

APPENDIX WATER

*WATER DEMAND TECH MEMO AND WATER
INFRASTRUCTURE PLAN*

***REVISED WATER DEMAND
TECHNICAL MEMO***

Technical Memorandum

To: Kirsty Shelton
Chris Meredith

From: Peter Haase, MS, PE

Date: Revised October 4, 2019

Subject: **Water Demand Analysis for
Maha Resort at Guenoc**

Dear Kirsty and Chris:

Sherwood Design Engineers, Inc. (SDE) has prepared a revised water demand analysis for the First Phase (Phase I) and Future Phase of development planned for the Maha Resort at Guenoc, in Lake County, California (The Project). The water demand analysis presents The Project water demands for the Phase I and future phased projects as described in the Specific Plan of Development (SPOD) submitted to the County of Lake July 1, 2019. The technical memorandum describes the methodology and the results of the water demand analysis.

1. Project Description

The Project has applied to the County of Lake for a development application. Pursuant to the California Environmental Quality Act (CEQA) the application will include an Environmental Impact Report (EIR). The EIR will include a programmatic analysis of the impacts to rezone the 16,000-acre Guenoc Ranch to "Guenoc Valley District (GVD)". In addition to the programmatic level EIR to allow the rezone, the EIR will include a detailed, project level analysis of the impacts at a Project level review of the first phase (Phase I) of development, submitted as the SPOD.

The Programmatic review of the overall project will occur in the EIR to assess the environmental impacts of the rezone. Project level review will analyze the specific objectives and environmental impacts of the proposed first phase of development, as outlined in the SPOD. The Project Level review EIR will analyze the environmental changes caused by a development including the construction and operation, whereas the programmatic EIR will look at the impacts of the rezone classification rather than a project specific analysis. Future phases of the project will require additional CEQA review.

As referenced in SPOD, Phase I includes the construction of the roads and the utility infrastructure, approximately 225 hotel rooms, 144 resort residential units, and 411 Residential villas, workforce and staff housing, and the accessory to resort commercial structures. This report looks at the feasibility of these operations relating to the phase one development. (The actual number of hotel rooms has been reduced for the Phase I project; however, for this analysis the original room numbers presented in the SPOD have been used, which results in a more conservative estimate of water demand).

Future phase development will include additional hotel rooms, resort residential units, residential villas, expanded sport facilities and recreation opportunities.

2. Water Demand Analysis

The Project will rely on both potable and non-potable water demands to supply the various water uses at the site. The Project will be designed with two separate water systems: a potable water system primarily used to supply all the drinking, interior, and recreation water demands features (i.e. swimming pools) for The Project and a separate non-potable water system will be installed to meet all the non-drinking water and primarily exterior water demands for irrigation, non-recreational water features (i.e. fountains and other non-recreational features), fire protection water and construction related water demands.

Potable water demand will be met by onsite water supply wells that have been or will be constructed to meet the State's standards for drinking water supply. Non-potable water demand will be met by a combination of existing surface water entitlements stored in the existing onsite reservoirs for areas that are located on Place of Use (POU) land, on-site recycled wastewater, and from groundwater supply wells. All POU land has an existing appropriative permit water right so that surface water can be used for a beneficial purpose, such as irrigation on that delineated land.

The following sections include a description of the methodology used to calculate the water demands for the project and results of the water demand calculations.

2.1. Potable Water Demand

Onsite deep groundwater supply wells will be used to supply potable water to the project.

SDE calculated the potable or domestic water demands for the project. The potable water demands include the following:

- Domestic and commercial water needs for drinking, cooking, bathing, toilet flushing, and laundry.
- Clean-in-place (wash) water for wineries and other food related production facilities.

SDE employed water use values published in technical references for similar types of uses and the expected occupancy rates.^{1,2} SDE used two different occupancy rates for the hospitality and residential uses: the first occupancy rate represents the average occupancy rate for similar resorts managed by the development team, which run at 60% for the hotel rooms and resort villas, and 40% for the estate villas, and the second occupancy rate assumes the resort and villas are at full occupancy (100%). Similarly, many of the support facilities are not expected to run at full occupancy, which is also accounted for in the water demand calculations.

Commercial Retail Space. Water demand values for commercial uses are calculated based on values published based on the area or square footage of retail and commercial space, a method relied on by many jurisdictions in California.³

Makeup Water for Pools and Recreational Water Features. Water demand calculations for pools and man-made recreational water features have been estimated using pan evaporative data reported for Markley Cove in Lake Berryessa by the CA Department of Water Resources. The annual average pan evaporation rate at Lake Berryessa was calculated to be 53 inches

¹ USEPA. 1980. *Design Manual: Onsite Wastewater Treatment and Disposal Systems*

² R. Crites and G. Tchobanoglous. 1998. *Small & Decentralized Wastewater Management Systems*. WCB/McGraw-Hill

³ San Francisco Public Utility Commission, *Water Use Calculator*

per year for the period from 1991 to 2018.

Winery Process Water Demands. Water demand calculations for the winery production is based on the amount of water used per case of wine produced at the winery. SDE used 16 gallons of water required to produce a case or 2.4 gallons of wine.⁴

Table 1 presents the values relied upon to calculate the potable water demands for both Phase I and Future Phase potable water demands. Tables 2 and 3 presents the estimated daily water demands under average and maximum occupancy rates for both the Phase I and Future Phase projects, respectively. Tables 4 and 5 presents the estimated annual average potable water demand for Phase I and Future Phase projects, respectively. Table 5 presents the potable water demand for the Future Phase development. Table 6 presents a summary the total daily and annual potable water demands for both the Phase I and Future Phase projects.

Table 1. Unit Water Demands Values

Description	Unit	Unit Demand	Reference Number
Restaurant			
Staff	gpd	15	1,2
Guest	gpd	10	1,2
Pool			
Staff	gpd	15	1,2
Guest	gpd	15	
Hotel			
Staff	gpd	15	1,2
Guest	god	75	1,2
Resort Villa Resident	gpd	75	1,2
Villa Resident	gpd	75	1,2
Pool Evaporative Loss	gpsf	0.1175	
Winery Production	gpc	16	4
Notes:			
gpd - gallons per day			
gpsf - gallons per square foot of water area			
gpc - gallons per case			

⁴ Storm, D.R., 200. *Winery Utilities: Planning, Design & Operation*. Chapman & Hall Enology Library

Use	Unit	Quantity	Water Demand (gallons)	Average Occupancy Rate (percent)	Average Daily Water Demand (gallons/day)	Average Daily Water Demand (ac-ft/day)	Full Occupancy (percent)	Maximum Day Water Demand (gallons/day)	Maximum Annual Water Demand (ac-ft/day)
1. Resort Facilities									
1.1. Hotel Rooms	EA	225	277.5	60%	37,463	0.11	100%	62,438	0.19
1.2. Resort Residential units	EA	144	427.5	60%	36,936	0.11	100%	61,560	0.19
2. Residential Development									
2.1. Residential Estate Villas*	EA	411	674.4	40%	110,871	0.34	100%	277,178	0.85
2.2. Workforce Co-Housing	EA	300	75	70%	15,750	0.05	100%	22,500	0.07
3. Resort Amenities									
3.1. Outdoor Entertainment	Seats	500	5.5	60%	1,650	0.005	100%	2,750	0.01
3.2. Spa and Wellness Area	Visitors	70	25	60%	1,050	0.00	100%	1,750	0.01
3.3. Sports and Recreation	Visitors	0							
3.4. Equestrian Area	Visitors	105	18	60%	1,134	0.00	100%	1,890	0.01
3.5. Golf	Visitors	85	21	60%	1,071	0.00	100%	1,785	0.01
3.6. Camping Area	EA	42	64	60%	1,613	0.00	100%	2,688	0.01
3.7. Commercial & Retail	Visitors	120	23	60%	1,656	0.01	100%	2,760	0.01
4. Agricultural Production Facilities									
4.1. Wineries	Cases	62,500	16	60%	1,860	0.006	100%	2,956	0.01
4.2. Diversified Agricultural Production	Visitors	8	35	60%	168	0.001	100%	280	0.00
4.3. Livestock and Farm Management	Visitors	8	35	60%	168	0.001	100%	280	0.00
5. Essential Accessory Uses									
5.1. Back of House Facilities	EA	1	17100	60%	10,260	0.031	100%	17,100	0.05
5.2. Emergency Response Center	EA	1	4140	60%	2,484	0.008	100%	4,140	0.01
5.3. Alternative Energy Production	EA	1	280	100%	280	0.001	100%	280	0.00
5.4. Float Plane Dock	EA	1	60	25%	15	0.000	100%	60	0.00
5.5. Heliports	EA	1	30	25%	8	0.000	100%	30	0.00
Total Estimated Water Demand									
					224,436	0.69		462,425	1.42

*Occupancy rate represent similar resorts managed by the development team, which run at 60% for the hotel rooms and resort villas, and 40% for the estate villas.

Table 2. Phase I Average and Maximum Daily Potable Water Demand

Use	Unit	Quantity	Water Demand (gallons)	Average Occupancy Rate (percent)	Average Daily Water Demand (gallons/day)	Average Daily Water Demand (ac-ft/day)	Full Occupancy (percent)	Maximum Day Water Demand (gallons/day)	Maximum Annual Water Demand (ac-ft/day)
1. Resort Facilities									
1.1. Hotel Rooms	EA	225	277.5	60%	37,463	0.11	100%	62,438	0.19
1.2. Resort Residential units	EA	144	427.5	60%	36,936	0.11	100%	61,560	0.19
2. Residential Development									
2.1. Residential Estate Villas*	EA	411	674.4	40%	110,871	0.34	100%	277,178	0.85
2.2. Workforce Co-Housing	EA	300	75	70%	15,750	0.05	100%	22,500	0.07
3. Resort Amenities									
3.1. Outdoor Entertainment	Seats	500	5.5	60%	1,650	0.005	100%	2,750	0.01
3.2. Spa and Wellness Area	Visitors	70	25	60%	1,050	0.00	100%	1,750	0.01
3.3. Sports and Recreation	Visitors	0							
3.4. Equestrian Area	Visitors	105	18	60%	1,134	0.00	100%	1,890	0.01
3.5. Golf	Visitors	85	21	60%	1,071	0.00	100%	1,785	0.01
3.6. Camping Area	EA	42	64	60%	1,613	0.00	100%	2,688	0.01
3.7. Commercial & Retail	Visitors	120	23	60%	1,656	0.01	100%	2,760	0.01
4. Agricultural Production Facilities									
4.1. Wineries	Cases	62,500	16	60%	1860	0.006	100%	2,956	0.01
4.2. Diversified Agricultural Production	Visitors	8	35	60%	168	0.001	100%	280	0.00
4.3. Livestock and Farm Management	Visitors	8	35	60%	168	0.001	100%	280	0.00
5. Essential Accessory Uses									
5.1. Back of House Facilities	EA	1	17100	60%	10,260	0.031	100%	17,100	0.05
5.2. Emergency Response Center	EA	1	4140	60%	2,484	0.008	100%	4,140	0.01
5.3. Alternative Energy Production	EA	1	280	100%	280	0.001	100%	280	0.00
5.4. Float Plane Dock	EA	1	60	25%	15	0.000	100%	60	0.00
5.5. Heliports	EA	1	30	25%	8	0.000	100%	30	0.00
Total Estimated Water Demand									
					224,436	0.69		462,425	1.42

*Occupancy rate represent similar resorts managed by the development team, which run at 60% for the hotel rooms and resort villas, and 40% for the estate villas.

Table 3. Future Phase Average and Maximum Daily Potable Water Demand

Table 4. Phase I Average Annual Potable Water Demand

Use	Unit	Quantity	Water Demand (gallons)	Average Occupancy Rate (percent)	Average Annual Water Demand (gallons/yr)	Average Annual Water Demand (ac-ft/yr)
1. Resort Facilities						
1.1. Hotel Rooms	EA	225	277.5	60%	13,673,813	41.96
1.2. Resort Residential units	EA	144	427.5	60%	13,481,640	41.37
2. Residential Development						
2.1. Residential Estate Villas	EA	411	674.4	40%	40,468,046	124.17
2.2. Workforce Co-Housing	EA	300	75	70%	5,748,750	17.64
3. Resort Amenities						
3.1. Outdoor Entertainment	Seats	500	5.5	60%	39600	0.122
3.2. Spa and Wellness Area	Visitors	70	25	60%	383,250	1.18
3.3. Sports and Recreation	Visitors	0				
3.4. Equestrian Area	Visitors	105	18	60%	413,910	1.27
3.5. Golf	Visitors	85	21	60%	390,915	1.20
3.6. Camping Area	EA	42	64	60%	588,672	1.81
3.7. Commercial & Retail	Visitors	120	23	60%	604,440	1.85
4. Agricultural Production Facilities						
4.1. Wineries	Cases	62,500	16	60%	678840	2.083
4.2. Diversified Agricultural Production	Visitors	8	35	60%	102200	0.314
4.3. Livestock and Farm Management	Visitors	8	35	60%	168	0.001
5. Essential Accessory Uses						
5.1. Back of House Facilities	EA	1	17100	60%	3744900	11.491
5.2. Emergency Response Center	EA	1	4140	60%	906660	2.782
5.3. Alternative Energy Production	EA	1	280	100%	102200	0.314
5.4. Float Plane Dock	EA	1	60	25%	5475	0.017
5.5. Hellipads	EA	1	30	25%	2737.5	0.008
Total Estimated Water Demand					81,336,216	249.57

Table 5. Future Phase Average Annual Water Demand

Use	Unit	Quantity	Water Demand (gallons)	Average Occupancy Rate (percent)	Average Annual Water Demand (gallons/yr)	Average Annual Water Demand (ac-ft/yr)
1. Resort Facilities						
1.1. Hotel Rooms	EA	155	277.5	60%	13,673,813	41.96
1.2. Resort Residential units	EA	260	427.5	60%	13,481,640	41.37
2. Residential Development						
2.1. Residential Estate Villas*	EA	986	674.4	40%	40,468,046	124.17
2.2. Workforce Co-Housing	EA	200	75.0	70%	5,748,750	17.64
3. Resort Amenities						
3.1. Outdoor Entertainment	Seats	200	5.5	60%	15840	0.05
3.2. Spa and Wellness Area	Visitors	70	25.0	60%	383250	1.18
3.3. Sports and Recreation	Visitors	100	30.0	60%	657000	2.02
3.4. Equestrian Area	Visitors	105	18.0	60%	413910	1.27
3.5. Golf	Visitors	44	21.0	60%	202356	0.62
3.6. Wilderness Area						
3.7. Commercial & Retail	Visitors	60	23.0	60%	302220	0.93
4. Agricultural Production Facilities						
4.1. Wineries	Cases	292,000	16.0	60%	2882040	8.84
4.2. Diversified Agricultural Production	Visitors	8	35.0	60%	61320	0.19
4.3. Livestock and Farm Management	Visitors	8	35.0	60%	61320	0.19
5. Essential Accessory Uses						
5.1. Back of House Facilities	EA	1	8550.0	60%	1872450	5.75
5.2. Emergency Response Center	EA	1	2070.0	60%	453330	1.39
5.3. Alternative Energy Production	EA	1	168.0	100%	61320	0.19
5.4. Float Plane Dock	EA	1	20.0	25%	1825	0.01
5.5. Hellipads	EA	1	20.0	25%	1825	0.01
Total Estimated Water Demand					80,742,255	248

*Occupancy rate represent similar resorts managed by the development team, which run at 60% for the hotel rooms and resort villas, and 40% for the estate villas.

Table 6. Summary of Daily and Annual Potable Water Demands

Use	Average Daily Water Demand (gallons/day)	Average Daily Water Demand (ac-ft/day)	Maximum Day Water Demand (gallons/day)	Maximum Annual Water Demand (ac-ft/day)	Average Annual Water Demand (gallons/yr)	Average Annual Water Demand (ac-ft/yr)
Phase 1	224,436	0.7	462,425	1.4	81,336,216	250
Future Phase	211,894	0.7	406,669	1.2	80,742,255	248
Total Estimated Water Demand	436,330	1.3	869,093	2.7	162,078,471	497

2.2. Non-Potable Water Demand

The non-potable water demands include the landscape irrigation demands for the commercial and residential properties, new vineyard and farm areas, recreational areas including the Renaissance Golf Course and the Equestrian Center, roadway landscaping and greenroofs. Additional non-potable water demands include make up water for non-recreational water features (fountains and reflection pools). Non-potable water will also be used as the primary source for fire protection; however, the fire water demand will occur sporadically is not considered to be continuous, and as such, is not factored into the average demand analysis. There are three sources of non-potable water: recycled water, existing entitled surface water rights (appropriative and riparian) and groundwater. Although recycled and entitled water will be conveyed together to the end use, they will be stored separate. Recycled water will be stored in tanks whereas entitled water will continued to be stored in the existing reservoirs.

Irrigation Demand. The irrigation water demand estimates for the project have been calculated based on the water budget procedures established by the CA Department of Water Resources' Model Water Efficient Landscape Ordinance (MWELO) (CCR, Title 23 Waters, Division 2. Department of Water Resources, Chapter 2.7). The Estimated Total Water Use (ETWU) for each irrigation month was calculated using the ETWU formula in the MWELO. This formula was employed to calculate the water demand for all irrigated areas associated with the project including ornamental, recreational (golf course and equestrian fields/arenas) and new vineyard and farm areas. Actual water meter readings were not employed in this analysis.

Non-Recreational Water Features. There are water features (small ornamental ponds and engineered waterfalls incorporated at the Equestrian Center and Maha Farms as part of the Phase I development. At the Equestrian Center an 8-acre storage pond and constructed wetlands for habitat restoration is planned for this area. Non- potable will be used as the primary source of makeup water to replenish water losses from the pond and wetland system primarily as a result of evaporation. Monthly pan evaporation rates have been used to estimate the amount of makeup water that will be required to maintain these water features.

The Phase I project will include 452 acres of irrigated acres and 230 acres of this land is located in the Place of Use areas that can use surface water to meet the irrigation demands. The remaining 222 acres will be supplied by both recycled water and groundwater resources.

A variety of landscaping type are included in the The Project, including the golf course, the equestrian area, and other landscaped areas that will consist predominantly California native drought tolerant plantings, ornamental plantings, additional vineyards, farms and gardens and other landscape types. Based on the irrigation water demands prepared by SWA Landscape Architects the overall water demand for landscape irrigation is estimated to be 319.68 acre-feet per year or 1.44 acre-feet per acre for lands outside of the POU.

Tables 7 and 8 present estimated non-potable water demands for Phase I and Future Phase project areas to satisfy irrigation and evaporative make up water. The results present the average annual demand for both lands that will receive Place-Of-Use (POU) surface water demands, and land that is not in Place-Of-Use areas (Non-POU) and will rely on both recycled and groundwater to meet the non-potable demands. The results are presented in acre-feet per year.

The estimates indicate that the Phase I net water demand will be 482 ac-ft/yr.⁵ and the total non-potable water demand is estimated to be 1,027 ac-ft/yr. The estimates indicate that the Future Phase net water demand for Non-POU irrigation water will be 759 ac-ft/yr, and the total water demand is estimated to be 1,947 ac-ft/yr. The POU water demands will be met under the established appropriative rights.

The total annual net water demands supplied by recycled water and groundwater, for both phases of projects, are presented in Table 9. It is assumed that approximately 65% of the potable water will be available as recycled water for both Phase I and Future Phase Projects and the remaining Non-POU irrigation water demands lands will be supplied by groundwater. Based on these calculations for the Phase I project approximate 47% of the non-POU land can be irrigated by reclaimed water and the balance will be supplied by groundwater. For the Future Phase project approximately 27% of the non-POU land irrigation demand is estimated to be supplied by recycled water and the balance will be supplied by groundwater.

⁵ Note, the Project will rely on the existing water rights to continue to irrigate lands within the POU areas, approximately 545 ac-ft/yr for Phase 1 and approximately 1,187 ac-ft/yr for the Future Phase.

**Table 7. Phase I Annual Non-Potable Water Demand Estimates
(in Acre-Feet Per Year)**

Use	Unit	Total Acres	POU Acres	Non-POU Acres	Water Demand (ac-ft/ac)	POU Water Demand (ac-ft/yr)	Non-POU Water Demand (ac-ft/yr)
1. Resort Facilities							
1.1. Hotel Rooms	Acres	88.5	36.9	51.6	2	73.8	103.2
1.2. Resort Residential units	Acres	16.5	1.8	14.7	2	3.6	29.4
2. Residential Development							
2.1. Residential Estate Villas	Acres	87.7	40.3	47.4	2	80.6	94.8
2.2. Workforce Co-Housing	Acres	3.8	3.8	0	2	7.6	0
3. Resort Amenities							
3.1. Outdoor Entertainment	Acres	2	0	2	2	0.0	4
3.2. Spa and Wellness Area	Acres	6.2	0	6.2	2	0.0	12.4
3.3. Sports and Recreation	Acres	0					
3.4. Equestrian Area	Acres	46	46	0	2	92.0	0
3.5. Golf	Acres	86.2	48.2	35.6	4	192.8	142.4
3.6. Camping Area	Acres	2	0	2	1	0.0	2
3.7. Commercial & Retail	Acres	2	0	2	2	0.0	4
4. Agricultural Production Facilities							
4.1. Wineries (landscape)	Acres	5.7	5.7	0	2	11.4	0
4.2. Diversified Agricultural Production	Acres	6	0	6	3	0.0	18
5. Essential Accessory Uses							
5.1. Back of House Facilities	Acres	6.2	6.2	0	1	6.2	0
5.2. Emergency Response Center	Acres	1.3	1.3	0	2	2.6	0
5.3. Float Plane Dock	Acres	0.3	0	0.3	1	0.0	0.3
5.4. Hellipads	Acres	0.3	0	0.3	1	0.0	0.3
6. Other Non-Potable Demands							
6.1. Greenroofs	Acres	22.4	5.2	17.2	2	10.4	34.4
6.2. Entry Roads	Acres	61	23.8	37.2	1	23.8	37.2
6.3. Equestrian Lake	Acres	8	8	0	5	40.0	0
Total Estimated Existing and Proposed Water Demand (ac-ft/yr)						544.8	482.4
Total Net New Water Demand							482.4

**Table 8. Anticipated Future Phase Non-Potable Water Demand Estimates
(in Acre-Feet Per Year)⁶**

Use	Unit	Quantity	POU Acres	Non-POU Acres	Water Demand (ac-ft/ac)	POU Water Demand (ac-ft/yr)	Non-POU Water Demand (ac-ft/yr)
1. Resort Facilities							
1.1. Hotel Rooms	Acres	36	7.2	28.8	2	14.4	57.6
1.2. Resort Residential units	Acres	30	6	24	2	12.0	48.0
2. Residential Development							
2.1. Residential Estate Villas	Acres	227	113.5	113.5	2	227.0	227.0
2.2. Workforce Co-Housing	Acres	1.5	1.5	0	2	3.0	0.0
3. Resort Amenities							
3.1. Outdoor Entertainment	Acres	2	0	2	2	0.0	4.0
3.2. Spa and Wellness Area	Acres	6.2	0	6.2	2	0.0	12.4
3.3. Sports and Recreation	Acres	300	300	0	1.5	450.0	0.0
3.4. Equestrian Area	Acres	46	46	0	2	92.0	0.0
3.5. Golf	Acres	175	87.5	87.5	4	350.0	350.0
3.6. Camping Area	Acres	0		0	1	0.0	0.0
3.7. Commercial & Retail	Acres	1.5	0	1.5	2	0.0	3.0
4. Agricultural Production Facilities							
4.1. Wineries (landscaping)	Acres	11	0	11	2	0.0	22.0
4.2. Diversified Agricultural Production	Acres	3	1.5	1.5	3	4.5	4.5
4.3. Livestock and Farm Management	Acres	3	1.5	1.5	3	4.5	4.5
5. Essential Accessory Uses							
5.1. Back of House Facilities	Acres	3.2	3.2	0	1	3.2	0.0
5.2. Emergency Response Center	Acres	0.25	0.25	0	2	0.5	0.0
6. Other Non-Potable Demands							
6.1. Greenroofs	Acres	11.2	5.6	5.6	2	11.2	11.2
6.2. Entry Roads	Acres	30	15	15	1	15.0	15.0
Total Estimated Water Demand (ac-ft/yr)						1187.3	759.2
Total Net New Water Demand							759.2

⁶ Note: Future phases will be evaluated under a separate CEQA project level review process and document.

Table 9. Summary of Non-Potable Net Water Demands by Sources for Phase I and Future Phase Projects

Phase	Recycled Water (ac-ft/yr)	Groundwater (ac-ft/yr)	Total Water Demand (ac-ft/yr)
Phase I	154	328	482
Future Phase	162	597	759
Total Demand by Source (ac-ft/yr)	316	926	1,242

Fire Water Storage Requirements and Sources

Fire water demand for the site will be supplied by non-potable water sources including surface water from the surface water storage reservoirs, recycled wastewater and from non-potable irrigation groundwater wells. All of these sources of water will be connected to a common non-potable water distribution system, designated with the state mandated purple piping. The non-potable water distribution system will be sized to supply the fire water flows to water hydrants, to both internal and external fire sprinkler systems, to landscape and recreational area landscape areas and, non-recreational water features.

Fire water storage requirements have been calculated for each development cluster in order to determine the amount of water that will be maintained in each area; however, fire water demands have not been calculated as a water demand that must be met on a continuous basis. It is important to note that the existing surface water reservoirs maintained on the property will serve as a primary source of fire water for project. In some parts of the property the availability of surface water is limited, and in these areas standalone water storage facilities will be required.

The water storage requirements have been developed comparing both Lake County Fire Protection Standards (LCFPS) that apply to residential properties and the California Fire Code (CFC) that applies to the commercial uses on the site.

LCFPS requires that each residential lot has a minimum volume of water that must be available daily, equivalent to 350 gallons per residence.

The CFC minimum fire flow requirement for sprinklered buildings is 180,000 gallons of water to provide a fire flow of 1,500 gallons per minute for two (2) hours.

Using the Lake County requirements, SDE calculated the maximum fire water storage for the largest residential development cluster, Maha Farms, which will have 211 residential units at full build out. Based on this number of units the minimum fire water storage volume would be 73,850 gallons. Given the mixed use and commercial development planned in this area, 180,000 gallons of fire water will be required for this area. Based on this comparison it is safe to assume that for all of the mixed used clusters (commercial and residential developments 180,000 gallons of stored fire water will be required.

Table 10. presents the minimum volume of water required for the different areas on the property and the proposed source of fire water supply for the Phase I project. The Future Phase will be evaluated at the project level EIR for the specific project.

Table 10. Fire Water Volume and Source

PHASE ONE	Description	Residential Units	Residential Fire Storage	Commercial Storage	Proposed Water Source
	Onsite Workforce Housing	24	8,400	-	McCreary Reservoir
	Equestrian Center	180	63,000	180,000	McCreary Reservoir
	Red Hill Estates	131	45,850	180,000	Upper Bohn Reservoir
	Bohn Ridge Resort	68	23,800	180,000	McCreary Reservoir
	Resort at Trout Flat	68	23,800	180,000	Upper Bohn Reservoir
	Spa	11	3,850	180,000	Upper Bohn Reservoir
	Golf Course			180,000	Upper Bohn Reservoir
	Camping Area			180,000	New 180,000 Tank
	Central Back-of-House Facilities			180,000	Detert Reservoir
	Emergency Center & Short Term Staff Accomodations			180,000	Upper Bohn Reservoir
	Maha Farm	211	73,850	180,000	Upper Bohn Reservoir

***REVISED WATER INFRASTRUCTURE
TECHNICAL MEMO***

Technical Memorandum

To: Kirsty Shelton
Chris Meredith
Kevin Case

From: Peter Haase, MS, PE and Carina Chen, MS, PE

Date: October 14, 2019

Subject: **Water and Wastewater Supply Facilities for Maha Resort at Guenoc**

Dear Kirsty, Chris, and Kevin:

Sherwood Design Engineers, Inc. (SDE) has prepared a water supply facilities memorandum to provide a description of the proposed water supply facilities for the First Phase (Phase I) of the Maha Resort at Guenoc, in Lake County, California (The Project).

1. Project Description

The Project has applied to the County of Lake for a development application. Pursuant to the California Environmental Quality Act (CEQA) the application will include an Environmental Impact Report (EIR). The EIR will include a programmatic analysis of the impacts to rezone the 16,000-acre Guenoc Ranch to "Guenoc Valley District (GVD)". In addition to the programmatic level EIR to allow the rezone, the EIR will include a detailed, project level analysis of the impacts at a Project level review of the first phase (Phase I) of development, submitted as the Specific Plan of Development (SPOD).

The Programmatic review of the overall project will occur in the EIR to assess the environmental impacts of the entire project proposal. Project level review will analyze the specific objectives and environmental impacts of the proposed first phase of development, as outlined in the SPOD. The Project Level review EIR will analyze the environmental changes caused by a development including the construction and operation, whereas the programmatic EIR will look at the impacts of the rezone classification rather than a project specific analysis. Future phases of the project will require additional CEQA review.

Phase I includes the construction of the roads and the utility infrastructure, approximately 255 hotel rooms, 144 resort residential units, and 411 Residential villas, workforce and staff housing, and the accessory to resort commercial structures¹. This report looks at the feasibility of these operations relating to the phase one development.

Future phase development will include additional hotel rooms, resort residential units, residential villas, and expanded sport and recreation opportunities.

The Project will include both potable and non-potable water demands to supply the various water uses at the site. The Project will be designed with two separate water

¹ Since the publication of this study, the total units have been updated to be less than the number indicated here based on the tentative map lot analysis; therefore, the total analysis is conservative.

systems: a potable water system primarily used to supply all the drinking, interior, and recreation water demands features (i.e. swimming pools) for The Project and a separate non-potable water system will be installed to meet all the non-drinking water and primarily exterior water demands for irrigation, non-recreational water features (i.e. fountains and other features), fire protection water and construction related water demands.

Potable water demand will be met by onsite water supply wells that have been or will be constructed to meet the State's standards for drinking water supply. Non-potable water demand will be met by a combination of surface water from the onsite reservoirs for areas that are located on Place of Use (POU) land. On-site recycled wastewater, and groundwater supply wells will supply water to lands located outside of the designated POU land. POU land has an appropriative permit water right so that surface water can be used for a beneficial purpose, such as irrigation of agricultural on that delineated land.

Planned Water Supply Facilities

New water supply infrastructure is being planned for the Maha Resort that will include both a potable and non-potable water systems. The following sections provide a general description of these different water systems.

7.1. Potable Water System Improvements

The potable water system will include two main water systems that will serve the Guenoc Valley area and the Upper Bohn Lake area. The Guenoc Valley system will be designed to serve the Central Back of House area, the Equestrian Center, and the Bohn Ridge Resort. The Upper Bohn Lake system will serve the Maha Farm/Sales Center area, the Spa, Emergency Center and Support Services, the Red Hill Estates and Renaissance Golf Course, and the Resort at Trout Flat. A small water system will serve the remotely located Camping Area.

Each water system will include a series of deep, water supply wells that will pump water into the potable water distribution system. The distribution system will include a pressure piped network of main and submain lines to convey potable water to the commercial and residential parcels. The water distribution system that will consist of a series of branched and looped water lines and will be constructed with either PVC or HDPE pipe rated for drinking water. The potable water system will include strategically placed water storage tanks and booster pump station stations to maintain pressure in the system to meet maximum water demands.

Water Supply Wells. Based on the results of the ongoing hydrogeologic investigation it is apparent that each main water system will consist of water supply wells that are placed in areas of abundant groundwater yields. Each water system is being planned to have between two to four wells, and each well will likely be drilled to 300 to 500 feet deep and completed with at least a 50-foot sanitary seal. Each well will be designed to produce between 75 to 300 gallons per minute depending on the results of the pump test results.

The Back of House area will also be served by the existing spring. The spring reportedly provided approximately 10 gallons per minute and will be used for domestic water supply only.

At the Cross Roads area on the Upper Bohn Ridge zone there is a non-potable well (Cross Roads Well) that yields close to 300 gallons per minute. This well will be used for irrigation and other non-potable uses at the site.

Figure 1 shows the proposed and approximate locations of the water supply wells and spring for the Phase I project.

Each water system will have multiple wells (at least two) so that at any given time only one or two wells will be in operation, and one or two additional wells can be placed in standby and “rested” for several months. This will allow the system operator to manage wells in a manner so that they are not over pumping and over drafting the groundwater basin.

The placement of the wells will be done in a manner to avoid direct impacts to sensitive cultural, historic and biotic resources at the site.

Water Storage Tanks. A series of potable water storage tanks will be installed at each water system. The potable water storage tanks will be steel bolted above ground tanks placed in locations that are not visible to the commercial and residential parcels. The domestic water storage tanks will be sized to satisfy the maximum day demand requirements for each area.

For the Guenoc Valley water system the total amount of water storage is estimated to be approximately 181,000 gallons. A preliminary analysis indicates that three tanks would service this area. A 130,000 gallon tank would serve the Equestrian Center and the Central Back of House area. A 40,000 gallon tank would serve Bohn Ridge and a 11,000 gallon tank would serve the Spa.

For the Upper Bohn Lake water system, a total of approximately 270,000 gallons of potable water will be needed. For this system approximately 130,000 gallons will be needed at Maha Farms area, a 105,000 gallons to serve the Red Hill Estate, the golf course, the Emergency Center and short-term staff accommodations, and 35,000 to serve the Resort at Trout Flat.

Additional smaller tanks will be needed to serve remote areas. A 14,000 gallon tank will be needed at the onsite workforce housing area, a 9,000 gallon tank will be needed at the Wilderness Camp area, and a 5,000 gallon tank will be needed at the Aerial Access area.

The water storage tanks will likely be placed in elevated locations to provide gravity flow to the parcels served in the event of a power outage. The tanks will likely be placed on graded pads that will also be bermed with the cut material so that the grading cut and fill volumes are closely balanced to avoid the transport of soils from these sites. The location of the tank sites can be selected and planned so that their installation and operation does not impact sensitive cultural, historic, and biotic resources at the site.

Domestic Booster Pump Systems. A system of booster pump systems located at the water storage tanks and possibly within the distribution system will be used to maintain a uniform operating pressure in each water system. It is anticipated that each booster pump system will include at least three (3) booster pumps plumbed in parallel that will be operated by a variable frequency drive (VFD) controller to control how many pumps are operate at a time and to maintain the pressure requirements for the system. Under low or normal flow conditions it is likely

that a single booster pump is operating and as the water demand increases the standby pumps will turn on to maintain a constant flow and pressure throughout the distribution system.

The booster pump systems will typically be installed in close proximity to the water storage tanks and will be placed in areas that are graded as a result of the storage tanks. The booster pump systems will be installed in small enclosures and in small areas that should not impact sensitive cultural, historical or biotic resources at the site.

Water Distribution Network. The water systems will consist of both branched in in some locations looped water distribution systems. The water systems will consist primarily of 4-inch diameter water mains and 3-inch submains and 3- and 2-inch water laterals to supply the commercial buildings and residential parcels. The majority of the water mains and laterals will be installed in the planned roadways and driveways and will not be installed in undisturbed areas on the site. The installation of the water distribution should not result in any additional impacts to cultural, historic or biotic resources related to the installation of the new roads.

7.2. Non-Potable Water System Improvements

As discussed above, two non-potable water system will be installed to serve development in the Guenoc Valley and a second system to serve the projects in the Upper Bohn Lake area.

In general, both non-potable systems will include a new non-potable water distribution, new surface water pumping systems, and wastewater recycling systems. One or more new groundwater supply wells will be installed to meet the non-potable demand.

Non-Potable Water Distribution Systems. The non-potable water distribution will be constructed to supply fire, irrigation and make up water demands for the site. The non-potable water distribution system will be a "purple pipe" system so that it can convey recycled water, as well as other sources of non-potable through the distribution system. The non-potable water distribution system will serve fire hydrants and external and internal fire sprinkler systems for commercial and residential buildings. The non-potable water distribution system will consist primarily of 10-inch, 8-inch, and 6-inch water mains and submains, and 4-inch, 3-inch, and 2-inch diameter laterals to serve fire sprinkler systems and residential properties. The majority of the non-potable water distribution system will be installed in planned roadways and driveways and should not result in additional land disturbance and impacts to cultural, historic and biotic resources beyond impacts resulting from the construction of the new roads.

Surface Water Pumping Plants. Both non-potable water systems will include new pumping systems located in the vicinity of the existing pumping systems at Detert, McCreary, Lower Bohn Lake, and Upper Bohn Lake. A new pump station will be installed in the vicinity of the flashboard dam installed across Bucksnot Creek downstream of McCreary Reservoir and this pump station will house one pumping system to serve the Equestrian Center. Figure 2 shows the approximate location of the new surface water pumping plants.

The new surface water pump stations on Detert and McCreary Reservoirs will be connected to the Guenoc Valley non-potable water system and will be used to supply irrigation, fire protection and make up water for water features and ponds in this area. The surface water pump stations placed on Lower Bohn Lake and Upper Bohn Lake will be used to pump water to the non-potable

water system in the Upper Bohn Lake Region for irrigation, fire protection and make up water for evaporative losses in water features and ponds.

The new surface water pump stations at the reservoirs will be installed adjacent to the existing pumping plants and will be placed in areas that have been graded and should not result in substantial ground disturbance during their construction and installation. The new pumping plant at Bucksnot Creek will be placed in a small area above the normal highwater mark and outside of the immediate riparian zone of the creek. It will likely be within 50 feet of the creek and with the riparian zone; however, it will be constructed in a location that will minimize impacts to sensitive cultural, historic and biotic resources in this area.

The surface water pumps will likely be a turbine style pump that can deliver a high volume of water at a relatively high pressure to supply fire hydrants and large irrigation demands at certain parts of the property.

Water Reclamation (Recycled) Plants. Based on the decentralized and clustered development plan several small package type water recycling plants will be installed to treat wastewater from the development areas. Nine small package plants are current planned to serve the Phase I project and will include small treatment works at the Maha Farm, Redhill/Renassiance Golf Course, Resort at Trout Flat, Central Back of the House, Equestrian Center, Bohn Ridge Resort, the Spa, Onsite Workforce Housing, and a small system at the Camping Area. Figure 3 shows the approximate location of the nine (9) systems.

The treatment systems will be designed to meet State Title 22 recycled water regulations for tertiary level disinfected recycled water that can be used for unrestricted irrigation and recreational use of the water.

At each water reclamation facility there will be a recycled water storage tank and booster pump system that will pump recycled water into the non-potable water distribution system for landscape irrigation, fire protection and make up water to ornamental water features and ponds.

Each water reclamation plant will cover a relatively small area ranging from less than 1,000 square feet at the Camping Area to the largest area of 12,500 square feet for the largest system that will serve the Maha Farms area. The installation of all the water reclamation plants will require approximately one (1) acre of land. Figure 4 shows the typical layout of a water reclamation plant facility including the treatment plant, storage tank and related parking area.

The water reclamation plants will be placed in areas that are set back from the cluster developments to avoid potential odor and noise issues. The plants will be located close to planned roads to provide easy access to them and to avoid the need to construct long driveways or access roads to serve them. The plants will also be placed in area that will minimize grading and ground disturbance to the extent practical and to avoid impacts to sensitive flora and fauna.

Guenoc Ranch Irrigation Well and Conveyance Line. As previously discussed, the Property Owner (Lotusland Investment Holdings LLC) has purchased an off-site irrigation well in the vicinity of 20740 S. State highway 29 and 20830 S. State Highway 29. This high production well will be used as a primary source of non-potable water to supply irrigation, fire protection and make up water for water features and ponds, if required.

The condition of this well is marginal and appears to be partially filled with sand. Based on this condition the well will either be reconstructed or replaced in-kind. Based on a preliminary review of groundwater conditions at the site, it is likely that the well is constructed in old alluvium deposits derived from old channels of Putah and St. Helena Creek and possibly old lake or wetland deposits. The alluvium is estimated to be approximately 260 to 300 feet deep, and overlays low yielding hard bedrock. Pump test results indicate that the well has a high production capacity measured at 1,100 gallons per minute. A new well would be designed with a relatively large diameter (12-inch) casing and fitted with either a high capacity turbine or submersible style pump to yield high flows over 1,000 gallons per minute.

The well pump system will be connected to a long water conveyance line (8- to 10-inch diameter line) that will run parallel to Butts Canyon Road to convey groundwater to the property site. It is likely that the conveyance line will pump the water to Detert Reservoir.

The existing well is on land currently used for pasture and this use is assumed to continue and the reconstruction or replacement of the well will result in temporary and short-term constructed related localized impacts.

The new water conveyance line will be approximately 6 miles long and will be installed within the public right-of-way along Butts Canyon Road. The pipeline trench will likely be 24-inch wide by 40-inch deep. The construction of the pipeline and trench will require an encroachment permit from the County or State. The conveyance line will be installed in planned roadways where possible and should not result in additional land disturbance and impacts to cultural, historic and biotic resources beyond impacts resulting from the construction of the new roads.

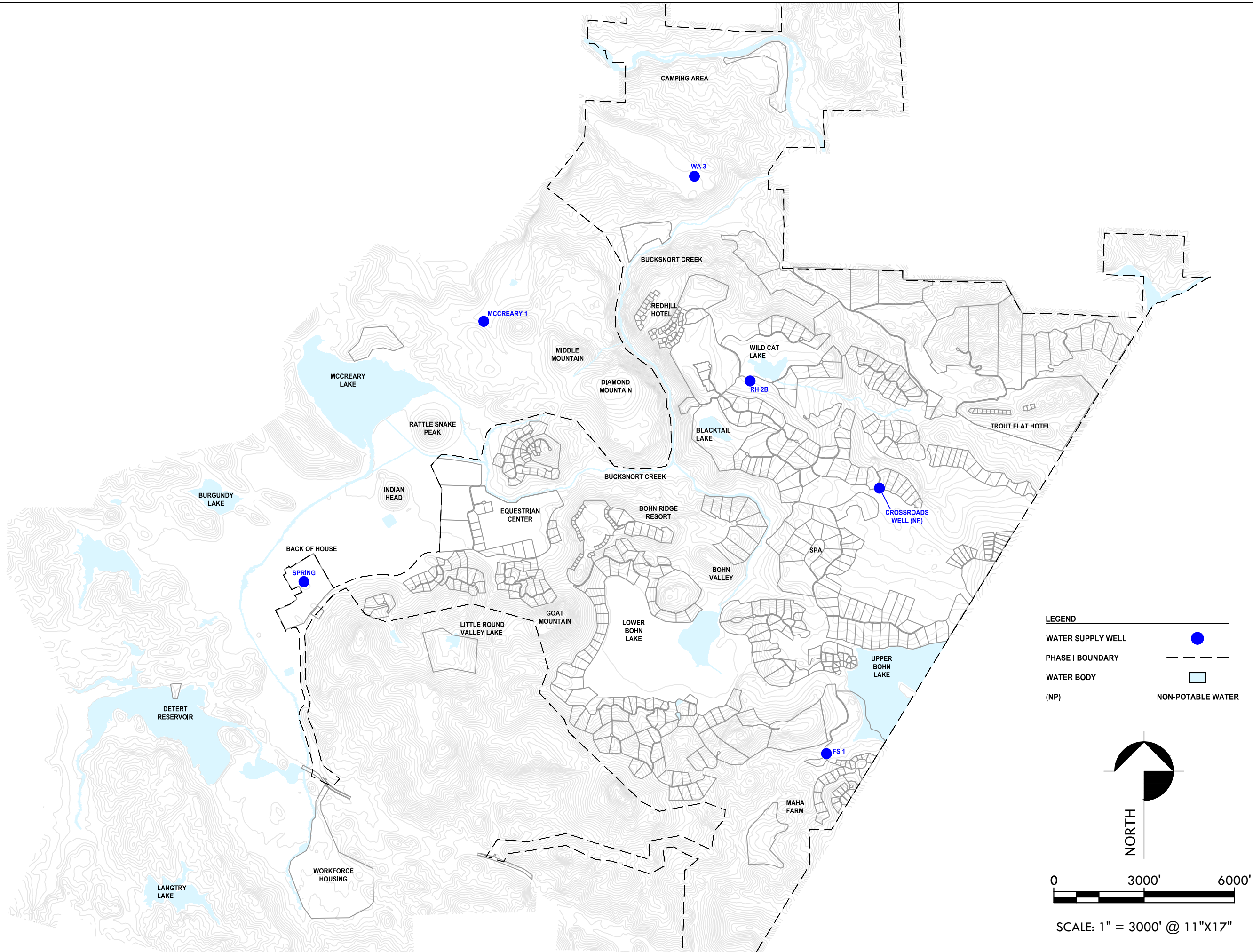


FIGURE 1. PROPOSED LOCATION OF WATER SUPPLY WELLS FOR THE PHASE I PROJECT

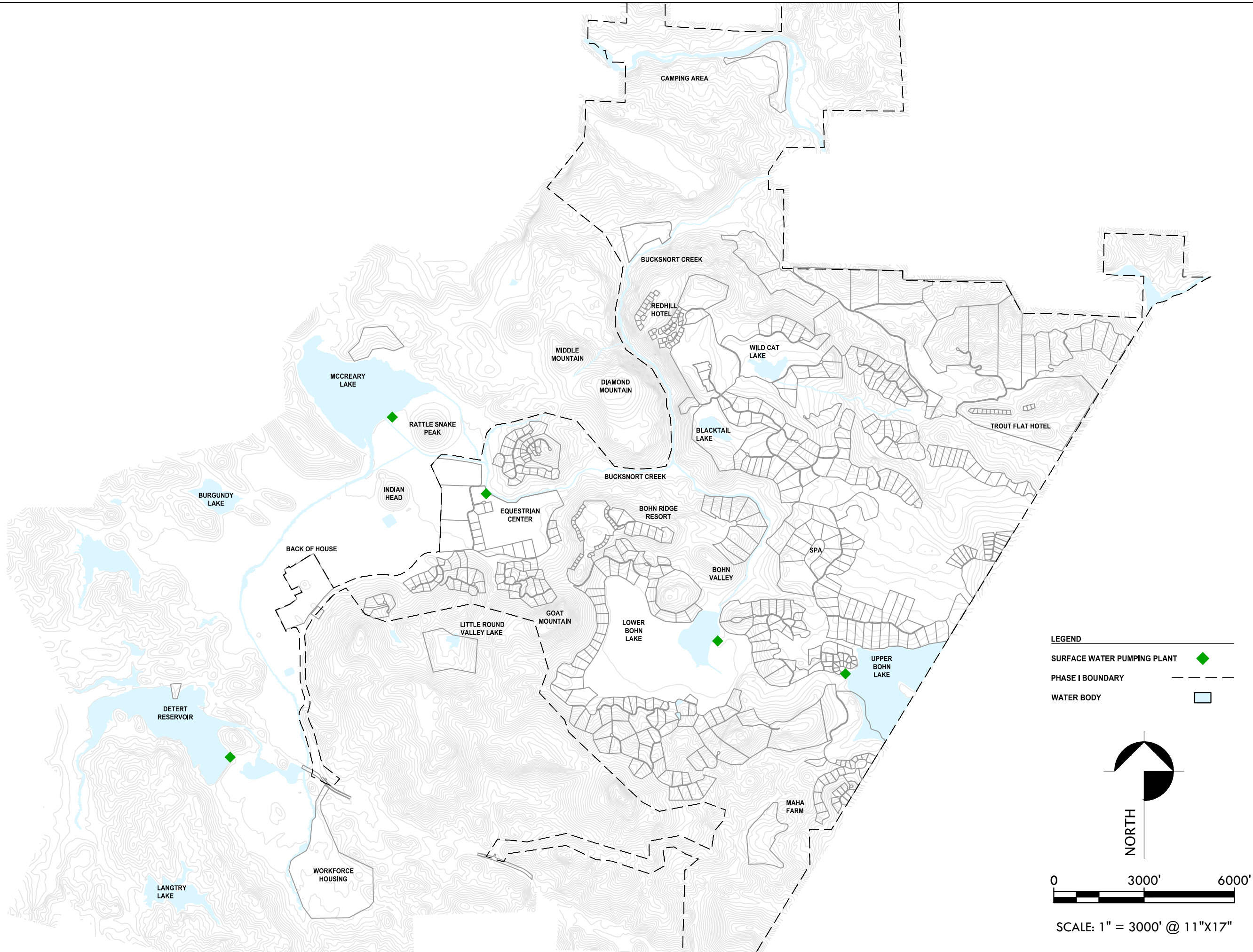


FIGURE 2. PROPOSED LOCATION OF SURFACE WATER PUMPING PLANTS

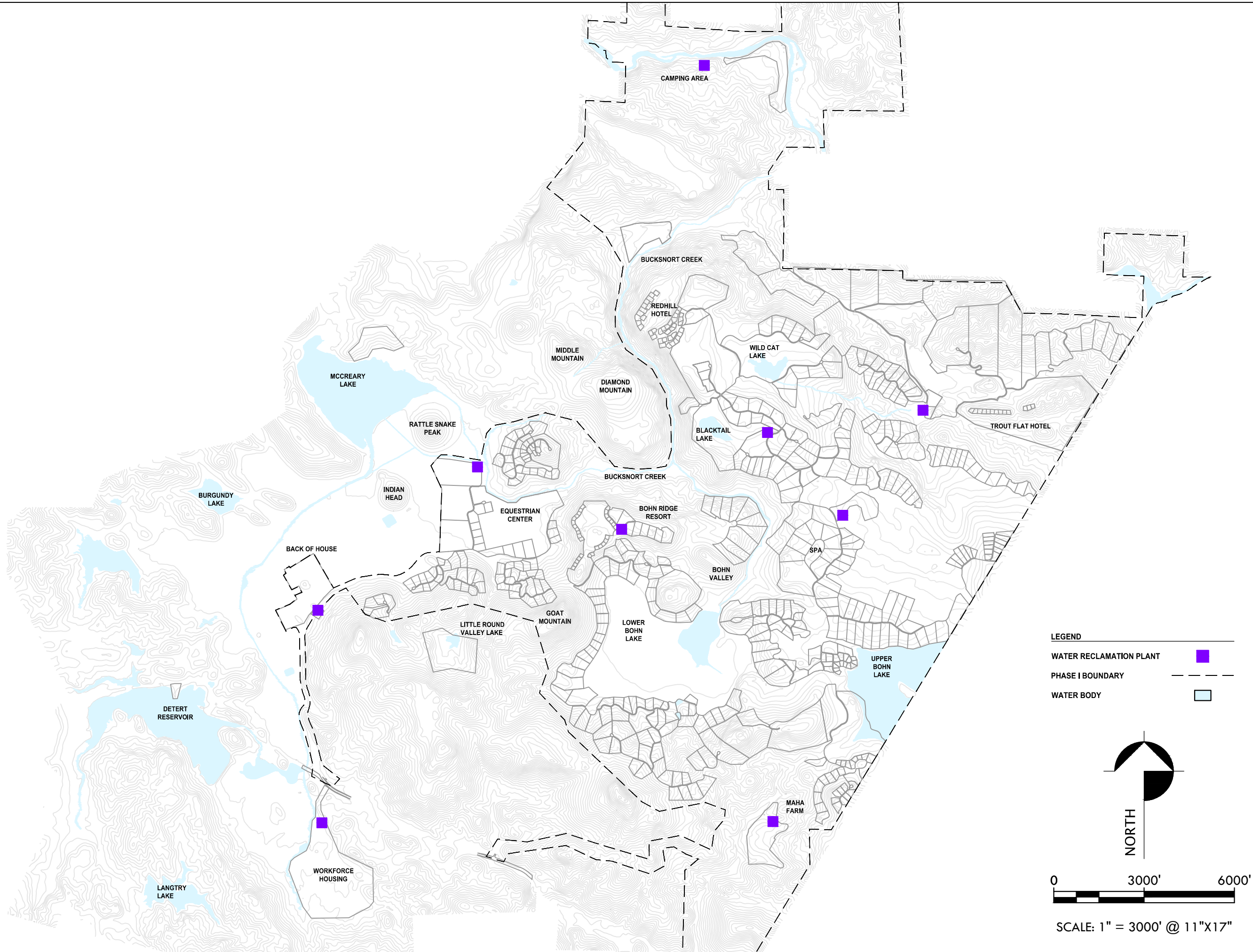


FIGURE 3. PROPOSED LOCATION OF WATER RECLAMATION FACILITIES

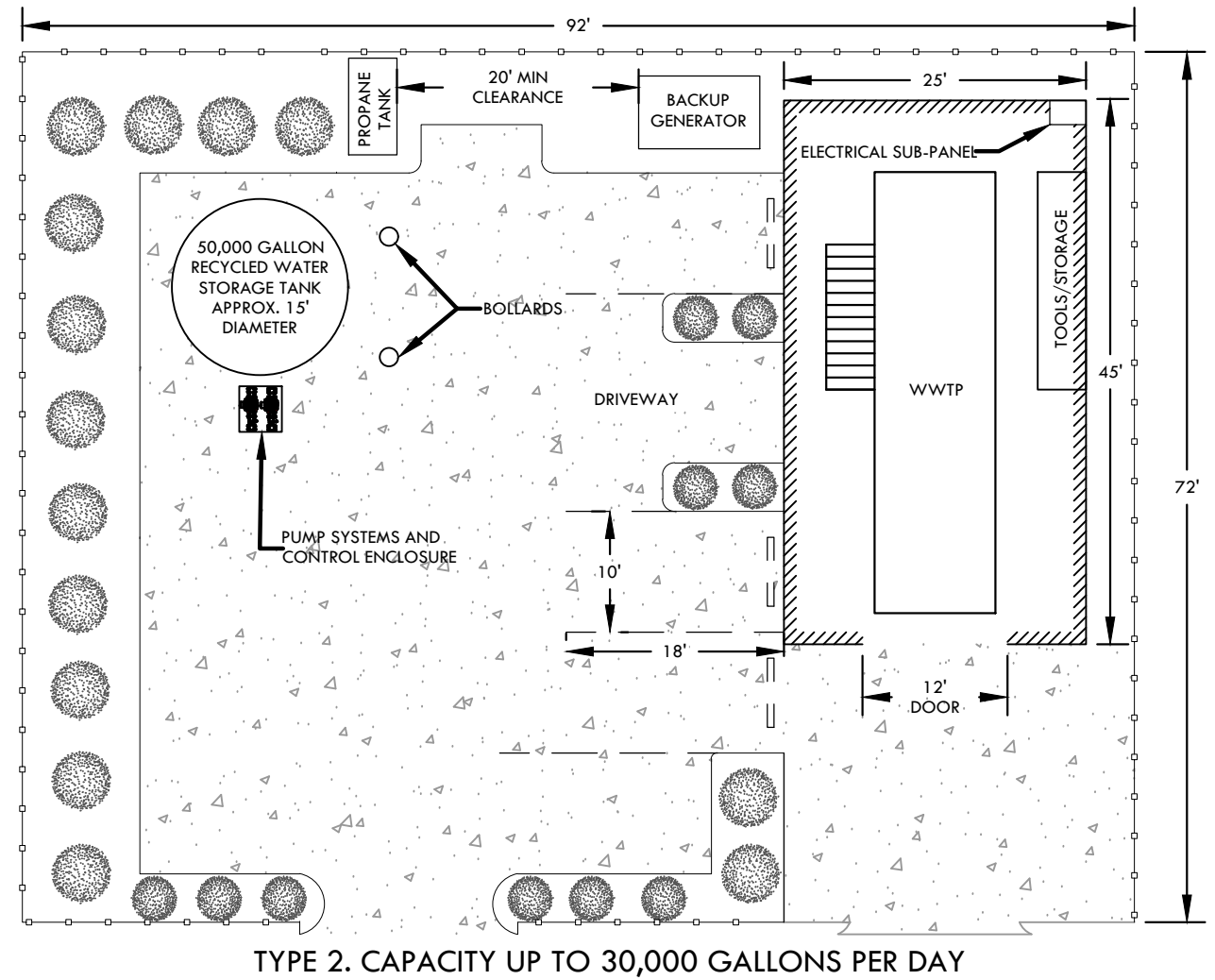
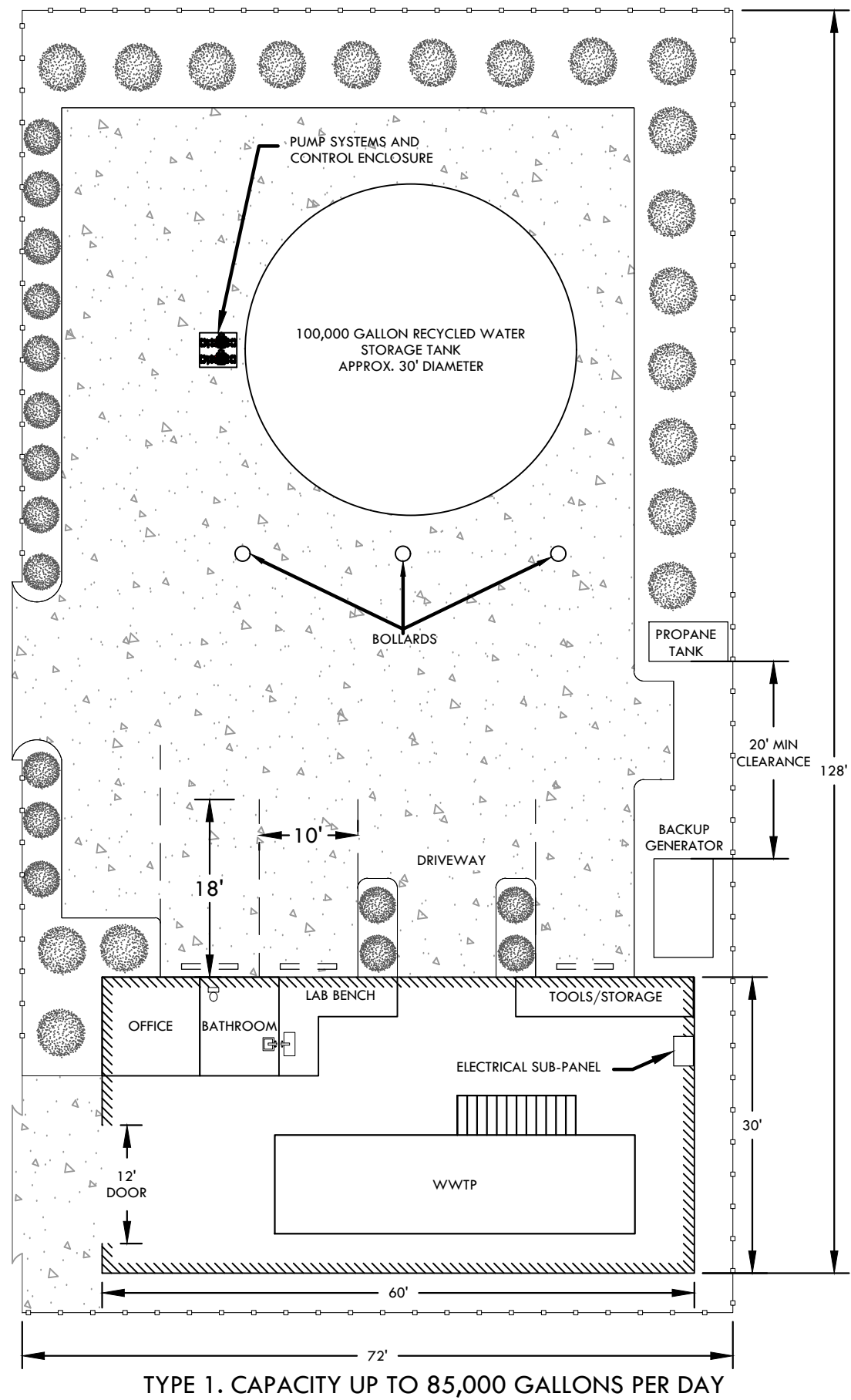


FIGURE 4. TYPICAL WATER RECLAMATION FACILITY LAYOUTS