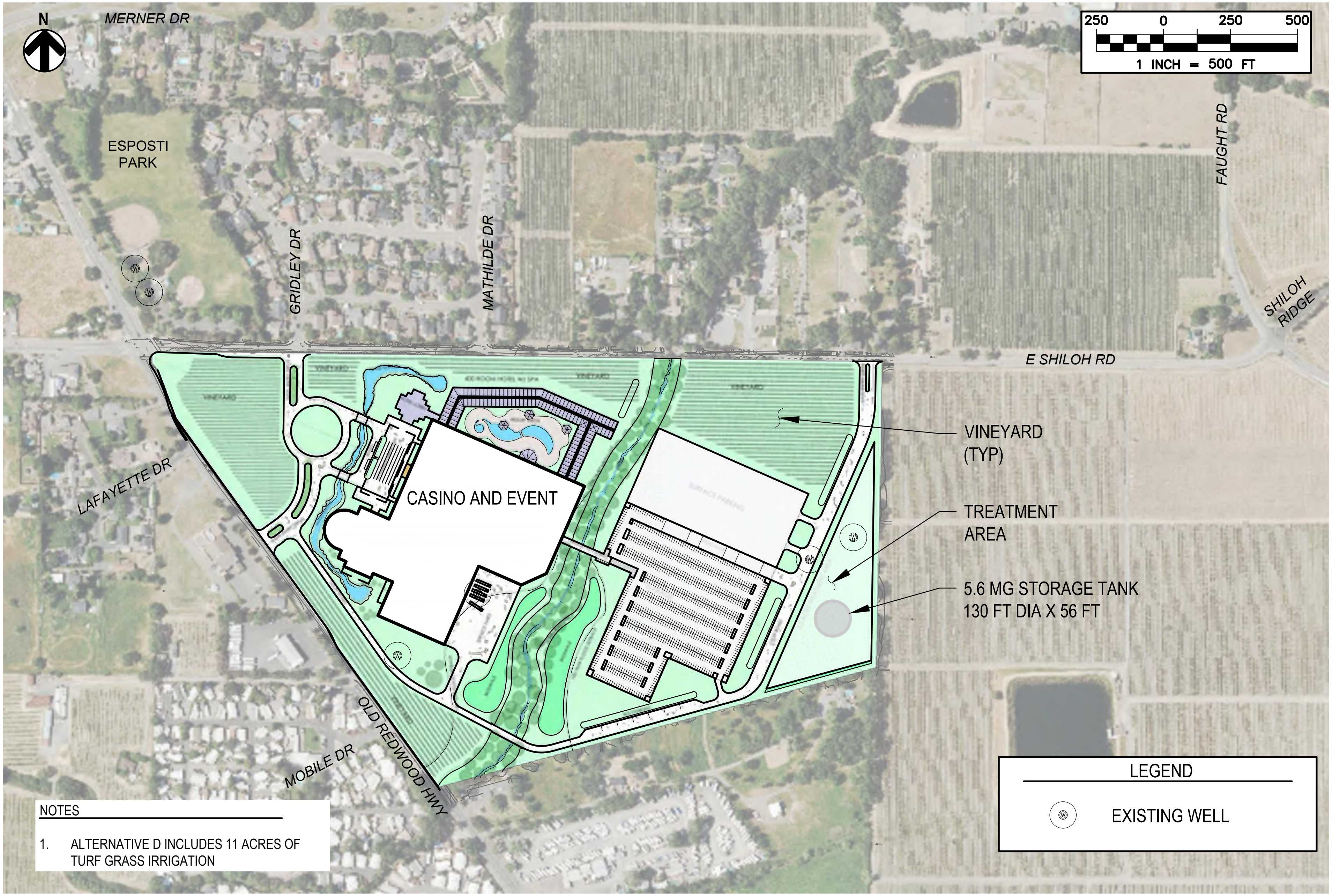

Figure 2-10
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 4 - Alternative A

HydroScience

Table 2-13: Estimated On-Site Seasonal Disposal Requirements for Alternative A

Seasonal Disposal Strategy	Landscape Irrigation (AF)	Vineyard Irrigation (AF)	Offsite (AF)	Surface Water Discharge (AF)	Max Storage (AF)
Option 1	13.3	3.9	0	116.1	37.1
Option 2	13.3	5.5	0	122.7	48.7
Option 3	13.3	4.8	33.2	87.2	15.0
Option 4	13.3	5.5	33.2	89.3	17.0

Notes:
1. This disposal strategy assumes that all effluent will be disposed to the irrigated areas from April to October and stored in a reservoir for surface water discharge during the wet season.
2. Offsite irrigation assumes an additional 11 acres of offsite turf grass irrigation.
3. Landscape irrigation includes 4.4 acres of irrigated area. Vineyard irrigation consists of 17.4 acres of vineyards for a total disposal area of 21.8 acres.

It is noted that for open-air storage ponds in this region, evaporative losses are estimated to be greater than precipitation captured. Thus, required storage for tanks is greater than those of storage ponds as shown in **Table 2-13**. Additional offsite turfgrass would reduce the amount of onsite seasonal storage required up to a point. The limiting month at the end of the dry season is the month of October when irrigation demand is zero and surface water discharge is limited. It is estimated that at a minimum, approximately 3.4 MG (10.6 AF) of storage (closed tank or open storage basin) would be required regardless of the available irrigation area.

Alternative B

There are two effluent disposal strategies for Alternative B.

- **Option 1:** During the dry season, effluent from the on-site WWTP would be recycled and used on-site for dual plumbed and cooling purposes and used to irrigate the vineyards and landscaping at agronomic rates. Effluent that could not be used for either purpose would be stored in the seasonal storage pond. Some amount of evaporation will also occur out of the storage pond.

  During the wet season, effluent from the on-site WWTP would be recycled and used on-site for dual plumbed and cooling purposes, discharged on-site to Pruitt Creek, stored in on-site seasonal storage ponds, and used to irrigate the vineyards and landscaping at agronomic rates. The landscaped areas and vineyard would be irrigated by pumping effluent out of the seasonal storage pond. Effluent stored in the seasonal storage pond would be discharged to Pruitt Creek, tributary to the Russian River, in accordance with flow limitation requirements.

- **Option 2:** Similar to Option 1, with the addition of 9 acres of off-site irrigation for effluent disposal and consequently reduced seasonal storage volume required.

Option 1 strategy assumes that the Project will be able to dispose of effluent to only within the project site. The second effluent disposal strategy, Option 2, assumes that effluent will be disposed of to offsite landscape irrigation in addition to all other disposal methods listed. Both options assume an open storage pond will be used for seasonal storage. **Table 2-14** summarizes conceptual estimates of the seasonal storage requirements and disposal requirements for two effluent disposal strategies for Alternative B.

These estimates are preliminary and are for planning purposes only. The Alternative B options and disposal areas for the wet season discharge and wet season storage are shown in **Figure 2-11** and **Figure 2-12**. Portions of the areas identified for vineyards are within the 100-year flood zone. This, however, is not expected to be an issue, during periods of rain since it is assumed that the vineyards will not be irrigated during the wet season.

Table 2-14: Estimated On-Site Seasonal Disposal Requirements for Alternative B

Seasonal Disposal Strategy	Landscape Irrigation (AF)	Vineyard Irrigation (AF)	Offsite (AF)	Surface Water Discharge (AF)	Max Storage (AF)
Option 1	20.2	6.3	0	66.9	13.9
Option 2	20.2	6.6	11.2	56.7	6.7

Notes:
1. This disposal strategy assumes that all effluent will be disposed to the irrigated areas from April to October and stored in a reservoir for surface water discharge during the wet season.
2. Offsite irrigation assumes an additional 9 acres of offsite turf grass irrigation.
3. Landscape irrigation includes 6.7 acres of irrigated area. Vineyard irrigation consists of 22 acres of vineyards for a total disposal area of 28.7 acres.

Additional offsite turfgrass would reduce the amount of onsite seasonal storage required up to a point. The limiting month at the end of the dry season is the month of October when irrigation demand is zero and surface water discharge is limited. It is estimated that at a minimum, approximately 2.2 MG (6.7 AF) of storage in an open storage pond would be required regardless of the available irrigation area. If Option 1 was pursued with a closed storage tank instead, then the required volume would be approximately 6 MG (18.3 AF).

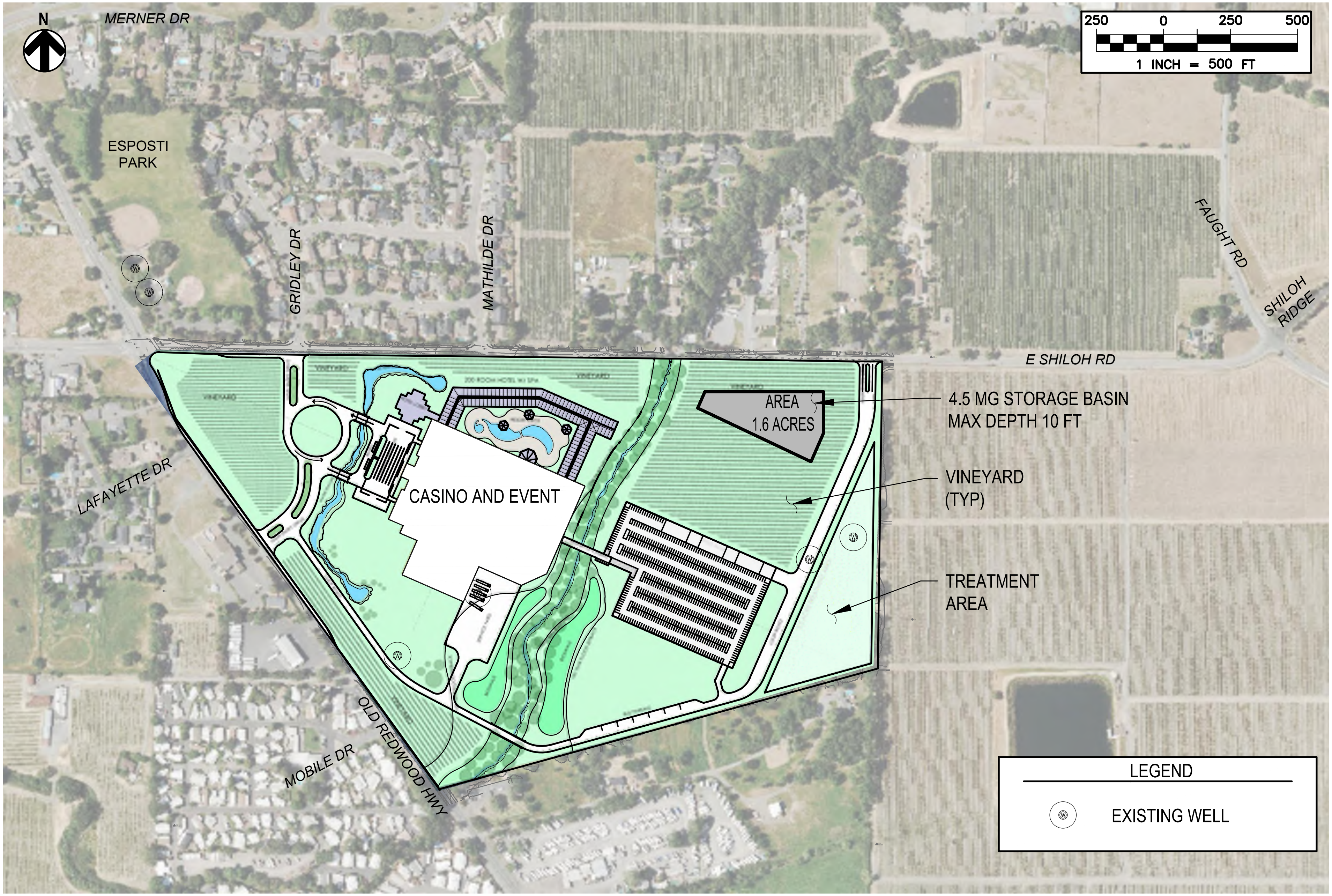

Figure 2-11
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 1 - Alternative B

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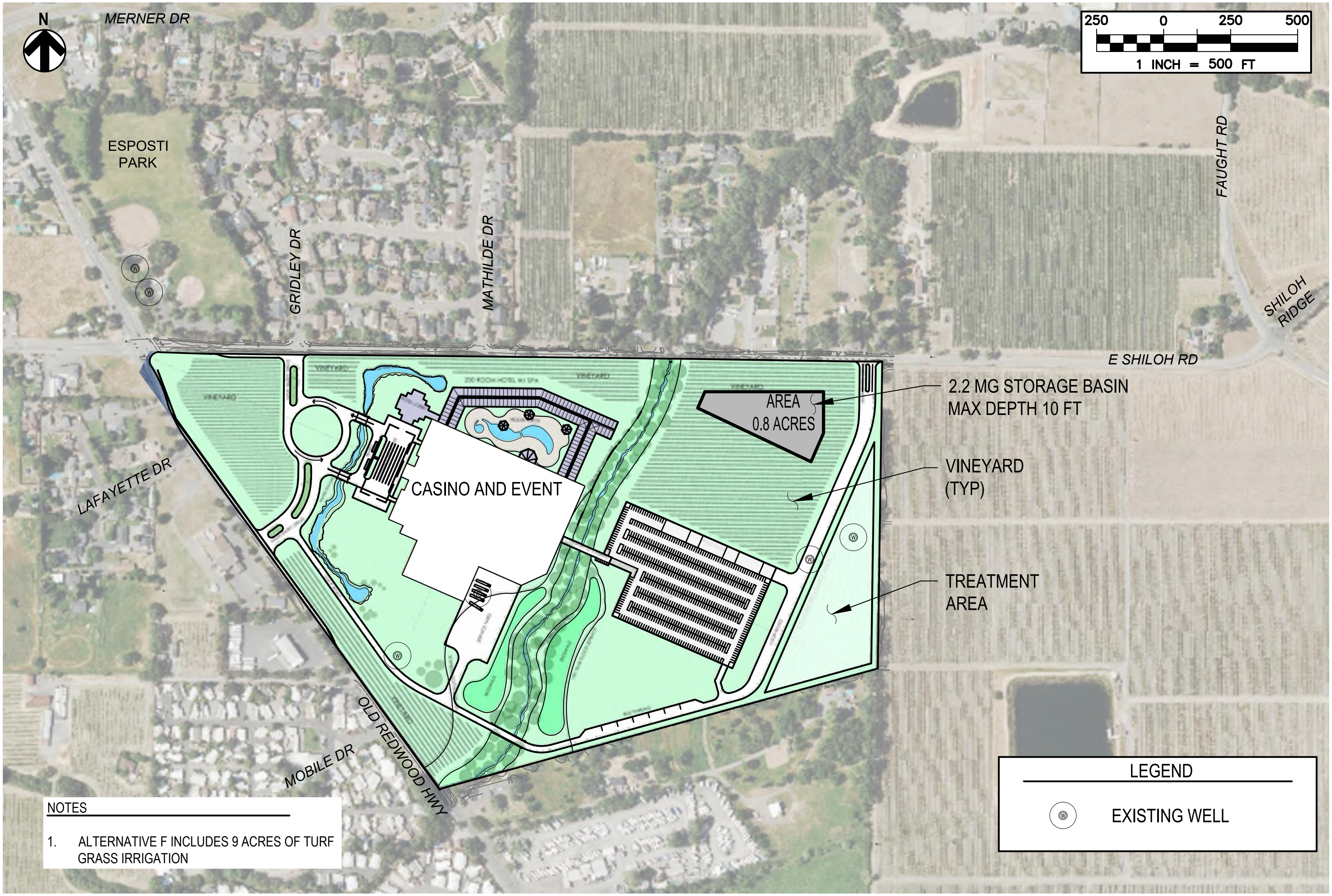

HydroScience

Figure 2-12
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 2 - Alternative B

Alternative C

There is one option identified for Alternative C given the acreage available for landscape/vineyard irrigation with recycled water.

During the dry season, effluent from the on-site WWTP would be recycled and used on-site for dual plumbed and cooling purposes and used to irrigate the vineyards and landscaping at agronomic rates. Effluent that could not be used for either purpose would be stored in the seasonal storage pond. Some amount of evaporation will also occur out of the storage pond.

During the wet season, effluent from the on-site WWTP would be recycled and used on-site for dual plumbed and cooling purposes, discharged on-site to Pruitt Creek, stored in on-site seasonal storage ponds, and used to irrigate the vineyards and landscaping at agronomic rates. The landscaped areas and vineyard would be irrigated by pumping effluent out of the seasonal storage pond. Effluent stored in the seasonal storage pond would be discharged to Pruitt Creek, tributary to the Russian River, in accordance with flow limitation requirements.

Storage is sized so that sufficient recycled water is stored through the wet season to meet the irrigation demands of the dry season.

Table 2-15: Estimated On-site Seasonal Disposal Requirements for Alternative C

Seasonal Disposal Strategy	Landscape Irrigation (AF)	Vineyard Irrigation (AF)	Offsite (AF)	Surface Water Discharge (AF)	Max Storage (AF)
Option 1	0.3	13.7	0	2.3	13.2

Notes:
1. This disposal strategy assumes that all effluent will be disposed to the irrigated areas from April to October and stored in a reservoir for surface water discharge during the wet season.
2. Landscape irrigation includes 8.3 acres of irrigated area. Vineyard irrigation consists of 45.3 acres of vineyards for a total disposal area of 53.6 acres.

As shown in **Table 2-15** above, this strategy assumes that the Project will be able to dispose of effluent to only within the project site. If this alternative was pursued with a closed storage tank instead, then the required volume would be approximately 3.4 MG (10.4 AF).

These estimates are preliminary and are for planning purposes only. The Alternative C storage and disposal areas are shown in **Figure 2-13**. Portions of the areas identified for vineyards are within the 100-year flood zone. This, however, is not expected to be an issue, during periods of rain since it is assumed that the vineyards will not be irrigated during the wet season.

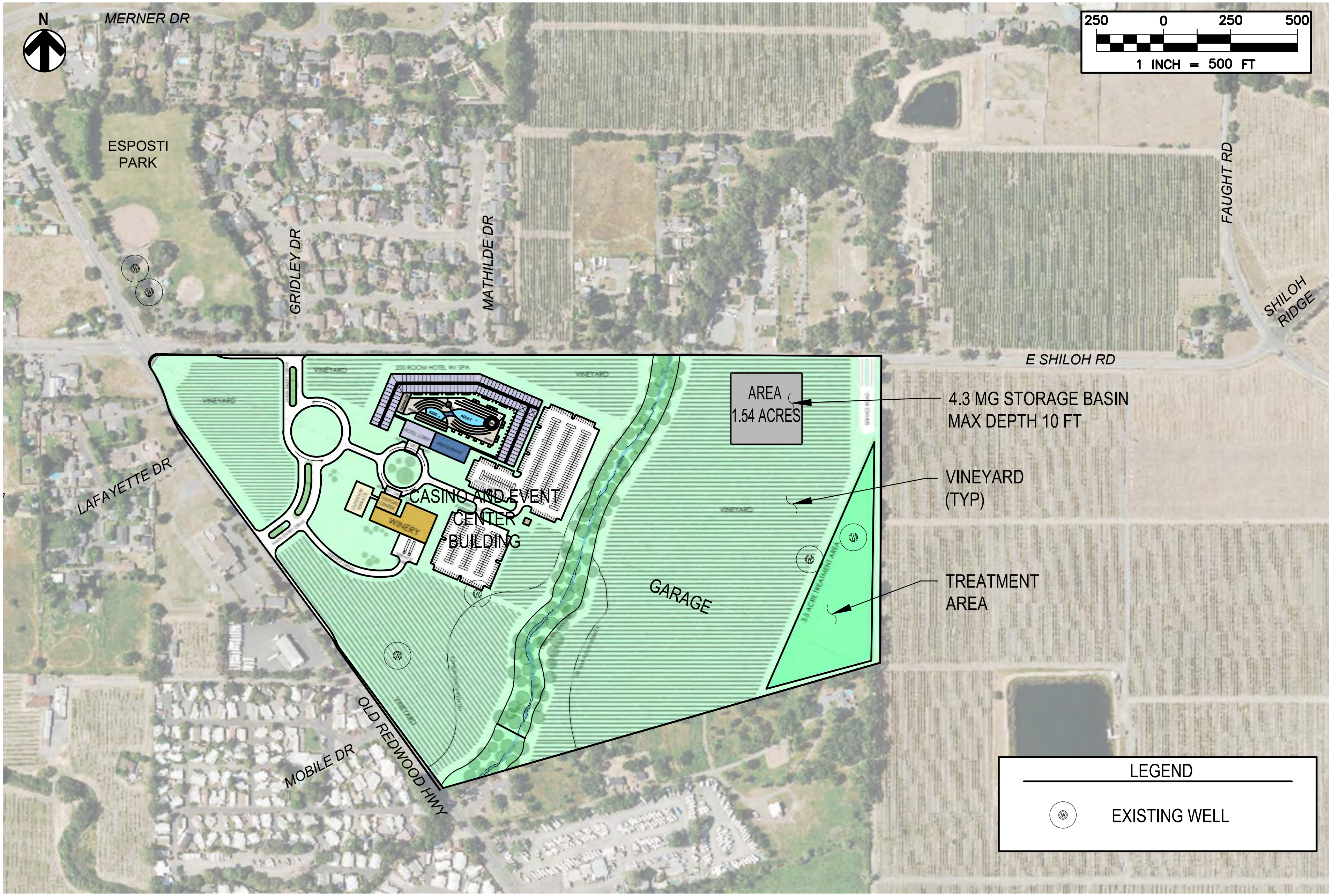

Figure 2-13
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Option 1 - Alternative C

HydroScience

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SECTION 3 – LOCAL HYDROGEOLOGY

This section presents a summary of the available information regarding the hydrogeology at the Project site.

3.1 Santa Rosa Valley Basin

According to the DWR Bulletin 118, California's Groundwater Update 2020 (November 2021), the groundwater basin underlying the Town is the Santa Rosa Plain, a sub-basin (DWR number 1-055.01) of the Santa Rosa Valley Basin. The Santa Rosa Plain drains toward the Russian River and is part of the North Coast Hydrologic Region. The Santa Rosa Plain Sub-basin is the largest basin in the County and underlies the most populated areas of the County. The Windsor hydrogeologic subarea is located in the northern portion of the Santa Rosa Plain and underlies the Town of Windsor (Windsor Basin).

The following description is excerpted from the California's Groundwater Update 2013 (DWR April 2015):

The second largest groundwater basin in the North Coast region is the Santa Rosa Valley Groundwater Basin (1-055) in Sonoma County. The groundwater basin covers approximately 101,000 acres, and is divided into three groundwater subbasins: the Santa Rosa Plain (1-055.01), Healdsburg Area (1-055.02), and Rincon Valley (1-055.03). The groundwater basin extends to the northwest to the edge of the Russian River floodplain, west to the Mendocino Range, south to the hills dividing the Santa Rosa and Petaluma valleys, southeast to the Sonoma Mountains, and northeast to the Mayacamas Mountains.

The Santa Rosa Plain Groundwater Subbasin covers an area of approximately 80,000 acres and is home to approximately half of the population of Sonoma County. The four main geologic units, which form the primary aquifers in the Santa Rosa Plain Groundwater Subbasin, are sedimentary deposits of the Alluvium and Glen Ellen formations, the Wilson Grove Formation (previously described as the Merced Formation), and the Sonoma Volcanics. The groundwater subbasin's best water-producing units are stream channels filled with alluvial sands and gravels, groundwater basin-fill alluvium and alluvial fan deposits that connect the Santa Rosa Plain with its bordering hills, and massive sandstone units of the Wilson Grove Formation. The Sonoma Volcanics, a thick sequence of lava flows present along the eastern boundary of the groundwater basin, produce variable amounts of water. The Petaluma Formation also produces variable amounts of water, but underlies much of the groundwater basin at depth and is important in terms of its extensive distribution and the number of wells producing from it. Groundwater within the Santa Rosa Plain Groundwater Subbasin is generally present under confined conditions, except locally in the vicinity of clay or silt horizons where conditions may be semi-confined or confined.

The Glen Ellen Formation consists of continental deposits of partially cemented gravel, sand, silt, and clay, and also yields modest amounts of water to smaller groundwater wells. The thickness of the formation ranges from approximately 1,500 to 3,000 feet. Permeability of the formation varies greatly by location; data indicates that some wells can produce more than 500 gallons per minute (gpm), but most wells produce less and incur significant drawdowns. The Glen Ellen Formation produces groundwater primarily for domestic well use. This formation is notable because it is composed of continental sediments, rather than marine sediments, like many of the other water-bearing formations in the area.

3.1.1 Windsor Basin

The following is excerpted from the Hydrologic and Geochemical Characterization of the Santa Rosa Plain (SRP) Watershed – Scientific Investigations Report 2013–5118 (U.S. Geological Survey, 2013):

The analysis of gravity data reveals two deep, steep-sided sedimentary basins: the Windsor basin beneath the northern part of the SRP and the Cotati basin beneath the southern part, which are separated by a buried bedrock ridge (McPhee and others, 2007; Langenheim and others, 2008). The Windsor basin is about 5.5 by 7.5 mi in size and is centered near the town of Windsor. The thickest exposures of the Glen Ellen Formation in the Santa Rosa Plain Watershed are observed near this basin in the hills that flank the northeast side of the Santa Rosa Plain Watershed. The basin has a roughly triangular form, bounded by the Healdsburg fault segment on the northeast, the Trenton Ridge fault to the south, and a zone of poorly exposed normal faults on the west. Inversion of gravity data indicates the basin is 3,000–6,500 ft deep (Langenheim and others, 2008). The southern and western margins of the Windsor basin appear to have a series of downward steps into the basin (Langenheim and others, 2010), indicating that normal faulting played a role in basin subsidence. Based on outcrop and well data, the deeper parts of the Windsor basin are likely filled with tuff beds and lavas of the Sonoma Volcanics intercalated with sedimentary units of the Petaluma Formation (McLaughlin and others, 2008). Rocks of the Glen Ellen Formation and Quaternary alluvial fan deposits overlie these older rocks.

3.2 Project Site Geotechnical Conditions

A geotechnical study was conducted by Cal Engineering & Geology, Inc. and their observations and conclusions were documented in the Draft Geotechnical Data Memorandum on May 9, 2022. It was concluded that development was not precluded by the soil and geotechnical conditions observed at the site. It is noted that prior to any construction on the site, additional work associated with the preparation of a geotechnical report is required. However, the study provides a summary of the site's soil and geologic conditions.

Three general soil types were observed at the site. Alluvial deposits were encountered in each test pit to the maximum depth explored of 6 feet. The encountered alluvium within the upper four feet of several test pits primarily consisted of lean clays with varying amounts of sand, silt, and gravel and occasional silty sand layers. Shallow soils encountered in another test pit were more granular and consisted of moist to wet silty sand, clayey gravel, and clayey sand from 0 to 5 feet below the ground surface. Sandy lean clay and lean clay with sand was encountered in all test pits from approximately 5 to 6 feet below ground surface. For a more detailed description of the encountered soils, the test pit logs, and laboratory test results are included in **Appendix D.**

3.3 Local Groundwater Supply

The Windsor Water District serves the Town and select parcels south of Shiloh Road and west of Old Redwood Highway. The following details about the water supply are excerpted from the 2020 Draft Urban Water Management Plan (July 2021).

The Town's active potable water supply sources are the Russian River Well Field and Sonoma Water's transmission system (aqueduct). Both provide surface water from the Russian River. The Russian River Well Field has been in operation since 1984. The well field is located on a 27-

acre parcel located near the Russian River. It currently contains five production wells which intercept underflow from the Russian River with individual capacities of approximately 1,300 gallons per minute (gpm). The well field is owned by the Town, and water is extracted under water rights maintained by Sonoma Water. The Town currently has an application pending with the State Water Resources Control Board (SWRCB) Division of Drinking Water (submitted by the Windsor Water District in 1990) to obtain its own water rights for diversion via these wells.

The Town has purchased surface water from Sonoma Water since 1985 (Town of Windsor, 2015). Purchased water is delivered through Sonoma Water's 36-inch diameter Santa Rosa Aqueduct, and continues through a 12-inch diameter water transmission main at the southern end of the Charles M. Schulz–Sonoma County Airport where it connects to the Town's water system. Sonoma Water diverts water into the Santa Rosa Aqueduct via Ranney Collectors under the Russian River and supplements this supply with groundwater wells located in the Santa Rosa Plain Groundwater Basin.

The Town owns five off-river groundwater wells. These wells include the Esposti Park irrigation well, the Esposti Park potable well, Bluebird Well 1, Bluebird Well 2 and the Keiser Park irrigation well. Only one of the five wells, the Esposti irrigation well, is active; the remaining four off-river groundwater wells are inactive. The Esposti irrigation well provides raw water for park irrigation and is not used as a potable source.

The Town has begun implementation of a well drilling program beginning with the Esposti Park potable well to evaluate the thickness and productivity of the deeper sedimentary units in the Windsor area to develop groundwater wells that can be used to augment the Town's water supply.

Other local domestic wells located within the vicinity of the Project site are generally shallow from 100 up to 200 ft below ground surface (bgs). (*Sustainable Groundwater Management Act (SGMA) Data Viewer*, DWR, https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels)

3.3.1 Esposti Park Well

The Town is in the process of developing the Esposti potable well as a potable water source. In 2010, the Town initiated exploratory drilling, well construction, and testing at Bluebird Court and Esposti Park. For the purpose of this Study due to its proximity to the Project site, the Esposti Park well will be discussed in detail. Esposti Park shares the intersection of Shiloh Road and Old Redwood Highway with the Project site. It is expected that the subsurface conditions at the Project site will be similar if not identical to those at Esposti Park.

An exploratory borehole was drilled to 1,040 ft bgs. Drill cutting samples were logged during pilot drilling by a California-licensed hydrogeologist. In general, the sand and gravel units encountered during drilling correlate with the Glen Ellen Formation. The generalized lithology encountered during drilling is summarized in **Table 3-1**.

Table 3-1: Esposti Park Lithologic Summary

Top Depth (feet)	Bottom Depth (feet)	Lithology
0	60	Light brown sandy clay
60	82	Variably colored well-sorted sand
82	90	Light gray sandy clay
90	115	Poorly sorted medium gravel, variably-colored; grading to green gray with depth
115	132	Dark gray-green silty clay
132	152	Gray-green sand with rare cobble; poorly sorted. Increasing coarseness with depth
152	163	Light brown sandy clay
163	223	Gray-green sand with rare cobble; poorly sorted. Increasing coarseness with depth to fine-to-medium sand
223	232	Light gray silty clay
232	336	Poorly sorted sand with rate pebbles. Increasing coarseness. Changing to gravel with sand and then to medium sand with pebbles
336	350	Light gray sandy clay. Light brown volcanic ash identified starting at 341 feet bgs
350	377	Variably colored gravel and sand. Grades from fine to medium. Some volcanic ash.
377	381	Ash predominant with sand and gravel
381	650	Variably-colored gravel and sand. Some ash interspersed at intervening layers. Interspersed clay with sand and gravel between 510 and 520 feet bgs.
650	700	Interbedded clay and ash with some sand. Trending to tan clay with depth
700	736	Gravel and sand
736	804	Dark gray micaceous clay with layers of sand ranging from fine to medium.
804	826	Gray-green fine to medium sand. Abundant ash starting at 810 feet bgs.
826	832	Light gray sandy clay
832	841	Sand and gravel
841	854	Dark gray fat clay
854	862	Poorly sorted sand with gravel, variably colored
862	970	Dark gray fat clay
970	1030	Silty sands to poorly sorted sand
1030	1040	Clay

The well screen was designed to screen permeable sands and gravels with good water quality as identified by field observations, soil cuttings and depth-specific water quality samples collected during borehole advancement. A total screen length of 160 feet was installed over six intervals as detailed in **Table 3-2**. The screen consists of stainless-steel continuous wire-wrap construction with a 0.125 inch slot size. Stainless steel blank casing ranging in length from 10 to 50 feet in length separates the screened intervals and was placed opposite lower permeability strata within the more permeable strata.

Table 3-2: Esposti Park Screened Intervals and Lengths

Screened Interval Depths (feet bgs)	Screen Length (feet)
380 to 420	40
430 to 450	20
460 to 470	10
480 to 510	30
545 to 565	20
615 to 655	40
Total Length	**160**

After well construction and development, groundwater samples were collected and analyzed. Results indicated concentrations of arsenic and manganese that exceeded drinking water standards. Further investigation was stalled due in part to the water quality issues coupled with a lack of urgency to develop additional water supply. The original well testing report: *Windsor Groundwater Well Installation and Testing Project Summary Report (September 2010)* detailing the subsurface conditions and well construction is included as **Appendix B**.

In 2016 and 2017, the Town reinitiated the well investigation and pursued redevelopment of the Esposti Supply Well; performing a pump test and evaluating water quality and treatment options. Results of this work determined that the well can reliability produce 400 gpm. Pumping at a rate of 800 gpm is possible but is not sustainable for more than a day due to hydrogeologic limitations to aquifer permeability. The groundwater production is from confined aquifer units located below 380 ft bgs. Pumping from the confined aquifer did not result in a significant effect on the overlying shallow groundwater. Thus it is not expected to affect local domestic wells installed at shallower depths (up to 200 ft bgs).

The well produces water that meets all of the requirements for drinking water with the exception of arsenic and manganese. The 2016 concentration of arsenic was 0.057 milligrams per liter (mg/L) and manganese was 0.860 mg/L. These concentrations are significantly above the maximum contaminant levels (MCLs) of 0.010 mg/L and 0.050 mg/L, respectively. The testing also confirmed that these elevated concentrations of arsenic and manganese are repeatable and consistent, screened across multiple aquifer zones.

The recommended option for water treatment is a two-step process; the first step removes manganese through catalytic oxidation (greensand filtration) and the second step removes arsenic through media adsorption.

The redevelopment, testing, and recommendations for the Esposti Well are documented in the *Town of Windsor and Windsor Water District Esposti Supply Well Redevelopment, Pumping Test and Treatment Feasibility Study (October 3, 2017)*, included as **Appendix C**.

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SECTION 4 – BACKGROUND AND REGULATORY ISSUES

This section identifies the typical regulatory requirements applicable to the Project with respect to the proposed water supply, wastewater treatment, and wastewater discharge methods identified in this report.

4.1 Water Supply

In general, Sonoma Valley water supply issues are characterized by limited groundwater supply and over-committed surface water supplies. Thus, the primary options that exist for securing water for the Project include evaluating the existing irrigation wells and their suitability as a potable water supply and constructing a new on-site water supply well.

4.1.1 Groundwater Supply and Management

Historically, shallow zone wells (<200 feet deep) showed no significant decline in groundwater levels. There are several shallow wells located within the vicinity of the Project site, as is typical for the periphery of the Town. It was noted during the pumping tests at Esposti well that there was no decline in groundwater levels in the shallow zone (Esposti irrigation well) indicating that pumping from the intermediate zone (>380 ft bgs) does not generally affect shallow zone water levels in those wells. Water level elevations in three shallow wells located south of the Project site (**Figure 2-4**) and monitored by DWR are historically stable.

Groundwater quality in neighboring wells commonly include higher levels of iron, manganese, and arsenic requiring treatment for elevated levels. Each of these constituents is found in higher-than-normal concentrations in certain areas of Sonoma County.

Neither iron nor manganese in water presents a health hazard. Iron will cause reddish-brown staining of laundry, porcelain, dishes, utensils, and even glassware. Manganese acts in a similar way but causes a brownish-black stain. Soaps and detergents do not remove these stains, and the use of chlorine bleach and alkaline builders (such as sodium carbonate) can actually intensify the stains. If these constituents are present in groundwater, treatment of the groundwater to remove these constituents is recommended.

Arsenic occurs naturally as a trace component in many rocks and sediments. Whether the arsenic is released from these geologic sources into groundwater depends on the chemical form of the arsenic, the geochemical conditions in the aquifer, and the biogeochemical processes that occur. Arsenic also can be released into groundwater as a result of human activities, such as mining, and from its various uses in industry, in animal feed, as a wood preservative, and as a pesticide. In drinking-water supplies, arsenic poses a problem because it is toxic at low levels and is a known carcinogen. In 2001, the USEPA lowered the MCL for arsenic in public-water supplies to 10 micrograms per liter (µg/L) from 50 µg/L.

Construction of an on-site well will be largely exempt from local environmental and public reviews associated with off-site impacts, but will be subject to Federal environmental and public reviews through the National Environmental Policy Act (NEPA) and regulatory oversight by the USEPA and the IHS.

Adjacent Domestic Wells: The well drillers logs for the Esposti well show that the water bearing zones in the local soils are separated by impervious clay layers preventing the vertical movement of water from the upper bearing zones, where most domestic wells terminate, if the lower zones are being pumped. The Esposti potable well is drilled to 675 feet. Domestic wells, on the other hand, are not typically drilled to depths greater than 200 feet. This suggests that these wells draw from the shallow alluvial aquifer. During testing of the Esposti potable well there was no change in the water levels of the irrigation well, which was drilled to 300 feet bgs and is located 30 feet from the potable well. There are several domestic wells located to the west and southwest of the Project site. To prevent significant impacts to local domestic wells, the proposed Project should also construct deep terminating wells, screen in the deeper water bearing formations below a depth of 200 feet, similar to the Town's local well construction. It is not anticipated that properly constructed on-site wells for the Project will adversely affect local wells.

No information was available regarding the construction of the existing on-site irrigation wells. It is recommended that the well is tested and investigated further to understand its construction, capacity, and water quality.

Groundwater Sustainability Plan (GSP): The Santa Rosa Plain groundwater basin is monitored by the Groundwater Sustainability Agency. The recently updated GSP (January 2022), indicates that groundwater is typically a primary source for water supply for irrigated agriculture and a secondary source of supply for many municipal water purveyors (except California American Water Company's Larkfield District); most of the water supply is imported water and local surface water. The Project will evaluate the current GSP to maintain the integrity of the subbasin water quality and available supply for the future. The Project's intent is to use recycled water where appropriate to reduce the potable water consumption it would otherwise require. The recycled water quality will be per Title 22 standards for tertiary treated effluent for reuse as described in the next section.

4.2 Recycled Water

It is expected that the WWTP will produce recycled water for on-site reuse, which will add to the water quality requirements of the effluent from the WWTP. In order to reuse recycled water on non-trust land in California, a Title 22 reclamation permit would be required. The RWQCB typically issues this permit in California. However, on trust land, the USEPA would regulate the use of recycled water use and would be responsible for granting a NPDES permit to use recycled water on-site. The USEPA has typically deferred their recycled water standards to California's Title 22 standards for trust land projects in California. IHS would regulate the use of recycled water on trust lands. For the range of uses considered for this project, it would be expected that the WWTP would need to produce disinfected tertiary recycled water in accordance with Title 22 requirements. Disinfected tertiary recycled water meets the following water quality requirements, which are specific to the MBR treatment process expected for the Project's wastewater treatment facility:

- Has been passed through a microfiltration, ultrafiltration, nanofiltration, or reverse osmosis membrane so that the turbidity of the filtered wastewater does not exceed any of the following:
    - 0.2 NTU more than 95 percent of the time within a 24-hour period; and
    - 0.5 NTU at any time.

- The filtered wastewater has been disinfected by either:
  - A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or
  - A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of the demonstration. The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed an MPN of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30 day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters.

In addition to the aforementioned recycled water quality requirements, there are a number of operational, use, and reporting restrictions identified in Title 22. However, it is not expected that any of these requirements will limit the viability of recycled water reuse on-site, and these requirements are typical for any recycled water use application. All uses of recycled water would have to be approved by USEPA. As long as disinfected tertiary recycled water is produced, there would appear to be no issues associated with this intended use. It is also noted that the minimum quality of discharge to the Russian River is typically disinfected tertiary recycled water.

4.3 Wastewater

The regulatory requirements pertinent to wastewater treatment and wastewater discharge methods are identified in *Section 2.3 Wastewater* and *Section 2.3.4 Effluent Disposal*, respectively. The reader is referred to those sections for additional details.

The WWTP will be designed to comply with the effluent quality requirements of the NPDES permit when these are determined. The MBR process discussed in *Section 2.3.3 Wastewater Treatment Facilities* is expected to be capable of meeting these requirements with minimal modifications.

Nitrogen removal will be achieved in the anoxic basin of the MBR process as discussed in *Section 6.2.3 Immersed Membrane Bioreactor System (Packaged)*. It is expected that the effluent nitrogen concentrations will meet the limitations imposed by the USEPA in their NPDES permit.

If phosphorus removal is required, the MBR process is well suited to provide for phosphorous removal to very low concentrations. Phosphorus removal is enhanced in MBR treatment plants by employing one or multiple of the following operational methods: 1) addition of a coagulant to the aeration basin, 2) a higher solids retention time in the MBR basins, 3) ensuring there is an ample carbon source for the microorganisms, and 4) utilization of a membrane, which virtually eliminates any particulate phosphorus in the effluent. The method(s) the Tribe will employ for phosphorus removal will be determined during the WWTP design phase, but those methods would be designed to comply with the NPDES permit effluent limitations.

This section will present the requirements for determining the potential impacts of receiving waters upon discharge of tertiary treated wastewater, and the sludge disposal options and pertinent disposal regulations.

4.3.1 Baseline Monitoring Program

Baseline water quality for receiving waters, Mark West Creek tributary to Russian River, is required as a basis for determining if the beneficial uses of the receiving waters will be impacted by the proposed discharge of tertiary treated wastewater.

The current NPDES permits for the Dry Creek Rancheria WWTP (Dry Creek WWTP), Ukiah WWTP, and Windsor WWTP may be reviewed to gain a sense of the requirements specified in local NPDES permits issued by the USEPA and North Coast RWQCB and are publicly available. These WWTPs are the nearest to the proposed Shiloh Resort WWTP with a surface water discharge to the Russian River or its tributaries, and are the most applicable surface water discharge permits for the WWTP. These permits all include seasonal surface water discharge to the Russian River or its tributaries, tertiary treatment, and land disposal.

The primary unknown regulatory issues associated with the proposed wet season discharge of wastewater to Mark West Creek is the surface water quality at the discharge location. Since there is an existing gauge station at Mark West Creek, and streamflows are highest at that location, this is a logical area to begin baseline water quality monitoring.

In order to begin detailed discussions with the RWQCB on the feasibility of discharging to the Pruitt Creek, the Project would need to begin to collect receiving water quality data near the anticipated discharge site and at the Mark West Creek gauge station. This data would help the RWQCB evaluate the background water quality of the receiving waters, identify potential water quality restrictions, and understand the impacts of the proposed new discharge on the aquatic habitat.

4.3.2 Sludge Disposal

Sludge (biosolids) produced by the WWTP must also be disposed of in accordance with the California Code of Regulations, Water Code, Resource Conservation and Recovery Act, and the RWQCB policy. These regulations are commonly referred to as the 40 CFR Part 503 Biosolids Rule promulgated by the USEPA. It is anticipated that biosolids produced by the project WWTP will be disposed of to an off-site landfill in accordance with all regulatory requirements. Prior to off-site disposal, biosolids will be dewatered. The dewatered sludge, also known as cake, would be periodically hauled to a Class III landfill for disposal. The frequency and volume of dewatered sludge is typically determined during the design phase of the project, as more data is available on the source water quality and treatment process.

4.3.3 Cooling Tower Brine Generation and Disposal

The flowrate and water quality of brine generation from cooling tower processes is unknown. It will ultimately depend on the water chemistry of the makeup water, type/model of the cooling system and operation of the cooling system. Disposal sources for brine generation from cooling processes generally include offsite disposal or discharge to: surface water bodies, sewer system, ocean outfall, deep well injection, incineration, and environmental service providers. If disposal to the WWTP is the preferred option, further evaluation will be required to determine the maximum limits of constituents of concern, expected brine flow rates, expected water quality monitoring parameters, cycles of concentration, etc. Further evaluation will be needed to determine the brine generation volume and most cost-effective disposal alternative. Similarly for the brine generated from the recycled water treatment process (see **Section 2.3.4**), EBMUD accepts and treats this type of waste.

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SECTION 5 – WATER FACILITY REQUIREMENTS

This section identifies preliminary water supply, water treatment, water storage, and pumping requirements to supply the proposed Project with water.

The facilities identified in this section are based on HydroScience's experience with similar projects. The general concept for the water supply facility is that the Project will maximize the reuse of recycled water in order to minimize the water supply requirements for the Project. This section describes the following facilities:

- Water Production Wells
- Water Treatment Plant
- Water Storage Tank and Pump Station

The overall water facilities will be located based on the final design of the Project facilities. All of the recommended water supply facilities described in this section are preliminary and should be utilized for planning purposes only.

5.1 Water Production Wells

The potable water supply system must have a firm reliable supply based on projected water demands. Firm capacity is the remaining water supply capacity with the largest single source out of service. In a well system, it is generally recommended to have a minimum of two wells available for service, so one can be serviced without interrupting the water supply. The actual well capacity, location, and operating strategy will be further developed during the design phase.

A key design requirement that must be addressed during the construction of the wells is the need to minimize impacts to neighboring domestic wells. The test hole should be drilled a minimum of approximately 700 feet deep, and screen sections should be placed primarily in the deeper aquifer sections, and not in the upper aquifers above 200 feet. Per DWR, the new well or existing well to used will require a minimum radius of 50-ft control zone around the well, to protect the source from vandalism, tampering, and other possible sources of contamination. The wells are anticipated to have similar lithographic, water production, and water quality characteristics as the existing Esposti Park Supply Well. The Town has detected high concentrations of arsenic and manganese thus, the implementation of water treatment to remove arsenic and manganese, as described in **Section 5.2**, will likely be required to treat the well water.

Table 5-1 shows the recommended design criteria for on-site wells. Each well is expected to have an approximate footprint of 20 feet by 30 feet, including the pump, well, piping, and miscellaneous equipment. Each well would also be setback from any recycled water use area or impoundment as required by Title 22 criteria.

Table 5-1: Recommended Water Production Well Design Criteria

Parameter	Value
Approximate depth	700 ft
Casing diameter	12-inch
Surface seal depth	100 feet minimum
Casing material	Copper bearing steel
Screen material	Wire-wrapped stainless steel
Approximate screen depth range	Between 350 ft and 650 ft
Pump type	Vertical turbine multistage
Method of control	On/off by tank level

5.2 Water Treatment Plant

Based on the groundwater conditions identified in **Section 3**, and the known arsenic and manganese issues found in local wells described in **Section 4**, it is anticipated that water supplied from any on-site well will exceed the State drinking water standards for arsenic and manganese. Thus, an on-site water treatment plant to remove these constituents will be required. It is recommended that the treatment plant utilize a manganese greensand pressure filtration process to remove manganese to acceptable levels. The backwash waste stream would be directed into a holding tank and settled water would be recycled back into the front of the plant at a rate not exceeding 10% of the plant's rated capacity. Manganese sludge would be periodically discharged from the tank to the sewer system. Media adsorption is recommended for the removal of arsenic. Arsenic is removed by filtering the water through media consisting of oxides and/or hydroxides of Fe, Ti, or Al. There are a variety of media on the market for the removal of arsenic. Treatment modeling of the specific water chemistry is required to narrow down the various media options. On-site pilot testing or testing using rapid small-scale column testing follows treatment modeling.

The two treatment vessels would be installed in series. A typical layout of the treatment plant is shown in **Figure 5-1**. A process flow diagram showing how water is treated within the treatment plant is shown as **Figure 5-2**.

CONTROL BUILDING SPECIFICATIONS:

10' x 10' x (LOW SIDE) W 8' x 10' CANOPY
-SHED STYLE 1:12 SLOPE

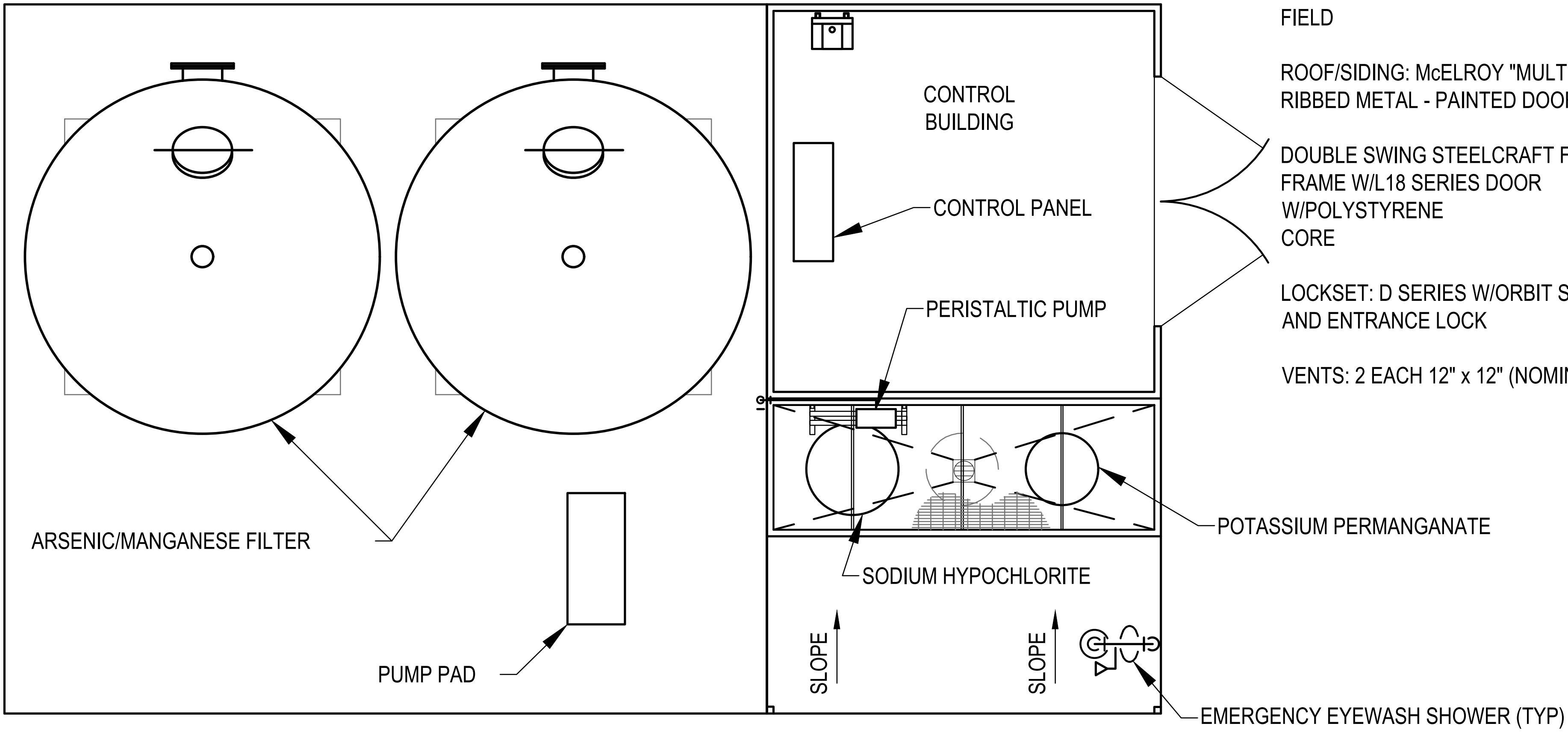
FRAME: 2" x 2" x 120 STEEL TUBE ALL
WELDED WALL SECTIONS TO BE BOLTED IN
FIELD

ROOF/SIDING: McELROY "MULTI-RIB" 28 GA
RIBBED METAL - PAINTED DOOR: 6' x 6'-8"

DOUBLE SWING STEELCRAFT F-16 SERIES
FRAME W/L18 SERIES DOOR
W/POLYSTYRENE
CORE

LOCKSET: D SERIES W/ORBIT STYLE KNOB
AND ENTRANCE LOCK

VENTS: 2 EACH 12" x 12" (NOMINAL)



SITE PLAN
SCALE: 1" = 50'-0"

HydroScience

Figure 5-1
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Preliminary Water Treatment Plant Layout

PIPE SERVICE KEY

BW BACKWASH
D DRAIN
FW FILTERED WATER
KMN POTASSIUM PERMANGANATE
O OVERFLOW
RW RAW WATER
SW SURFACE WASH
SCLS SODIUM HYPOCHLORITE
SAM SAMPLE
W WATER
ARV AIR RELEASE VALVE

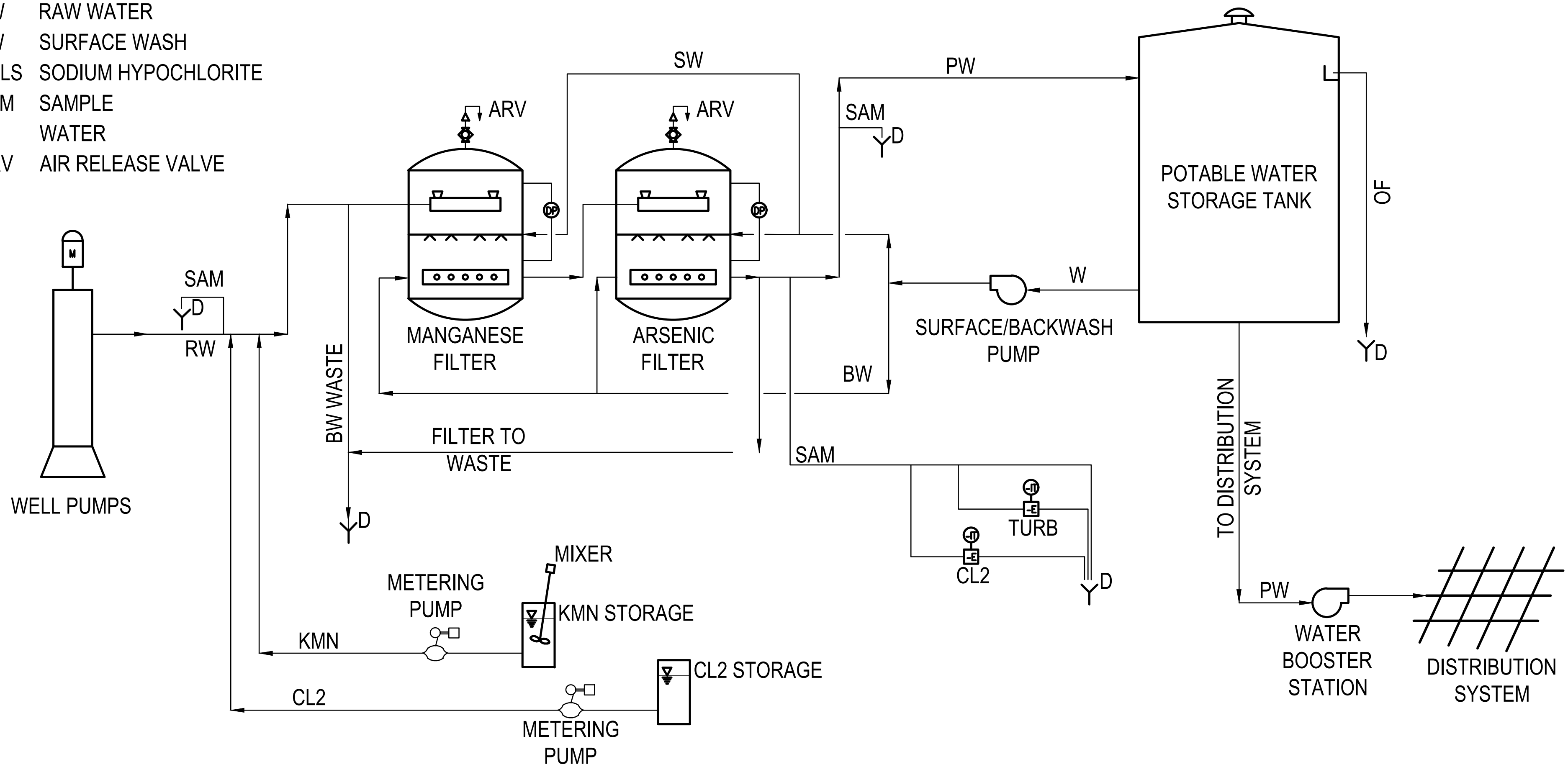


Figure 5-2
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Preliminary Process Flow Diagram

HydroScience

The manganese filtration process consists of oxidation using a feed stream of sodium hypochlorite, and filtration through a manganese greensand filtration media. The function of the manganese greensand is to provide a catalyst to fully oxidize manganese, which may not be accomplished solely with a sodium hypochlorite oxidant. Potassium permanganate will be used to initially condition and prepare the media, and it may be used continuously or intermittently to aid in oxidation, if required. Arsenic is removed with simple on/off cycling and infrequent backwashing is required. Gentle breakthrough curve allows for reduced sampling frequency. Pilot testing is required to determine adsorption capacity. Efficiency is subject to competing adsorption by non-target compounds. Sodium hypochlorite would be used to disinfect the water before on-site distribution. A continuous monitoring residual analyzer will monitor chlorine residual at the end of the filters, before entering a water storage tank. Chlorine dosage control would be manual, with options for automatic pacing based on residual. The water treatment plant process facilities would be located within an enclosed building.

Significant features of the plant would include:

- PLC control system interlinked to a common water/wastewater SCADA system.
- Surface wash to reduce the possibility of “mudball” formation on the media surface.
- Fail-safe control valves that would fail in the filter-forward mode of operation.

The recommended Water Treatment Plant design criteria are summarized in **Table 5-2.**

Table 5-2: Recommended Water Treatment Plant Design Criteria for Alternative A

Parameter	Value
Process	Pressure filtration
Media for Catalytic Oxidation	Anthracite/greensand
Number of filters[1]	1
Filter loading rate	3 gpm/sf
Filter size	10 ft diameter
Media for Adsorption	TBD
Number of filters[1]	1
Filter loading rate	3 gpm/sf
Filter size	10 ft diameter
Oxidant	Sodium Hypochlorite
Process control	PLC/on with service well

Notes:
1. Number of filters does not include redundant unit. Systems are typically designed for N+1 redundancy; two total filters per filter type is recommended.

5.3 Water Storage Tank and Pump Station

A water storage tank would be constructed to store water produced by the water treatment plant. The actual required capacity of the tank is dependent on the Project’s fire flow requirements, however, the anticipated capacity is approximately 1.0 million gallons (MG), and would be of welded steel construction meeting all American Water Works Association (AWWA) specifications for welded steel tanks. A typical section of a tank is shown in **Figure 5-3**. The tank would be a cylindrical shape. Having a shorter tank will make it easier to camouflage, and would hide the tank better from the site's guests. The tank sizing would be based on standard pre-engineered tank dimensions, which are typically in 8-foot increments. It is also possible that the tank would be partially or completely buried, but for the purposes of this analysis, it is assumed that the tank would be located at grade.

Since the site is largely flat, with no land at an elevation suitable for gravity feed to the distribution system, it is recommended that this tank be utilized as the supply, and a pump station be utilized to maintain pressure in the distribution system. This potable water pump station will be required to convey water from the storage tank to the facilities requiring potable water, and would be sized to handle both fire flow and domestic demands. The ultimate pumping capacity will be dependent on fire flow requirements, and would be satisfied by two variable-speed high-service pumps that are half the capacity of the projected flow requirement. **Table 5-3** shows the design criteria for the water storage tank and pump station.

Table 5-3: Recommended Water Storage Tank and Pump Station Design Criteria

Parameter	Value
Water Storage Tank	
Approximate size	1.0 MG
Approximate diameter	75 feet
Approximate height	32 feet
Construction	Welded steel
Potable Water Pump Station	
Low service pump number	2
Low service pump type	Variable speed turbine
High service pump number	2
Hydropneumatic tank approximate volume range[1]	1,000 - 2,000 gallons

Notes:
1. Exact volume is TBD and will be determined during the design phase of the project. Tank volume is dependent on the flowrate and pressure the hydropneumatics tank is expected to provide.

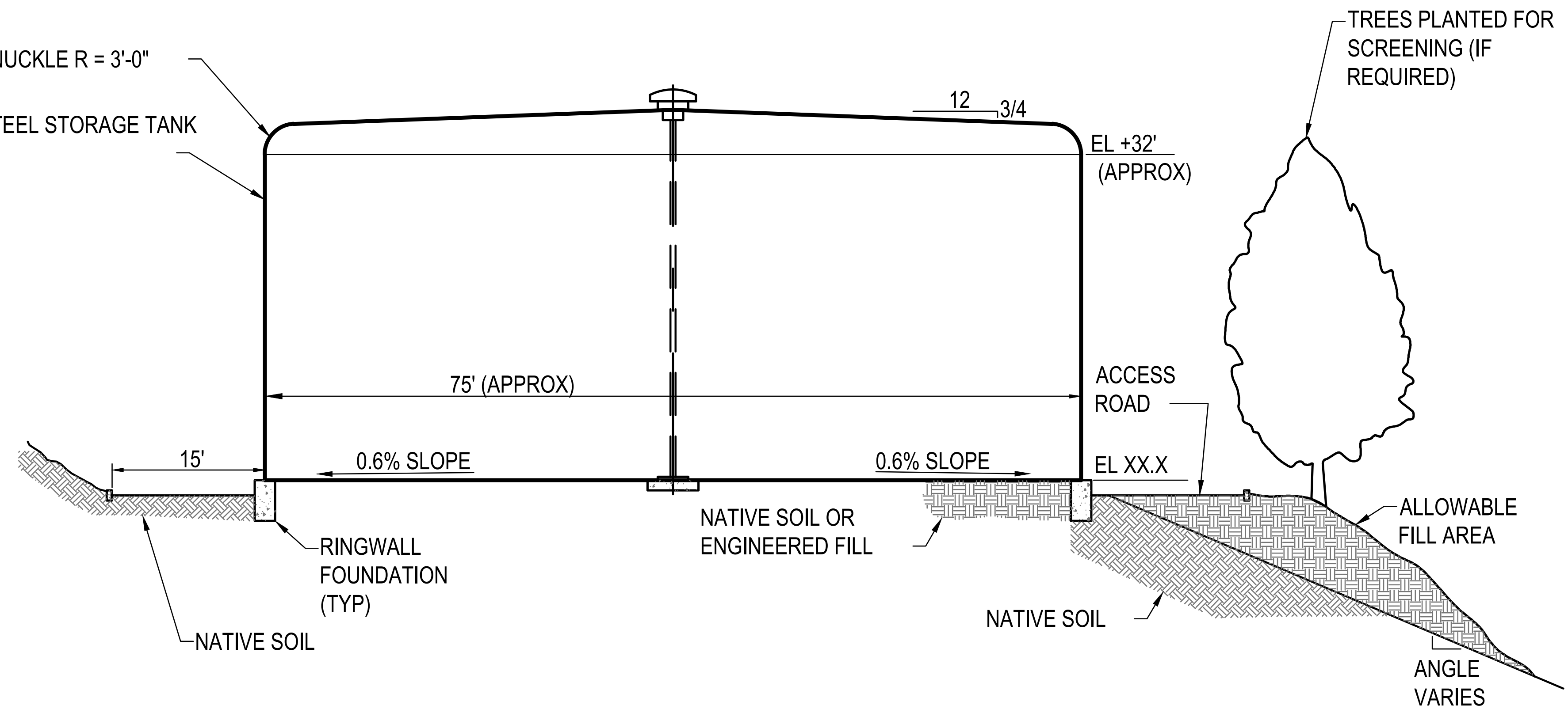


Figure 5-3
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Typical Potable Water Storage Tank

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SECTION 6 – WASTEWATER FACILITY REQUIREMENTS

This section identifies preliminary wastewater collection, wastewater treatment, effluent discharge, and recycled water facilities required to manage wastewater generated by the proposed Project.

The general concepts for the wastewater facilities are to comply with all applicable permitting requirements, maximize on-site water reuse, and ensure that the wastewater and recycled water facilities are designed in a manner that does not limit existing uses or future expansion. This section describes the following facilities:

- Collection System
- Treatment Plant
- Discharge Facilities
- Operations and Maintenance
- Recycled Water Facilities

The overall wastewater facilities will be located based on the final design of the Project facilities. All of the recommended wastewater facilities described in this section are preliminary, and should be utilized for planning purposes only.

6.1 Wastewater Collection System

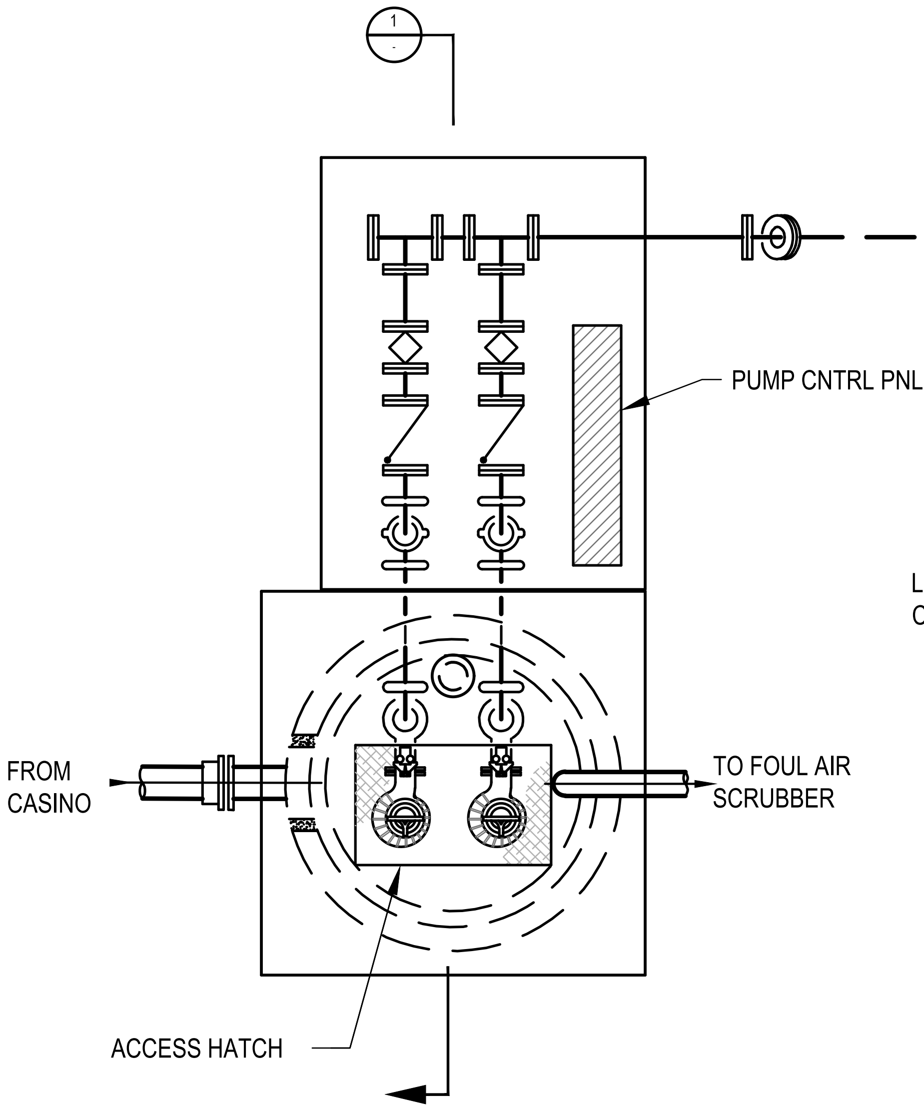
Wastewater from casino facilities is typically gravity fed to a lift station. Gravity sewer would likely be laid along planned roadways within the parcel to facilitate future maintenance, The gravity sewer main will require crossing beneath the existing creek to reach the proposed lift station and WWTP site. This may require a siphon under the creek, depending on the depth of the gravity main relative to the depth of the creek bed.

Wastewater will be pumped through a sewage transmission pipeline from the casino lift station to the headworks of the WWTP. It is likely that a duplex wet well sewage lift station with a standby pump will be required to convey sanitary sewage to the WWTP. The lift station wet well will also be used to collect surface water runoff from the treatment site.

Recommended design criteria for the lift station(s) are shown in **Table 6-1**. A figure showing a typical sewage lift station layout is shown in **Figure 6-1**. The station should be designed to lift the maximum daily flow with one pump out of service.

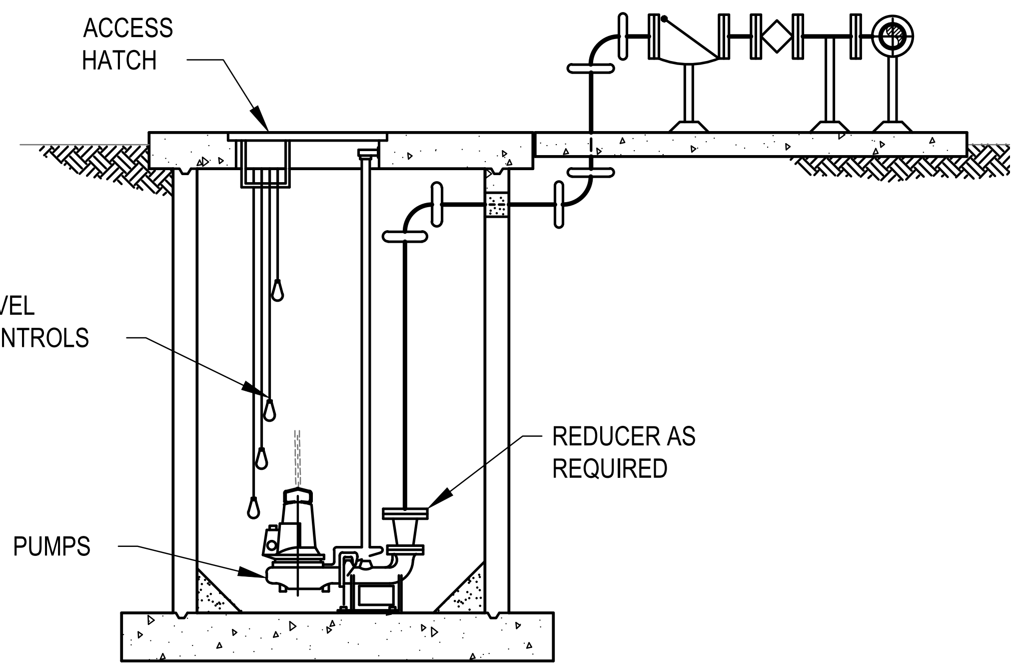
Table 6-1: Recommended Sanitary Sewage Lift Station Design Criteria

Parameter	Value
Purpose	Lift raw water to WWTP facilities
Type	Submersible non-clog centrifugal
Quantity	Three (2 duty, 1 standby)
Controls	Variable speed, level switch start and shutoff



TYPICAL LIFT STATION PLAN

NTS



SECTION

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Figure 6-1
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Typical Influent Lift Station

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6.2 Wastewater Treatment Plant

This section provides a description of the recommended wastewater treatment components required for the Project. Each of the following major process components is described below:

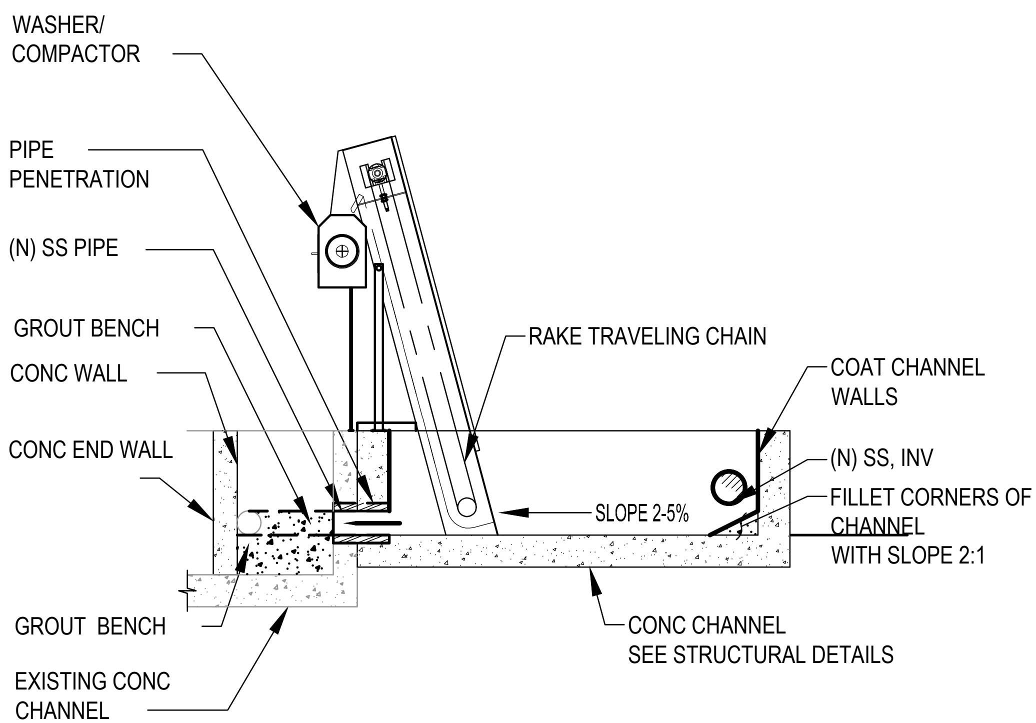
- Coarse Screening Facility;
- Headworks;
- Immersed Membrane Bioreactors;
- UV Disinfection;
- Chlorine Disinfection;

6.2.1 Coarse Screening Facility

The coarse screening facility for the WWTP is typically gravity fed and upstream of the casino lift station wet well. Due to the sources and quality of the wastewater, it is important to remove large debris to protect the downstream processes, specifically the pumps. Sewage lift station pumps typically handle solids less than 3” in diameter, so large towels, bedsheets, etc., may cause clogging and significant downtime. A typical layout for the coarse screening facility is shown as **Figure 6-2**. **Table 6-2** shows some of the design criteria for the headworks facility.

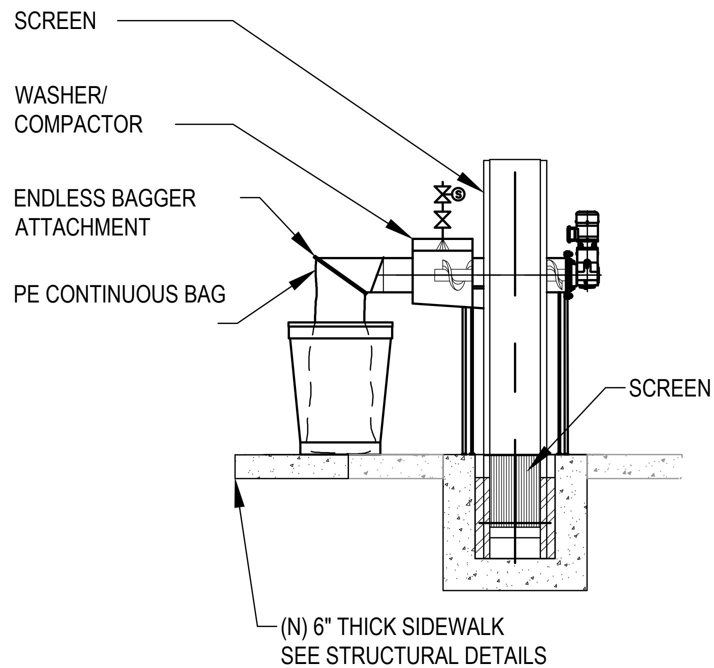
Table 6-2: Coarse Screen Design Criteria

Parameter	Value
Coarse Screening facilities	Enclosed bar screen, multi-rake style, ¼” bar spacing, washer/compactor system, and bar screen bypass system
Metering facilities	Magnetic flow meter on influent pipe
Odor control	Corrosion resistant plate covered channels, soil filter
Control	Continuous operation



TYPICAL SCREEN SECTION A –

SCALE: 3/4" = 1'-0"



TYPICAL SCREEN SECTION B –

SCALE: 1/4" = 1'-0"

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Figure 6-2
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Typical Coarse Screening Facility

6.2.2 Headworks

The headworks for the WWTP would typically include influent flow measurement, rotary type fine screens, and any required grit removal facilities. Due to the sources and quality of the wastewater, it is not expected that grit removal facilities are required at this time. However, fine screens are required to protect excessive fouling of the MBR membranes. The fine screens typically include a built-in washer/compactor and 2-mm openings that remove hair, inorganics, and wastes. The 2-mm opening is necessary to protect the integrity of the membrane filters downstream. The washed and compacted screenings collected at the headworks are typically stored in bins on-site to be periodically disposed of at a landfill.

The raw influent would be pumped by the collection system pump station through the headworks facility. After flow measurement, influent would be routed to a covered headworks influent box for distribution to two influent channels. During normal operation, one channel would be in-service, with the other available as a standby. Slide gates would control flow to each channel. Each headworks channel would be sized to match the hydraulic capacity of the plant. Within the channels would be rotary type fine screens to remove large materials from the raw influent. A map showing a typical layout for the headworks facility is shown as **Figure 6-3**. **Table 6-3** shows some of the design criteria for the headworks facility.

Table 6-3: Headworks Design Criteria

Parameter	Value
Screening facilities	Enclosed cylindrical screen with 2-mm circular perforations, integral shaftless helical scraper/conveyor and compactor, mechanical washer to break up fecal material
Metering facilities	Magnetic flow meter on influent pipe
Odor control	Corrosion resistant plate covered channels, soil filter
Control	Continuous operation

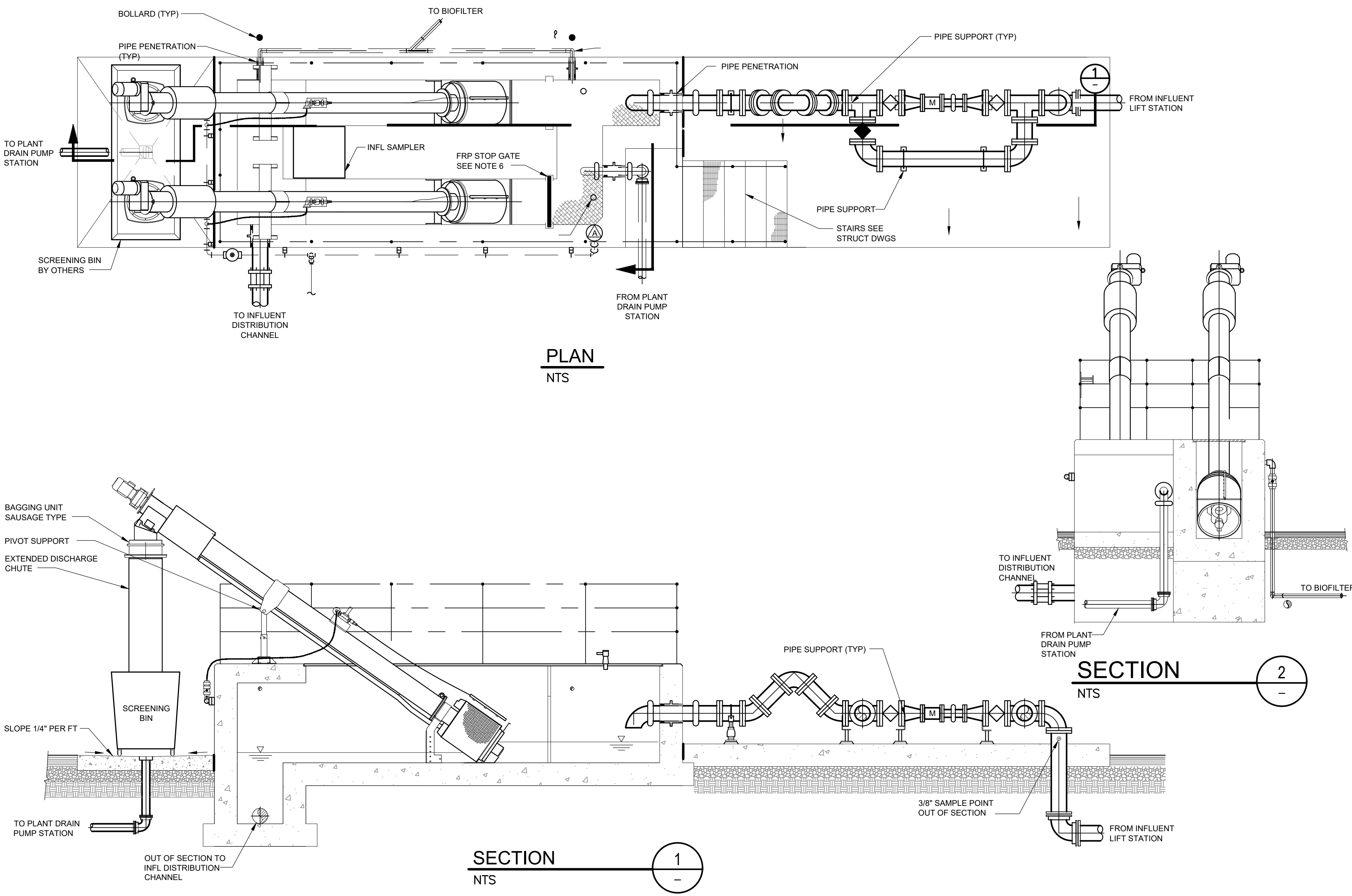

Figure 6-3
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Typical Headworks Facility

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6.2.3 Immersed Membrane Bioreactor System (Packaged)

An MBR is recommended because of the ease of permitting the plant due to the high-quality effluent, and the effluent's potential suitability for discharge. Sewage would travel between the headworks and the MBRs within a covered influent distribution force main. The force main would pass through headworks to an influent splitter box that would evenly distribute the flow to the two MBR process trains. Sluice gates would be provided to isolate basins for maintenance.

Each MBR process train is divided into three sections: an anoxic section, an aerobic section with mechanical mixers, and an aerobic section containing the immersed membranes. A typical layout for the MBR is shown as **Figure 6-4**. The proposed wastewater treatment plant would meet the design flow requirements specified in **Section 2.3.2**. The general configuration of the packaged MBR would be as follows.

Anoxic Basin: Within the anoxic basin, the influent is mixed with mixed liquor in a tank with a dissolved oxygen (DO) equal to zero. The mixed liquor is pumped back to the anoxic basin from the immersed membrane section of the MBR. The introduction of new influent wastewater to the basin provides a substrate for the return activated sludge to respire and synthesize. The lack of DO in the basin facilitates nitrification and denitrification. Ammonia compounds are converted to nitrates by nitrifying bacteria. Denitrifying bacteria convert nitrates to nitrogen gas, which volatilize out of the basin. The proportion of recirculated mixed liquor to the volume of influent is approximately 6:1. The anoxic basin has a relatively small retention time compared to the aeration basin or the immersed membrane section, due to its smaller volume.

Aeration Basins: The mixed liquor produced by the anoxic basin would flow by gravity through a short channel to the adjacent aeration basin. The aeration basin differs from the anoxic basin in that this basin contains DO, which is introduced to the tank through a series of fine bubble diffusers, connected by headers and pumped by a series of blowers. The DO is required to convert dissolved organic material into a filterable solid material. In this process, aerobic bacteria utilize the carbon in the wastewater for respiration and cell synthesis. The primary outcome result from this basin is an overall reduction in the biochemical oxygen demand (BOD), and the production of a filterable floc.

Immersed Membranes: The microfiltration membranes are long, hollow, spaghetti-like fibers with a nominal pore size of between 0.1 – 0.4 microns. Each of the individual microfiltration membranes is bundled together into modules, and each module is approximately 6 inches in diameter and 5 feet tall. The modules are grouped into sets, called cassettes, which are immersed into the mixed liquor solution. Each of the membrane modules is attached to headers, which create a suction and force water (permeate) through the membrane into the hollow center and onwards to the disinfection process. The mixed liquor that is not forced through the membrane is recirculated back to the anoxic zone. A portion of this recirculated mixed liquor is wasted to the dewatering system and disposal.

Each MBR train contains one permeate pump to force water through the membrane, including an additional standby permeate pump for the overall process that can draw from either train. These pumps can also pump permeate to the backpulse tanks, where water is stored in order to backwash the membrane. The permeate pumps also function as backpulse pumps, which pump permeate from the permeate tanks back to the membranes and keeps solids from accumulating on the membrane surface. The membranes are typically backwashed every 15 minutes, and each backwash lasts about two minutes. The entire backwash process is controlled by a PLC, which operates automatic control valves and isolates the membranes from the permeate pumping process. Sodium hypochlorite and/or citric acid is typically injected into the backpulse flow to facilitate membrane cleaning and prevent regrowth in the membrane modules.

Other facilities: A number of pumps, blowers, chemical storage, chemical metering, control, and electronic facilities are required in order to operate the MBR process. Some of these facilities are typically located in a building near the MBR process or are included on an equipment pad near the MBR system fully enclosed with sound attenuation provisions. Typically, an operations building is constructed which houses plant controls, the motor control center, maintenance facilities, chemical storage and metering, a laboratory, restroom/ washroom, and offices/space for staff. During design development, these facilities will be further defined. **Figure 6-5** shows the proposed electrical, controls, and operations building.

It is typical for a wastewater facility design to include equalization and emergency storage capacity. Equalization capacity will moderate the peak daily flows entering the WWTP. Emergency storage is typically plumbed into the sewage lift station designed to provide sufficient capacity for a peak flow event (or to-be-determined volume) if the lift station fails to deliver. The equalization tank would consist of a concrete tank either at or below grade, of a to-be-determined volume and size. Emergency storage is typically buried concrete or reinforced plastic that is gravity fed and drained from the sewage lift station.

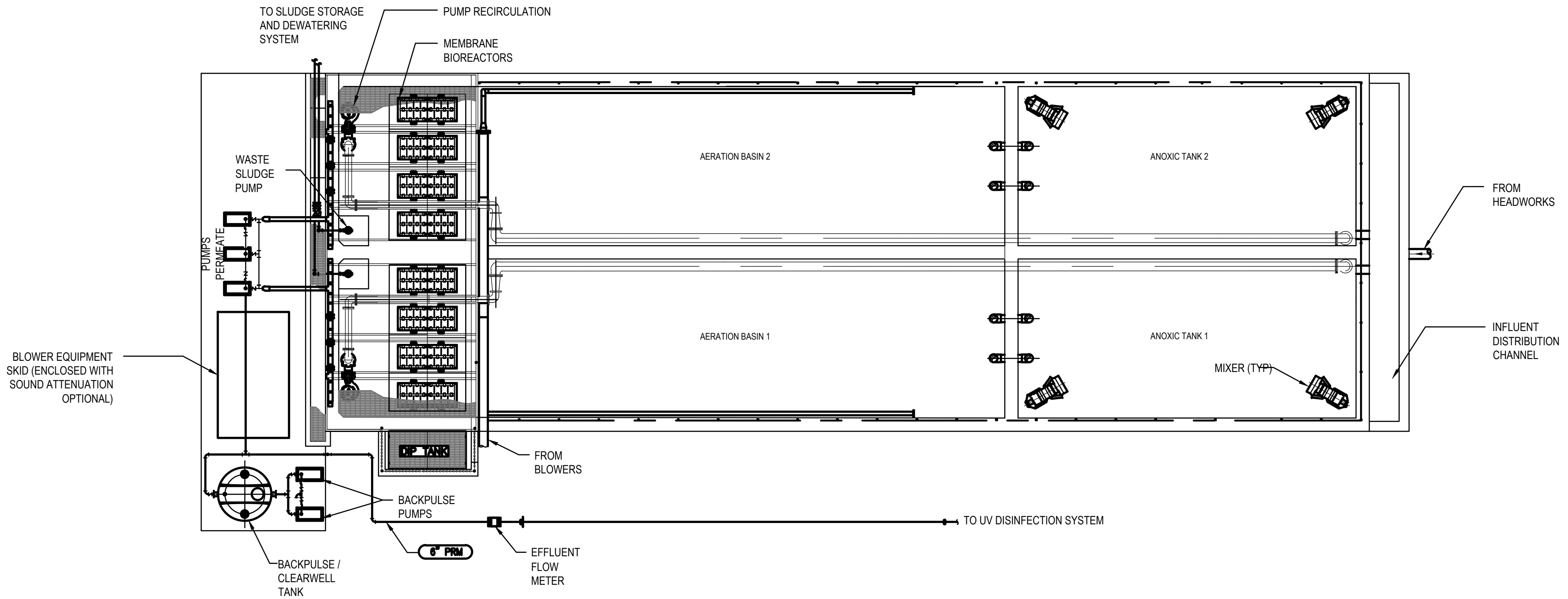

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Figure 6-4
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Preliminary Wastewater Treatment Facility Plan

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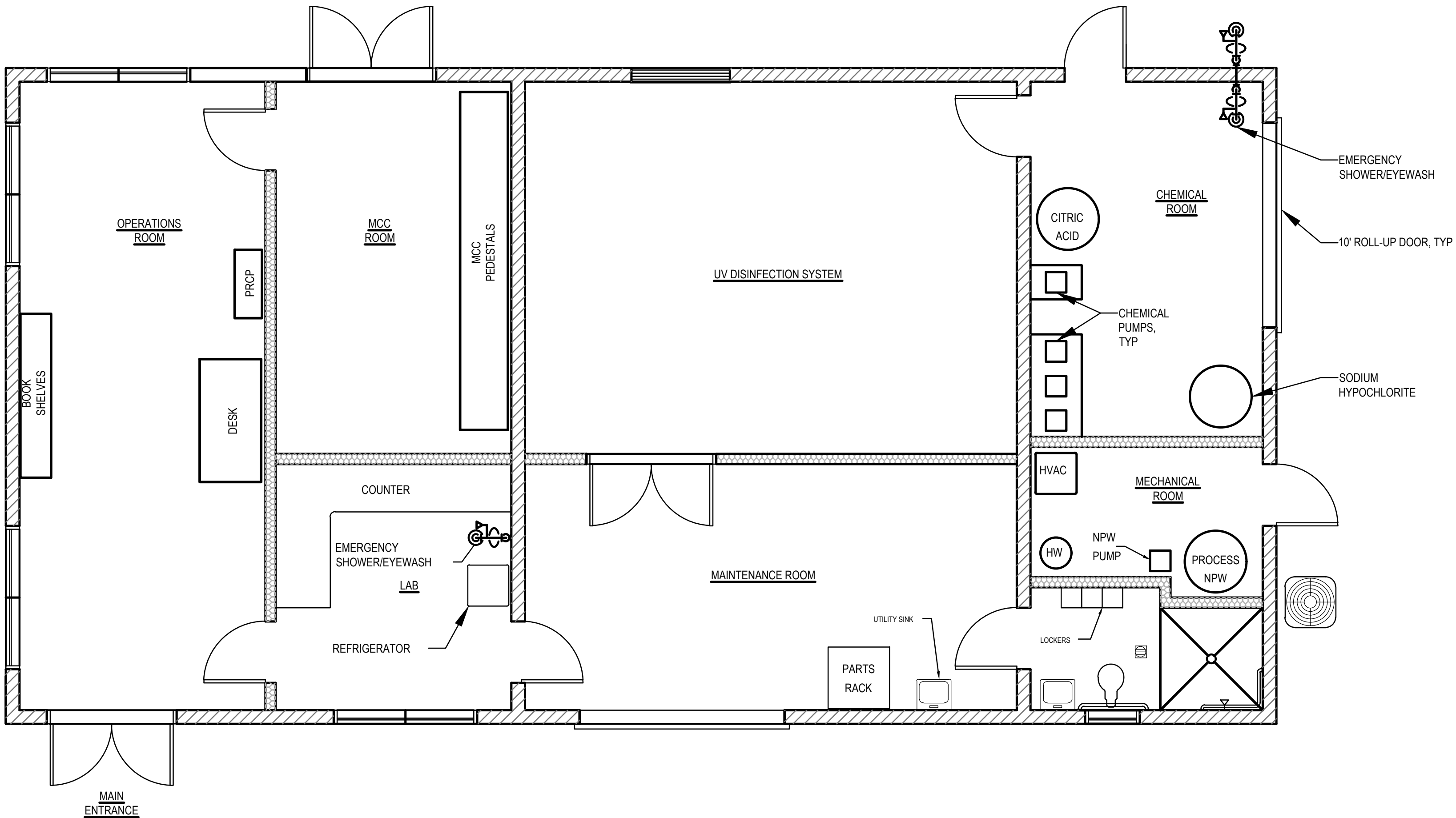

PLAN

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HydroScience

Figure 6-5
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Preliminary Operations Building Floor Plan

6.2.4 Ultraviolet Disinfection

Disinfection to meet discharge and reclamation virus and coliform water quality standards would be provided by constructing or installing an ultraviolet (UV) disinfection system in the operations building. UV disinfection facilities are typically contained within a long, narrow steel channel tank or pipe channel, with banks of UV lamps situated in a laminar flowing channel. A weir would control the water level in the channel, ensuring that the lamps are always submerged. Each UV lamp emits a light with a specific wavelength that is capable of inactivating bacteria and virus, preventing them from reproducing. A proposed location for UV facilities is shown in **Figure 6-5** in the operations building floor plan. **Table 6-4** shows a summary of the recommended UV disinfection design criteria.

Table 6-4: UV Disinfection Design Criteria

Parameter	Value
Lamp location	In-line
Type of lamps	2020W medium pressure UV lamps
Transmittance	65% through quartz sleeve
Flow metering	Magnetic flow meter

6.2.5 Chlorine Disinfection

Though the UV facilities would be designed to disinfect the treated wastewater, they do not continue to disinfect the wastewater after it leaves the UV channel. In order to prevent regrowth of bacteria in the recycled water distribution system, sodium hypochlorite is typically added in small quantities. The introduction of this chemical creates a residual concentration of chlorine that persists in the recycled water and ensures that it is safe to use after it leaves the WWTP. Typical recycled water distribution systems require at least a positive chlorine residual at the point of use, and the dosing of sodium hypochlorite will be adjusted to meet this goal. It is believed that a dose of between 2-3 mg/L for recycled water used for on-site irrigation, cooling, or toilet/urinal flushing would suffice. Chlorine would be dosed at a location downstream of the UV disinfection facilities, and before recycled water is pumped to the recycled water storage tank. Any water discharged to surface waters would be non-chlorinated or fully de-chlorinated prior to discharge.

Chlorine is a very common disinfectant in the treatment and disinfection of wastewater. Sodium hypochlorite is used throughout the wastewater industry for chlorine disinfection, and when used in accordance with that chemical's SDS, is safe for use for this purpose.

6.2.6 Effluent Pump Station

The purpose of the effluent pump station would be to pump treated wastewater to the recycled water storage tank for storage and disposal. This pump station is expected to be a low head pump station that fills the recycled water tank to provide system storage. This pump station would also provide pumping capacity to convey treated effluent directly to the seasonal storage basin/tank if needed, during a higher-than-normal precipitation year for surface water disposal.

6.2.7 Operation and Maintenance

A detailed description of the operations and maintenance program will be prepared following completion of the WWTP design. However, it is expected that the WWTP would be operated and maintained similarly to the standards of other tertiary WWTPs in California.

To this effect, this WWTP will be staffed with operators who are qualified to operate the plant safely, effectively, and in compliance with all permit requirements and regulations. It is expected that the operators will have qualifications similar to those required by the SWRCB Operator Certification Program. This program specifies that for tertiary level WWTPs with design capacities of 1.0 MGD or less, the chief plant operator must be at least a Grade III operator. Supervisors and Shift Supervisors must be at least a Grade II.

6.3 Recycled Water

This section discusses the recommended design criteria for the Project's recycled water facilities. The recommended on-site recycled water facilities include:

- Recycled Water Storage Tank and Pump Station for On-site Landscape Irrigation/Dual Plumbing Facilities/Vineyard Irrigation/Cooling Tower Makeup
- Seasonal Storage Ponds/Tank and Distribution Pump Station

Each of the recycled water facilities is described in the following sections. The overall recycled facilities will be located based on the final design of the Project facilities. All of the recommended facilities described in this section are preliminary and should be utilized for planning purposes only.

6.3.1 Recycled Water Storage Tank and Pump Station

The purpose of this tank would be to provide equalization storage for on-site recycled water use used by the Project for toilet flushing, on-site landscaping, vineyard irrigation, and other uses. Should seasonal storage facilities be constructed, the water may also be pumped to the seasonal storage basins from this storage tank. If desired, recycled water could be utilized to supply water for fire protection, such as the sprinkler systems and fire hydrants.

A typical section for the tank is shown as **Figure 6-6**. The recycled water storage tank would be constructed within the proposed WWTP site. Since the proposed site is relatively flat, the tank would not maintain pressure in the recycled water distribution system. This storage tank would be similar to the potable water storage tank with respect to construction methods. **Table 6-5** shows a summary of the recommended storage tank design criteria assuming the stored recycled water would supply only the Casino and Hotel facilities, Casino landscape and vineyards.

Table 6-5: Recycled Water Storage Tank Design Criteria

Parameter	Value
Approximate size	1 MG
Approximate diameter	60 feet
Approximate height	43 feet
Construction	Welded steel

The recycled water pump station would pump water from the recycled water storage tank to the recycled water distribution system. This pump station would likely need to continuously operate, since there will be no system storage. There are no suitable locations at the proposed Project site for a recycled water storage tank at an elevation that would allow gravity to maintain distribution system pressure.

Optionally, and if layout area permits, the recycled water storage tank and pump station may be sized to meet the recycled water demands of the Project in addition to providing seasonal storage capacity. However, this would require further evaluation and planning.

6.3.1.1 On-Site Water Reuse Facilities

This report assumes that the casino building will be dual-plumbed with both potable and recycled water. The primary uses of recycled water will be for toilet and urinal flushing, on-site landscape irrigation, on-site vineyard irrigation, and cooling tower makeup. The on-site recycled water reuse facilities will be designed to ensure that they comply with all SWRCB standards. The required on-site facilities will be identified upon completion of a site plan and preliminary engineering. The primary on-site design requirements include:

- Recycled water irrigation facilities marked in a purple color.
- Signage informing the public recycled water is used.
- Pipelines in separate trenches a minimum distance away from other water pipelines.
- Labeling of recycled water valves, boxes, and sprinkler heads.

Within the building, the interior plumbing system will have to be plumbed separately from the building's potable water system and contain no cross connections. The dual plumbed piping systems must be distinctly marked and color-coded.

6.3.2 Seasonal Storage and Discharge Facilities

The proposed seasonal discharge strategy will rely heavily on utilizing the irrigated areas for the summer application of recycled water that cannot be discharged off-site. Seasonal holding ponds, if required, would be constructed using semi-buried ponds and berms. The ponds would need to be lined with a relatively impermeable material such as clay or concrete to minimize percolation into the groundwater and are expected to be located outside of the 100-year flood plain. A typical section for the pond is shown as **Figure 6-7.**

The discharge pump station would pump out of the seasonal storage ponds/tank to the irrigated areas for re-use. These pumps will operate seasonally, typically between April and October, and would be sized to convey the entire volume of recycled water stored in the seasonal storage ponds plus a portion of the daily summertime wastewater flows within a 5-day a week, 8 hours per day time period between March and October.

If a discharge permit is obtained from the RWQCB, the preferred location for a discharge facility is near Pruitt Creek, tributary to Pool Creek and Mark West Creek. This would include a new discharge pipeline, outfall structure, and facility since currently none exist. The outfall structure would be designed to prevent erosion of the natural creek banks and erosion downstream. The elevation of the outfall pipe invert is typically determined during the design phase of the project. The outfall pipe outlet will likely include a duckbill check valve or similar component to protect against settlement/silting inside the pipe or nesting of small animals or rodents. The area around the outfall pipe will be covered with rip rap or similar material to prevent natural erosion around the pipe from occurring and to protect the banks during periods of discharge. The pipe material will need to be suitable for permanent exposure to sunlight and creek water quality conditions.

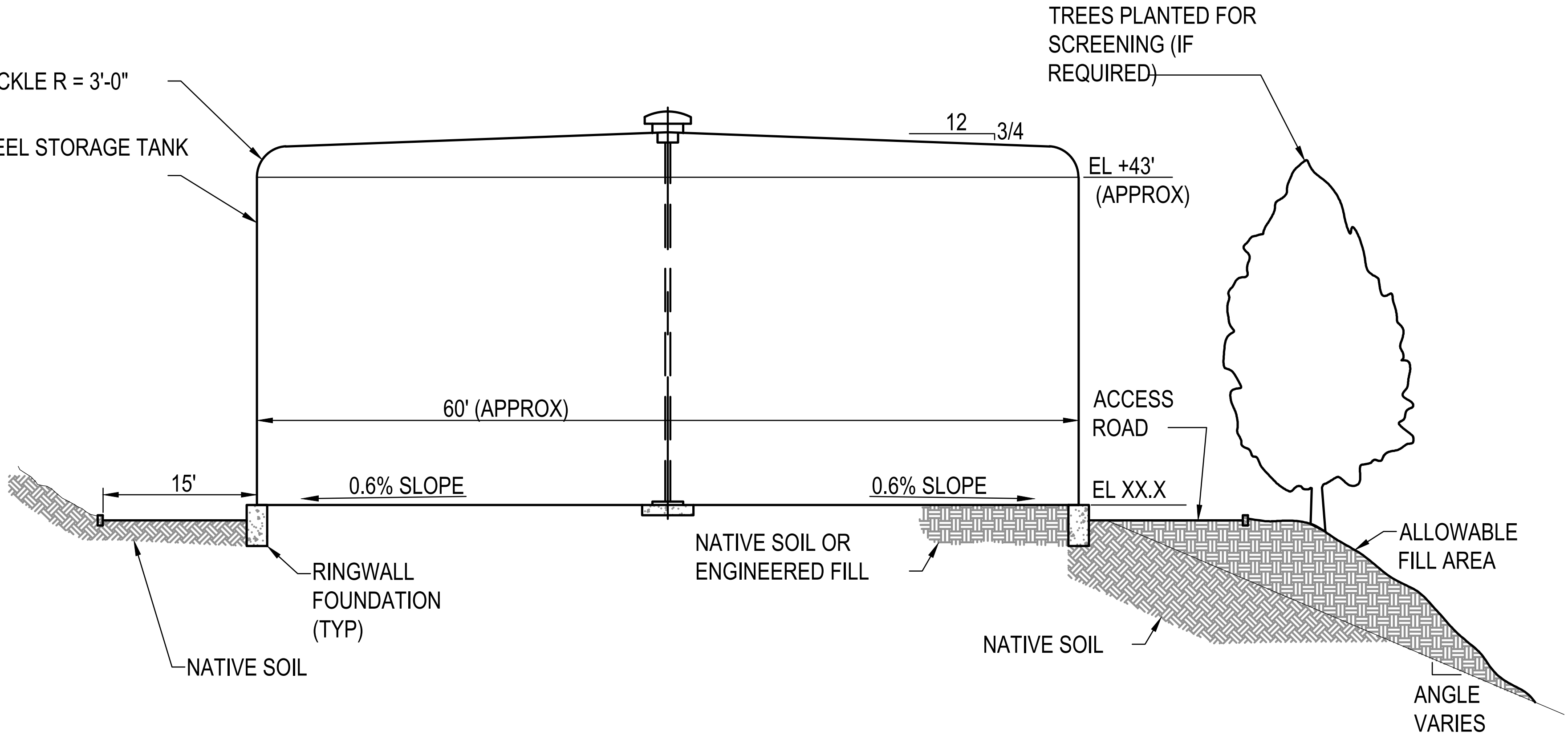

Figure 6-6
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Typical Recycled Water Storage Tank

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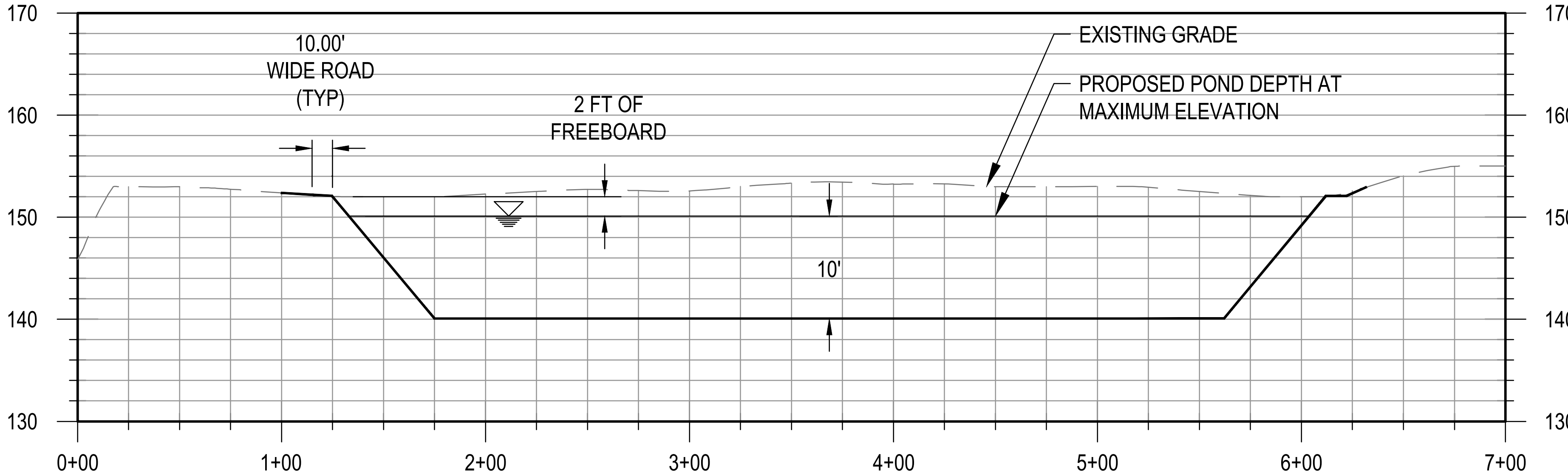

TYPICAL BASIN SECTION

(ELEVATIONS SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY)

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Figure 6-7
Acorn Environmental
Shiloh Resort and Casino Project Water and Wastewater Feasibility Study
Typical Open Storage Basin Elevation

SECTION 7 – RECOMMENDATIONS

This feasibility study report makes the following preliminary recommendations with respect to the proposed Project. This section identifies the recommendations for Alternative A and Alternative B program alternatives.

7.1 Water Supply

The Project should drill two on-site water supply wells to a depth of approximately 700 feet. Each well should be capable of meeting the peak day Project water demands.

The wells should screen off the more shallow aquifers above approximately 200 feet drawing from the deeper aquifer at depths around 400-600 feet.

The Project should plan on the following water supply facilities:

- Investigate the disposition of the existing onsite irrigation well and determine its suitability as a potable water supply source
- One additional potable well (assuming the existing well could be utilized as a second supply)
- Arsenic and Manganese water treatment plant
- Steel water storage tank
- Water distribution pump station

7.2 Wastewater Handling

The Project should construct an on-site WWTP to treat an average weekend flow of 400,000 gpd, 300,000 gpd, and 75,000 gpd for Alternatives A, B, and C, respectively.

The Project should maximize the on-site recycling of wastewater.

The Project should apply for a NPDES permit to discharge effluent to Pruitt Creek.

Flow limitations for off-site discharged should be monitored with the existing USGS gauging station at Mark West Creek. The Project should prepare contingency plans for on-site disposal of wastewater in the event that the NPDES permit is delayed or denied.

The Project should plan on constructing the following wastewater handling facilities:

- Immersed membrane bioreactor WWTP with UV Disinfection & Chlorination
- Effluent pump station
- Recycled water storage tank and pump station
- Recycled water distribution pump station
- Seasonal storage pond
- Acquiring additional property for turf grass irrigation (Alternative A and B only)

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APPENDIX A
Acorn Environmental
Water and Wastewater Feasibility Study
Projected Water and Wastewater Flows

Koi Full Build-out Space Program

	SF	SUBTOTAL	TOTAL	COMMENTS
CASINO				
Casino - Grade Level				
Vestibule	780			
Lobby	12110			
Event Center	53380			2800 Seats
BOH	56750			
Loading Dock	6750			
Net to Conversion	12,977	129,770.00		
Casino - 2nd floor				
Gaming Floor	114,345			3000 Slots / 110 Table Games
Casino Bar	7,855			
Reception Lobby	1,500			
Retail	2,250			
Unassigned 1	2,700			
Service Bar 1	1,250			
Mens Restroom 1	1,250			
Womens Restroom 1	1,250			
High Limits	8,250			
Board Room 1	2,500			
Board room 2	3,700			
Breakout	14,535			
Ballroom	12,400			
Mens Restroom 2	1,000			
Women's Restroom 2	1,000			
Service Bar 2	1,000			
BOH/ Service Elevator	1,240			
Mens Restroom 3	1,000			
Womens Restroom 3	1,000			
Service Bar 3	1,000			
Unassigned 2	11,035			
Cage/ Bank	5,400			
Bridge	5,240			
Sports Book	9,900			
BOH	1,680			
BOH/ Service Elevator	2,100			
Kitchen 1	5,100			
Restaurant 1	7,000			230 Seats
Food Hall	14,000			465 Seats
Mens Restroom 4	830			
Womens Restroom 4	830			
Service Bar 4	830			
Coffee Shop	2,750			
Unassigned 3	2,000			
Large Ballroom	32,500			
Breakout	8,550			

	SF	SUBTOTAL	TOTAL	COMMENTS
Mens Restroom 5	1,600			
Womens Restroom 5	1,600			
BOH	6,300			
Circulation	45,547			
Net to gross conversion	34,582	345,817		
Casino - 3rd floor				
Restaurant 2	5,870			195 Seats
Kitchen 2	3,790			
Restaurant 3	13,940			465 Seats
Restaurant 4	5,290			175 Seats
Kitchen 3	4,390			
Restaurant 5	5,340			175 Seats
Circulation	16,050			
BOH	5,300			
Net to gross conversion	5,997	59,970	535,557	
HOTEL				
Hotel - Grade Level				
Check -in	11,900			
Guestrooms (100)	51,885			100 Rooms per floor
Circulation	5,720			
BOH	3,170			
Net to gross conversion	7,268	72,675		
Hotel - 2nd Floor				
Guestrooms (100)	51,885			100 Rooms per floor
Circulation	5,720			
BOH	3,170			
Net to gross conversion	6,078	60,775		
Hotel - 3rd Floor				
Guestrooms (100)	51,885			100 Rooms per floor
Circulation	5,720			
BOH	3,170			
Net to gross conversion	6,078	60,775		
Hotel - 4th Floor				
Guestrooms (100)	51,885			100 Rooms per floor
Circulation	5,720			
BOH	3,170			
Net to gross conversion	6,078	60,775		
Hotel - 5th Floor				
Spa	13,930			10 Occupants + Staff
Net to gross conversion	1,393	13,930	268,930	
Heated and Cooled Total			804,487	
PARKING				
Casino				
Drop-off	51,000			
Covered - On Grade	235,000			
Bus	6,200	292,200		
Garage				
Garage - Grade level	303,520			
Garage - 2nd floor	303,520			

	SF	SUBTOTAL	TOTAL	COMMENTS
Garage - 3rd Floor	303,520			
Garage - 4th floor	303,520	1,214,080		
Paved Multi-purpose Area				
Parking	183,100	183,100	1,689,380	
Sq Footage Grand Total			**3,298,354**	
Parking Count Summary				
Casino/ Drop-off	800			
Garage - 1st Floor	923			
Garage - 2nd Floor	923			
Garage - 3rd Floor	923			
Garage - 4th Floor	923			
Paved Multi-Purpose Area	618			
Bus	9	5119		

Koi Reduced Intensity Space Program

	SF	SUBTOTAL	TOTAL	COMMENTS
CASINO				
Casino - Grade Level				
Vestibule	780			
Lobby	12110			
BOH	28423			
Loading Dock	6750			
Net to Conversion	4,806	48,063.00		
Casino - 2nd floor				
Gaming Floor	114,345			3000 Slots / 110 Table Games
Casino Bar	7,855			
Reception Lobby	1,500			
Retail	2,250			
Unassigned 1	2,700			
Service Bar 1	1,250			
Mens Restroom 1	1,250			
Womens Restroom 1	1,250			
High Limits	8,250			
Board Room 1	2,500			
Board room 2	3,700			
Breakout	14,535			
Ballroom	12,400			
Mens Restroom 2	1,000			
Women's Restroom 2	1,000			
Service Bar 2	1,000			
BOH/ Service Elevator	1,240			
Mens Restroom 3	1,000			
Womens Restroom 3	1,000			
Service Bar 3	1,000			
Unassigned 2	11,035			
Cage/ Bank	5,400			
Bridge	5,240			
Sports Book	9,900			
BOH	1,680			
BOH/ Service Elevator	2,100			
Kitchen 1	5,100			
Restaurant 1	7,000			230 Seats
Food Hall	14,000			465 Seats
Mens Restroom 4	830			
Womens Restroom 4	830			
Service Bar 4	830			
Coffee Shop	2,750			
Unassigned 3	2,000			
Mens Restroom 5	1,600			
Womens Restroom 5	1,600			
BOH	6,300			

	SF	SUBTOTAL	TOTAL	COMMENTS
Circulation	38,629			
Net to gross conversion	29,785	297,849		
Casino - 3rd floor				
Restaurant 2	5,870			195 Seats
Kitchen 2	3,790			
Restaurant 3	13,940			465 Seats
Restaurant 4	5,290			175 Seats
Kitchen 3	4,390			
Restaurant 5	5,340			175 Seats
Circulation	16,050			
BOH	5,300			
Net to gross conversion	5,997	59,970	405,882	
HOTEL				
Hotel - Grade Level				
Check -in	11,900			
Guestrooms (100)	51,885			100 Rooms per floor
Circulation	5,720			
BOH	3,170			
Net to gross conversion	7,268	72,675		
Hotel - 2nd Floor				
Guestrooms (100)	51,885			100 Rooms per floor
Circulation	5,720			
BOH	3,170			
Net to gross conversion	6,078	60,775		
Hotel - 3rd Floor				
Spa	13,930			10 Occupants + Staff
Net to gross conversion	1,393	13,930	147,380	
Heated and Cooled Total			553,262	
PARKING				
Casino				
Drop-off	51,000			
Covered - On Grade	235,000			
Bus	6,200	292,200		
Garage				
Garage - Grade level	303,520			
Garage - 2nd floor	303,520			
Garage - 3rd Floor	303,520			
Garage - 4th floor	303,520	1,214,080		
Sq Footage Grand Total			**1,106,524**	
Parking Count Summary				
Casino/ Drop-off	760			
Garage - 1st Floor	923			
Garage - 2nd Floor	923			
Garage - 3rd Floor	923			
Garage - 4th Floor	923			
Bus	9	4461		

	SF	SUBTOTAL	TOTAL	O.L.	COMMENTS

Koi Non - Gaming Square Footages

	SF	SUBTOTAL	TOTAL	O.L.	COMMENTS
Hotel	65,000 / Level	130,000 SF			
Hotel Lobby	8,000 SF				
Spa	14,000 SF			760 (Includes Hotel/Lobby)	
Restaurant	4,700 SF	4,700 SF Kitchen		337	
Winery	20,000 SF			67	
Visitor Center	5,000 SF			17	
			212,400 SF	**1,181**	

Parking Calculations	Regulation Summary	SF/Room Count			Spaces Required
Hotel	1 space/unit plus 1 space for manager	200 Rooms	5 Managers/ Staff		205 Req'd
Dining	1 Space/60 sq. ft. dining area	4,700 SF			79 Req'd
Spa	1 Space/100 SF	14,000 SF			140 Req'd
Winery	1 Space/2000 SF	46,000 SF			23 Req'd
Visitor Center	1 Space/250 SF	5,000 SF			20 Req'd
					Total
					467 Req'd

*O.L. Stands for Occuapant Load

Parking Code -https://library.municode.com/ca/sonoma_county/codes/code_of_ordinances?nodeId=CH26SOCOZORE_ART86PARE

Koi Full Build-out Space Program

	SF	SUBTOTAL	TOTAL	O.L.	COMMENTS
CASINO					
Casino - Grade Level					
Vestibule	780				
Lobby	12110				
Event Center	53380			2800	2800 Seats
BOH	59330			198	
Loading Dock	6750				
Net to Conversion	13,235	132,350.00		2,998.00	
Casino - 2nd floor					
Gaming Floor	114,345			10395	2,750 Slots/105 Table Games
Casino Bar	7,855				
Reception Lobby	1,500				
Retail	2,250				
Unassigned 1	2,700				
Service Bar 1	1,250				
Mens Restroom 1	1,250				
Womens Restroom 1	1,250				
High Limits	8,250			750	
Board Room 1	2,500			250	
Board room 2	3,700			370	
Breakout	14,535				
Ballroom	12,400			1,240	
Mens Restroom 2	1,000				
Women's Restroom 2	1,000				
Service Bar 2	1,000				
BOH/ Service Elevator	1,240				
Mens Restroom 3	1,000				
Womens Restroom 3	1,000				
Service Bar 3	1,000				
Unassigned 2	11,035				
Cage/ Bank	5,400				
Bridge	5,240				
Sports Book	9,900				
BOH	1,680				
BOH/ Service Elevator	2,100				
Kitchen 1	5,100			26	
Restaurant 1	7,000			467	230 Seats
Food Hall	14,000			465	465 Seats
Mens Restroom 4	830				
Womens Restroom 4	830				
Service Bar 4	830				
Coffee Shop	2,750			184	
Unassigned 3	2,000				

Parking Code -https://library.municode.com/ca/sonoma_county/codes/code_of_ordinances?nodeId=CH26SOCOZORE_ART86PARE

	SF	SUBTOTAL	TOTAL	O.L.	COMMENTS
Large Ballroom	32,500			3250	
Breakout	8,550				
Mens Restroom 5	1,600				
Womens Restroom 5	1,600				
BOH	6,300				
Circulation	45,547				
Net to gross conversion	34,582	345,817		17,397	
Casino - 3rd floor					
Restaurant 2	5,870			392	195 Seats
Kitchen 2	3,790			19	
Restaurant 3	13,940			930	465 Seats
Restaurant 4	5,290			353	175 Seats
Kitchen 3	4,390			22	
Restaurant 5	5,340			356	175 Seats
Circulation	16,050				
BOH	5,300				
Net to gross conversion	5,997	59,970		2,072	
			538,137	**19,469**	
HOTEL					
Hotel - Grade Level					
Check -in	11,900				
Guestrooms (100)	51,885				100 Rooms per floor
Circulation	5,720				
BOH	3,170				
Net to gross conversion	7,268	72,675			
Hotel - 2nd Floor					
Guestrooms (100)	51,885				100 Rooms per floor
Circulation	5,720				
BOH	3,170				
Net to gross conversion	6,078	60,775			
Hotel - 3rd Floor					
Guestrooms (100)	51,885				100 Rooms per floor
Circulation	5,720				
BOH	3,170				
Net to gross conversion	6,078	60,775			
Hotel - 4th Floor					
Guestrooms (100)	51,885				100 Rooms per floor
Circulation	5,720				
BOH	3,170				
Net to gross conversion	6,078	60,775			
Hotel - 5th Floor					

Parking Code -https://library.municode.com/ca/sonoma_county/codes/code_of_ordinances?nodeId=CH26SOCOZORE_ART86PARE

	SF	SUBTOTAL	TOTAL	O.L.	COMMENTS
Spa	13,930				10 Occupants + Staff
Net to gross conversion	1,393	13,930	**268,930**	**1,345**	
Heated and Cooled Total			**807,067**	**20,814**	

PARKING

Casino					
Drop-off	51,000				
Covered - On Grade	235,000				
Bus	6,200	292,200			
Garage					
Garage - Grade level	303,520				
Garage - 2nd floor	303,520				
Garage - 3rd Floor	303,520				
Garage - 4th floor	303,520	1,214,080			
Paved Multi-purpose Area					
Parking	183,100	183,100	1,689,380		
Sq Footage Grand Total			**3,303,51**		

Parking Count Summary

Casino/ Drop-off	800				
Garage - 1st Floor	923				
Garage - 2nd Floor	923				
Garage - 3rd Floor	923				
Garage - 4th Floor	923				
Paved Multi-Purpose Area	618				
Bus	9	5119			

Parking Calculations	**Regulation Summary**	**SF/Room Count**			**Spaces Required**
Hotel	1 space/unit plus 1 space for manager	400 rooms	40 Managers/ Staff		440 Req'd
Dining	1 Space/60 sq. ft. dining area	51,440 SF			857 Req'd
Event Center	1 Space/4 seats or 1 space/75 sq. ft. floor area, whichever is greater	2800 Seats/ 53380 SF			712 Req'd
Casino	1 Space per slot machine/2 Space per table game	2,960			2,960 Req'd
					Spaces Required
					4,969

Parking Code -https://library.municode.com/ca/sonoma_county/codes/code_of_ordinances?nodeId=CH26SOCOZORE_ART86PARE

Project: **Shiloh Resort and Casino Project**
Program **Alternative A**
Date: **12/7/2022**
Title: **Water Demand and Wastewater Flow Projection**

							A.M.		P.M.	Typical WEEKDAY Flows		A.M.		P.M.	Typical WEEKEND Peak Flows	WEIGHTED AVERAGE Day Flows
Element	**Units**	**Quantity**	**Quantity**	**Unit Flow (gpd/unit)**	**Base Flow**	**Factor**		**Factor**			**Factor**		**Factor**			
			SF	**gpd/unit**	**gpd**	**%**	**gpd**	**%**	**gpd**	**gpd**	**%**	**gpd**	**%**	**gpd**	**gpd**	**gpd**
CASINO			535,557													
Casino - Grade Level																
Vestibule	SF		780	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Lobby	SF		12,110	0.0	0	30%	0	50%	0	0	70%	0	80%	0	0	0
Event Center	seats	2800	53,380	35	98,000	0%	0	30%	29,400	14,700	30%	29,400	90%	88,200	58,800	33,600
BOH	LS	1	56,750	7,000	7,000	30%	2,100	50%	3,500	2,800	70%	4,900	100%	7,000	5,950	4,150
Loading Dock	SF		6,750	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Subtotal					**105,000**					**17,500**					**64,750**	**37,750**
Casino - Second Floor																
Gaming Floor	SF		114,345	0.6	68,607	30%	20,582	50%	34,304	27,443	60%	41,164	90%	61,746	51,455	37,734
Casino Bar	SF		7,855	0.7	5,106	30%	1,532	50%	2,553	2,042	60%	3,063	100%	5,106	4,085	2,918
Reception Lobby	SF		1,500	0.0	0	30%	0	50%	0	0	60%	0	80%	0	0	0
Retail	SF		2,250	0.05	113	30%	34	50%	56	45	60%	68	80%	90	79	59
Unassigned	SF		15,735	0.1	1,574	30%	472	50%	787	629	60%	944	80%	1,259	1,101	832
Service Bar	SF		4,080	0.1	408	30%	122	50%	204	163	60%	245	80%	326	286	216
Men's Restroom	SF		5,680	0.0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Women's Restroom	SF		5,680	0.0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
High Limits	LS	1	8,250	2,500	2,500	30%	750	50%	1,250	1,000	60%	1,500	80%	2,000	1,750	1,321
Board Room	SF		6,200	0.5	3,100	30%	930	50%	1,550	1,240	60%	1,860	80%	2,480	2,170	1,639
Breakout	SF		23,085	0.5	11,543	30%	3,463	50%	5,771	4,617	50%	5,771	80%	9,234	7,503	5,854
Ballroom	SF		44,900	0.75	33,675	0%	0	0%	0	0	50%	16,838	90%	30,308	23,573	10,103
BOH/Service Elevator	SF	1	9,220	1,500	1,500	0%	0	0%	0	0	0%	0	0%	0	0	0
Cage/Bank	SF		5,400	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Bridge	SF		5,240	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Sports Book	SF		9,900	0.7	6,435	30%	1,931	50%	3,218	2,574	50%	3,218	80%	5,148	4,183	3,263
Kitchen	SF		5,100	0.0	0	30%	0	50%	0	0	70%	0	100%	0	0	0
Restaurant 1	seats	230	7,000	70	16,100	30%	4,830	50%	8,050	6,440	60%	9,660	90%	14,490	12,075	8,855
Food Hall	seats	465	14,000	60	27,900	30%	8,370	50%	13,950	11,160	60%	16,740	90%	25,110	20,925	15,345
Coffee Shop	SF		2,750	2.6	7,150	50%	3,575	50%	3,575	3,575	90%	6,435	60%	4,290	5,363	4,341
Circulation	SF		45,547	0.0	0	0%	0	50%	0	0	50%	0	80%	0	0	0
Subtotal					**185,709**					**60,929**					**134,546**	**92,479**
Casino - Third Floor																
Restaurant 2	seats	195	5,870	70	13,650	30%	4,095	50%	6,825	5,460	60%	8,190	90%	12,285	10,238	7,508
Restaurant 3	seats	465	13,940	70	32,550	30%	9,765	50%	16,275	13,020	60%	19,530	90%	29,295	24,413	17,903
Restaurant 4	seats	175	5,290	70	12,250	30%	3,675	50%	6,125	4,900	60%	7,350	90%	11,025	9,188	6,738
Restaurant 5	seats	175	5,340	70	12,250	30%	3,675	50%	6,125	4,900	60%	7,350	90%	11,025	9,188	6,738
Kitchen	SF		8,180	0.0	0	30%	0	65%	0	0	70%	0	100%	0	0	0
Circulation	SF		16,050	0.0	0	30%	0	65%	0	0	50%	0	80%	0	0	0
BOH	LS	1	5,300	7,000	7,000	30%	2,100	65%	4,550	3,325	50%	3,500	80%	5,600	4,550	3,850
Subtotal					**77,700**					**31,605**					**57,575**	**42,735**
HOTEL[6]																
Hotel - Grade Level																
Check-In	SF		11,900	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
Guestrooms	rooms	100	51,885	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Circulation	SF		5,720	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
BOH	LS	1	3,170	2,500	2,500	30%	750	50%	1,250	1,000	80%	2,000	50%	1,250	1,625	1,268
Subtotal					**27,500**					**11,000**					**19,125**	**14,482**
Hotel - Second Floor																
Guestrooms	rooms	100	51,885	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Circulation	SF		5,720	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
BOH	LS	1	3,170	2,500	2,500	30%	750	50%	1,250	1,000	80%	2,000	50%	1,250	1,625	1,268
Subtotal					**27,500**					**11,000**					**19,125**	**14,482**
Hotel - Third Floor																
Guestrooms	rooms	100	51,885	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Circulation	SF		5,720	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
BOH	LS	1	3,170	2,500	2,500	30%	750	50%	1,250	1,000	80%	2,000	50%	1,250	1,625	1,268
Subtotal					**27,500**					**11,000**					**19,125**	**14,482**
Hotel - Fourth Floor																
Guestrooms	rooms	100	51,885	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Circulation	SF		5,720	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
BOH	LS	1	3,170	2,500	2,500	30%	750	50%	1,250	1,000	80%	2,000	50%	1,250	1,625	1,268
Subtotal					**27,500**					**11,000**					**19,125**	**14,482**
Hotel - Fifth Floor																
Spa	No. Occup	10	13,930	0.10	1,393	50%	697	50%	697	697	90%	1,254	90%	1,254	1,254	935
Subtotal					**1,393**					**697**					**1,254**	**935**
Total Area			**802,387**													
GRAND TOTAL WW FLOWS				**BASE FLOW**	**479,900**		**WEEKDAY AVERAGE FLOW**			**154,800**		**WEEKEND AVERAGE FLOW**			**334,700**	**231,900**
Calculated Peaking Factor										1.00					2.16	1.50
AVG POTABLE WATER DEMAND (20% INCREASE OVER WW FLOW ESTIMATE)					**575,900**					**185,800**					**401,700**	**278,300**

Assumptions -
1. Circulation, check-in and similar areas were included in BOH lump sums for Hotel and Casino.
2. All dining facilities will see high usage due to proximity to major road. Dining facility usage includes kitchen use.
3. Unit flows used were based on the most conservative values found in online data, real time data from previous projects, etc.
4. Unassigned element will see similar usage as a service bar.
5. Usage for restrooms included in the other demands.
6. The swimming pool is expected to experience nominal water loss through evaporation.

Project: **Shiloh Resort and Casino Project**
Program **Alternative B**
Date: **12/7/2022**
Title: **Water Demand and Wastewater Flow Projection**

Element	Units	Quantity	Quantity	Unit Flow (gpd/unit)	Base Flow	A.M. Factor	A.M.	P.M. Factor	P.M.	Typical WEEKDAY Flows	A.M. Factor	A.M.	P.M. Factor	P.M.	Typical WEEKEND Peak Flows	WEIGHTED AVERAGE Day Flows
			SF	gpd/unit	gpd	%	gpd	%	gpd	gpd	%	gpd	%	gpd	gpd	gpd
CASINO																
Casino - Grade Level																
Vestibule	SF		780	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Lobby	SF		12,110	0.0	0	30%	0	50%	0	0	70%	0	80%	0	0	0
BOH	LS	1	28,423	3,500	3,500	30%	1,050	50%	1,750	1,400	70%	2,450	100%	3,500	2,975	2,075
Loading Dock	SF		6,750	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Subtotal					**3,500**					**1,400**					**2,975**	**2,075**
Casino - Second Floor																
Gaming Floor	SF		114,345	0.6	68,607	30%	20,582	50%	34,304	27,443	60%	41,164	90%	61,746	51,455	37,734
Casino Bar	SF		7,855	0.7	5,106	30%	1,532	50%	2,553	2,042	60%	3,063	100%	5,106	4,085	2,918
Reception Lobby	SF		1,500	0.0	0	30%	0	50%	0	0	60%	0	80%	0	0	0
Retail	SF		2,250	0.05	113	30%	34	50%	56	45	60%	68	80%	90	79	59
Unassigned	SF		15,735	0.1	1,574	30%	472	50%	787	629	60%	944	80%	1,259	1,101	832
Service Bar	SF		4,080	0.1	408	30%	122	50%	204	163	60%	245	80%	326	286	216
Men's Restroom	SF		5,680	0.0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Women's Restroom	SF		5,680	0.0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
High Limits	LS	1	8,250	2,500	2,500	30%	750	50%	1,250	1,000	60%	1,500	80%	2,000	1,750	1,321
Board Room	SF		6,200	0.50	3,100	30%	930	50%	1,550	1,240	60%	1,860	80%	2,480	2,170	1,639
Breakout	SF		14,535	0.50	7,268	30%	2,180	50%	3,634	2,907	50%	3,634	80%	5,814	4,724	3,686
Ballroom	SF		12,400	1	9,300	0%	0	0%	0	0	50%	4,650	90%	8,370	6,510	2,790
BOH/Service Elevator	SF	1	11,320	2,500	2,500	0%	0	0%	0	0	0%	0	0%	0	0	0
Cage/Bank	SF		5,400	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Bridge	SF		5,240	0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Sports Book	SF		9,900	0.7	6,435	30%	1,931	50%	3,218	2,574	50%	3,218	80%	5,148	4,183	3,263
Kitchen	SF		5,100	0.0	0	30%	0	50%	0	0	70%	0	100%	0	0	0
Restaurant 1	seats	230	7,000	70	16,100	30%	4,830	50%	8,050	6,440	60%	9,660	90%	14,490	12,075	8,855
Food Hall	seats	465	14,000	60	27,900	30%	8,370	50%	13,950	11,160	60%	16,740	90%	25,110	20,925	15,345
Coffee Shop	SF		2,750	2.6	7,150	50%	3,575	50%	3,575	3,575	90%	6,435	60%	4,290	5,363	4,341
Circulation	SF		38,629	0.0	0	0%	0	50%	0	0	50%	0	80%	0	0	0
Subtotal					**158,059**					**59,219**					**114,705**	**82,998**
Casino - Third Floor																
Restaurant 2	seats	195	5,870	70	13,650	30%	4,095	50%	6,825	5,460	60%	8,190	90%	12,285	10,238	7,508
Restaurant 3	seats	465	13,940	70	32,550	30%	9,765	50%	16,275	13,020	60%	19,530	90%	29,295	24,413	17,903
Restaurant 4	seats	175	5,290	70	12,250	30%	3,675	50%	6,125	4,900	60%	7,350	90%	11,025	9,188	6,738
Restaurant 5	seats	175	5,340	70	12,250	30%	3,675	50%	6,125	4,900	60%	7,350	90%	11,025	9,188	6,738
Kitchen	SF		8,180	0.0	0	30%	0	65%	0	0	70%	0	100%	0	0	0
Circulation	SF		16,050	0.0	0	30%	0	65%	0	0	50%	0	80%	0	0	0
BOH	LS	1	5,300	7,000	7,000	30%	2,100	65%	4,550	3,325	50%	3,500	80%	5,600	4,550	3,850
Subtotal					**77,700**					**31,605**					**57,575**	**42,735**
HOTEL[6]																
Hotel - Grade Level																
Check-In	SF		11,900	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
Guestrooms	rooms	100	51,885	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Circulation	SF		5,720	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
BOH	LS	1	3,170	2,500	2,500	30%	750	50%	1,250	1,000	80%	2,000	50%	1,250	1,625	1,268
Subtotal					**27,500**					**11,000**					**19,125**	**14,482**
Hotel - Second Floor																
Guestrooms	rooms	100	51,885	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Circulation	SF		5,720	0.0	0	30%	0	50%	0	0	100%	0	100%	0	0	0
BOH	LS	1	3,170	2,500	2,500	30%	750	50%	1,250	1,000	80%	2,000	50%	1,250	1,625	1,268
Subtotal			**133,450**		**27,500**					**11,000**					**19,125**	**14,482**
Hotel - Third Floor																
Spa	No. Occup	10	13,930	0.10	1,393	50%	697	50%	697	697	90%	1,254	90%	1,254	1,254	935
Subtotal					**1,393**					**697**					**1,254**	**935**
Total Area			**686,712**													
GRAND TOTAL WW FLOWS				**BASE FLOW**	**295,700**			**WEEKDAY AVERAGE FLOW**		**115,000**			**WEEKEND AVERAGE FLOW**		**214,800**	**157,800**
Calculated Peaking Factor										1.00					1.87	1.37
AVG POTABLE WATER DEMAND (20% INCREASE OVER WW FLOW ESTIMATE)					**354,900**					**138,000**					**257,800**	**189,400**

Assumptions -
1. Circulation, check-in and similar areas were included in BOH lump sums for Hotel and Casino.
2. All dining facilities will see high usage due to proximity to major road. Dining facility usage includes kitchen use.
3. Unit flows used were based on the most conservative values found in online data, real time data from previous projects, etc.
4. Unassigned element will see similar usage as a service bar.
5. Usage for restrooms included in the other demands.
6. The swimming pool is expected to experience nominal water loss through evaporation.

Project: **Shiloh Resort and Winery (Non-Gaming)**
Program **Alternative C**
Date: **12/7/2022**
Title: **Water Demand and Wastewater Flow Projection**

						A.M.		P.M.		Typical WEEKDAY Flows	A.M.		P.M.		Typical WEEKEND Peak Flows	WEIGHTED AVERAGE Day Flows
Element	**Units**	**Quantity**	**Quantity**	**Unit Flow[2] (gpd/unit)**	**Base Flow**	**Factor**		**Factor**			**Factor**		**Factor**			
			SF	**gpd/unit**	**gpd**	**%**	**gpd**	**%**	**gpd**	**gpd**	**%**	**gpd**	**%**	**gpd**	**gpd**	**gpd**
FACILITY																
Dining[1]			4,700	2.6	12,220	30%	3,666	50%	6,110	4,888	60%	7,332	90%	10,998	9,165	6,721
Kitchen			4,700	0.0	0	0%	0	0%	0	0	0%	0	0%	0	0	0
Winery[4]			20,000	-											2,112	2,112
Visitor Center	SF	5,000	2,500	0.05	125	30%	38	50%	63	50	60%	75	90%	113	94	69
Tasting Room[5]			2,500	0.30	750	30%	225	50%	375	300	60%	450	90%	675	563	413
Subtotal					**13,095**					**5,238**					**11,933**	**9,314**
HOTEL[3]																
Hotel - Grade Level																
Lobby	LS	1	8,000	5,000	5,000	30%	1,500	50%	2,500	2,000	100%	5,000	100%	5,000	5,000	3,286
Guestrooms	rooms	100	65,000	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Subtotal					**30,000**					**12,000**					**22,500**	**16,500**
Hotel - Second Floor																
Guestrooms	rooms	100	65,000	250	25,000	30%	7,500	50%	12,500	10,000	50%	12,500	90%	22,500	17,500	13,214
Subtotal					**25,000**					**10,000**					**17,500**	**13,214**
Hotel - Third Floor																
Spa			14,000	0.10	1,400	50%	700	50%	700	700	90%	1,260	90%	1,260	1,260	940
Subtotal					**1,400**					**700**					**1,260**	**940**
Total Area			**186,400**													
GRAND TOTAL WW FLOWS				**BASE FLOW**	**69,500**			**WEEKDAY AVERAGE FLOW**		**28,000**			**WEEKEND AVERAGE FLOW**		**53,200**	**40,000**
Calculated Peaking Factor										1.00					1.90	1.43
AVG POTABLE WATER DEMAND (20% INCREASE OVER WW FLOW ESTIMATE)					**83,400**					**33,600**					**63,900**	**48,000**

Assumptions -
1. All dining facilities will see high usage due to proximity to major road. Dining facility usage includes kitchen use.
2. Unit flows used were based on the most conservative values found in online data, real time data from previous projects, etc.
3. The swimming pool is expected to experience nominal water loss through evaporation.
4. See separate table for winery calculations. Winery flow projections are not affected by time of day, but are affected by duration of crush season. The projections have been included in the water balance.
5. Assumed tasting room is 50% of the visitor center area building space.

Project: **Shiloh Resort (Non-Gaming)**
Program **Alternative C**
Date: **12/7/2022**
Title: **Water Demand and Wastewater Flow Projection - Winery**

						Crush Season			Non-Crush Season			Average Day Flows		AVERAGE Day Flows
Element	Units	Quantity	Production	Efficiency[1]	Annual Flow	Factor[2]	Length	Flow	Factor	Length		Crush Season	Non-Crush Season	
		SF	cases/year	gal/case	gal	%	days	gal	%	days	gpd	gpd	gpd	gpd
FACILITY														
Winery (Production)		20,000	15,000	4.8	72,000	90%	31	64,800	10%	334	7,200	2,090	22	2,112
Subtotal					**72,000**							**2,090**	**22**	**2,112**
Total Area			**20,000**											
GRAND TOTAL WW FLOWS				**BASE FLOW**	**72,000**					**WEEKDAY AVERAGE FLOW**		**2,100**	**100**	**2,200**
Calculated Peaking Factor												1.00	0.05	1.05
AVG POTABLE WATER DEMAND (20% INCREASE OVER WW FLOW ESTIMATE)					**86,400**							**2,600**	**200**	**2,700**

Assumptions -

1. Efficiency was assumed to be better than what is typical for a small facility due to being a new facility/infrastructure.
2. Percentage of grapes harvested during crush season is higher than typical due to relatively flat topography for the site and assumption that all grapes will be ready for harvesting around the same time.

Water Balance - Shiloh Resort and Casino Feasibility Study - Proposed (Alternative A)

Scenario: Alternative A - Option 1

August 2022 By: Jory Benitez/Angela Singer, HydroScience

INPUT
INPUT-Adjust as necessary
OUTPUT-Max Elevation

WASTEWATER INFLUENT FLOW			STORAGE DATA			OTHER INPUTS			RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES [2]								
Daily Average Wastewater Influent Flow	231,900	gpd	Basin Volume	12.1	MG	100-YR Multiplier	2.06	unitless	andscape Irrigation (Casino)	4.4	acres	Vineyards (Casino)	12.4	acres	Landscpe Irrig (TBD)	0.0	acres
I/I (PWWF-PDWF)	250,452	gpd	Basin Area	4.08	acres	Pan Evap Coefficient	0.75	unitless	Dual Plumbing	26.4	MG	Surface Water Discharge	301	MG	Additonal Turf Grass	0.0	acres

		100-YEAR ANNUAL PRECIPITATION RETURN PERIOD													AVERAGE ANNUAL PRECIPITATION RETURN PERIOD													
No. Days		31	30	31	31	28	31	30	31	30	31	31	30		31	30	31	31	28	31	30	31	30	31	31	30	
	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
CLIMATE INPUTS																											
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION																											
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS																											
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	3.3	3.4	3.5	3.5	3.6	3.7	3.7	3.8	3.9	3.9	4.0	4.1		4.1	4.0	3.9	3.9	3.8	3.7	3.7	3.6	3.5	3.5	3.4	3.3	
Total Water Surface Area	acre	3.3	3.4	3.5	3.5	3.6	3.7	3.7	3.8	3.9	3.9	4.0	4.1		4.1	4.0	3.9	3.9	3.8	3.7	3.7	3.6	3.5	3.5	3.4	3.3	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.5	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.6
Total Evaporation	ac-ft	-1.2	-0.4	-0.3	-0.3	-0.4	-0.7	-1.4	-2.1	-2.7	-3.3	-3.0	-2.2	-17.8	-1.5	-0.6	-0.4	-0.4	-0.5	-0.9	-1.3	-2.0	-2.4	-2.9	-2.6	-1.8	-17.3
Total Precipitation	ac-ft	1.2	1.9	4.2	3.4	3.7	2.6	1.3	0.6	0.2	0.0	0.0	0.1	19.3	0.7	1.1	2.3	1.8	1.9	1.3	0.6	0.3	0.1	0.0	0.0	0.0	10.2
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION																											
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-2.6	-2.7	-2.7	-2.4	-2.7	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-35.9	-3.3	-3.2	-3.3	-3.3	-3.0	-3.3	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-39.2
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.6	-2.7	-2.9	-2.5	-1.8	-11.6	-0.1	0.0	0.0	0.0	0.0	0.0	-1.0	-2.0	-2.8	-2.9	-2.5	-1.9	-13.3
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-1.3	-1.2	-0.7	-0.2	-3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.5	-1.3	-1.2	-0.7	-0.2	-3.9
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-16.6	-16.6	-16.6	-16.6	-16.6	-16.6	-3.1	0.0	0.0	0.0	0.0	-104.3	-1.5	-18.6	-18.6	-18.6	-18.6	-18.6	-18.6	-3.1	0.0	0.0	0.0	0.0	-116.1
RAW WATER MAKE-UP																											
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE																											
Beginning Storage Volume	ac-ft	0.0	10.6	7.9	8.6	8.2	6.8	5.1	0.0	5.3	10.3	14.7	20.3		27.5	37.1	30.7	26.2	21.2	14.9	8.8	0.0	4.5	9.5	14.3	20.3	
Change in Water Volume[4]	ac-ft	10.6	-2.6	0.6	-0.3	-1.4	-1.7	-5.1	5.3	5.0	4.4	5.5	7.3		9.6	-6.5	-4.5	-5.0	-6.2	-6.1	-8.8	4.5	5.0	4.8	6.0	7.6	
Final Storage Volume	ac-ft	10.6	7.9	8.6	8.2	6.8	5.1	0.0	5.3	10.3	14.7	20.3	27.5		37.1	30.7	26.2	21.2	14.9	8.8	0.0	4.5	9.5	14.3	20.3	27.9	

	100-Year	Average
Maximum Seasonal Storage (ac-ft)	**27.5**	**37.1**
mg	**9.0**	**12.1**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard/spray/leach field is 17.4 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

Water Balance - Shiloh Resort and Casino Feasibility Study - Proposed (Alternative A)

Scenario: Alternative A - Option 2

August 2022 By: Jory Benitez/Angela Singer, HydroScience

Legend
INPUT
INPUT-Adjust as necessary
OUTPUT-Max Elevation

WASTEWATER INFLUENT FLOW			***STORAGE DATA***			***OTHER INPUTS***			***RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES [2]***								
Daily Average Wastewater Influent Flow	231,900	gpd	Tank(s) Total Volume	15.9	MG	100-YR Multiplier	2.06	unitless	andscape Irrigation (Casino)	4.4	acres	Vineyards (Casino)	17.4	acres	Landscpe Irrig (TBD)	0.0	acres
I/I (PWWF-PDWF)	250,452	gpd				Pan Evap Coefficient	0.75	unitless	Dual Plumbing	26.4	MG	Surface Water Discharge	301	MG	Additonal Turf Grass	0.0	acres

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5
Open Storage Basin	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Water Surface Area	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.5
Total Evaporation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Precipitation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-2.6	-2.7	-2.7	-2.4	-2.7	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-35.9
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.6	-2.7	-2.9	-2.5	-1.8	-11.6
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.8	-1.7	-1.0	-0.3	-5.5
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	**-14.3**	**-14.3**	**-14.3**	**-14.3**	**-14.3**	**-14.3**	-3.1	0.0	0.0	0.0	0.0	-90.5
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	**0.0**	10.5	8.7	7.7	6.5	4.1	2.7	0.0	6.5	13.5	20.7	29.0	
Change in Water Volume[4]	ac-ft	10.5	-1.9	-1.0	-1.2	-2.4	-1.4	-2.7	6.5	7.0	7.2	8.3	9.3	
Final Storage Volume	ac-ft	10.5	8.7	7.7	6.5	4.1	2.7	0.0	6.5	13.5	20.7	29.0	38.3	

Maximum Seasonal Storage (ac-ft) **38.3**
mg **12.5**

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Water Surface Area	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.6
Total Evaporation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Precipitation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-3.2	-3.3	-3.3	-3.0	-3.3	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-39.2
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landscape Irrigation (Casino)	ac-ft	-0.1	0.0	0.0	0.0	0.0	0.0	-1.0	-2.0	-2.8	-2.9	-2.5	-1.9	-13.3
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.8	-1.7	-1.0	-0.3	-5.5
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	**-19.7**	**-19.7**	**-19.7**	**-19.7**	**-19.7**	**-19.7**	-3.1	0.0	0.0	0.0	0.0	-122.7
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	38.3	48.7	40.6	33.1	25.5	16.8	9.2	0.0	6.0	12.9	20.1	28.3	
Change in Water Volume[4]	ac-ft	10.3	-8.1	-7.5	-7.6	-8.7	-7.7	-9.2	6.0	6.9	7.2	8.3	9.2	
Final Storage Volume	ac-ft	48.7	40.6	33.1	25.5	16.8	9.2	0.0	6.0	12.9	20.1	28.3	37.6	

Maximum Seasonal Storage (ac-ft) **48.7**
mg **15.9**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard/spray/leach field is 17.4 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

Water Balance - Shiloh Resort and Casino Feasibility Study - Proposed (Alternative A)

Scenario: Alternative A - Option 3

August 2022 By: Jory Benitez/Angela Singer, HydroScience

Legend
INPUT
INPUT-Adjust as necessary
OUTPUT-Max Elevation

WASTEWATER INFLUENT FLOW			STORAGE DATA			OTHER INPUTS		
Daily Average Wastewater Influent Flow	231,900	gpd	Basin Volume	4.9	MG	100-YR Multiplier	2.06	unitless
I/I (PWWF-PDWF)	250,452	gpd	Basin Area	1.74	acres	Pan Evap Coefficient	0.75	unitless

RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES[2]									
andscape Irrigation (Casino)	4.4	acres	Vineyards (Casino)	15.0	acres	Landscpe Irrig (TBD)	11.0	acres	
Dual Plumbing	26.4	MG	Surface Water Discharge	301	MG	Additonal Turf Grass	0.0	acres	7.8

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5
Open Storage Basin	acre	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	
Total Water Surface Area	acre	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.5
Total Evaporation	ac-ft	-0.6	-0.2	-0.1	-0.1	-0.2	-0.3	-0.5	-0.8	-1.0	-1.1	-1.0	-0.7	-6.6
Total Precipitation	ac-ft	0.6	1.0	2.0	1.6	1.6	1.1	0.5	0.2	0.1	0.0	0.0	0.0	8.7
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-2.6	-2.7	-2.7	-2.4	-2.7	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-35.9
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-3.9	-6.7	-7.2	-6.3	-4.6	-28.9
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.6	-2.7	-2.9	-2.5	-1.8	-11.6
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-1.5	-1.5	-0.9	-0.2	-4.8
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-15.3	-15.3	-15.3	-15.3	-15.3	-15.3	-3.9	0.0	0.0	0.0	0.0	-97.4
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	0.0	10.6	8.4	8.3	7.5	5.5	3.9	0.0	1.3	1.0	0.1	1.2	
Change in Water Volume[4]	ac-ft	10.6	-2.1	-0.2	-0.8	-2.0	-1.6	-3.9	1.3	-0.3	-0.9	1.1	4.1	
Final Storage Volume	ac-ft	10.6	8.4	8.3	7.5	5.5	3.9	0.0	1.3	1.0	0.1	1.2	5.3	

Maximum Seasonal Storage (ac-ft) **10.6**
mg **3.4**

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	
Total Water Surface Area	acre	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.6
Total Evaporation	ac-ft	-0.6	-0.3	-0.2	-0.2	-0.2	-0.4	-0.5	-0.8	-1.0	-1.1	-1.0	-0.7	-6.9
Total Precipitation	ac-ft	0.3	0.5	1.0	0.8	0.8	0.5	0.2	0.1	0.0	0.0	0.0	0.0	4.2
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-3.2	-3.3	-3.3	-3.0	-3.3	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-39.2
Landscape Irrigation (TBD)	ac-ft	-0.3	0.0	0.0	0.0	0.0	0.0	-2.6	-5.1	-7.0	-7.3	-6.3	-4.8	-33.2
Landscape Irrigation (Casino)	ac-ft	-0.1	0.0	0.0	0.0	0.0	0.0	-1.0	-2.0	-2.8	-2.9	-2.5	-1.9	-13.3
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.7	-1.5	-1.5	-0.9	-0.2	-4.8
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-1.7	0.0	0.0	0.0	0.0	-87.2
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	5.3	15.0	12.9	11.9	10.6	8.1	6.3	0.0	1.7	0.9	0.0	1.1	
Change in Water Volume[4]	ac-ft	9.8	-2.2	-1.0	-1.3	-2.5	-1.8	-6.3	1.7	-0.8	-0.9	1.1	3.8	
Final Storage Volume	ac-ft	15.0	12.9	11.9	10.6	8.1	6.3	0.0	1.7	0.9	0.0	1.1	4.9	

Maximum Seasonal Storage (ac-ft) **15.0**
mg **4.9**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard/spray/leach field is 17.4 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

Water Balance - Shiloh Resort and Casino Feasibility Study - Proposed (Alternative A)

Scenario: Alternative A - Option 4

August 2022 By: Jory Benitez/Angela Singer, HydroScience

INPUT
INPUT-Adjust as necessary
OUTPUT-Max Elevation

WASTEWATER INFLUENT FLOW			STORAGE DATA			OTHER INPUTS			RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES [2]								
Daily Average Wastewater Influent Flow	231,900	gpd	Tank(s) Total Volume	5.6	MG	100-YR Multiplier	2.06	unitless	ndscape Irrigation (Casino)	4.4	acres	Vineyards (Casino)	17.4	acres	Landscpe Irrig (TBD)	11.0	acres
I/I (PWWF-PDWF)	250,452	gpd				Pan Evap Coefficient	0.75	unitless	Dual Plumbing	26.4	MG	Surface Water Discharge	301	MG	Additonal Turf Grass	0.0	acres 9.9

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5
Open Storage Basin	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Water Surface Area	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.5
Total Evaporation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Precipitation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-2.6	-2.7	-2.7	-2.4	-2.7	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-35.9
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-3.9	-6.7	-7.2	-6.3	-4.6	-28.9
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.6	-2.7	-2.9	-2.5	-1.8	-11.6
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.8	-1.7	-1.0	-0.3	-5.5
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-14.3	-14.3	-14.3	-14.3	-14.3	-14.3	-5.7	0.0	0.0	0.0	0.0	-92.9
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	0.0	10.5	8.7	7.7	6.5	4.2	2.9	0.0	0.0	0.3	0.3	2.2	
Change in Water Volume[4]	ac-ft	10.5	-1.8	-1.0	-1.2	-2.3	-1.3	-2.9	0.0	0.3	0.0	1.9	4.7	
Final Storage Volume	ac-ft	10.5	8.7	7.7	6.5	4.2	2.9	0.0	0.0	0.3	0.3	2.2	7.0	

Maximum Seasonal Storage (ac-ft) **10.5**
mg **3.4**

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	7.2	7.0	7.2	7.2	6.5	7.2	7.0	7.2	7.0	7.2	7.2	7.0	84.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	22.1	21.4	22.1	22.1	20.0	22.1	21.4	22.1	21.4	22.1	22.1	21.4	260.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Water Surface Area	acre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.6
Total Evaporation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Precipitation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-6.9	-6.7	-6.9	-6.9	-6.2	-6.9	-6.7	-6.9	-6.7	-6.9	-6.9	-6.7	-81.1
Cooling Tower	ac-ft	-3.3	-3.2	-3.3	-3.3	-3.0	-3.3	-3.2	-3.3	-3.2	-3.3	-3.3	-3.2	-39.2
Landscape Irrigation (TBD)	ac-ft	-0.3	0.0	0.0	0.0	0.0	0.0	-2.6	-5.1	-7.0	-7.3	-6.3	-4.8	-33.2
Landscape Irrigation (Casino)	ac-ft	-0.1	0.0	0.0	0.0	0.0	0.0	-1.0	-2.0	-2.8	-2.9	-2.5	-1.9	-13.3
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.8	-1.7	-1.0	-0.3	-5.5
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-14.0	-14.0	-14.0	-14.0	-14.0	-14.0	-3.8	0.0	0.0	0.0	0.0	-89.3
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	7.0	17.0	14.7	12.9	11.0	8.0	6.0	0.0	0.2	0.1	0.0	2.0	
Change in Water Volume[4]	ac-ft	10.1	-2.4	-1.8	-1.9	-3.0	-2.0	-6.0	0.2	-0.1	-0.1	1.9	4.5	
Final Storage Volume	ac-ft	17.0	14.7	12.9	11.0	8.0	6.0	0.0	0.2	0.1	0.0	2.0	6.4	

Maximum Seasonal Storage (ac-ft) **17.0**
mg **5.6**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard/spray/leach field is 17.4 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

Water Balance - Shiloh Resort and Casino Feasibility Study - Reduced Intensity (Alternative B)

Scenario: Alternative B - Option 1

August 2022 By: Jory Benitez/Angela Singer, HydroScience

INPUT
INPUT-Adjust as necessary
OUTPUT-Max Elevation

WASTEWATER INFLUENT FLOW			STORAGE DATA			OTHER INPUTS			RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES[2]								
Daily Average Wastewater Influent Flow	157,800	gpd	Basin Volume	4.5	MG	100-YR Multiplier	2.06	unitless	andscape Irrigation (Casino)	6.7	acres	Vineyards (Casino)	19.8	acres	Landscape Irrig (TBD)	0.0	acres
I/I (PWWF-PDWF)	170,424	gpd	Basin Area	1.61	acres	Pan Evap Coefficient	0.75	unitless	Dual Plumbing	18.2	MG	Surface Water Discharge	301	MG	Additional Turf Grass	0.0	acres

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	4.9	4.7	4.9	4.9	4.4	4.9	4.7	4.9	4.7	4.9	4.9	4.7	57.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	15.0	14.6	15.0	15.0	13.6	15.0	14.6	15.0	14.5	15.0	15.0	14.5	177.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5
Open Storage Basin	acre	1.2	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.6	1.6	
Total Water Surface Area	acre	1.2	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.6	1.6	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.4
Total Evaporation	ac-ft	-0.4	-0.1	-0.1	-0.1	-0.1	-0.2	-0.5	-0.8	-1.0	-1.3	-1.2	-0.9	-6.8
Total Precipitation	ac-ft	0.4	0.7	1.5	1.2	1.3	1.0	0.5	0.2	0.1	0.0	0.0	0.0	7.0
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-4.7	-4.6	-4.7	-4.7	-4.3	-4.7	-4.6	-4.7	-4.6	-4.7	-4.7	-4.6	-55.8
Cooling Tower	ac-ft	-2.3	-1.8	-1.8	-1.8	-1.7	-1.8	-2.2	-2.3	-2.2	-2.3	-2.3	-2.2	-24.7
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-2.4	-4.1	-4.4	-3.9	-2.8	-17.6
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-2.0	-1.9	-1.1	-0.3	-6.3
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-10.6	-10.6	-10.6	-10.6	-10.6	-10.6	-3.1	0.0	0.0	0.0	0.0	-68.1
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	0.0	6.7	5.2	5.2	4.9	3.8	2.8	0.0	1.2	1.9	2.2	4.0	
Change in Water Volume[4]	ac-ft	6.7	-1.5	0.0	-0.4	-1.1	-1.0	-2.8	1.2	0.7	0.4	1.8	3.8	
Final Storage Volume	ac-ft	6.7	5.2	5.2	4.9	3.8	2.8	0.0	1.2	1.9	2.2	4.0	7.8	

Maximum Seasonal Storage (ac-ft) **7.8**
mg **2.5**

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	4.9	4.7	4.9	4.9	4.4	4.9	4.7	4.9	4.7	4.9	4.9	4.7	57.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	15.0	14.6	15.0	15.0	13.6	15.0	14.6	15.0	14.5	15.0	15.0	14.5	177.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2	
Total Water Surface Area	acre	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2	1.2	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.4
Total Evaporation	ac-ft	-0.6	-0.2	-0.2	-0.1	-0.2	-0.3	-0.5	-0.7	-0.9	-1.0	-0.9	-0.6	-6.3
Total Precipitation	ac-ft	0.3	0.4	0.9	0.7	0.7	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.9
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-4.7	-4.6	-4.7	-4.7	-4.3	-4.7	-4.6	-4.7	-4.6	-4.7	-4.7	-4.6	-55.8
Cooling Tower	ac-ft	-2.3	-2.2	-2.3	-2.3	-2.1	-2.3	-2.2	-2.3	-2.2	-2.3	-2.3	-2.2	-26.9
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Landscape Irrigation (Casino)	ac-ft	-0.2	0.0	0.0	0.0	0.0	0.0	-1.6	-3.1	-4.3	-4.4	-3.9	-2.9	-20.2
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-2.0	-1.9	-1.1	-0.3	-6.3
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-3.1	0.0	0.0	0.0	0.0	-66.9
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	7.8	13.9	11.6	10.4	8.8	6.4	4.4	0.0	0.4	1.0	1.5	3.6	
Change in Water Volume[4]	ac-ft	6.1	-2.3	-1.3	-1.6	-2.4	-2.0	-4.4	0.4	0.6	0.6	2.1	3.9	
Final Storage Volume	ac-ft	13.9	11.6	10.4	8.8	6.4	4.4	0.0	0.4	1.0	1.5	3.6	7.5	

Maximum Seasonal Storage (ac-ft) **13.9**
mg **4.5**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard field is 22 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

Water Balance - Shiloh Resort and Casino Feasibility Study - Reduced Intensity (Alternative B)

Scenario: Alternative B - Option 2

August 2022 By: Jory Benitez/Angela Singer, HydroScience

INPUT
INPUT-Adjust as necessary
OUTPUT-Max Elevation

WASTEWATER INFLUENT FLOW			STORAGE DATA			OTHER INPUTS		
Daily Average Wastewater Influent Flow	157,800	gpd	Basin Volume	2.2	MG	100-YR Multiplier	2.06	unitless
I/I (PWWF-PDWF)	170,424	gpd	Basin Area	0.83	acres	Pan Evap Coefficient	0.75	unitless

RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES[2]								
andscape Irrigation (Casino)	6.7	acres	Vineyards (Casino)	20.7	acres	Landscpe Irrig (TBD)	8.9	acres
Dual Plumbing	18.2	MG	Surface Water Discharge	301	MG	Additonal Turf Grass	0.0	acres

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	4.9	4.7	4.9	4.9	4.4	4.9	4.7	4.9	4.7	4.9	4.9	4.7	57.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	15.0	14.6	15.0	15.0	13.6	15.0	14.6	15.0	14.5	15.0	15.0	14.5	177.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5
Open Storage Basin	acre	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	
Total Water Surface Area	acre	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.4
Total Evaporation	ac-ft	-0.3	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.4	-0.4	-0.5	-0.4	-0.3	-2.9
Total Precipitation	ac-ft	0.3	0.5	0.9	0.7	0.7	0.5	0.2	0.1	0.0	0.0	0.0	0.0	4.0
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-4.7	-4.6	-4.7	-4.7	-4.3	-4.7	-4.6	-4.7	-4.6	-4.7	-4.7	-4.6	-55.8
Cooling Tower	ac-ft	-2.3	-1.8	-1.8	-1.8	-1.7	-1.8	-2.2	-2.3	-2.2	-2.3	-2.3	-2.2	-24.7
Landscape Irrigation (TBD)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	**-1.5**	**-1.2**	**-1.0**	**-2.5**	-3.7	-10.0
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-2.4	-4.1	-4.4	-3.9	-2.8	-17.6
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-2.1	-2.0	-1.2	-0.3	-6.6
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	**-10.2**	**-10.2**	**-10.2**	**-10.2**	**-10.2**	**-10.2**	-3.1	0.0	0.0	0.0	0.0	-65.9
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	**0.0**	6.7	5.4	5.3	4.8	3.5	2.5	0.0	0.0	0.0	0.0	0.0	
Change in Water Volume[4]	ac-ft	6.7	-1.3	-0.1	-0.5	-1.3	-1.0	-2.5	0.0	0.0	0.0	0.0	0.6	
Final Storage Volume	ac-ft	6.7	5.4	5.3	4.8	3.5	2.5	0.0	0.0	0.0	0.0	0.0	0.7	

Maximum Seasonal Storage (ac-ft) **6.7**
mg **2.2**

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	4.9	4.7	4.9	4.9	4.4	4.9	4.7	4.9	4.7	4.9	4.9	4.7	57.6
I/I Contributions	MG	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0	0	0	0.1
TOTAL Wastewater Influent	ac-ft	15.0	14.6	15.0	15.0	13.6	15.0	14.6	15.0	14.5	15.0	15.0	14.5	177.0
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	
Total Water Surface Area	acre	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.4
Total Evaporation	ac-ft	-0.3	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.4	-0.4	-0.5	-0.4	-0.3	-3.0
Total Precipitation	ac-ft	0.1	0.2	0.5	0.4	0.4	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.9
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-4.7	-4.6	-4.7	-4.7	-4.3	-4.7	-4.6	-4.7	-4.6	-4.7	-4.7	-4.6	-55.8
Cooling Tower	ac-ft	-2.3	-2.2	-2.3	-2.3	-2.1	-2.3	-2.2	-2.3	-2.2	-2.3	-2.3	-2.2	-26.9
Landscape Irrigation (TBD)	ac-ft	-0.2	0.0	0.0	0.0	0.0	0.0	-2.1	**-0.6**	**-1.0**	**-1.0**	**-2.5**	**-3.9**	-11.2
Landscape Irrigation (Casino)	ac-ft	-0.2	0.0	0.0	0.0	0.0	0.0	-1.6	-3.1	-4.3	-4.4	-3.9	-2.9	-20.2
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.9	-2.1	-2.0	-1.2	-0.3	-6.6
Additional Turf Grass	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface Water Discharge (Creek)	ac-ft	-1.5	**-8.7**	**-8.7**	**-8.7**	**-8.7**	**-8.7**	**-8.7**	-3.1	0.0	0.0	0.0	0.0	-56.7
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	0.7	6.7	6.0	6.1	6.0	5.0	4.6	0.0	0.0	0.0	0.0	0.0	
Change in Water Volume[4]	ac-ft	6.1	-0.7	0.0	-0.1	-0.9	-0.4	-4.6	0.0	0.0	0.0	0.0	0.3	
Final Storage Volume	ac-ft	6.7	6.0	6.1	6.0	5.0	4.6	0.0	0.0	0.0	0.0	0.0	0.4	

Maximum Seasonal Storage (ac-ft) **6.7**
mg **2.2**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard 22 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

Water Balance - Shiloh Resort and Casino Feasibility Study - Non-Gaming Facility (Alternative C)

Scenario: Alternative C - Option 1

August 2022 By: Jory Benitez/Angela Singer, HydroScience

INPUT-Adjust as necessary

WASTEWATER INFLUENT FLOW			STORAGE DATA		OTHER INPUTS	
Daily Average Wastewater Influent Flow	37,900	gpd	Basin Volume	4.3 MG	100-YR Multiplier	2.06 unitless
I/I (PWWF-PDWF)	40,932	gpd	Basin Area	1.54 acres	Pan Evap Coefficient	0.75 unitless

RECYCLED WATER DISTRIBUTION AND DISPOSAL ALTERNATIVES[2]								
andscape Irrigation (Casino)	8.3	acres	Vineyards (Casino)	43.2	acres	Landscpe Irrig (TBD)	0.0	acres
Dual Plumbing	7.0	MG	Surface Water Discharge	0.7	MG	Additonal Turf Grass	0.0	acres

100-YEAR ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	4.32	6.85	14.63	11.59	12.16	8.50	4.08	2.00	0.51	0.02	0.02	0.31	65.00
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.40	0.93	0.86	1.21	2.13	4.37	6.68	8.25	9.92	9.05	6.50	55.57
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	1.2	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.2	1.1	13.8
Winery Wastewater Influent	MG	0.065	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.1
I/I Contributions	MG	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0.0
TOTAL Wastewater Influent	ac-ft	3.8	3.5	3.6	3.6	3.3	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42.7
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.2	0.4	0.8	0.6	0.6	0.5	0.2	0.1	0.0	0.0	0.0	0.0	3.5
Open Storage Basin	acre	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.5	1.4	1.3	1.2	1.1	
Total Water Surface Area	acre	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.5	1.4	1.3	1.2	1.1	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.1
Total Evaporation	ac-ft	-0.4	-0.1	-0.1	-0.1	-0.1	-0.3	-0.6	-0.8	-0.9	-1.1	-0.9	-0.6	-6.0
Total Precipitation	ac-ft	0.4	0.7	1.5	1.3	1.4	1.0	0.5	0.2	0.1	0.0	0.0	0.0	7.2
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-1.8	-1.8	-1.8	-1.8	-1.6	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-21.4
Cooling Tower	ac-ft	-0.9	-0.7	-0.7	-0.7	-0.6	-0.7	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9	-9.5
Landscape Irrigation (TBD)	ac-ft	0	0	0	0	0	0	0	0	0	0	0	0	0
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	-0.2	-0.3
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	-4.4	-4.2	-2.5	-0.7	-13.7
Additional Turf Grass	ac-ft	0	0	0	0	0	0	0	0	0	0	0	0	0
Surface Water Discharge (Creek)	ac-ft	-1.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	0.0	0.0	0.0	0.0	0.0	-2.3
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	0.0	0.0	1.8	4.9	7.6	10.3	12.5	13.2	11.8	7.4	3.0	0.5	
Change in Water Volume[4]	ac-ft	0.0	1.8	3.1	2.7	2.7	2.1	0.8	-1.5	-4.4	-4.4	-2.5	-0.5	
Final Storage Volume	ac-ft	0.0	1.8	4.9	7.6	10.3	12.5	13.2	11.8	7.4	3.0	0.5	0.0	

Maximum Seasonal Storage (ac-ft) **13.2**
mg **4.3**

AVERAGE ANNUAL PRECIPITATION RETURN PERIOD

	Units	October	November	December	January	February	March	April	May	June	July	August	September	Water Year
No. Days		31	30	31	31	28	31	30	31	30	31	31	30	
CLIMATE INPUTS														
Precipitation	in	2.10	3.33	7.11	5.63	5.91	4.13	1.98	0.97	0.25	0.01	0.01	0.15	31.58
Pan Evaporation	in	5.72	2.48	1.66	1.53	2.15	3.79	5.82	8.90	11.00	13.22	12.06	8.67	77.00
Effective Water Surface Evaporation	in	4.29	1.86	1.25	1.15	1.61	2.84	4.37	6.68	8.25	9.92	9.05	6.50	57.75
WASTEWATER GENERATION														
Facility Wastewater Influent (ADWF)	MG	1.2	1.1	1.2	1.2	1.1	1.2	1.1	1.2	1.1	1.2	1.2	1.1	13.8
Winery Wastewater Influent	MG	0.065	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.1
I/I Contributions	MG	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0.0
TOTAL Wastewater Influent	ac-ft	3.8	3.5	3.6	3.6	3.3	3.6	3.5	3.6	3.5	3.6	3.6	3.5	42.7
WWTP CONTRIBUTIONS														
Site Run-off	ac-ft	0.1	0.2	0.4	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0	1.7
Open Storage Basin	acre	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.5	1.4	1.3	1.2	1.1	
Total Water Surface Area	acre	1.1	1.2	1.2	1.3	1.4	1.5	1.5	1.5	1.4	1.3	1.2	1.1	
Cooling Tower Evaporation/Drift Loss[5]	ac-ft	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.2
Total Evaporation	ac-ft	-0.4	-0.2	-0.1	-0.1	-0.2	-0.3	-0.6	-0.8	-0.9	-1.1	-0.9	-0.6	-6.2
Total Precipitation	ac-ft	0.2	0.3	0.7	0.6	0.7	0.5	0.3	0.1	0.0	0.0	0.0	0.0	3.5
Total Percolation	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RECYCLED WATER DISTRIBUTION														
Dual Plumbing	ac-ft	-1.8	-1.8	-1.8	-1.8	-1.6	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-1.8	-21.4
Cooling Tower	ac-ft	-0.9	-0.9	-0.9	-0.9	-0.8	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9	-10.3
Landscape Irrigation (TBD)	ac-ft	0.0	0	0	0	0	0	0	0	0	0	0	0	0
Landscape Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vineyard Irrigation (Casino)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.9	-4.4	-4.2	-2.5	-0.7	-13.7
Additional Turf Grass	ac-ft	0.0	0	0	0	0	0	0	0	0	0	0	0	0
Surface Water Discharge (Creek)	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAW WATER MAKE-UP														
Blend Raw Water[1]	ac-ft	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	2.5	0.4	4.0
MONTHLY STORAGE BALANCE														
Beginning Storage Volume	ac-ft	0.0	1.0	2.2	4.1	5.8	7.4	8.7	9.3	7.7	3.3	0.0	0.0	
Change in Water Volume[4]	ac-ft	1.0	1.2	1.9	1.7	1.6	1.3	0.7	-1.7	-4.4	-3.3	0.0	0.0	
Final Storage Volume	ac-ft	1.0	2.2	4.1	5.8	7.4	8.7	9.3	7.7	3.3	0.0	0.0	0.0	

Maximum Seasonal Storage (ac-ft) **9.3**
mg **3.0**

Note:
1. Blend Raw Water is the deficit in ww flow generated to meet recycled water demands, to resolve then less water would be discharged for irrigation or surface water.
2. Total available area for vineyard field is 45.3 acres approximately.
3. Assumed all equipment open basin/tankage would include covers and won't contribute to ww flows, confirm as more information becomes available.
4. Change in water volume negative since stored volume is available to be transferred out to distribution.
5. Cooling tower evaporation loss estimated at 1.5% of monthly water demand.

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APPENDIX B

Acorn Environmental

Water and Wastewater Feasibility Study

Windsor Groundwater Well Installation and Testing Project

Summary Report

This appendix is available upon request. Please contact the following person for a copy:

Chad Broussard
Environmental Protection Specialist,
Bureau of Indian Affairs
Pacific Regional Office,
2800 Cottage Way, Room W–2820,
Sacramento, CA 95825
telephone: (916) 978–6165
e-mail: chad.broussard@bia.gov

APPENDIX C

Acorn Environmental

Water and Wastewater Feasibility Study

Esposti Supply Well Redevelopment, Pumping Test and Treatment Feasibility Study

This appendix is available upon request. Please contact the following person for a copy:

Chad Broussard
Environmental Protection Specialist,
Bureau of Indian Affairs
Pacific Regional Office,
2800 Cottage Way, Room W–2820,
Sacramento, CA 95825
telephone: (916) 978–6165
e-mail: chad.broussard@bia.gov

APPENDIX D

Acorn Environmental

Water and Wastewater Feasibility Study

Geotechnical Data Memorandum

CE&G
Pragmatic Expertise™

CAL ENGINEERING & GEOLOGY
785 Ygnacio Valley Rd. | Walnut Creek | CA 94596
6455 Almaden Expwy., Suite 100| San José | CA 95120
23785 Cabot Blvd., Suite 321 | Hayward | CA 94545
www.caleng.com

GEOTECHNICAL DATA MEMORANDUM

To: Curtis Lam, Principal
HydroScience Engineers
741 Allston Way
Berkeley, California 94710

From: Christian Rodil, E.I.T. & Kevin Loeb P.G., C.E.G.
Cal Engineering & Geology, Inc.
6455 Almaden Expwy., Suite 100
San Jose, California 95120

CERTIFIED ENGINEERING GEOLOGIST
KEVIN P. LOEB
No. 2763
STATE OF CALIFORNIA

Date: 26 July 2022

RE: Geotechnical Data Memorandum
Windsor Wastewater Treatment System Project
Windsor, California
CE&G Document 220270.001

INTRODUCTION

Cal Engineering & Geology, Inc. (CE&G) has provided geotechnical engineering services to HydroScience Engineers for the Windsor Wastewater Treatment System Project located in Windsor, California. This geotechnical memorandum has been prepared to provide a summary of subsurface soil and groundwater conditions, as well as percolation rate data for the project site soils to be considered during the design and construction of the planned improvements.

SCOPE OF SERVICES

The purpose of CE&G's geotechnical engineering services was to explore and evaluate the percolation potential of shallow subsurface soils in the planned percolation pond areas, around the project site as well as provide information on subsurface soils for use by the project designer.

The scope of work completed for this study and memorandum included:

- Completion of an office study to identify and evaluate relevant geologic and geotechnical information available for the site, including published geologic maps, and unpublished geotechnical information in our files regarding the site and vicinity.

- Geologic reconnaissance to observe current site conditions and to mark for Underground Service Alert (USA) utility clearance.

- Excavation of four test pits to visually classify subsurface soils and perform percolation testing.

- Laboratory testing to determine key engineering index properties of selected earth materials.

- Engineering analyses to evaluate percolation rates of on-site shallow soils.

- Preparation of this geotechnical data memorandum.

SITE DESCRIPTION

The project site is located at 222 E Shiloh Rd. in Windsor, California as shown in Figure 1, and is bounded by Old Redwood Highway on the west; East Shiloh Road on the north; a neighboring vineyard to the east; and Santa Rosa Mineral Gem Society to the south. The project site is divided by the northeast-southwest trending Pruitt Creek, which flows southwest. Most of the project site is comprised of vineyards with various access roads and a single dwelling unit and associated improvements as well as a storage structure near the eastern border. Elevations throughout the project site range from approximately 134 to 160 feet above sea level with elevations decreasing from northeast to southwest.

A topographic survey of the project site was prepared by HMH, Inc. and provided to us by HydroScience Engineers. The topographic survey as well as other site features are shown in the attached Site Plan (Figure 2).

SITE GEOLOGY

The general vicinity of the project site has been mapped several times, with geologic mapping having different emphases (e.g., Knudsen and others, 2000; Graymer and others, 2006; and Witter and others, 2006). Knudsen and others (2000) mapped Quaternary geologic materials in detail for much of the San Francisco Bay Area. Much of Knudsen and others' mapping was incorporated or refined by Witter and others (2006). For the purposes of the project, the Quaternary geologic mapping of Knudsen and others (2000), refined by Witter and others (2006) is the most detailed and pertinent. The central and southwestern portions of the site are mapped as being underlain by Holocene to Latest Pleistocene aged basin deposits, which generally consist of poorly drained, clay-rich soils (Witter and others, 2006). The northern and eastern limits of the project site are mapped as being underlain by Holocene-aged alluvial fan deposits, which generally consist of varying amounts of sand, gravel, silt, and clay, and are moderately- to poorly-sorted and bedded (Witter and others, 2006). Historical stream channel deposits are mapped along the on-site Pruitt Creek area and are described as "loose, unconsolidated, poorly- to well-sorted sand, gravel, and cobbles, with minor silt and clay" (Witter and others, 2006).

NRCS SOIL SURVEY

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey was reviewed for the project area. The soil survey identifies general shallow soil materials that may be encountered within the upper few feet. The project site is shown on the NRCS soil map as being underlain by the following shallow soil materials:

- Huichica loam (HtA/HuB): Generally, extends to depths about 57 inches below grade. This unit is imperfectly drained, has a slow runoff class, and has very low to moderately low saturated hydraulic conductivity (Ksat) of 0.00 to 0.06 in/hr.

- Yolo silt loam (YsA): Generally, extends to depths about 65 inches below grade. This unit is well-drained, has a slow to medium runoff class, and has moderately high to high saturated hydraulic conductivity (Ksat) of 0.60 to 2.00 in/hr.

- Riverwash (RnA): Generally, consists of barren, coarse-textured, alluvial areas that are exposed along streams with low water levels and are subject to shifting during normal high-water levels. This unit is excessively drained and has high to very high saturated hydraulic conductivity (Ksat) of 5.95 to 19.98 in/hr.

The attached Figure 4 shows the NRCS soil survey map for the project site. Further soil descriptions are included in Attachment C.

REGIONAL GROUNDWATER

Groundwater level data from the Sustainable Groundwater Management Act (SGMA) database, by the Department of Water Resources (DWR), was reviewed for a site located approximately 0.5 miles south of the project area. According to the database, depth to groundwater ranges from about 9 ft below ground surface (bgs) after wet seasons to about 37 ft bgs after dryer seasons, between 2018 and early 2022.

FIELD EXPLORATION

SITE RECONNAISSANCE

CE&G performed field reconnaissance of the site on April 4, 2022, in advance of performing the test pits and percolation testing. Site reconnaissance consisted of photographic documentation of the project site and identifying and marking the test pit locations for utility clearance by Underground Service Alert (USA). The test pit locations were also cleared by a private utility locator.

SUBSURFACE EXPLORATIONS

Scope of Explorations

Our field explorations included excavating four test pits in the vicinity of the planned percolation ponds and/or leach fields. The test pits were excavated by Houck's Grading on April 11, 2022, using a mini excavator equipped with 12-inch and 24-inch-wide buckets. The test pits were excavated to a depth of 5 feet bgs. An additional 12-inch by 12-inch hole was hand-excavated at the bottom of each test pit to approximately 6 feet bgs for percolation testing, which is further described in the Percolation Testing Section of this memorandum. Test pit locations were selected by HydroScience Engineers and are shown in Figure 2.

Logging and Sampling

The materials encountered in the test pits were logged in the field by a CE&G engineer. The soil was visually classified in the field, office, and laboratory according to the Unified Soil Classification System (USCS) in general accordance with ASTM D2487 and D2488.

Soil samples obtained from the test pits were packaged and sealed in the field to reduce the potential for moisture loss. The samples were taken to CE&G's local laboratory for further analysis and storage.

LABORATORY TESTING

Laboratory testing was performed to obtain information regarding the physical and index properties of selected samples recovered from the test pits. Tests performed included grain size distribution and Atterberg limits. Tests were completed in general conformance with applicable ASTM standards. The results of the laboratory tests are summarized on the test pit logs in Attachment B and are included in Attachment C.

SOIL CONDITIONS ENCOUNTERED

Alluvial deposits were encountered in each test pit to the maximum depth explored of 6 feet. The encountered alluvium within the upper four feet of test pits P-1, P-2, and P-3 primarily consists of lean clays with varying amounts of sand, silt, and gravel and occasional silty sand layers. Shallow soils encountered in test pit P-4 are more granular and consist of moist to wet silty sand, clayey gravel, and clayey sand from 0 to 5 feet below the ground surface. Sandy lean clay and lean clay with sand was encountered in each of the four test pits from approximately 5 to 6 feet below ground surface.

For a more detailed description of the encountered soils, the test pit logs, and laboratory test results are included in Attachments B and C.

GROUNDWATER CONDITIONS ENCOUNTERED

Perched groundwater was encountered at approximately 2 feet bgs in test pit P-4. Groundwater was not encountered in test pits P-1, P-2, or P-3.

PERCOLATION TESTING

Percolation testing was performed by CE&G on April 12 and 13, 2022, at three locations on the project site, selected by HydroScience Engineers. The three percolation tests were designated as P-1, P-2 and P-3, and their approximate locations are shown in Figure 2. Soil samples were collected from each percolation testing zones (depth of 5 to 6 feet) for laboratory analysis.

The previously discussed test pits were utilized to perform the percolation tests in general conformance with Regional Water Quality Control Board Basin Plan percolation testing guidelines for OTWS sites. Percolation testing was only performed in 3 of the 4 test pits due to perched groundwater seeping into and filling the bottom 6 inches of test pit P-4.

Preparation for the percolation tests consisted of excavating a 12-inch diameter by 12-inch deep hole into the bottom of each test pit and continuously presoaking the test holes for 12 hours. Starting 24-hours after beginning the initial presoak, the test holes were again presoaked for one additional hour by continuously adding water to maintain a constant head of 12 inches within the test hole. Once the presoaking was completed, the testing began with 12 inches of water above the bottom of the hole. Water level drops were then measured and recorded at varying time intervals for the observed rate of percolation. Upon completion of the percolation testing, the test pits were backfilled with the stockpiled soil and compacted using the excavator bucket.

Data plots showing the recorded cumulative water level drops versus time are shown on Charts 1, 2, and 3 for tests P-1, P-2, and P-3, respectively. The average slopes of the recorded values were used to calculate the percolation rates for each percolation test. The calculated percolation rates are listed in Table 1.

Chart 2 – Percolation Testing Measurements for P-1

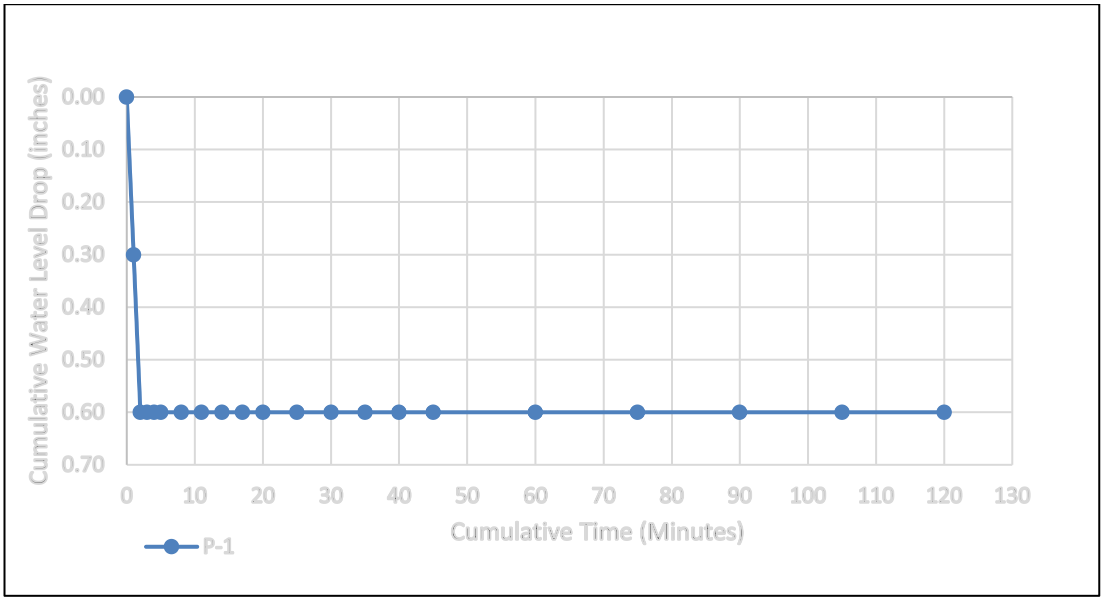

Chart 2 – Percolation Testing Measurements for P-2

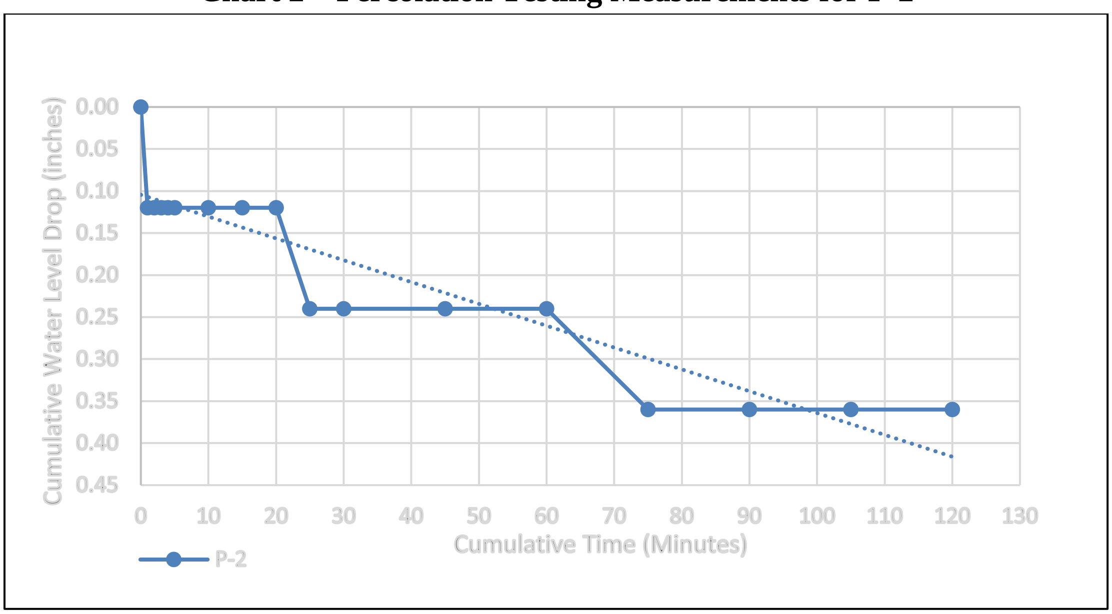

Chart 3 – Percolation Testing Measurements for P-3

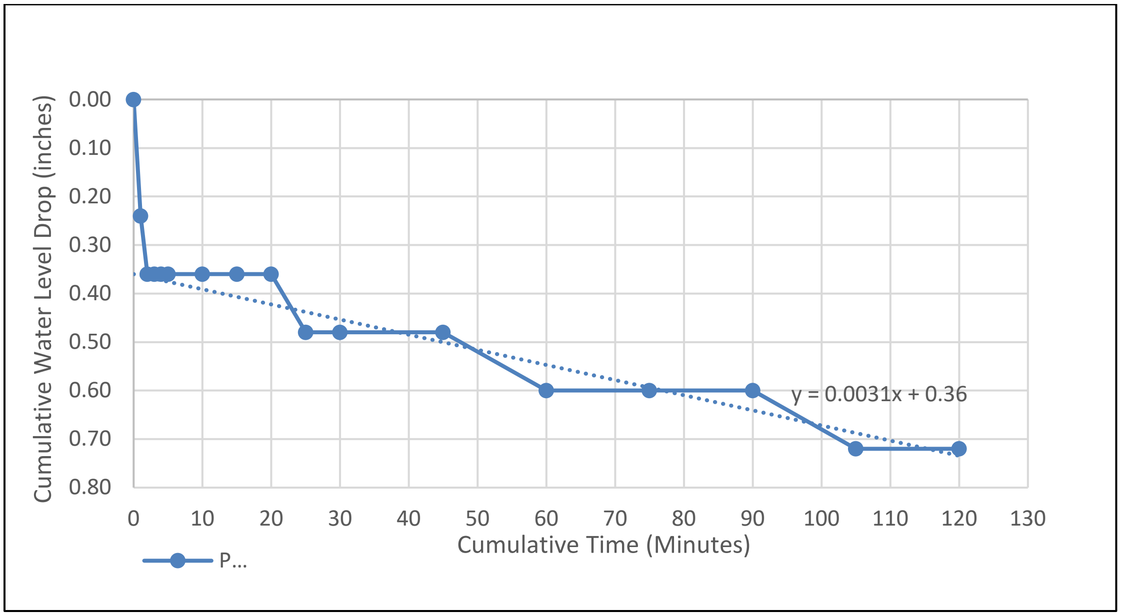

Table 1 – Percolation Rate Data

Infiltration Test ID	Soil Type	Average Percolation Rate (in/hr)	Average Percolation Rate (in/min)
P-1	Sandy Lean Clay	0.0	0.000
P-2	Sandy Lean Clay	0.2	0.003
P-3	Sandy Lean Clay	0.2	0.003
NRCS*	--	0.00 to 0.06	--

*NRCS saturated hydraulic conductivity (Ksat) values for shallow soils within the site vicinity.

CONCLUSIONS

CE&G has performed data research and field explorations to characterize the subsurface soil and groundwater conditions, including percolation rates of shallow soils for the Windsor Wastewater Treatment System Project. A summary of infiltration rates is presented in Table 1.

In our judgment, percolation rates ranging from 0.00 to 0.2 in/hr are recommended for the sandy lean clay soils encountered from approximately 5 to 6 feet below the ground surface. Percolation testing of P-4 was unsuccessful due to the presence of perched groundwater.

LIMITATIONS

The information presented in this memorandum is based upon information provided to us regarding the project, subsurface conditions encountered at the exploration locations, our reconnaissance, and professional judgment.

The information provided in this report and on the test pit logs should be provided to the engineer for design of the proposed improvements.

We have employed accepted geologic and geotechnical engineering procedures, and our professional opinions and conclusions are made in accordance with generally accepted geotechnical engineering principles and practices. This standard is in lieu of all warranties, either expressed or implied.

The locations of the exploratory test pits were determined by using a handheld GPS, and tape and compass methods from established site features and are considered to be approximate. Site conditions described in the text of this report are those existing at the time of our last field exploration and reconnaissance in April 2022 and are not necessarily representative of the site conditions at other times or locations.

Unanticipated soil conditions are frequently encountered during construction and cannot be fully determined by a limited number of subsurface exploration locations. Additional expenditures may be required during the construction phases of the project as conditions vary. If it is found during construction that subsurface conditions differ from those described on the exploratory logs, then the findings presented in this report shall be considered invalid, unless the changes are reviewed and the findings modified and approved in writing by Cal Engineering & Geology, Inc.

The evaluation or identification of the potential presence of hazardous materials at the site was not requested and is beyond the scope of this project. If you have any questions regarding this report, or if we may be of further service, please contact us.

REFERENCES

Graymer, R.W., and 5 others, 2006, Geologic Map of the San Francisco Bay Region. U.S. Geological Survey, Scientific Investigations Map 2918.

Department of Water Resources (DWR), 2015, Sustainable Groundwater Management Act (SGMA) https://sgma.water.ca.gov/webgis

Knudsen, K.L., and 7 others, 2000, Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California; a Digital Database: U.S. Geological Survey Open-File Report 00-444, 1:24,000.

U.S. Department of Agriculture, 2019, Natural Resources Conservation Service Soil Survey, accessed April 2022. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Witter, R. C., Knudsen, K. L., Sowers, J. M., Wentworth, C. M., Koehler, R. D., Randolph, C. E., and Gans, K. D., 2006, Maps of Quaternary deposits and liquefaction susceptibility in the central San Francisco Bay region, California (No. 2006-1037). Geological Survey (US).

BASEMAP REFERENCE

1. STREET CENTERLINES FROM CALTRANS CALIFORNIA ROAD SYSTEM, DOWNLOADED ON 18 FEB 2020.
2. ORTHOIMAGERY FROM ESRI (MAXAR), 2019.

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CE&G
CAL ENGINEERING & GEOLOGY

6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

WINDSOR WASTEWATER TREATMENT SYSTEM PROJECT
222 EAST SHILOH ROAD
WINDSOR, CALIFORNIA

SITE LOCATION MAP

220270	JULY 2022	FIGURE 1

REFERENCES

1. TOPOGRAPHIC BASEMAP FROM HYDROSCIENCE; CAD FILES RECEIVED ON 4/4/2022.
2. ORTHOIMAGERY FROM AUTODESK MAP IMAGE; MAXAR, MICROSOFT CORPORATION, 2022.

SUBSURFACE EXPLORATION

P-4 TEST PIT LOCATION BY CE&G, PERFORMED ON 4/11/2022

100 0 100 200
SCALE FEET

N

CE&G
CAL ENGINEERING & GEOLOGY

6455 Almaden Expwy.
Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

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SITE PLAN

220270	JULY 2022	FIGURE 2

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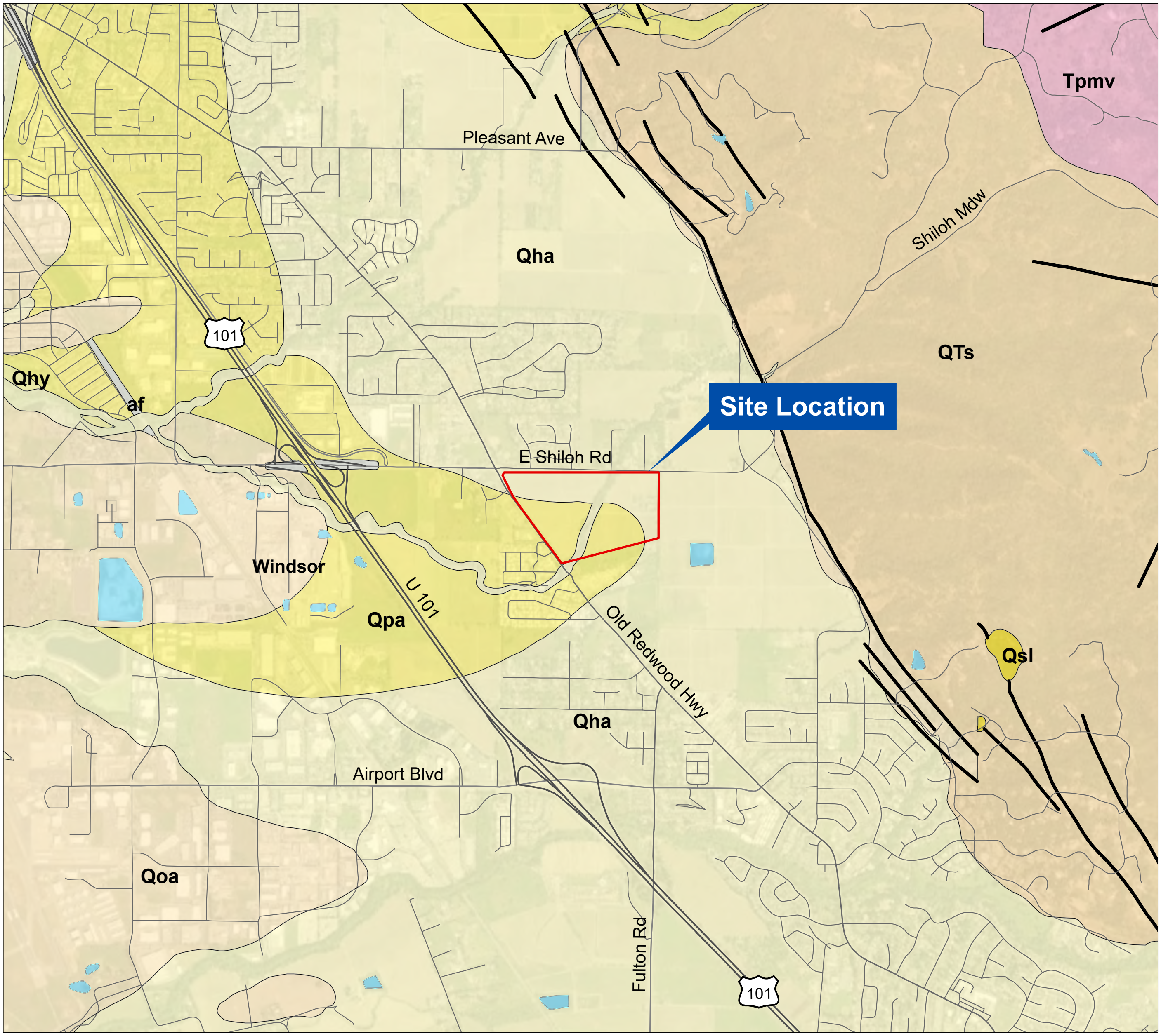
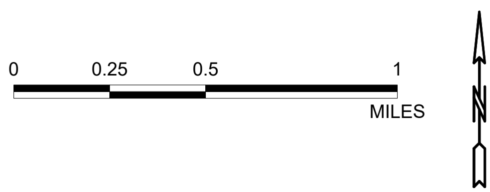


BASEMAP REFERENCE

1. REGIONAL GEOLOGY FROM GRAYMER, 2006.



MAP UNIT DESCRIPTION

af	Artificial Fill
Qhy	Alluvium (late Holocene)
Qha	Alluvium (Holocene)
Qsl	Hillslope deposits (Quaternary)
Qpa	Alluvium (Pleistocene)
Qoa	Alluvium (early Pleistocene)
QTs	Sediments (early Pleistocene and (or) Pliocene)
Tpmv	Volcanic rocks (Pliocene and early Miocene)

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Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

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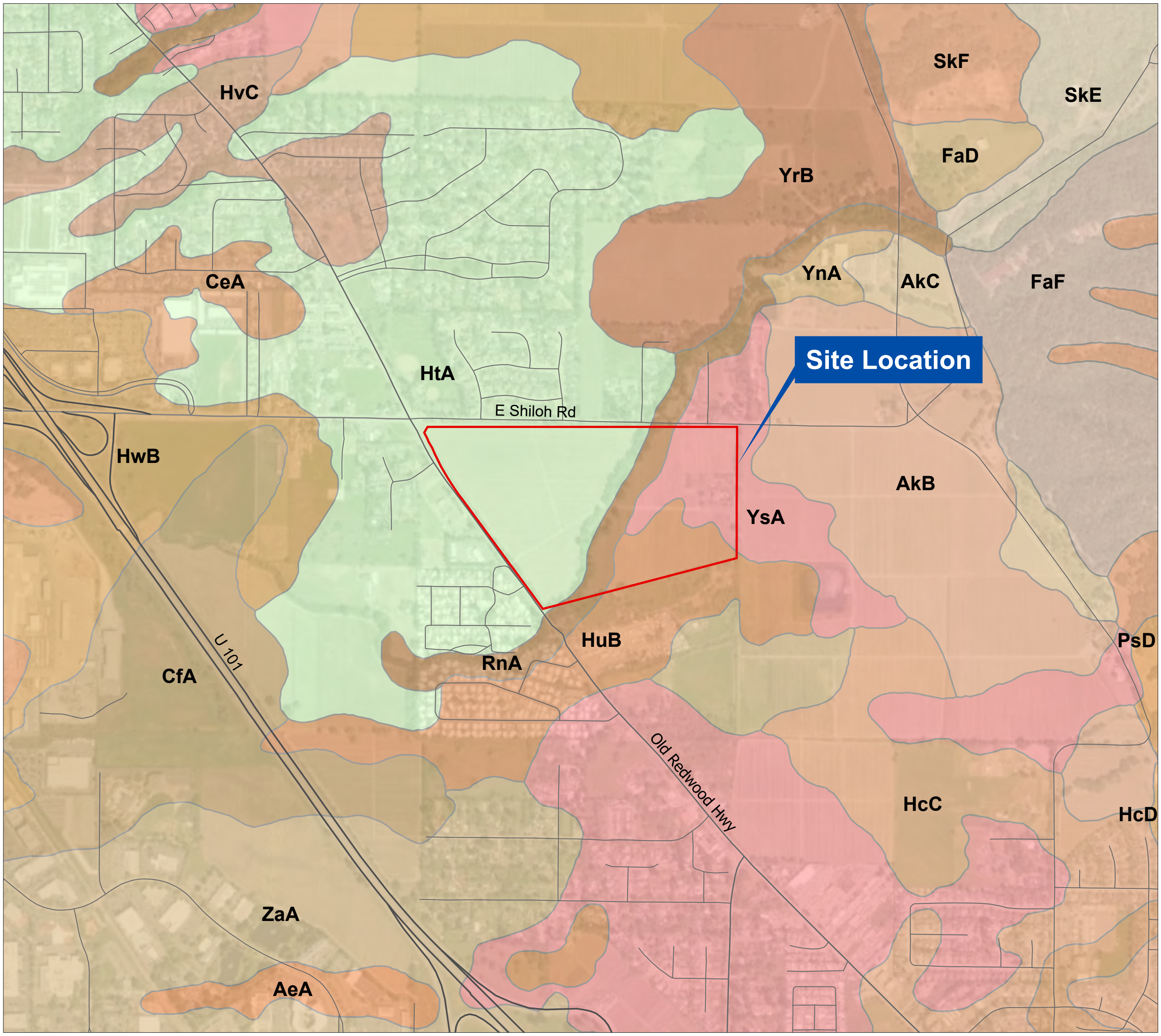
REGIONAL GEOLOGY MAP

220270	JULY 2022	FIGURE 3



BASEMAP REFERENCE

1. SOIL DATA FROM NATURAL RESOURCES CONSERVATION SERVICE, US DEPARTMENT OF AGRICULTURE; WEB SOIL SURVEY, ACCESSED ONLINE ON 6/29/2020.

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MAP UNIT DESCRIPTION

AeA	Alluvial land, clayey
AkB	Arbuckle gravelly loam, 0 to 5 percent slopes
AkC	Arbuckle gravelly loam, 5 to 9 percent slopes
CeA	Clear Lake clay, sandy substratum, drained, 0 to 2 percent slopes, MLRA 14
CfA	Clear Lake clay, ponded, 0 to 2 percent slopes
FaD	Felta very gravelly loam, 5 to 15 percent slopes
FaF	Felta very gravelly loam, 30 to 50 percent slopes
HcC	Haire clay loam, 0 to 9 percent slopes
HcD	Haire clay loam, 9 to 15 percent slopes
HtA	Huichica loam, 0 to 2 percent slopes
HuB	Huichica loam, ponded, 0 to 5 percent slopes
HvC	Huichica loam, shallow, 0 to 9 percent slopes
HwB	Huichica loam, shallow, ponded, 0 to 5 percent slopes
PsD	Positas gravelly loam, 9 to 15 percent slopes
RnA	Riverwash
SkE	Spreckels loam, 15 to 30 percent slopes
SkF	Spreckels loam, 30 to 50 percent slopes
YnA	Yolo loam, 0 to 10 percent slopes, moist, MLRA 14
YrB	Yolo gravelly loam, 0 to 8 percent slopes, MLRA 14
YsA	Yolo silt loam, 0 to 5 percent slopes, MLRA 14
ZaA	Zamora silty clay loam, moist, 0 to 2 percent slopes, MLRA 14

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CAL ENGINEERING & GEOLOGY

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Suite 100
San Jose, CA 95120
Phone: (408) 440-4542

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NRCS SOIL MAP

220270	JULY 2022	FIGURE 4

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Attachment A. NRCS Soil Descriptions

This appendix is available upon request. Please contact the following person for a copy:

Chad Broussard
Environmental Protection Specialist,
Bureau of Indian Affairs
Pacific Regional Office,
2800 Cottage Way, Room W–2820,
Sacramento, CA 95825
telephone: (916) 978–6165
e-mail: chad.broussard@bia.gov

Attachment B. Test Pit Logs

This appendix is available upon request. Please contact the following person for a copy:

Chad Broussard
Environmental Protection Specialist,
Bureau of Indian Affairs
Pacific Regional Office,
2800 Cottage Way, Room W–2820,
Sacramento, CA 95825
telephone: (916) 978–6165
e-mail: chad.broussard@bia.gov

Attachment C. Laboratory Testing

This appendix is available upon request. Please contact the following person for a copy:

Chad Broussard
Environmental Protection Specialist,
Bureau of Indian Affairs
Pacific Regional Office,
2800 Cottage Way, Room W–2820,
Sacramento, CA 95825
telephone: (916) 978–6165
e-mail: chad.broussard@bia.gov