Section 2—
Estimated Waste Water Production and Proposed Treatment Irrigation and Storage Technical Memorandum

Paraiso Springs Resort – Estimated Wastewater Production and Proposed Treatment, Irrigation, and Storage

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This technical memorandum presents recommendations for wastewater treatment and recycling for the Paraiso Springs Resort, based on the land use and site plan for the Project dated July 2005 (see Attachment 1, Site Plan). To determine peak wastewater production, it is assumed that the resort will be operating at full capacity for each of four Project development phases.

Estimated Wastewater Production

The companion technical memorandum, *Paraiso Springs Resort – Estimated Potable Water Demand and Potable Water Source* (CH2M HILL, January 27, 2009 and Revised: August 3, 2010), estimated the peak potable water demand at full occupancy and build-out to be 42,380 gallons per day (gpd). This would translate to 36,495 gpd entering the sewer system, as shown in Table 1 below, using a conservative estimate of 90% of the potable supply and 85% occupancy of the Hotel and 100% of all other Project features.

TABLE 1
Estimated Peak Wastewater Production
Paraiso Springs Resort – Estimated Wastewater Production and Proposed Treatment, Irrigation, and Storage

Development Phase	Estimated Production (gpd)
Phase 1	18,312
Phase 2	6,633
Phase 3	6,104
Phase 4	5,446
Buildout	**36,495**

Proposed Wastewater Treatment

To address the needs of the resort and regulatory requirements, it was determined that wastewater treated to a level of tertiary filtered and disinfected, as defined by California Title 22, would be provided. This would allow the water to be recycled for landscape and crop irrigation throughout the resort.

A variety of biological treatment processes were evaluated, including the following:

- Suspended growth
- Fixed growth
- Suspended growth combined with membrane treatment (membrane bioreactor)
- Constructed wetlands

Each of these processes is available as a package from manufacturers. Of these, the membrane bioreactor (MBR) combined with ultraviolet light (UV) disinfection is recommended for the following reasons:

- Lowest land requirement
- Construction possible at grade level, eliminating the potential for disrupting the shallow aquifer
- Available from major manufacturers with good service support
- Includes integral filtration step
- Low potential for odors

A catalog cut of a typical MBR system is included as Attachment 2.

The first step of treatment would be fine screening at the head of the treatment plant. The screenings, comprising both organic and inorganic material, would be macerated and washed, thereby returning most of the organic matter to the waste stream. The residual waste would be compacted and disposed of in a dumpster for hauling to a landfill.

Waste would flow through the screens to the biological treatment tank. The biomass would be aerated using blowers. Excess biomass would be wasted from the system about once per month and hauled to a municipal septage receiving facility. During periods of low flow, tank compartments can be placed into an “idle” mode during which the biomass is maintained, but little additional cell growth occurs. The biological process would be designed to achieve nitrate-nitrogen levels of less than 10 milligrams per liter (mg/L), which is the drinking water standard.

Water would exit the biological process through membranes submerged in the biological treatment tank to separate solids and liquid. The membranes would be backwashed periodically with air, and cleaned less frequently with chemical cleaning agents.

The filtered water would then be disinfected in a UV system. The UV system could be contained in either an open channel or enclosed in a pipe. Recycled water would then be used for onsite irrigation.

Irrigation and Storage

The balance between irrigation and storage is sensitive to the resort occupancy rate, which determines the volume of wastewater production. For this analysis, a full occupancy rate was assumed for each phase of development (Phases 1 through 4). Phase 4 represents full buildout and includes all prior phases. Wastewater treatment capacity, supplemental irrigation, and seasonal storage requirements were also sized for maximum occupancy.

This section briefly summarizes the results of a water balance analysis for projected recycled wastewater flows and landscape irrigation requirements within the planned development. Estimates were developed for the total area that could be irrigated, the volume of balancing storage that would be needed given expected monthly wastewater flows, and supplemental fresh-water requirements.

Input Values

Projected full-occupancy recycled water flows were determined for the four project phases, ranging from 18,312 gpd in Phase 1, to 36,495 gpd in Phase 4 at buildout.

Monthly rainfall data were available for Paloma, California, and Soledad, California, from the Western Regional Climatic Data Center (http://www.wrcc.dri.edu/). Site-specific data for the Paraiso Springs Resort area suggest that the average annual rainfall total is 11 inches. The data by month were averaged for the Paloma and Soledad sites, and were scaled so that the typical year total was 11 inches. Monthly wet- and dry-year data from the Paloma and Soledad sites were similarly scaled. The level of uncertainty in these precipitation estimates is such that a reasonable return period cannot be estimated. In calculating irrigation water requirements, standard Natural Resource Conservation Service procedures (USDA-NRCS, 1993) were used to estimate the amount of precipitation that would actually enter the root zone and be available to plants (typical effective precipitation). Monthly rainfall estimates are presented in Table 2.

TABLE 2
Monthly Rainfall Values Assumed for Each Scenario (inches)
Paraiso Springs Resort – Estimated Wastewater Production and Proposed Treatment, Irrigation, and Storage

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Typical	2.2	2.3	2.0	0.7	0.2	0.1	0.0	0.0	0.1	0.5	1.1	1.6	11.0
Typical “Effective”	0.82	1.08	0.98	0.35	0.08	0.0	0.0	0.0	0.03	0.21	0.54	0.75	4.84
Wet	4.6	4.8	4.1	1.4	0.4	0.1	0.1	0.1	0.3	0.9	2.3	3.3	22.4
Dry	1.0	1.1	0.9	0.3	0.1	0.0	0.0	0.0	0.1	0.2	0.5	0.8	5.1

The irrigated area of the development is projected to be much smaller than the total Resort area, and includes predominantly the Arroyo Seco (AsC), Cropley (CnC), Fluvents, and Placienta (PnD) soil map units. In terms of landform, this area consists of alluvial fans, terraces, and plains. Some of these soils (AsC, Fa, and the PnD below a depth of 13 inches) have very low water-holding capacities. This limitation will influence plant growth, irrigation system design, and soil amendments or topsoil that may be needed.

Approach

Landscaping for the development was projected to be a complex mixture of wine grapes, grass, and trees and shrubs, with a total area of 23.8 acres. For evapotranspiration estimates, it was assumed that the fraction of the total acreage devoted to each crop would be 8.5 acres turf – warm-season low water use type (35.7 percent of land area), 6.8 acres (28 percent) grape vines, and 8.5 acres (35.7 percent) general landscaping (low water use, drought-tolerant trees/shrubs/grass). Water requirements by crop for each precipitation year scenario were taken from California Polytechnic State University's Irrigation Technology Resource Center database (http://www.itrc.org/), combined with landscape irrigation water demand approaches (UCES, 2000). Supplemental reference crop evapotranspiration data were obtained from the California Irrigation Management Information System (CIMIS), http://wwwcimis.water.ca.gov/cimis/welcome.jsp. No irrigation was assumed in January, but irrigation was assumed in November, December, and February if projected water demand was greater than effective precipitation. The site of the resort is approximately at the boundary of two different CIMIS data zones (Zone 6 and Zone 12), and these data were also averaged.

Water Balance Results

Estimated water demands and flow rates indicate that approximately 1.7 million gallons (MG) of seasonal storage will be required in Phase 1 for recycled water that exceeds the amount that can be irrigated, generally during November through February (see Attachment 3 and Table 3). Needed wet-weather storage capacity, based on a 120-day storage requirement for wastewater flows, totals 2.2 MG for Phase 1, and 4.38 MG by Phase 4.

TABLE 3
Summary of Water Balance Results by Project Phase (Full Occupancy)
Paraiso Springs Resort – Estimated Wastewater Production and Proposed Treatment, Irrigation, and Storage

	Potable Water Use[a] (gpd)	WW Production[b] (gpd)	Wet Weather Storage Volume Required Based on Irrigation Demands vs. Flows[c] (MG)	Wet Weather Storage Based on 120 day Requirement (MG)	Fresh Water Supplement[d] (MG/year)
Phase 1	21,430	18,312	1.74	2.20	11.8
Phase 2	7,630	6,633	2.54	2.99	9.4
Phase 3	7,040	6,104	3.28	3.73	7.2
Phase 4	6,280	5,446	4.10	4.38	5.2
Buildout	42,380	36,495			

[a] Potable water use from Table 2 in Estimated Potable Water Demand and Potable Water Source memorandum.

[b] Wastewater production values based on 90 percent of potable water use and Project occupancy assumption noted below.

[c] Wet weather storage volume based on CH2M HILL preliminary Water Balance Model for Project.

[d] Fresh water supplement is for 23.8 acres of site irrigation, based on CH2M HILL preliminary Water Balance Model for Project. It assumed that all 23.8 acres are constructed and need to be irrigated beginning with Phase 1.

Note:

Full occupancy is 85 percent occupancy for hotel and 100 percent occupancy for all other elements of Project, used for WW calculation only.

WW = wastewater

The seasonal storage facility is planned to be an underground reinforced concrete reservoir. According to the data shown here, the maximum size of the underground recycled water reservoir would be 4.38 MG to meet County requirement of 120 days of storage. The reservoir size for that amount of storage would be approximately 28,750 square feet (250 feet by 115 feet by 20.4 feet deep) constructed beneath the parking lot near the wastewater treatment facility (see Attachment 1, Site Plan). A smaller reservoir would be constructed in Phase 1, but would be expanded for future development phases. Future expansions would be sized according to actual water use data. The actual size and configuration of the underground reservoir will be determined during final design, considering final design-level geotechnical engineering and landscape architectural data.

From approximately April through October, supplemental water will be needed to meet irrigation demand. The peak month for supplemental water use is expected to be July, with approximately 2.57 MG to meet demand in Phase 1, and 2.01 MG in Phase 4.

Adjustments to the projected plant species and volume of irrigation actually used for landscaping could significantly reduce supplemental fresh-water requirements.

Soil Density

While most of the development is planned in alluvial soils, some dense sandy soils exist in the upper alluvium zone at several locations within the proposed Project development area, as indicated in the Project Geologic Report. Attachment 4 is a site geologic map by Landset Engineers showing the site plan, landscape areas, and soil densities.

The dense soils shown in Attachment 4 will be addressed in a variety of ways. Prior to construction, additional soil explorations will be performed to better characterize the existing soils and guide final design and development of the landscaping materials and irrigation requirements. Refinements to the current Preliminary Landscape Plan will be made as soil conditions dictate, and appropriate specifications will be developed to prepare the areas to be planted and irrigated.

During construction, site earthwork operations will disturb the in situ soils, as a significant amount of excavation and fill will be necessary to rough or mass grade the site. It is anticipated that soil preparation in landscape areas will include ripping/scarification, tilling, and amending the soil following the rough grading and site construction. Ripping/tilling, depth will vary with soil conditions and plant types. For denser soil areas, this depth could be up to 24 to 30 inches for most shrubs, plants, and grasses and deeper for large shrubs, trees, and the vineyard area. The exact specifications will be developed in conjunction with the landscape architect.

Following construction, the landscape areas/irrigation system will be monitored closely to optimize performance of the wastewater distribution system through adaptive management. If irrigation rates, plant types, or soil conditions need adjustments, they will be made on an ongoing basis as part of the Resort maintenance.

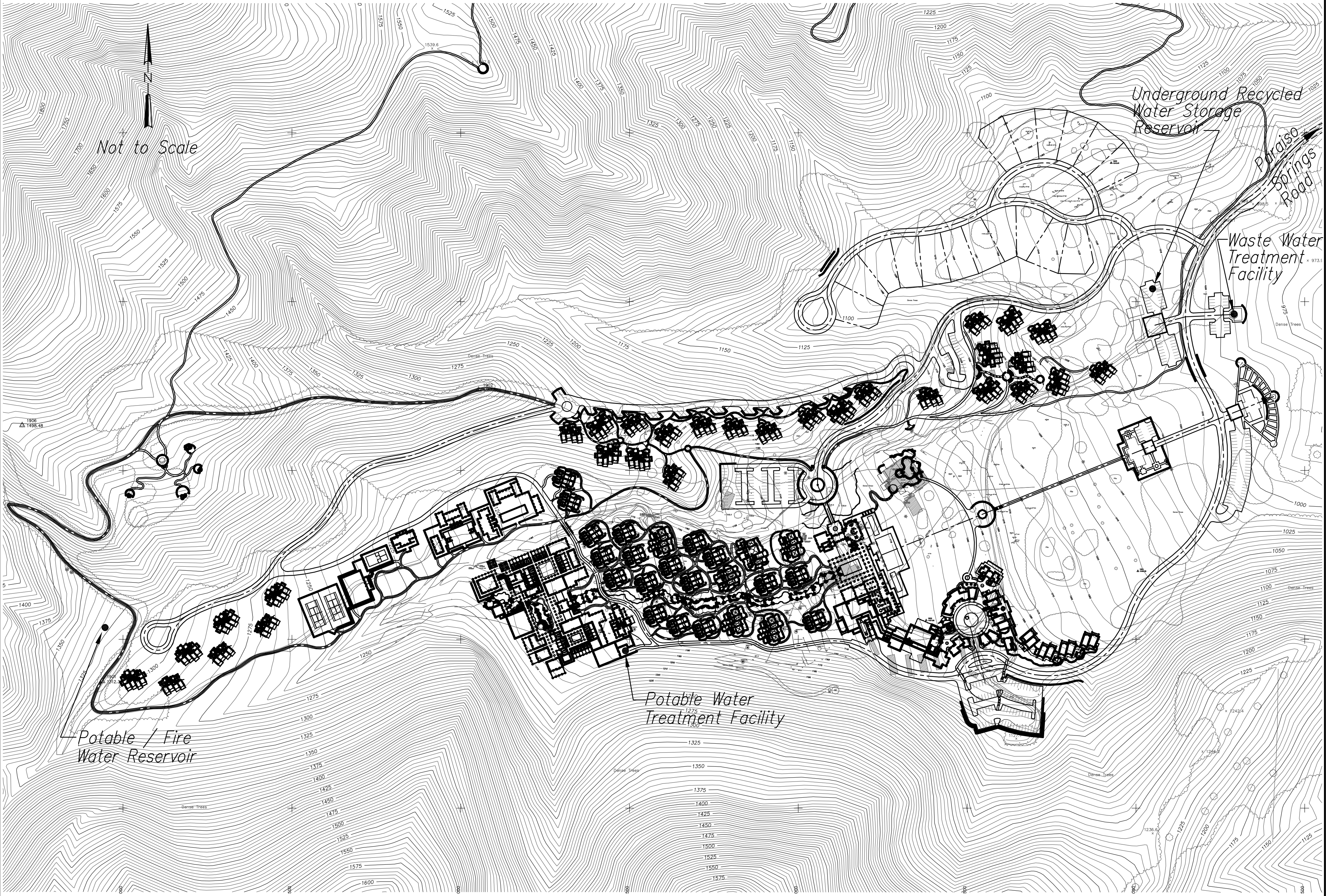
As a contingency, if future soil exploration, final design, or the adaptive management process dictates a change to the planned irrigation/planting areas, additional alluvium areas within the Project limits are available for irrigation. Please refer to Attachment 4, which shows the extent of alluvium soils outside the planned development footprint that could be used for irrigation/wastewater disposal, if necessary.

References

USDA-NRCS. 1993. Irrigation Water Requirements. *Part 623 National Engineering Handbook, Chapter 2*. U.S. Department of Agriculture, Natural Resources Conservation Service, Washington, D.C.

UCES. 2000. *A Guide to Estimating Irrigation Water Needs of Landscape Plantings in California: the Landscape Coefficient Method and WUCOLS III*. University of California Extension Service, California Department of Water Resources, U.S. Bureau of Reclamation.

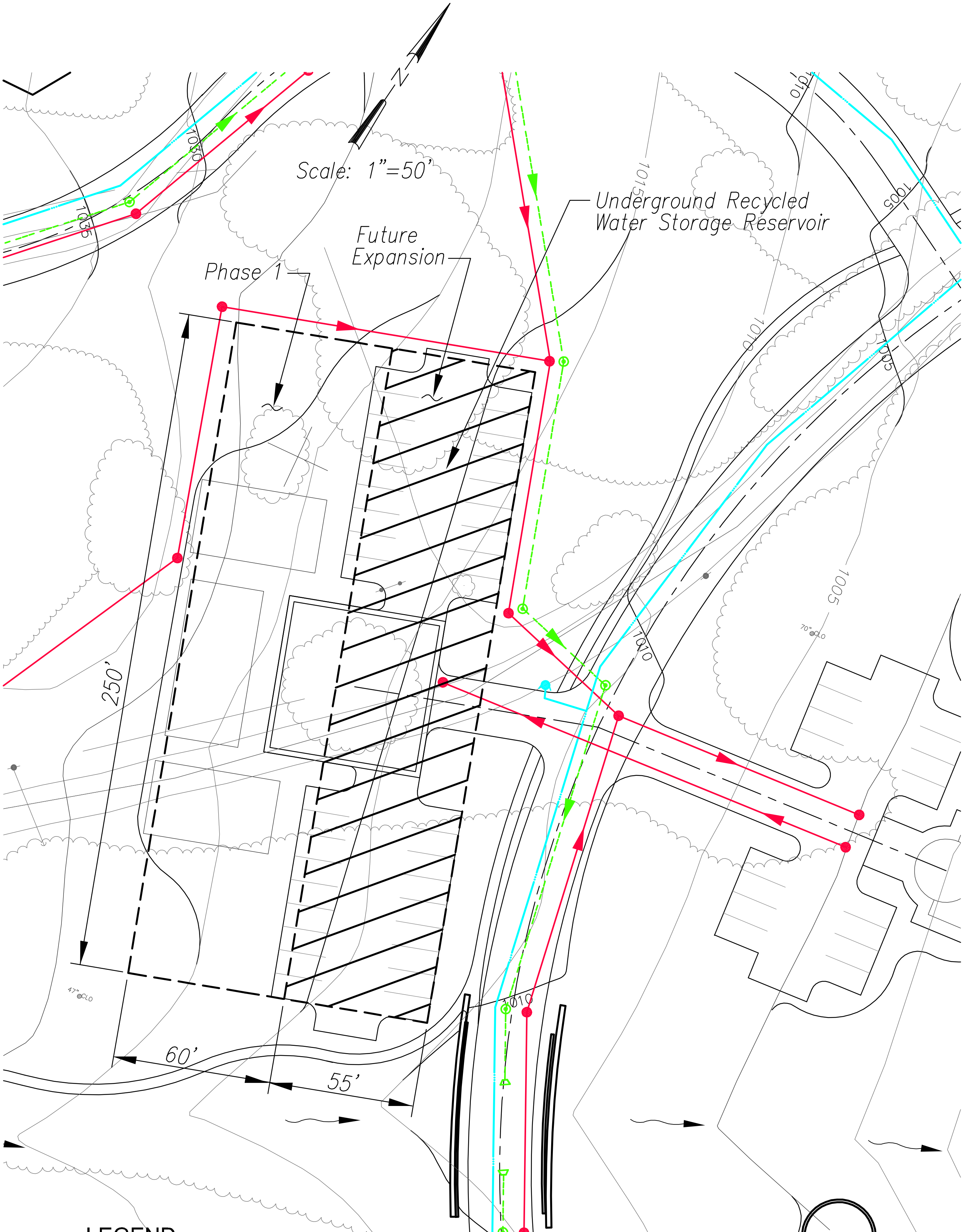
Attachment 1
Site Plan



PARAISO SPRINGS RESORT

Soledad, California

Site Plan



LEGEND

- WATER MAIN
- STORM SEWER
- SANITARY SEWER

PARAISO SPRINGS RESORT

Soledad, California

Underground Recycled Water Storage Reservoir Location Map

Attachment 2
Typical Membrane Bioreactor

Z-MOD* M Packaged Plants

Pre-engineered Packaged Plants are cost effective, compact solutions for wastewater treatment

Base System

- Complete systems incorporate screening, biological equipment, filtration equipment and disinfection
- Stainless steel or epoxy coated carbon steel membrane tank and equipment skid
- Skid mounted permeate pumps, backpulse pumps, membrane aeration blowers, backpulse tank, valves, GE Fanuc PLC and HMI Interface
- Plant start-up and operator training
- Epoxy coated carbon steel or 316SS Frame
- SCH 80 PVC Piping
- Epoxy coated carbon steel or 316SS Membrane tank
- High density polyethylene backpulse tank
- 316SS air header

Application Dependent Options

- Biological equipment includes screening, process blowers, diffusers, transfer pumps, grinder pumps, mixers and enhanced nitrogen removal systems
- Chemical systems for enhanced coagulation, pH control and membrane cleaning
- Effluent systems including turbidity measurement and UV disinfection
- Maintenance packages including shelf spares, spare parts, service contracts and process tracking software
- 24/7 technical support
- Zenotrac data analysis system

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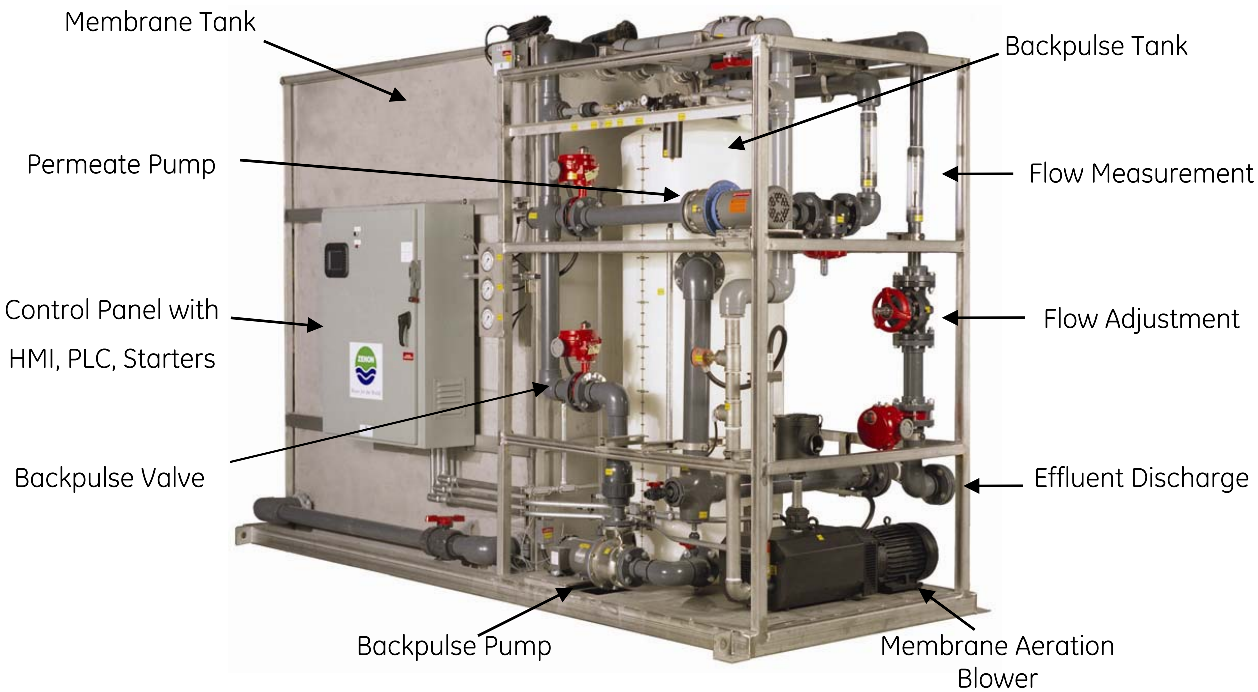
SC-ZMODM-DAT-EN 0107 NA/EMEA

Z-MOD M


Membrane Tank
Backpulse Tank
Permeate Pump
Flow Measurement
Control Panel with
HMI, PLC, Starters
Flow Adjustment
Backpulse Valve
Effluent Discharge
Backpulse Pump
Membrane Aeration
Blower

DATA SHEET Z-MOD M SYSTEMS

	Units	M2D	M4	M4D	M8	M8D	M16D	M44D
Design Flow Rates								
Average Flow	gpd	10,000	20,000	20,000	40,000	40,000	40,000	110,000
Peak Flow	gpd	20,000	40,000	40,000	80,000	80,000	80,000	220,000
Permeate Discharge Design								
Design Flow Rate	gpm	7.5	28	15	56	28	56	76
Max TDH Required	psig	12.95	14.15	12.95	13.15	14.15	13.15	25
Available TDH	psig	22	20	18	18	20	18	55
Discharge Pressure	psig	9	6	5	5	6	5	20
Cassette Configuration								
Type of Membrane:		500A	500A	500A	500A	500A	500A	500C
Number of Trains:		2	1	2	1	2	2	2
Number of Cassettes per Train:		1	1	1	1	1	1	1
Number of Modules per Cassette:		2	4	2	8	4	8	22
Standard Equipment								
Membrane Aeration Blowers		2	1	2	1	2	2	2
Membrane Modules		2	4	4	8	8	16	44
Membrane Tanks		2	1	2	1	2	2	2
Permeate Pumps		2	1	2	1	2	2	2
Backpulse Pumps		2	1	2	1	2	2	2
Backpulse Tank		1	1	1	1	1	1	1
Control Panel		1	1	1	1	1	1	1
PLC		1	1	1	1	1	1	1
HMI		1	1	1	1	1	1	1
Equipment Skid		1	1	1	1	1	1	1
Tie points Connections								
Influent Piping	inch	1.5"	2"	2"	3"	3"	3"	3"
Effluent Piping	inch	1.5"	1.5"	2"	2"	2"	3"	3"
Recirculation Piping	inch	3"	3"	3"	4"	4"	6"	6"
Utility Water Piping	inch	2"	2"	2"	2"	2"	2"	3"
Equipment Footprint								
Skid Installation Length	ft	12	9.7	12	12.25	15	15	15
Skid Installation Width	ft	6.4	4.2	6.4	4.2	7	7	7
Skid Installation Height	ft	9	9	9	9	9	9	9
Typical Building Dimensions								
Maximum Required Building Length	ft	30	30	30	30	30	30	30
Maximum Required Building Width	ft	18	18	18	18	18	18	18
Membrane Clearance Height	ft	14	14	14	14	14	14	14

** All dimensions include process blowers, UV disinfection, membrane lay down and all optional chemical skids in the scope

	M2D	M4	M4D	M8	M8D	M16D	M44D
Process Equipment							
Process Aeration Blowers	2	2	2	2	2	2	2
Acoustical Enclosure for Process Blowers	2	2	2	2	2	2	2
Aerobic Diffusers	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Anoxic Mixing (Periodic Air Mixing)	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Anoxic Mixing (Mechanical Mixer)	1	1	1	1	1	1	1
Grinder Pump	2	2	2	2	2	2	3
TN Removal System	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Recirculation Pumps (Pump From Design)	2	1	2	1	2	2	2
Chemical Equipment							
pH Adjustment	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Enhanced Coagulation	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Phosphorous Removal	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Co-Nutrient Dosing	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
NaOCl Cleaning System	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Citric Acid Cleaning System	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Effluent & Discharge Equipment							
Turbidity Measurement	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
Effluent Flow Measurement	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
UV Disinfection Peak Flow - No Redundancy	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot	1 Lot
UV Disinfection Redundancy at Average Flow	2 Lot	2 Lot	2 Lot	2 Lot	2 Lot	2 Lot	2 Lot
Control Equipment							
Allen Bradley PLC upgrade	1	1	1	1	1	1	1
Auto dialer	1	1	1	1	1	1	1

All information provided is based on typical characteristics which vary depending influent characteristics and plant configuration

Attachment 3
Water Balance Results

WATER BALANCE SUMMARY

PHASE 1

		31	28	31	30	31	30	31	31	30	31	30	31	
Typical Precip Scenario (23.8 ac)		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
IRRIGATION														
ETc potential	[in]	0.75	1.30	2.24	2.89	4.15	4.04	4.13	3.62	2.71	1.64	0.77	0.89	**29.12**
Effective Precipitation	[in]	0.82	1.08	0.98	0.35	0.08	0.00	0.00	0.00	0.03	0.21	0.54	0.75	**4.84**
GIRR (85% application efficiency)	[in]	0.00	0.26	1.48	2.99	4.79	4.75	4.86	4.26	3.15	1.69	0.28	0.16	**28.66**
GIRR	[MG]	0.00	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**
AVAILABLE WATER														
Available Wastewater	[in]	0.88	0.79	0.88	0.85	0.88	0.85	0.88	0.88	0.85	0.88	0.85	0.88	**10.34**
Available Wastewater	[MG]	0.57	0.51	0.57	0.55	0.57	0.55	0.57	0.57	0.55	0.57	0.55	0.57	**6.68**
Supplemental Fresh Water to meet GIRR without considering inflows from storage	[MG]	-	-	0.39	1.38	2.53	2.52	2.57	2.19	1.49	0.52	-	-	**13.58**
Total Water Supply (WW+FW)	[MG]	0.57	0.51	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.55	0.57	**18.07**
STORAGE														
Inflows to Storage (WW>GIRR)	[MG]	0.57	0.34	-	-	-	-	-	-	-	-	0.37	0.46	**1.74**
Cumulative Volume into Storage	[MG]	1.40	1.74	1.36	-	-	-	-	-	-	-	0.37	0.83	**1.74**
Outflows from Storage (GIRR>WW)	[MG]	-	-	0.39	1.36	-	-	-	-	-	-	-	-	**1.74**
Net Fresh Water Requirement	[MG]	-	-	-	0.02	2.53	2.52	2.57	2.19	1.49	0.52	-	-	**11.84**
Total Water Land Applied (total water supply-inflows to storage+outflows from storage)	[MG]	-	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**

Notes:

GIRR = Gross Irrigation Requirement (ETc - effective precipitation)/(irrigation efficiency)

ETc = Expected average evapotranspiration

WW = wastewater

FW = fresh water

Irrigated Acres 23.8

WATER BALANCE SUMMARY
PHASE 1

Typical Precip Scenario (23.8 ac)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		31	28	31	30	31	30	31	31	30	31	30	31	
IRRIGATION														
ETc potential	[in]	0.75	1.30	2.24	2.89	4.15	4.04	4.13	3.62	2.71	1.64	0.77	0.89	**29.12**
Effective Precipitation	[in]	0.82	1.08	0.98	0.35	0.08	0.00	0.00	0.00	0.03	0.21	0.54	0.75	**4.84**
GIRR (85% application efficiency)	[in]	0.00	0.26	1.48	2.99	4.79	4.75	4.86	4.26	3.15	1.69	0.28	0.16	**28.66**
GIRR	[MG]	0.00	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**
AVAILABLE WATER														
Available Wastewater	[in]	1.20	1.08	1.20	1.16	1.20	1.16	1.20	1.20	1.16	1.20	1.16	1.20	**14.09**
Available Wastewater	[MG]	0.77	0.70	0.77	0.75	0.77	0.75	0.77	0.77	0.75	0.77	0.75	0.77	**9.10**
Supplemental Fresh Water to meet GIRR without considering inflows from storage	[MG]	-	-	0.18	1.18	2.32	2.32	2.36	1.98	1.29	0.32	-	-	**11.96**
Total Water Supply (WW+FW)	[MG]	0.77	0.70	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.75	0.77	**18.07**
STORAGE														
Inflows to Storage (WW>GIRR)	[MG]	0.77	0.53	-	-	-	-	-	-	-	-	0.57	0.67	**2.54**
Cumulative Volume into Storage	[MG]	2.01	2.54	2.36	1.18	-	-	-	-	-	-	0.57	1.24	**2.54**
Outflows from Storage (GIRR>WW)	[MG]	-	-	0.18	1.18	1.18	-	-	-	-	-	-	-	**2.54**
Net Fresh Water Requirement	[MG]	-	-	-	-	1.14	2.32	2.36	1.98	1.29	0.32	-	-	**9.42**
Total Water Land Applied (total water supply-inflows to storage+outflows from storage)	[MG]	-	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**

Notes:
GIRR = Gross Irrigation Requirement (ETc - effective precipitation)/(irrigation efficiency)
ETc = Expected average evapotranspiration
WW = wastewater
FW = fresh water

Irrigated Acres 23.8

WATER BALANCE SUMMARY
PHASE 1

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		31	28	31	30	31	30	31	31	30	31	30	31	
IRRIGATION														
ETc potential	[in]	0.75	1.30	2.24	2.89	4.15	4.04	4.13	3.62	2.71	1.64	0.77	0.89	**29.12**
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GIRR (85% application efficiency)	[in]	0.00	0.26	1.48	2.99	4.79	4.75	4.86	4.26	3.15	1.69	0.28	0.16	**28.66**
GIRR	[MG]	0.00	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**
AVAILABLE WATER														
Available Wastewater	[in]	1.49	1.35	1.49	1.44	1.49	1.44	1.49	1.49	1.44	1.49	1.44	1.49	**17.54**
Available Wastewater	[MG]	0.96	0.87	0.96	0.93	0.96	0.93	0.96	0.96	0.93	0.96	0.93	0.96	**11.33**
Supplemental Fresh Water to meet GIRR without considering inflows from storage	[MG]	-	-	-	1.00	2.13	2.14	2.18	1.79	1.11	0.13	-	-	**10.47**
Total Water Supply (WW+FW)	[MG]	0.96	0.87	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.93	0.96	**18.08**
STORAGE														
Inflows to Storage (WW>GIRR)	[MG]	0.96	0.70	0.01	-	-	-	-	-	-	-	0.75	0.86	**3.28**
Cumulative Volume into Storage	[MG]	2.57	3.27	3.28	2.28	0.15	-	-	-	-	-	0.75	1.61	**3.28**
Outflows from Storage (GIRR>WW)	[MG]	-	-	-	1.00	2.13	0.15	-	-	-	-	-	-	**3.28**
Net Fresh Water Requirement	[MG]	-	-	-	-	-	1.99	2.18	1.79	1.11	0.13	-	-	**7.19**
Total Water Land Applied (total water supply-inflows to storage+outflows from storage)	[MG]	-	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**

Notes:
GIRR = Gross Irrigation Requirement (ETc - effective precipitation)/(irrigation efficiency)
ETc = Expected average evapotranspiration
WW = wastewater
FW = fresh water

Irrigated Acres 23.8

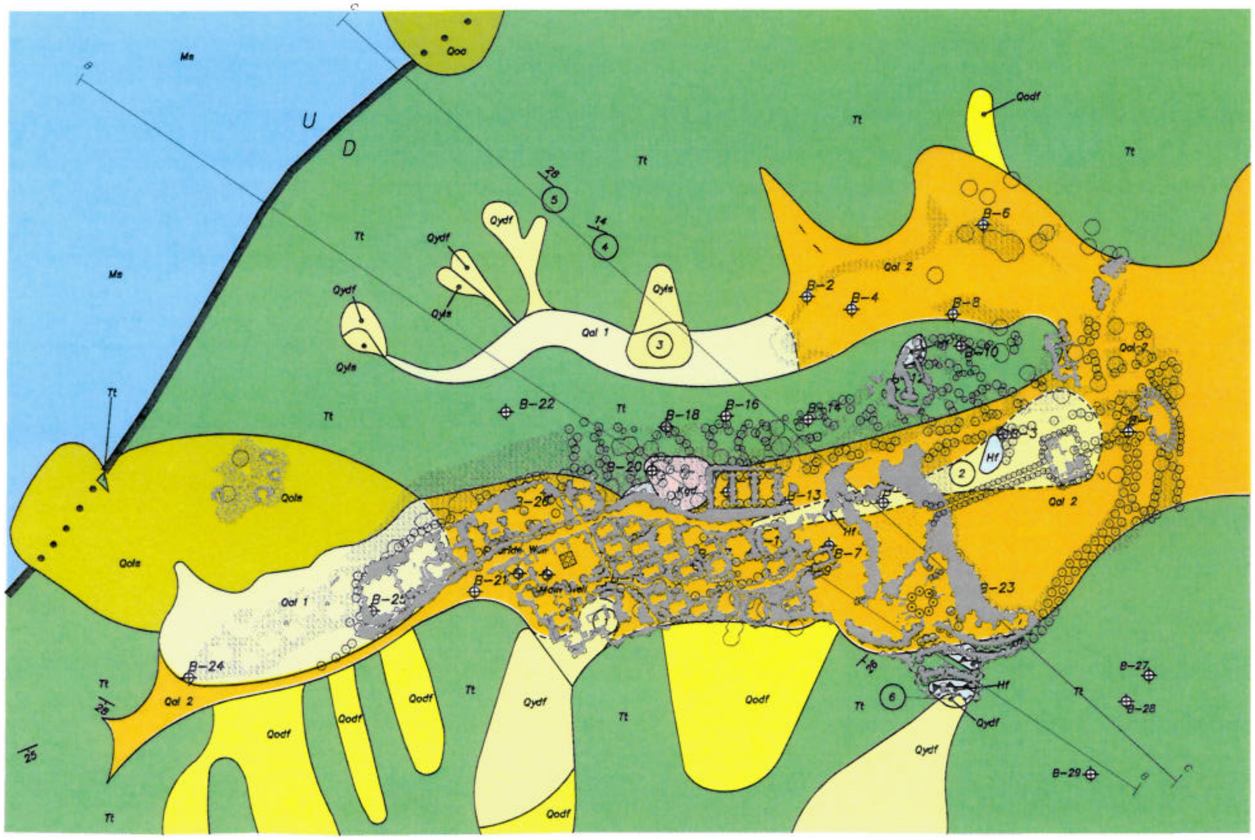
WATER BALANCE SUMMARY
PHASE 1

Typical Precip Scenario (23.8 ac)		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
		31	28	31	30	31	30	31	31	30	31	30	31	
IRRIGATION														
ETc potential	[in]	0.75	1.30	2.24	2.89	4.15	4.04	4.13	3.62	2.71	1.64	0.77	0.89	**29.12**
Effective Precipitation	[in]	0.82	1.08	0.98	0.35	0.08	0.00	0.00	0.00	0.03	0.21	0.54	0.75	**4.84**
GIRR (85% application efficiency)	[in]	0.00	0.26	1.48	2.99	4.79	4.75	4.86	4.26	3.15	1.69	0.28	0.16	**28.66**
GIRR	[MG]	0.00	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**
AVAILABLE WATER														
Available Wastewater	[in]	1.75	1.58	1.75	1.69	1.75	1.69	1.75	1.75	1.69	1.75	1.69	1.75	**20.61**
Available Wastewater	[MG]	1.13	1.02	1.13	1.09	1.13	1.09	1.13	1.13	1.09	1.13	1.09	1.13	**13.32**
Supplemental Fresh Water to meet GIRR without considering inflows from storage	[MG]	-	-	-	0.83	1.96	1.98	2.01	1.62	0.94	-	-	-	**9.35**
Total Water Supply (WW+FW)	[MG]	1.13	1.02	1.13	1.93	3.09	3.07	3.14	2.76	2.04	1.13	1.09	1.13	**18.29**
STORAGE														
Inflows to Storage (WW>GIRR)	[MG]	1.13	0.85	0.17	-	-	-	-	-	-	0.04	0.91	1.03	**4.14**
Cumulative Volume into Storage	[MG]	3.07	3.93	4.10	3.27	1.30	-	-	-	-	0.04	0.96	1.98	**4.10**
Outflows from Storage (GIRR>WW)	[MG]	-	-	-	0.83	1.96	1.30	-	-	-	-	-	-	**4.10**
Net Fresh Water Requirement	[MG]	-	-	-	-	-	0.67	2.01	1.62	0.94	-	-	-	**5.24**
Total Water Land Applied (total water supply-inflows to storage+outflows from storage)	[MG]	-	0.17	0.96	1.93	3.09	3.07	3.14	2.76	2.04	1.09	0.18	0.10	**18.52**

Notes:
GIRR = Gross Irrigation Requirement (ETc - effective precipitation)/(irrigation efficiency)
ETc = Expected average evapotranspiration
WW = wastewater
FW = fresh water

Irrigated Acres: 23.8

Attachment 4
Soil Density Exhibits



LANDSCAPING LEGEND:

- PROPOSED TURF
- PROPOSED MEADOW PLANTINGS
- PROPOSED SHRUBBERY
- PROPOSED TREE

NOTES:

1: Debris flow deposit of March 1995 event.
2: Flooding of March 1995 event.
3: Recent landslide deposit.
4: Location of slickenside surface trending N85W 66S, S80W 14.
5: Location of slickenside surface trending N79W 40S, W10.
6: Debris flow of March 1995 event.

Qal 1	Qyaf	Qyls	Hf	Holocene	Quaternary
Qal 2	Qodf				
Qoa		Qols		Pleistocene	
Tt				Miocene	Tertiary
Kgd				Cretaceous	Mesozoic
Ms					Paleozoic?

EXPLANATION:

Hf: Fill(Holocene): Fill deposits consisting of unconsolidated to semiconsolidated sand, silt, clay, and trace gravel.

Qyls: Landslide(Holocene): Recent landslide deposits, mostly occuring in the steeper slopes of the Tierra Redonda Formation(Tt).

Qydf: Debris flow(Holocene): Recent debris flow deposits, mostly occuring in the Tierra Redonda Formation(Tt).

Qydf: Debris flow(Holocene): Recent debris flow deposits, mostly occuring in the Tierra Redonda Formation(Tt).

Qodf: Debris flow(Holocene): Older debris flow deposits, mostly occuring in the Tierra Redonda Formation(Tt).

Qal 1: Alluvium(Holocene): Unconsolidated sand, silt, gravels, cobbles, and rare boulders.

Qal 2: Alluvium(Holocene): Unconsolidated sand, silt, and trace gravel.

Qols: Landslide(Pleistocene): Older landslide deposits consisting of unconsolidated to semiconsolidated boulders and cobbles supported by a sand and clay matrix.

Qoa: Alluvium(Pleistocene): Older alluvial deposits consisting of unconsolidated to semiconsolidated boulders and cobbles.

Tt: Tierra Redondo Formation(Miocene): Marine sandstone, conglomerate, and some mudstone.

Kgd: Granitic Basement Rock(Cretaceous): Hornblende granodiorite with phenocrysts of feldspar.

ms: Sierra De Salinas Schist(Paleozoic?): Biotite quartzofeldspathic schist of feldspar.

Contact: Dashed where approximate, querried where unknown.

Fault: Dashed where approximate, dotted where concealed
U = upthrown side
D = downthrown side

Water Well.

Strike and dip.

B-29 Boring location.

Cut ▽ and Fill ▼ Slope.

APPROVED BY:

BRAIN E. PAPURELLO No. C.E.G 2226

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REVISED GEOLOGICAL MAP
OF
PARAISO HOT SPRINGS RESORT
PARAISO SPRINGS ROAD
SOLEDAD/GREENFIELD AREA MONTEREY COUNTY, CALIFORNIA

SCALE: 1"=200'
DATE: DEC 2004
JOB# LSW-0337-01
SHEET 1 OF 3 SHEETS

NO.	DATE	BY	REVISION
2	10/28/09	CDC	ADD PROPOSED LANDSCAPING
1	5/23/08	JLN	RELEASED TO CLIENT

L:\CIVIL\PROJECTS - CARLSON\0835-01 Paraiso Springs\Geo-Landscape.dwg

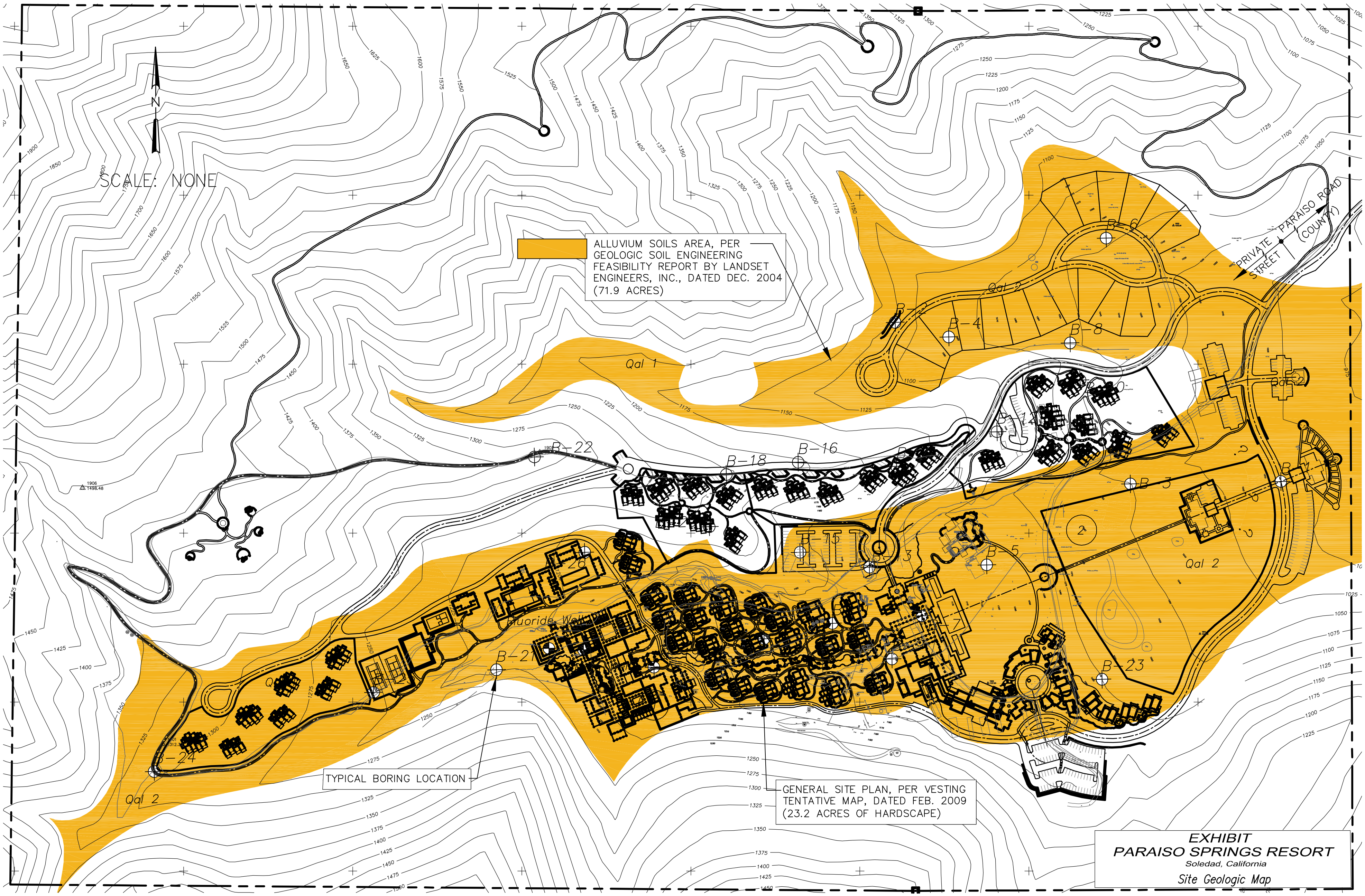

EXHIBIT
PARAISO SPRINGS RESORT
Soledad, California
Site Geologic Map