Memorandum

TO: Daniela Hofreiter, Project Manager

FROM: Jim Bennett, Water Resources Manager

SUBJECT: Groundwater Use Estimates Review
P23-009 Karve Ski Slope Project

DATE: May 28, 2024

In a review of the estimated water use updated 11/20/2023, it indicates total estimated water use for the project would be 3,344,181 gallons per year based on water use for main+bunny slopes, the tubing lanes, and landscaping. This clearly shows a reduction of water use from the estimated historical water use for the driving range of 6,891,000 gallons.

To aid in finalizing the County review of the water use estimates provided, please provide the following:

1. The number of square feet individually for the bunny slopes, the main slopes, and the tubing lanes.
2. Backup information from other built projects with ski slopes from where these water use estimates have been derived or any other information to help County staff understand how the estimates were calculated since we are not familiar with artificial ski slopes water use within the County of San Diego.

RESPONSE TO COMMENTS:

1. See attached plan for square footage of ski areas:
   - Bunny hill – 7,481.39 square feet
   - Main ski run #1 – 42,777.10 square feet
   - Main ski run #2 – 41,027.38 square feet
   - Tube run #1 – 25,367.39 square feet
   - Tube run #2 – 9,073.62 square feet
2. The applicant has developed the site and used information gathered from three key sources:
   a. The applicant worked with Dong Chen of JF Dry Ski https://www.mushroomdryski.com/ , the manufacturer of the dry ski material to be used for the proposed ski slope, and has built several dry

ski slope installations. JF also owns and operates Xindu JF Dry Ski Four Seasons Ski Resort in Chengdu, China (an operating dry ski park) and provided the applicant with their water usage at this facility required to lubricate and achieve the proper slickness required for skiing on their specific material.

b. The applicant collaborated with Luke Schrab, the inventor, owner, and president of mSnow (https://msnow.ski/), a company that manufactures and installs the material for the proposed tubing lanes. Luke, who holds a degree in engineering, custom designs each tubing project layout, ensuring that each installation is unique. The water usage calculations for the tubing lanes were derived from Luke's design specific to this site.
c. The Liberty Mountain Snowflex Center at Liberty University https://www.liberty.edu/campusrec/snowflex/ offers a similar concept but uses a different material for their skiable surface. The applicant gathered information from park managers Drew Sherwood and Caleb Acree, who provided the applicant with water usage data and slope misting system information.

3. Water calculation for the site were developed by each of the following and letter have been provided for support:
    a. Howard Associates, the landscape architect for the project using the WELO calculation from the landscape plans, see page 3 of the landscape plans attached with the submittal.
    b. Kool Fog was retained to design the misting system necessary for the various runs on the site and determined the water use calculation based on information gathering, square footage of the run areas and their estimated water usage was 1,736,064 gallons per year.
    c. Luke Schrab of mSnow noted above provided calculations for the 8 tube runs of 702,720 gallons per year.
4. Howard Associates provided the typical water calculation for a golf driving based on the site’s acreage.

GROUNDWATER RESOURCES - ATTACHMENT I

KARVE DRY SKI PARK - WELL WATER USAGE PROJECTIONS UPDATED 2024.07

MAIN SLOPE + BUNNY SLOPES ONLY			
SLOPE SIZE COMPARISON: ADJUSTMENTS	**KARVE**	**NOTES**	**RESOURCES**
ANNUAL PROJECTED WATER USAGE (MAIN + BUNNY SLOPES ONLY) IN GALLONS - ADJUSTED FOR SEASONAL FACTORS		**Karve will operate 3,136 hours / yr or an average of 261.3 hours / mo**	**Water usage provided by KoolFog**
HOT SEASON USAGE = All 4 Months (June - Sept).	1,393,920	4 Months X 352 Hrs per Month X 990 Gals per Hr = 1,393,920 Gallons in Hot Season	
NON-HOT SEASON USAGE = All 8 Months (Oct - May). **Non-Hot Season water usage is 65% of Hot Season usage**	342,144	8 Months X 216 Hrs per Month X 198 Gals per Hr = 342,144 Gallons in Non-Hot Season	
12 MONTH PROJECTED WATER USAGE (MAIN + BUNNY ONLY) IN TOTAL GALLONS	**1,736,064**	**ANNUAL SLOPE WATER USAGE**	
Tubing Lane material is different than ski slope material and requires less water.		**Includes all 8 lanes**	
TUBING LANES			
12 MONTH PROJECTED TUBING LANES WATER USAGE TOTAL GALLONS	**702,720**	**ANNUAL TUBING LANES WATER USAGE**	**Water usage provided by Luke Schrab of mSnow**
ANNUAL TOTAL COMBINED MAIN + BUNNY SLOPES + 8 TUBING LANES WATER USAGE	**2,438,784**		
ANNUAL IRRIGATION USEAGE BASED ON WELO CALCULAITONS - PROPOSED PROJECT	**1,002,559**		**HOWARD ASSOCIATES - PROPOSED LANDCAPE AND IRRIGATION PLAN**
TOTAL PROJECT USEAGE FOR PROPOSED PROJECT	**3,441,343**		
ANNUAL HISTORIC WELL WATER FOR GOLF DRIVING RANGE GRASS	**6,891,000**	**BASED ON 195,000 SF OF DRIVING RANGE AREA AND USING ETFA CALCULATIONS**	**HOWARD ASSOCIATES - LETTER ATTACHED**
ANNUAL REDUCTION IN WATER USAGE WITH PROJECT	**3,449,657**	**50% reduction in well water usage with proposed project**	

7/10/2024 11:56

Compiled by T. Mathew, Project Planner, CCI

koolfog

7/09/2024

Attention to:
Karl Kozak & Ben Cseri @ SD Ski Partners, LLC
Regarding KARVE Ski Park

Karve Ski Park Annual Estimated H2O usage for ski runs.

Hot Season: 4 months (June, July, Aug & Sept), each mister would activate for an average of 5 seconds every min. (or 5 min per hour). Each mister would use 1 gallon of H2O per hour. With a total of 990 misters (runs #1, #2 & bunny hill) it equates to 990 gallons of H2O per hour.

Cooler Season: 8 months per year (Oct - May), each mister would activate for an average of 5 secs every 5 min (or 1 min per hour). Each mister would use 1/5 gallon of H2O her hour. With a total of 990 misters (runs #1, #2 & bunny hill), it equates to 198 gallons of H2O per hour.

Annual H2O Usage: Hot season total of 1,408 hrs operation x 990 gal. per hr. = 1,393,920 gallons. Cooler Season total of 1,728 hrs of operation x 198 gal. per hr. = 342,144 gallons

Total Annual H2O: Hot Season 1,393,920 gallons + Cooler Season 342,144 gallons = **1,736,064 gallons per year.**

Misting Area Details:

Run #1 - 100' Widest Section x 480' Long (42,777 sq.ft.) 48 rows of misting lines, with nozzles 10' offset from center = 480 nozzles
Run #2 - 100' Widest Section x 440' Long (41,072 sq. ft.) 44 rows of misting lines, with nozzles 10' offset center = 440 nozzles
Run #3 - 100' Wide x 70' Long (7,481 sq.ft. - bunny hill) 7 rows of misting lines, with nozzles 10' offset center = 70 nozzles

Sincerely,

Robert Xanders

Koolfog Inc.

Misting Systems Engineer

31145 Plantation Drive

Thousand Palms, CA 92276

t: 760.321.9203

koolfog.com

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mSnow

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7/10/2024

TO: Karl Kozak & Ben Cseri @ SD Ski Partners

RE: KARVE Ski Park

Regarding the 8 planned synthetic tubing lanes at Karve Ski Park that my company is designing and installing, water usage calculations were performed.

During maximum usage, each lane uses 7,320 gallons per month. All 8 lanes in total will consume a maximum of 58,560 gallons per month.

This equates to a maximum annual water usage of 702,720 gallons for the synthetic tubing lanes at Karve Ski Park.

Please don't hesitate to call or email if you have any further questions.

Regards,

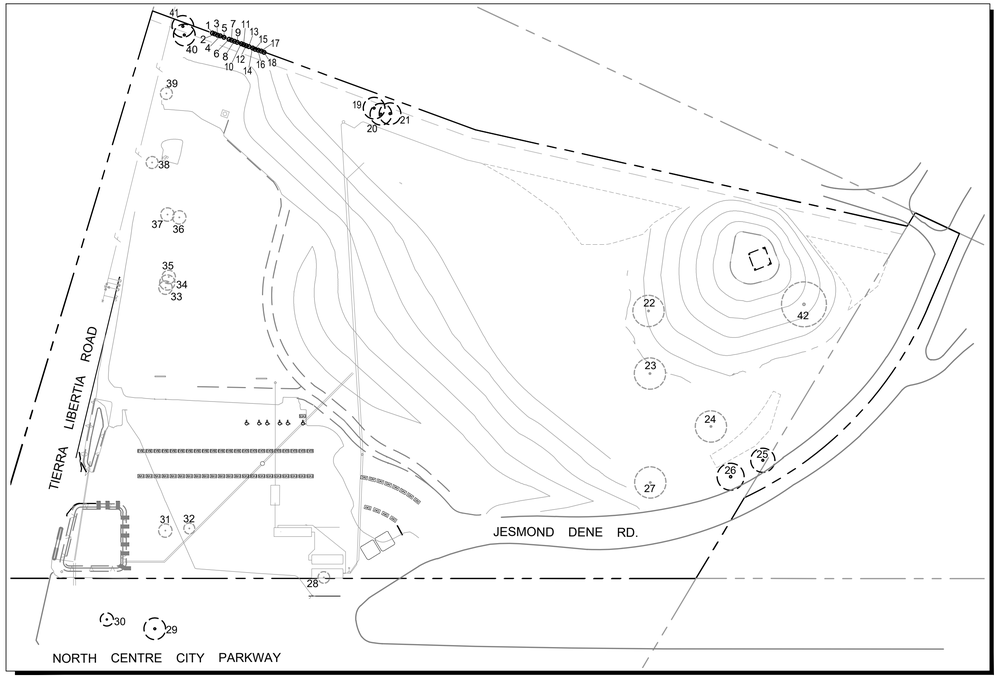
Luke Schrab

Co-Owner

Plastisnow LLC

(414) 397-1233

luke@msnow.ski

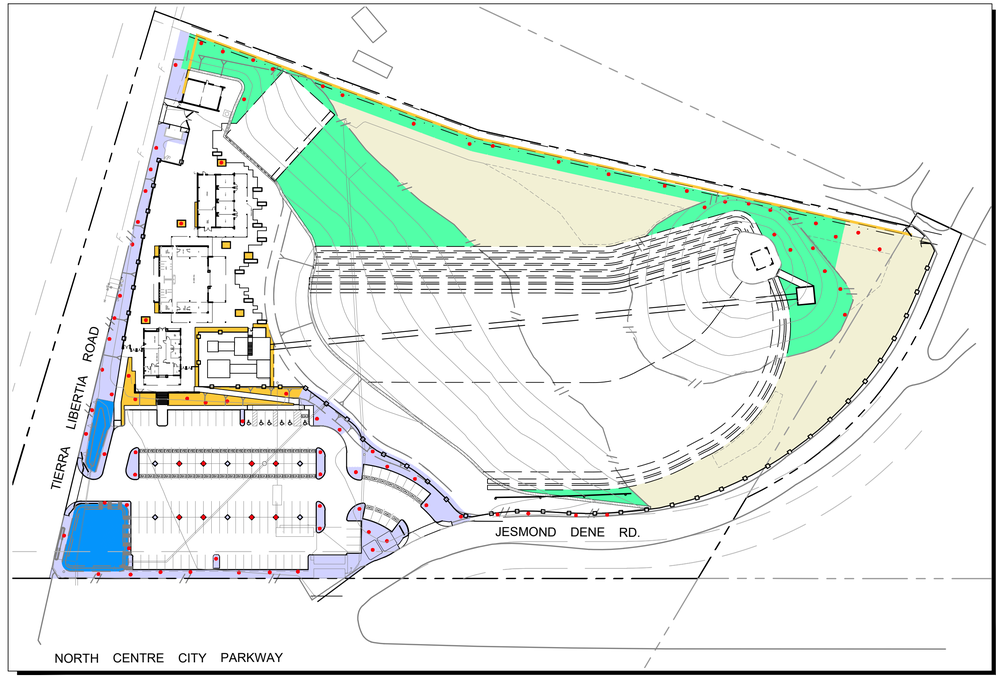


EXISTING TREE SURVEY

Existing Tree Legend

SYMBOL	CALIPER	BOTANICAL NAME	COMMON NAME	CONDITION	STATUS
1	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
2	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
3	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
4	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
5	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
6	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
7	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
8	14"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
9	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
10	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
11	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
12	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
13	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
14	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
15	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
16	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
17	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
18	4"	CUPRESSUS SEMPERVIRENS	ITALIAN CYPRESS	GOOD	REMOVE
19	4"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMAIN
20	6"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMAIN
21	15"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMAIN
22	15"	QUERCUS AGRIFOLIA	COAST LIVE OAK	GOOD	REMOVE
23	12"	QUERCUS AGRIFOLIA	COAST LIVE OAK	GOOD	REMOVE
24	6"	EUCALYPTUS SPP.	EUCALYPTUS	FAIR	REMOVE
25	6"	EUCALYPTUS SPP.	EUCALYPTUS	FAIR	REMAIN
26	6"	EUCALYPTUS SPP.	EUCALYPTUS	FAIR	REMAIN
27	12"	EUCALYPTUS SPP.	EUCALYPTUS	FAIR	REMOVE
28	4"	CERCIDIUM SPP.	PALO VERDE	GOOD	REMOVE
29	18"	PHOENIX CANARIENSIS	CANARY ISLAND PALM	GOOD	REMAIN
30	12"	WASHINGTONIA ROBUSTA	MEXICAN FAN PALM	GOOD	REMAIN
31	4"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMOVE
32	3"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMOVE
33	8"	SYAGRUS ROMANZOFFIANUM	QUEEN PALM	GOOD	REMOVE
34	15"	SYAGRUS ROMANZOFFIANUM	QUEEN PALM	GOOD	REMOVE
35	6"	SYAGRUS ROMANZOFFIANUM	QUEEN PALM	GOOD	REMOVE
36	3"	FICUS SPP.	FIG	GOOD	REMOVE
37	4"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMOVE
38	6"	KOELREUTERIA SPP.	GOLDEN RAIN TREE	GOOD	REMOVE
39	5"	QUERCUS AGRIFOLIA	COAST LIVE OAK	GOOD	REMOVE
40	30"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMOVE
41	15"	EUCALYPTUS SPP.	EUCALYPTUS	GOOD	REMOVE
42	24"	EUCALYPTUS SPP.	EUCALYPTUS	FAIR	REMOVE

Landscape Concept Plan
Karve Ski Park



HYDROZONE MAP

Hydrozone Legend

	ZONE 1	SHRUBS, GROUND COVERS - MODERATE WATER USE - DRIP IRRIGATION
	ZONE 2	TREES, SHRUBS, GROUND COVERS ON SLOPES - LOW WATER USE - MP ROTATORS / ROTORS
	ZONE 3	TREES - MODERATE WATER USE - BUBBLERS
	ZONE 4	BIO-BASINS - LOW WATER USE - MP ROTATORS / ROTORS
	ZONE 5	EXISTING NATURAL LANDSCAPE TO REMAIN - NO IRRIGATION
	ZONE 6	TREES, SHRUBS, GROUND COVERS - LOW WATER USE - DRIP IRRIGATION

County of San Diego, PDS, Zoning Division
WATER EFFICIENT LANDSCAPE WORKSHEET
Continued

REFERENCE EVAPOTRANSPIRATION (ETo)____ 57.0

Hydrozone # / Planting **(a)** Description	Plant Factor (PF)	Irrigation **(b)** Method	Irrigation Efficiency **(c)** (IE)	ETAF (PF/IE)	Landscape Area In Square Feet	ETAF x Area	Estimated Total Water Use **(d)** (ETWU)
Regular Landscape Areas							
1-shrubs, g.c.	0.5	Drip-sub	0.9	0.56	4,229	2,349	83,029
2-trees, shrubs, g.c.-slopes	0.3	Rotator	0.7	0.43	36,709	15,732	555,984
3-Trees	0.5	Bubblers	0.85	0.59	3,000	1,765	62,365
4-Basins	0.3	Rotators	0.7	0.43	6,360	2,726	96,327
5-Ex. Natural landscape							0
6-trees, shrubs, g.c.	0.3	Drip-sub	0.9	0.33	17,390	5,797	204,854
				Totals	67,688	28,369	1,002,559
Special Landscape Areas							
				1.0			0
				Totals	0	0	0
					Estimated Total Water Use **(ETWU) Total**		1,002,559
					Maximum Water Allowance **(MAWA)(e)**		1,004,679
					Irrigation Efficiency **(IE) Average****		1.01

****Average Irrigation Efficiency for overall irrigation system shall meet or exceed 0.75 (total of all efficiency ratings divided by number of hydrozones).**

ETAF CALCULATIONS

Average ETAF for Regular Landscape Areas must be 0.42 or below for all areas. ***Provide Totals based on information calculated in Worksheet above.***

Regular Landscape Areas		***Totals***
Total ETAF x Area	(B) =	28,369
Total Area	(A) =	67,688
Average ETAF	**(B) ÷ (A) =**	0.42

All Landscape Areas		***Totals***
Total ETAF x Area	(B+D) =	28,369
Total Area	(A+C) =	67,688
Site wide ETAF	(B+D) ÷ (A+C)	0.42

(d)
ETWU (Annual Gallons Required) =
Eto x 0.62 x ETAF x Area

ETo - see Appendix A in Water Efficient Landscape Design Manual. **(ETO = 51.1)**
0.62 is the conversion factor to gallons per sq. ft.
ETAF is Plant Factor/Irrigation Efficiency.
Area is the Landscaped Area for each hydrozone.

(e)
MAWA (Annual Gallons Allowed) =
(ETo)(0.62)[(ETAF x LA) + ((1- ETAF) x SLA)]

LA is the total landscape of all hydrozone areas in sq. ft.
SLA is the total special landscape area in square feet.
ETAF is 0.42 for all areas

0 40' 80' 240'
Scale 1" = 80'

North

rla 2681
HOWARD ASSOCIATES
landscape architecture
2442 second avenue
san diego ca 92101 619 718 9660

July 2, 2024