EnviroMINE, Inc.
Environmental & Mine Permitting Services

April 26, 2021

Mr. Jim Bennett
County of San Diego
Department of Planning and Development Services
5510 Overland Ave, 3rd Floor
San Diego, CA 92123

RE: Groundwater Use Analysis, Cottonwood Sand Mine
PDS2018-MUP-18-023, PDS2018-RP-18-001

1.0 Introduction

The Cottonwood Sand Mining Project (Project) site is located within the unincorporated southwestern portion of San Diego County. The Project site (Figure 1) comprises two 18-hole golf courses (Lakes and Ivanhoe) within the Valle de Oro Community Plan area and adjacent to the community of Rancho San Diego. Irrigation of the Lakes course ceased in the summer of 2017 and the Ivanhoe course is still irrigated. Water use estimates provided herein assume that the Lakes course would re-open and that irrigation will resume at prior levels if the land use is not changed. Thus, water use estimates for both courses combined are presented. However, in Chapter 4.0 Summary below, a statement is made that indicates how much water demand currently occurs without irrigation of the Lakes course.

Extractive operations for the proposed Project are expected to continue for approximately 10 years with a total sand production for export of 3.8-million cubic yards (5.7-million tons).

The purpose of this letter is to present the water use estimates for the existing golf club operations based on information provided by the golf course superintendent and the ET method as described in Groundwater Sustainability Plan for Borrego Valley (https://www.sandiegocounty.gov/content/dam/sdc/pds/SGMA/F-Baseline-Pumping-Allocation-Methodology.pdf).The estimated annual water usage from well pump data provided by the course superintendent is 840 acre feet (ac. ft.). The estimated annual water usage for irrigation using the ET method is 788.2 ac. ft. and golf course pond evaporation of 15.4 ac. ft., the total golf course water consumption is 803.6 ac. ft.

Estimated annual water use for the proposed mining operation, including irrigation to establish a diverse plant population on site, equals 139.9 ac. ft. per year.

The estimated reduction in consumptive groundwater use while the quarry is in operation, relative to water usage with both golf courses being irrigated, is approximately 663.7 ac. ft. per year.

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1.1 History of Groundwater Use

Cottonwood Golf Club is a public golf club that consists of two 18-hole championship golf courses constructed along the sides of the Sweetwater River (Figure 1) in the Rancho San Diego/Jamacha area of San Diego County. It was permitted in 1962 and opened for golf play in 1963. Since then, the facility has relied exclusively on groundwater for irrigation of the courses, landscaping on the property, and filling of golf course water hazards.

Groundwater is produced from eight (8) existing wells placed at various locations on the Property (Figure 2). Three of the wells are located on the Lakes Course, west of Steele Canyon Road, and the other five are east of Steele Canyon Road. All existing wells will be used by the mining operation. When the wells are no longer needed for mining or reclamation, six of the wells will be abandoned under permit by the County of San Diego. Two wells will be left in place as monitoring wells per the request of the Sweetwater Authority. These wells are located at the northeast property line and southwest property line and are referred to as Ivanhoe #11 and Lakes #11. It is anticipated that abandonment of wells will occur as the area where a well is located is excavated, e.g., wells 15A and 15B will be the first two wells abandoned.

Groundwater is pumped from the wells to a series of golf course ponds. Water from the ponds is then fed directly into the irrigation lines or pumped to an approximately 3-million-gallon storage reservoir during the day. During nighttime and early morning hours, the stored water in the reservoir and water from wells is used to irrigate golf course vegetation. The storage reservoir is located on a parcel north of Willow Glen Road that is not part of the Cottonwood Sand Mine Project. This reservoir is not needed by the project due to the substantial reduction in water use. Two groundwater wells with pumps will remain available for irrigation of landscaping during the revegetation monitoring period. Once revegetated areas have met performance standards approved by the County, the project will be closed and the Reclamation Bond for the project released. Pumps in the two wells may be removed at that time but the wells will continue to be utilized by Sweetwater Authority to continue groundwater monitoring on the property.

1.2 Groundwater Wells in the Area

A request for information regarding groundwater wells that are permitted within one mile of the Project boundaries was submitted to the San Diego County Department of Environmental Health (DEH). DEH identified 114 permitted groundwater wells within the reference area and provided a map showing the one-mile area and the approximate location for each well (Figure 3). Unpermitted groundwater wells are not accounted for.

A review of the well location map indicates that most of the wells are in two areas within large-lot, residential parcels on the southern side of the Project site. These two areas, Steele Canyon Estates and the properties near Par 4 Drive, began development in the 1980s and continued into the early 2000s. At a minimum, golf course irrigation commenced 17 years prior to residential development adjacent to the Project site.

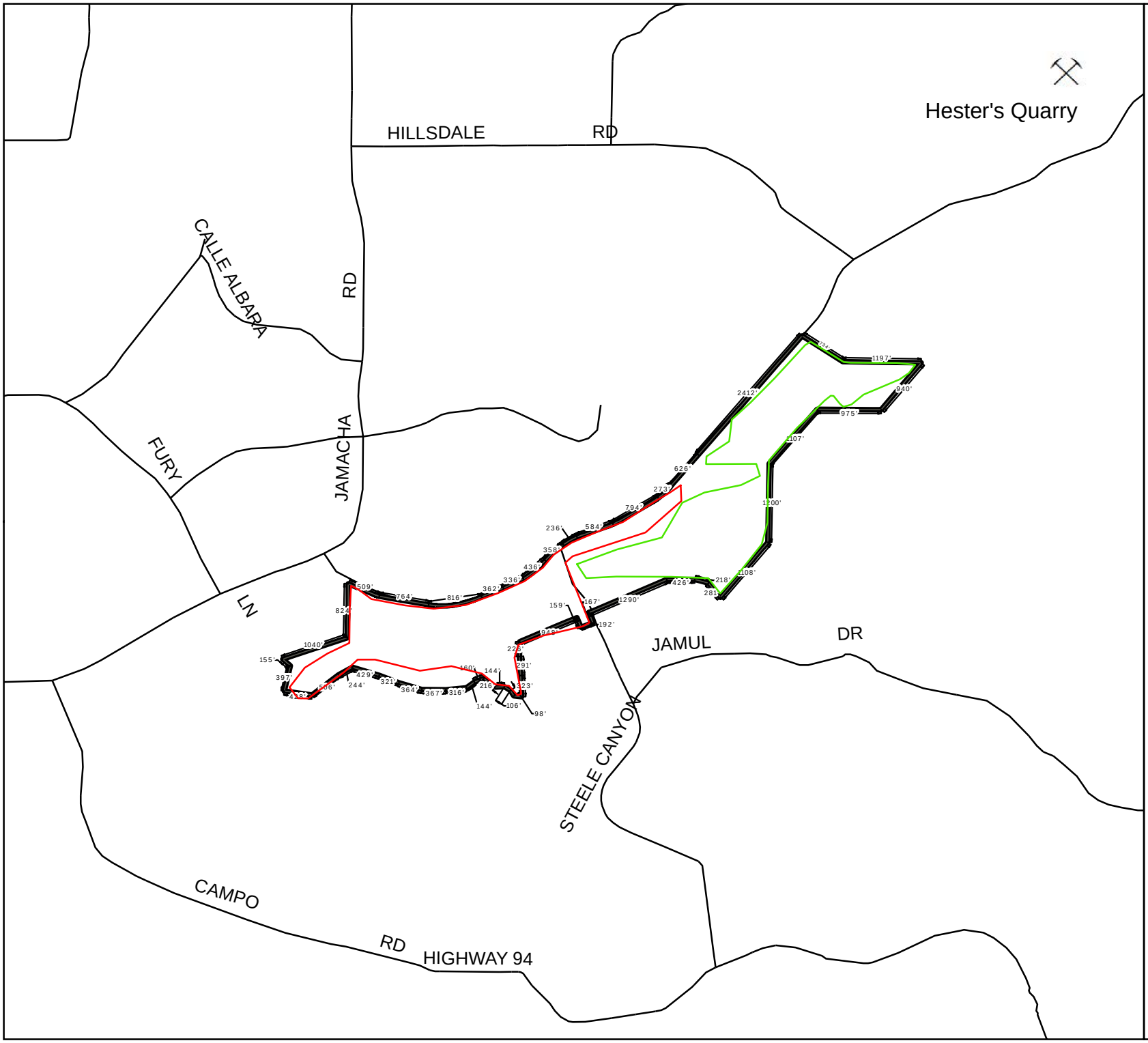

Figure 1
Cottonwood Sand Mine
Vicinity Map

Legend

- Ivanhoe Course
- Lakes Course
- Hester's Quarry
- Roads
- Property Boundary

N
W
E
S

Feet
0 1,500

1 in=2,000 feet

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Figure 2
Cottonwood Sand Mine
Groundwater Wells

Legend

- Groundwater Wells
- Project Boundary

N
W E
S

Feet
0 1,250

1 in=1,250 feet

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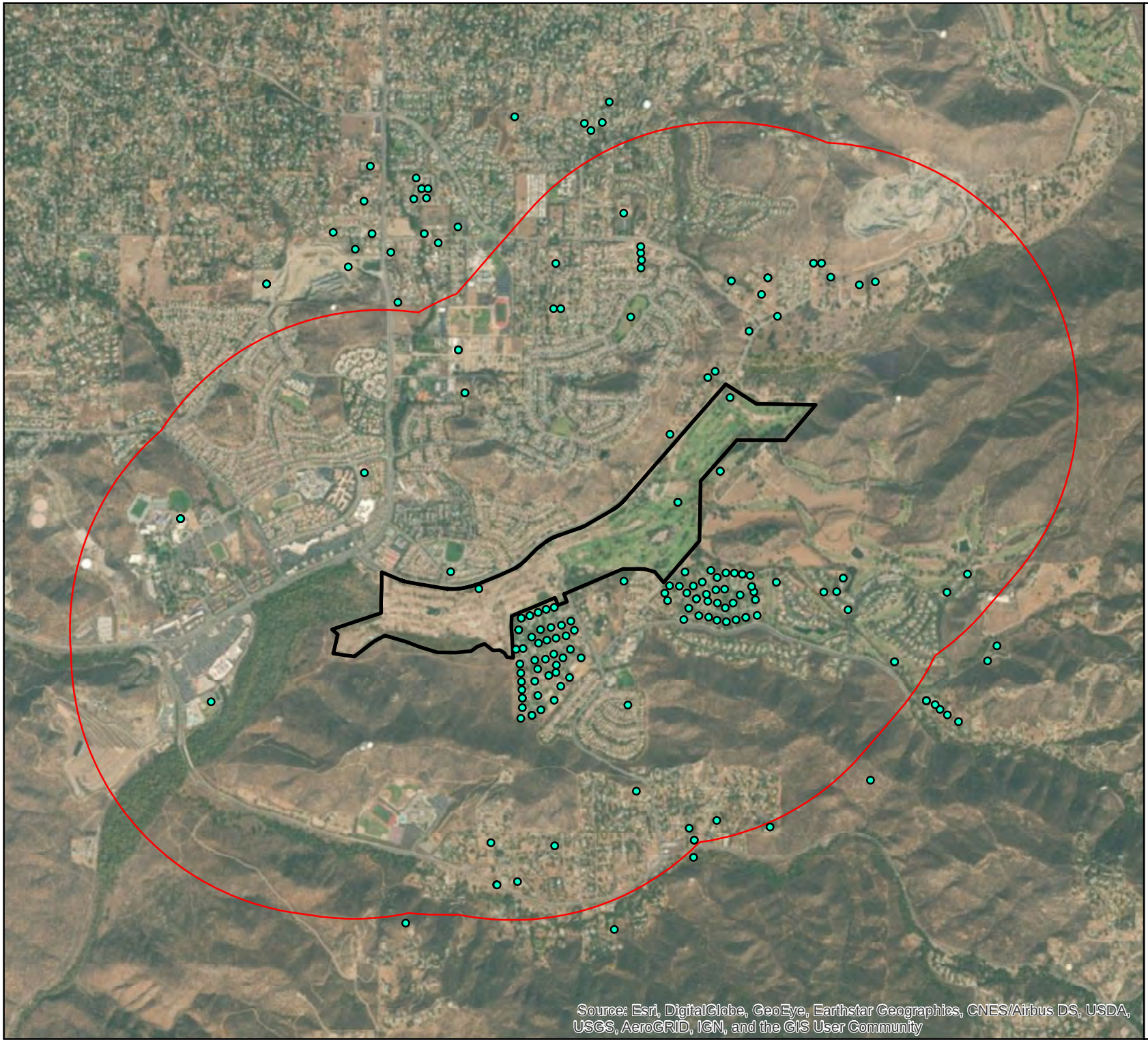

Figure 3
Cottonwood Sand Mine
Well Permits

Legend

- LWQD Well Permits
- Project Boundary - 1 Mile Buffer
- Project Boundary

N
W
E
S

Miles
0 0.45

1 in=0.5 miles

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1.3 Groundwater Level Monitoring

Sweetwater Authority has monitored groundwater levels from two monitoring wells on the Property since 2007. Groundwater level data collected by Sweetwater Authority is provided in Attachment A. One of the monitored wells is located next to the Property line on the southwestern end of the Property (APN 519-010-1500) and the second well is located next to the Property line on the northeastern end of the Property (APN 518-030-1500). Sweetwater Authority requested that these two wells be kept available during, and after, completion of the project so their monitoring program can continue to monitor the water levels in this stretch of the river. These wells will be available to supply process water to the mining operation when the existing ponds are removed.

Sweetwater Authority refers to the southwestern well as Hardwood and the well in the northeast is referred to as Cottonwood East. The Golf Club references its wells by the fairway number of the specific golf course nearest to a well's location. For example, #11 Lakes (Sweetwater Authority's Hardwood) is located off the green of Fairway #11 of the Lakes Course, while #8 Ivanhoe (Sweetwater Authority's Cottonwood East) is located along Fairway #8 of the Ivanhoe Course.

During the first two years of Sweetwater Authority's monitoring, dates that measurements were made were inconsistent. Starting in 2010, Sweetwater Authority attempted to make measurements monthly during each year. Occasionally, a measurement was not made if a pump was running, a well was capped or there was no access.

2.0 Golf Club Groundwater Use Estimates

2.1. Golf Course Groundwater Use

Superintendent's Estimate

The wells on the golf course are not metered, so estimates were made of groundwater use. The first estimate was provided by the golf course superintendent based on his experience managing the irrigation system and work on the site. Table 1.1 presents his estimate of water use based on the seasons.

Table 1.1. Course Superintendent's Estimate

Course Superintendent Daily Water Use Estimates	
Estimated daily use	
1,000,000	gallons per day warm season
500,000	gallons per day cool season
750,000	average gallons per day
273,750,000	gallons per year
840	**Ac. ft. per year**

This is similar with another estimate for the golf course (NBS/Lowery Engineers and Planners, 1990) of 500,000 gallons per day during winter and 1,500,000 gallons per day during peak summer irrigation demands.

Evapotranspiration Method

Area Irrigated

The area of the golf course is 195 acres. The area of the golf course that contains ponds is 4.6 acres. The irrigated area (190.4 acres) is the pond area subtracted from the golf course area.

Water Use Factor

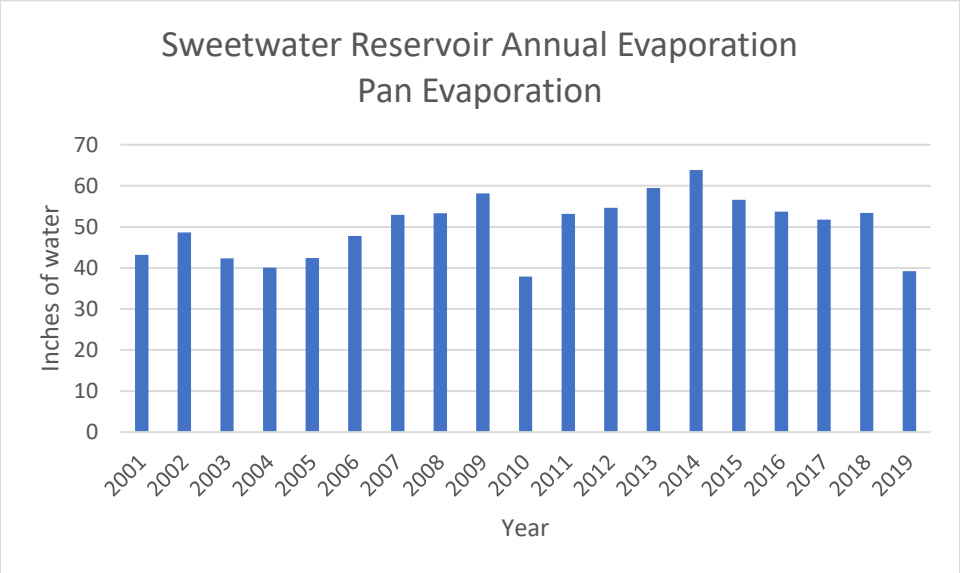
The Annual Water Use Factor (Equation A) estimates the total applied groundwater lost through the evaporation from soil and transpiration from plants (evapotranspiration). The groundwater that is lost is equivalent to the estimated groundwater usage for soil with specific vegetation cover.

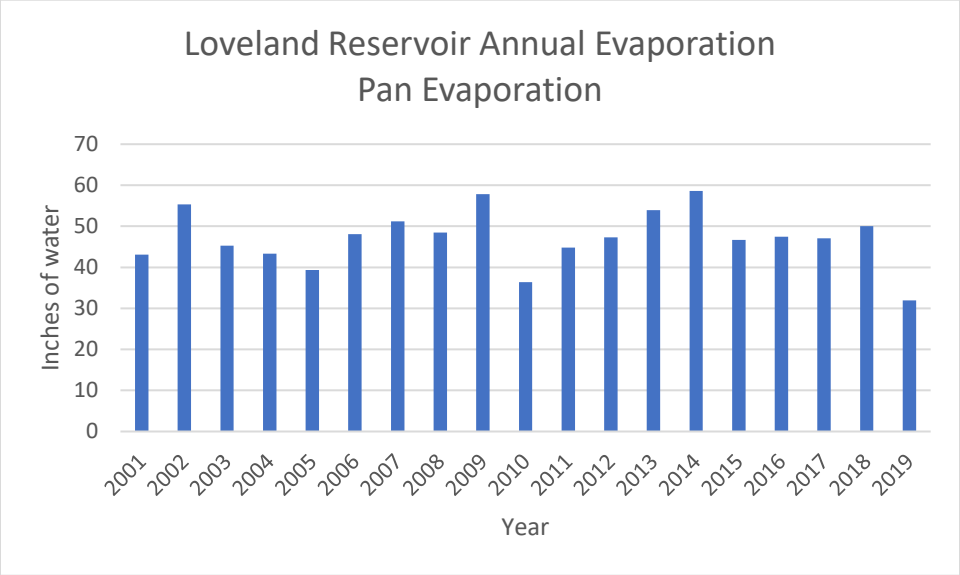
Equation A $$Annual\ Water\ Use\ Factor = \frac{\mathrm{ETo} * \mathrm{PF} * 1\ \mathrm{Acre}}{\mathrm{IE}}$$

Where:

ETo = Reference Evapotranspiration (feet/year)
PF = Plant Factor
IE = Irrigation Efficiency

The ETo of 49.7 inches/year (4.14 feet/year) that is used for this estimate is based on rates for Southern California Inland Valleys published by the California Department of Water Resources (Zone 6 from California Department of Water Resources. California Irrigation Management System (CIMIS), Evapotranspiration Zones Map. https://cimis.water.ca.gov/App_Themes/images/etozonemap.jpg).





The ground cover for the course includes warm and cool season turf. The PF value of 0.7 that is applied is the average for warm season turf (0.6) and cool season turf (0.8) (https://water.ca.gov/LegacyFiles/wateruseefficiency/docs/wucols00.pdf).

The course utilizes rotor irrigation for turf. The IE value of 0.7 that is applied is the value used for the rotor irrigation method in: Groundwater Sustainability Plan for Borrego Valley (https://www.sandiegocounty.gov/content/dam/sdc/pds/SGMA/F-Baseline-Pumping-Allocation-Methodology.pdf).

Applying these values to Equation A, the estimated groundwater use for a single acre of the golf course is 4.14 ac. ft./year. For the 190.4 acres of the golf course that are covered with turf, **the estimated water use is 788.2 ac. ft./year**.

2.2 Golf Course Pond Area

Because the water levels in all the golf course ponds are maintained by pumping, except for the 17th Fairway pond, which is the remains of an old mining pit, evaporation from the ponds must be included in estimating total groundwater usage. The area of each pond is presented below.

Lakes Course Pond Sizes (Figure 4):

- Fairway 1 – 46,150 sq.ft
- Fairway 11P1 – Island Tee – 29, 910 sq.ft.
- Fairway 11P2 – Original = 9,950 sq.ft. – Left in place for first year.
- Fairway 13 – 11,150 sq.ft.
- Fairway 16 – 33,775 sq.ft.
- Fairway 17 – 34,175 sq.ft. *Note: This pond is the result of pre-golf course land use and will be left in place. It will not be disturbed or used by the mine operation.*

Total Lakes Pond water area = 165,110 sq.ft.

Figure 4
Cottonwood Golf Club
Lakes Course
Ponds

Legend

- Ponds - Square Feet
- Project Boundary

N
W E
S

0 500 Feet

1 in=500 feet

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Ivanhoe Course Pond Sizes (Figure 5):

- Fairway 9 – 5,175 sq.ft.
- Fairway 12 – 21,000 sq. ft.
- Fairway 16 – 3,780 sq.ft
- Fairway 17 – 3,050 sq.ft

Total Ivanhoe Pond water area = 33,005 sq.ft.

Golf Course Ponds
Lakes: 165,110 sq. ft
Ivanhoe: 33,005 sq.ft.
Total: 198,115 sq.ft

2.2.1 Evaporation from Ponds

Average annual evaporation between 2001 and 2019 from pan evaporation data for Sweetwater and Loveland reservoirs = 4.05 feet/year. Total Golf Pond Evaporation (excludes the 0.8-acre 17th Fairway pond that is not supported by groundwater pumping):

- 163,940sq.ft.÷ 43,560 sq.ft./acre = 3.8 acres
- 3.8 acres x 4.05 ft/year = **15.4 ac. ft./year**

2.3 Total Annual Golf Course Consumptive Groundwater Use

The ET method provides an estimate of 788.2 **ac. ft./year** for golf course irrigation. Evaporation from ponds (15.4 ac. ft./year) is added for a **total groundwater use amount of 803.6 ac.ft/year.**

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Figure 5
Cottonwood Golf Club
Ivanhoe Course Ponds

Legend

- Ponds - Square Feet
- Project Boundary

N
W E
S

0 500 Feet

1 in=500 feet

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3.0 Project Water Use

3.1 Consumed Process Water

Sand quarries use water to move material on-site as a slurry, wash the material for use off-site and water roads. The total amount of water used in the mining and processing is "handled water". Water that is lost from the site during the mining and processing is "consumed water". Figure 6 presents a processing water flow diagram for a standard sand mining operation. Although the amount of handled water is significant, it is mostly recycled and "aggregate producers would be more accurately described as "handlers of water", not "consumers of water"" (Golder, 2006).

Consumed water is the total consumptive groundwater usage for the proposed quarry operation and this value correlates directly with the Annual Water Use Factor (plus pond evaporation) that is calculated for the golf courses above. The difference between the Annual Water Use Factor plus pond evaporation for the golf courses minus the consumed water value for the quarry operation equals the total savings in consumptive groundwater between the two uses.

Golder Associates (2006) ("Golder") conducted a study of four sand and gravel mines in Ontario Canada to quantify the consumed water use associated with operations that were producing material from above and below the groundwater table. This study is used here as a basis for estimating consumed water associated with the proposed Project.

Golder (2006) provides that there are three primary pathways for water loss from a quarry site:

1. Retained moisture on aggregate product that is shipped from the site.
2. Water that is applied directly on haul roads and stockpiles for dust control, which typically evaporates before being able to infiltrate into the ground, and
3. Wash water evaporation from stockpiled materials.

For estimation purposes, the quarry that is identified as "Pit/Above Water Table/with Washing" (Golder, 2006) was chosen. This pit model was chosen because it predominantly produces washed sand, and the total annual shipped tonnage of washed material is 571,938 tons of sand. These characteristics are most similar to the Project site. Also, for the four models presented by Golder, this model has the greatest consumptive water use per ton of ore produced (Golder, 2006, Table 6), making this the most conservative model to use for groundwater usage.

Consumed water for the quarry (Golder, 2006) includes:

1. Shipped offsite: 25.9 ac. ft./year
2. Evaporated from stockpiles: 5.7 ac. ft./year, and
3. Dust Control: 5.7 ac. ft./year.

This consumptive use equals 25.9 gallons/ton (Golder, 2006). Using this consumptive use for the Project at a production of 570,000 tons/year, the consumptive use would equal 45.3 ac. ft./year. However, since evaporation rates are lower and precipitation

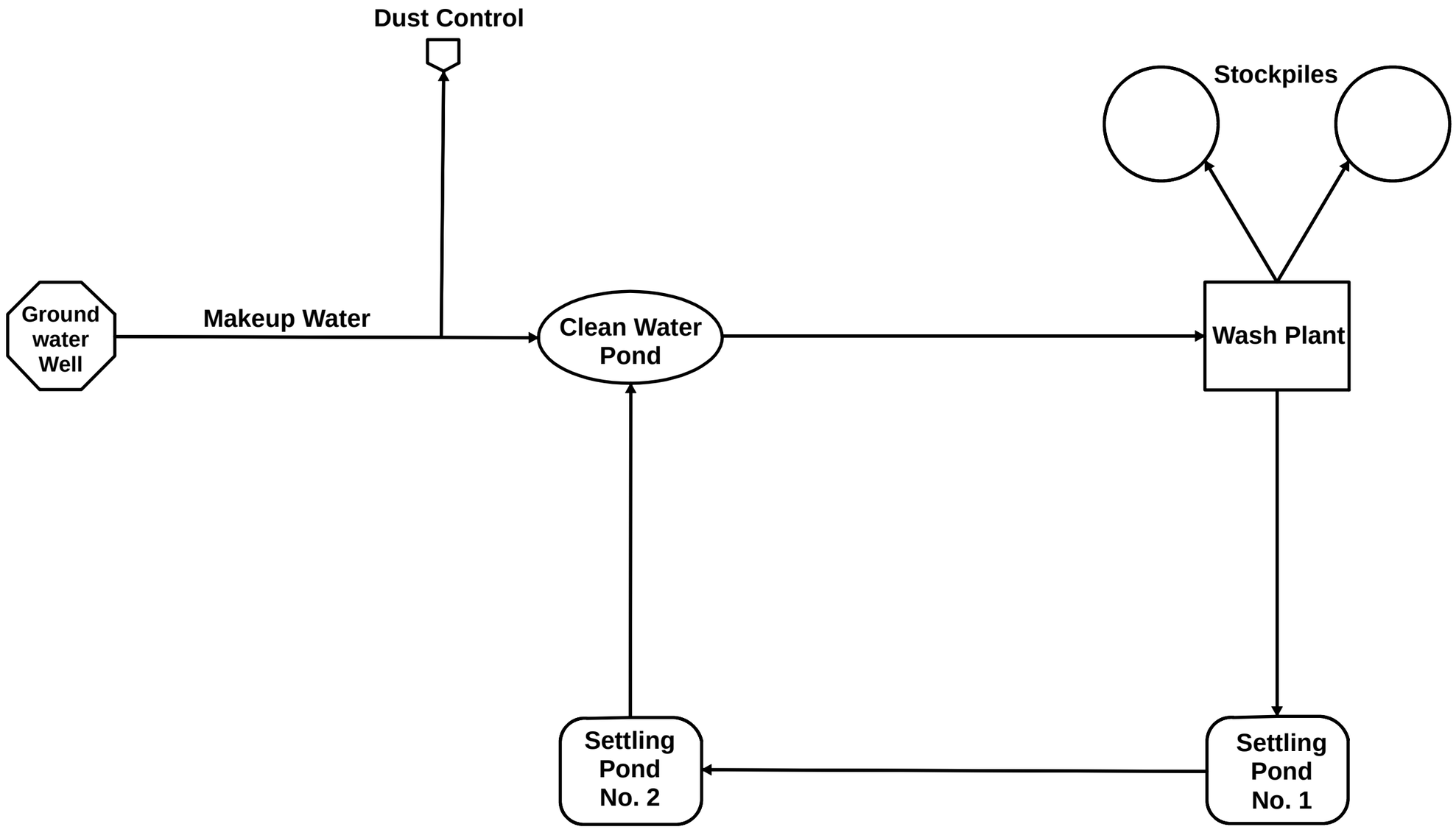

Figure 6
Water Consumption Schematic on Cottonwood Sand Mine

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rates are higher in Ontario, relative to the Project site, an adjustment is necessary for the estimated consumptive groundwater use.

Evapotranspiration rates for 5 areas of Ontario are provided at: https://www.ontario.ca/page/evapotranspiration. The lowest reported average annual potential evapotranspiration rate (approximately analogous to potential evaporation rate) is approximately 1 foot/year. This is approximately 4 times lower than the evaporation of 4.05 feet/year calculated above from pan evaporation data at Sweetwater and Loveland reservoirs.

The components of the consumptive groundwater use, except material shipped offsite need to be adjusted for tonnage and evaporation rates. The consumed water for evaporation from stockpiles and dust control are multiplied by 4 to account for differences in evaporation rates and adjusted for tonnage differences to estimate the consumptive uses expected to occur at the Project Site. The shipped offsite category is adjusted from the 571,938 tons reported in Golder's paper to 570,000 tons which Cottonwood plans to produce each year. Shipped offsite tonnage is not adjusted for an increase in evaporation rate since the moisture content of shipped material is transported offsite in both cases.

The adjustments are based on the following:

Golder (2006)

Ontario, Canada material shipped offsite is 571,938 tons/year

- Water shipped offsite: 7,668,890 gals./ton ÷ 571,938 tons = 13.4 gals./ton
- Evaporation: 1,677,570 gals./ton ÷ 571,938 tons = 2.9 gals./ton
- Dust Control:1,677,570 gals./ton ÷ 571,938 tons = 2.9 gals./ton

Adjust for evaporation rate increase:

- Water shipped offsite: 13.4 gals./ton - moisture content remains the same
- Evaporation: 2.9 gals./ton x 4.0 = 11.6 gals./ton
- Dust Control: 2.9 gals./ton x 4.0 = 11.6 gals./ton

Adjust for tonnage increase:

Cottonwood Sand Mine material shipped offsite = 570,000 tons/year proposed

- Water shipped offsite: 13.4 gals./ton x 570,000 tons = 7,638,000 gals./year
- Evaporation: 11.6 gals./ton x 570,000 tons = 6,612,000 gals./year
- Dust Control: 11.6 gals./ton x 570,000 tons = 6,612,000 gals./year

To convert the gals./year to ac. ft./year the equation is presented in the following example:

- 8,208,000 gals./year ÷ 325,841 gals./ac. ft. = 25.2 ac. ft./year

Using the adjustments above, the following table presents the difference in the two mining operations and the estimated consumptive water use for the Cottonwood Sand Mine:

Table 2.1 Consumptive Water Use on Two Sites

Consumptive Use	Golder (2006)	Evaporation Rate		Cottonwood Sand Mine
		Ontario, Canada	Cottonwood Sand Mine	
Water shipped offsite	23.5 ac. ft./year	1.0 feet/year	4.0 feet/year	23.4 ac. ft./year
Evaporation from Stockpiles	5.1 ac. ft./year	1.0 feet/year	4.0 feet/year	20.3 ac. ft./year
Dust Control	5.1 ac. ft./year	1.0 feet/year	4.0 feet/year	20.3 ac. ft./year
Totals:	**33.7 ac. ft./year**			**64 ac. ft./year**

Note: All results in Golder (2006) are reported in metric units. Information reported in this letter have been converted to imperial units.

This adjustment provides a conservative rate for annual process water at the Project.

3.2 Pit Ponds

Three pit areas where groundwater may be encountered are planned for the Cottonwood Sand Project. The first pit (Pit 1) will be excavated during Phase 1 on the northern side of the river channel and south of Willow Glen Drive. This pit will be progressively backfilled as the excavation continues. Exposure of groundwater as a free water surface will be limited to approximately 5-acres in size over an 18-month period or less. Pit 1 will be completely backfilled prior to the completion of this phase. No pond or free water surface will remain.

Pit 2 starts excavation in the eastern half of the Phase 2 area and will continue in a northeasterly direction during Phase 3. This pit is to be located south of the existing channel and east of Steele Canyon Road. The pit will not connect with the channel. As with Pit 1, Pit 2 will be progressively backfilled as it proceeds to the northeast and will be limited in size to approximately 5-acre, or less, of exposed groundwater at any time. It is expected that this entire pit will be excavated over a two-year time frame and is expected to be completely, filled during subphase 3b.

Pit 3 will be completed in the northeastern corner of the project area during Phase 3 and similar to the first two pits in size. It will also be limited to 5-acres in size if groundwater is encountered. This final pit will be completely backfilled prior to the end of Phase 3.

Evaporation from the 5-acre pit pond is calculated as follows:

- Pond Size: 5.0 acre.

- Pan Evapotranspiration rate: 4.05 ft./year
  - 5.0 acres. x 4.05 ft. year = **20.25 ac. ft./year**

3.3 Irrigation

Irrigation will be used on the revegetated areas for two years after seeding and planting. The purpose of irrigation will be to:

- establish vegetation,
- encourage growth, and
- ensure survival.

Irrigation will be discontinued in an area after the second year. Irrigation will be accompanied by an active weed control program.

The timing and frequency of irrigation will be based on the Project Biologist's recommendations, the water needs of various seed palettes used for the project and weather conditions during the year. For example, during the rainy season when rains are more frequent and heavier, irrigation will occur between storms and will be off during, and shortly after, rain events. Weather based automatic controllers (or rain sensors) capable of turning the system on and off will be used on the irrigation system for this purpose. During the drier months of the year after initial establishment, the irrigation schedule may be modified to a lower frequency and longer cycle. This method of irrigation is referred to as deep or deep-soak watering.

Below is a representative irrigation schedule for initial establishment:

Average	Days per Week	Cycles per Day	Run time per Cycle (min)	Run time per Week (min)
Wetland	3	2	30	180
Upland	2	1	17	34

To illustrate the discussion of irrigation scheduling, the initial establishment schedule presented above for upland species might be modified to watering 1 day per week for 34 minutes in 1 cycle during the dry season. Over the two-year period the number of days per week watering, the cycles per day and run times would be incrementally reduced to eliminate dependency of the vegetation on irrigation.

Irrigation will also be used for landscaping and any plantings of vegetation for the purpose of screening the operation. Areas identified for these purposes will be irrigated throughout the year and over the lifespan of the project.

3.3.1 Water Use for Irrigation

Irrigation water consumption was calculated using the County of San Diego Planning and Development Services Water Efficient Landscape Worksheet (Form PDS-405). An ETo of 48.7 inches was utilized based on rates for Southern California Inland Valleys published by the California Department of Water Resources (Zone 6 from CIMIS).

Planting Description	Plant Factor (PF)	Irrigation Method	Irrigation Efficiency (IE)	ETAF (PF/IE)	Landscape Area (Ft^2)	ETAF x Area	Estimated Total Water Use (gals.)
Regular Landscape Areas							
Slope Erosion Control	0.2	Rotors	0.75	0.2666	435,600	116,130	3,578,459
Right-of-Way	0.4	Drip	0.90	0.4444	15,120	6,720	207,049
Parking Area	0.3	Drip	0.75	0.4	1,180	470	14,544
Revegetation	0.2	Rotors	0.75	0.2666	1,742,400	464,520	14,313,838
						Total Water Use Per Full Year	18,113,890

Total water used for irrigation as estimated using the County of San Diego Planning and Development Services Water Efficient Landscape Worksheet (Form PDS-405) (above) is converted to ac. ft. as follows:

18,113,890 gals/year ÷ 325,841 gals/ac. ft. = **55.6 ac. ft./year**

The irrigation delivery system will specify low precipitation rotary sprinklers and dripper emitters which will be much more efficient when compared to the current system at the golf club. As an example of the improved efficiency, please see note #10 in the standard landscape notes below. These will be provided by the landscape architect for the landscape screening design plan title sheet for the project.

LANDSCAPE NOTES

1. ALL LANDSCAPE AREAS, INCLUDING THE RIGHT-OF-WAY, SHALL BE MAINTAINED BY THE OWNER IN A HEALTHY DISEASED FREE CONDITION.
2. ROOT BARRIERS SHALL BE PROVIDED FOR ALL TREES WITHIN 5' OF HARDSCAPE.
3. A 3" MINIMUM THICK LAYER OF SHREDDED WOOD MULCH SHALL BE PROVIDED IN ALL AREAS OF BARE SOIL, 3:1 SLOPE OR LESS, EXCEPT WHERE MULCH IS CONTRAINDICATED.
4. TREES AND SHRUBS SHALL BE PLACED A MINIMUM OF 5' AWAY FROM WATER METER, OR SEWER LATERALS; A MINIMUM OF 10' AWAY FROM POWER POLES; A MINIMUM OF 8' AWAY FROM FIRE HYDRANTS AND FIRE DEPARTMENT SPRINKLER AND STANDPIPE LOCATIONS.
5. ALL LANDSCAPE AREAS SHALL BE FINISH GRADED TO REMOVE ROCKS AND ENSURE SURFACE DRAINAGE AWAY FROM BUILDINGS.
6. ALL REQUIRED STREET TREES SHALL BE PLANTED OUTSIDE THE PUBLIC RIGHT-OF-WAY ON PRIVATE PROPERTY.
7. LANDSCAPE IMPROVEMENTS, INCLUDING, BUT NOT LIMITED TO, PLANTS, BERMS, WALLS (DECORATIVE OR RETAINING), SIGNS, AND STRUCTURES HAVE BEEN SELECTED AND POSITIONED SO AS TO AVOID OBSTRUCTING VIEWS OF MOTORISTS NEAR INTERSECTIONS OR AISLES, DRIVES, AND PEDESTRIAN WALKWAYS. TREES HAVE BEEN SELECTED (AND SHALL BE MAINTAINED) SUCH THAT, AT MATURE SIZE, SCAFFOLD BRANCHES WILL BE A MINIMUM OF 60 INCHES ABOVE FINISH GRADE.
8. PLANTINGS ADJACENT TO OPEN SPACE LOTS DO NOT CONTAIN ANY NON-NATIVE, INVASIVE, OR FIRE PRONE PLANTS.
9. EROSION CONTROL PLANTING IS PROVIDED FOR ALL SLOPES OVER 3 FEET IN VERTICAL HEIGHT AND ADDITIONAL PLAN TING (AS PER SECTION 87.417 OF THE GRADING ORDINANCE) IS PROVIDED FOR SLOPES OVER 15 FEET IN VERTICAL HEIGHT.
10. AN AUTOMATIC CONTROLLER SHALL BE WEATHER BASED (OR HAVE A MOISTURE SENSOR) AND UTILIZE A

RAIN SENSOR EITHER INTEGRAL OR AUXILIARY, CAPABLE OF SHUTTING OFF THE UNIT.

11. AVOID SPRINKLER RISERS IN CORNER, ALONG WALLS AND PARKING AREAS. NO OVERHEAD IRRIGATION WITHIN 24" OF AN IMPERMEABLE SURFACE OR IN AREAS LESS THAN 10' WIDE IN ANY DIRECTION
12. EXISTING ON-SITE WELL WATER SHALL BE UTILIZED FOR IRRIGATION

4.0 Summary

- Estimated water use by the Golf Club: 803.6 ac. ft./year or approximately 401.8 ac. ft./year per course.
- Estimated water use by the Project: 64 ac. ft./year consumed process water + 20.3 ac. ft./year pit pond evaporation + 55.6 ac. ft./year irrigation = 139.9 ac. ft./year.
- Decrease in consumptive groundwater use: Golf course use (786.5 ac. ft./year) – Operation consumptive use (139.9 ac. ft./year) = 646.6 ac. ft./year.

In total the sand mining operation will use 663.7 ac. ft. per year less water than the entire golf club operation or 261.9 ac. ft. per year less water than is used for a single golf course assuming the consumptive use of each golf course was equal.

5.0 Conclusion

The Cottonwood sand mining operation will utilize approximately 20 percent of the annual water used historically by the golf course operation. Eventually, groundwater use on the property will have been stopped completely.

6.0 References:

California Department of Water Resources. California Irrigation Management System, Evapotranspiration Zones Map.
https://cimis.water.ca.gov/App_Themes/images/etozonemap.jpg

County of San Diego. Planning and Development Services, Water Landscape Worksheet. Form PDS-405 (Rev. 03/25/16)

Del Bosque, E., 2020, Personal Communication e-mail 2/18/2020, Pan Evaporation Data Spreadsheet for Loveland and Sweetwater Reservoirs from 6/30/2000 to 1/31/2020.

Golder Associates, 2006, Water Consumption Study, prepared for Ontario Stone, Sand & Gravel Association, August 2006, downloaded March 2, 2020 at https://ossga.com/multimedia/31/2006-water_consumption_study-golder.pdf

NBS/Lowery Engineers and Planners, 1990, Middle Sweetwater River system water resources management study, v.1, Water Resources Audit, Prepared for Otay Water District, Sweetwater Authority, San Diego County Water Authority, 71 pages.

Univ. of CA. Publication 8044. Lawn Watering Guide for California.
https://www.ci.azusa.ca.us/DocumentCenter/View/26591/UC-Watering-Guide?bidId=

Attachment A. Cottonwood Golf Course Groundwater Monitoring Data		
Measurements Completed and Provided by Sweetwater Authority RP: Top of Casing		
Top of Casing to Ground Surface	25.6 inches	32.6 inches
Surface Elev.	371.2 ft.	329.3 ft.
Course Well Designation	**#11 Ivanhoe**	**#11 Lakes**
Sweetwater Designation	**Cottonwood**	**Hardwood**
Date	inches	inches
2007		
1/14/07	Pumping	Pumping
1/15/07	272	Pumping
1/17/07		Pumping
1/21/07		Pumping
1/31/07		91
2/20/07	275	
2/20/07		83
3/8/07		Pumping
3/8/07	Pumping	
2008		
1/7/08	321	91
1/30/08	295	85
2/1/08	262	Pumping
2/2/08	269	Pumping
2/5/08	224	57
2/7/08	246	Pumping
2/8/08	Pumping	74
2/9/08	212	56
2/14/08	Pumping	Pumping
9/24/08	Pumping	Pumping
12/17/08	252	80
2009		
1/8/09	Pumping	Pumping
2/4/09	Pumping	Pumping
3/18/09	Pumping	Pumping
4/2/09	Pumping	Pumping
4/3/09	Pumping	Pumping
5/1/09	Pumping	no access

6/16/09	Pumping	Pumping
7/10/09	Pumping	Pumping
8/24/09		
9/12/09	Pumping	Pumping
10/1/09	Pumping	Pumping
10/2/09	Pumping	Pumping
11/3/09	Pumping	Pumping
12/3/09	no access	no access
12/11/09	375	Pumping
2010		
1/22/10	354	69
2/2/10	no access	21
2/28/10	208	
3/15/10	201	Pump On
4/1/10	213	50
5/3/10	Pump on	Pump on
6/2/10	Pump on	Pump on
7/13/10	Pump on	Pump on
8/11/10	Pump on	Pump on
9/14/10	296	Pump on
10/8/10	317	Pump on
11/9/10	199	295
12/6/10	222	288
2011		
1/3/11	Pump on	217
2/2/11	Pump on	212
3/1/11	182	Pump on
4/2/11	Pump on	Pump on
5/3/11	193	194
6/3/11	Pump on	Pump on
7/1/11	Pump on	Pump on
9/5/11	Pump on	Pump on
10/9/11	Pump on	283
11/1/11	286	199
12/1/11	Pump on	278
2012		
1/3/12	265	93
2/1/12	Pump on	Pump on
3/2/12	Pump on	196
4/1/12	204	87
5/2/12	Pump on	206.4"

6/1/12	Pump on	81
7/1/12	Pump on	101
8/1/12	Pump on	Pump on
9/1/12	Pump on	182
10/1/12	290	Pump on
11/1/12	Pump on	Pump on
12/2/12	Pump on	Pump on
2013		
1/3/13	106	308
2/7/13	211	Pump on
3/1/13	Pump on	218
4/4/13	232	241
5/2/13	Pump on	Pump on
6/5/13	Pump on	Pump on
7/2/13	Pump on	Pump on
8/1/13	Pump on	Pump on
9/3/13	Pump on	Pump on
10/1/13	Pump on	Pump on
11/1/13	Pump on	Pump on
12/3/13	346	Pump on
2014		
1/1/14	Pump on	Pump on
2/4/14	338	107
3/4/14	326	102
4/1/14	332	104
5/1/14	Pump on	Pump on
6/1/14	Pump on	Pump on
7/1/14	Pump on	Pump on
7/31/14	Pump on	Pump on
9/3/14	Pump on	Pump on
10/1/14	Pump on	Pump on
11/1/14	Pump on	Pump on
12/1/14	377	Pump on
2015		
1/3/15	371	Pump on
2/1/15	360	Pump on
3/3/15	357	Pump on
4/2/15	360	Pump on
5/1/15	372	Pump on
6/1/15	372	Pump on
7/2/15	375	Pump on

8/2/15	Pump on	Pump On
9/1/15	Pump on	Pump On
9/30/15	412	Pump On
11/1/15	Pump on	Pump on
12/1/15	Pump on	Pump on
12/31/15	Pump on	157
2016		
2/1/16	Capped off	Pump on
3/3/16	382	Pump on
4/2/16	377	Pump on
5/1/16	378	Pump on
6/1/16	382	Pump on
7/1/16	389	Pump on
8/1/16	395	Pump on
9/1/16	416	Pump on
10/1/16	410	Pump on
11/2/16	413	Pump on
12/1/16	410	Pump on
2017		
1/2/17	414	Pump on
2/1/17	385	Pump on
3/3/17	320	62
4/3/17	228	Pump on
5/2/17	250	Pump on
5/31/17	260	159
7/2/17	270	Pump on
8/1/17	286	Pump on
9/1/17	292	Pump on
10/2/17	302	132
11/2/17	307	129
12/1/17	313	127
2018		
1/4/18	319	125
2/1/18	318	113
3/1/18	319	109
4/1/18	320	108
5/1/18	322	107
6/2/18	326	Pump on
7/3/18	331	196
8/2/18	338	Pump on
9/1/18	348	Pump on

10/1/18	350	Pump on
11/1/18	356	Pump on
12/2/18	358	152
	2019	
1/1/19	352	120
2/1/19	359	70
Average inches	311.3636364	139.326087
Average feet	23.9 bgs	8.9 bgs
Range: inches bgs	199 to 416	62 to 295
Range: feet	16.6 ft, - 34.7 ft. bgs	5.2 ft. to 24.6 ft.

Top of Casing to Ground Surface	25.6 inches	32.6 inches
Surface Elev.	371.2 ft.	329.3 ft.
Course Well Designation	**#11 Ivanhoe**	**#11 Lakes**
Sweetwater Designation	**Cottonwood**	**Hardwood**
Water Elevations	347.3 ft elev.	320.4 ft. elev.