Energy Facilities Siting and Environmental Protection Division	_____	**FILE:** 07-AFC-5
	Project Title: Ivanpah SEGS	
☒ **Telephone:**	☐ **Meeting Location:**	
NAME: Christopher Dennis	Date 11/05/08	**Time**
WITH: Kathy Rose, CH2MHILL		
SUBJECT: Water and Soils Questions (TDS, Construction, Erosion, and Drainage)		

Question 1: What is the estimated total dissolved solids (TDS) concentration in groundwater? Provide a reference.

Response: Groundwater quality was discussed in Section 5.15 (Water Resources) of the AFC, and relevant portions are copied below for reference.

Groundwater Quality (AFC page 5.15-11)

The quality of the groundwater varies throughout the Ivanpah Basin, with high levels of fluoride and sodium seen in some portions of the basin (DWR, 2004). Groundwater quality at the project wells is assumed to be similar to that of two nearby wells currently serving the Primm golf course (see Figure 5.15-2 for the location of these wells). Quality for these two nearby wells is summarized in Table 5.15-3. Because the project wells would be located further west than the Primm golf course wells, away from the dry lake and associated playa deposits, water quality in the project wells is expected to be equal to or better than the water quality in the Primm golf course wells.

TABLE 5.15-3
Groundwater Quality Data for the Primm Golf Course Wells

	Units	Colosseum Well No. 1	Colosseum Well No. 2
Aggressiveness Index (Calc)		—	12.52
Alkalinity ($CaCO_3$)	mg/L	160	161
Arsenic (Total)	µg/L	1.4	3.7
Barium (Total)	µg/L	150	120
Calcium (Total)	mg/L	36	30
Chloride	mg/L	69	41
Chromium (Total)	µg/L	<5	3.7
Color (A.P.H.A.)	Color Unit	—	<3
Copper	mg/L	<0.01	<0.01
Fluoride (Total)	mg/L	0.6	0.58

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TABLE 5.15-3
Groundwater Quality Data for the Primm Golf Course Wells

	Units	Colosseum Well No. 1	Colosseum Well No. 2
Iron (Total)	µg/L	<20	<20
Magnesium	mg/L	22	20
Nitrate (as N)	mg/L	2.3	1.9
Nitrite (as N)	mg/L	—	<0.2
Odor	TON	—	1
Potassium	mg/L	3	3
pH	Std Units	7.6	8.3
Radium 228	pCi/L	<1+/-0.74	<1+/-0.59
Selenium (Total)	µg/L	2.3	<5
Sodium	mg/L	59	57
Sulfate	mg/L	36	43
Total Alpha Particle	pCi/L	3.6+/-2.1	3.1+/-2.0
Total Beta Particle	pCi/L	3.1+/-1.5	3.1+/-1.5
Total Dissolved Solids (TDS)	mg/L	380	350
Uranium	µg/L	5	4.1
Volatile Organic Chemicals	µg/L	ND	ND

Source: County of San Bernardino Department of Public Health
Note: Data from samples taken in 1998, 2001, 2003, and 2005 depending on well and constituent. Data spans several years as there is not a complete data set for either well for either year.

— = Not Analyzed
µg/L = micrograms per liter
mg/L = milligrams per liter
ND = None Detected
pCi/L = picocuries per liter

Question 2: What is the estimated annual potable water demand during construction (in acre-feet)?

Response: Water use is discussed in Section 5.15.3.3 of the AFC. Potable water demand would include drinking water and wash water for workers during construction. All potable water would be supplied by construction contractors, and there would be no potable water generated by the project to support construction activities. Specifically, groundwater will not be pumped and treated to provide potable water during construction.

Question 3: What is the estimated time to complete Ivanpah 3?

Response: The construction schedule is described in AFC Section 5.10.4.3 and provided in Tables 5.10-13 through 5.10-15 of the AFC. It is anticipated that Ivanpah 3 will be constructed between months 27-48 (inclusive) following receipt of the Notice to Proceed. Therefore, estimated time to complete Ivanpah 3 is 22 months.

Question 4: What is the average daily water use for construction (in gallons)? What is the maximum daily water use (in gallons)?

Response: During construction, water will be used for dust suppression and pressure testing of pipes. Dust suppression activities are expected to primarily occur during initial clearing, grubbing and grading activities. These activities do not overlap for Ivanpah 1, 2 and 3. Water volume required for pressure testing was provided in Ivanpah SEGS Data Response Set 2A. Estimated average and maximum daily water use for each phase are shown in Table 4.1.

TABLE 4.1
Average and Maximum Water Demand During Construction.

Site	Size (acres)	Water Use			
		Dust suppression		Pressure Testing	
		(acre-feet)	(gallons)	(acre-feet)	(gallons)
Ivanpah 1	914	45.7	14.9 million	0.14	47,000
Daily Average		0.305	99,333		
Daily Maximum			146,333		
Ivanpah 2	914	45.7	14.9 million		
Daily Average		0.305	99,333		
Daily Maximum			---	Not applicable	
Ivanpah 3	1786	89.3	29.1 million		
Daily Average		0.595	194,000		
Daily Maximum			---	Not applicable	

Notes:

Acreages for Ivanpah 1, 2 and 3 were the same as those assumed in the RUSLE2 model.

Water demand for dust suppression is assumed to be 0.05 feet per acre over the 5-month (150 day) grading duration for each phase. (See AFC p. 5.11-15, Dust Suppression). Because graded acreage is less than total acreage for each phase, daily average and daily maximum water use are likely overestimated.

Maximum daily water use (gallons) is assumed to be average daily use plus volume required for pressure testing.

Question 5: What are the wind and water erosion potentials for Popups and Arizo soils?

Response: Updated soil losses via erosion by water were provided in Ivanpah SEGS Data Response Set 1D. Table 5.11-3R from that document is duplicated below. Specific information related to Popups and Arizo soils that were relevant to soil loss calculations were obtained from the RUSLE2 database. That information in provided in the following two pages.

TABLE 5.11-3R
Estimate of Soil Loss by Water Erosion Using Revised Universal Soil Loss Equation (RUSLE2)

Feature (acreage)[2]	Activity	Duration (months)	Estimates Using Revised Universal Soil Loss Equation[1]		
			Soil Loss (tons) without BMPs	Soil Loss (tons) with BMPs	Soil Loss (tons/yr) No Project
Ivanpah 1 (913.812 acres total; 690.28 acres to grade)	Grading	5	155.3	2.1	0.0088
	Construction	15	217.0	6.2	---
Ivanpah 2 (914.345 acres total; 690.68 acres to grade)	Grading	5	155.4	2.1	0.0088
	Construction	15	217.2	6.2	---
Ivanpah 3 (1785.36 acres total; 1335.13 acres to grade)	Grading	5	350.4	4.9	0.0453
	Construction	15	517.2	14.6	---
Substation and Storage/Administration Buildings (22.15 and 2.64 = 24.79 acres)	Grading	1	1.797	0.018	0.00038
	Construction	3	1.897	0.054	---
Laydown Area (120 acres, remaining 257 acres is not included due to the low level of disturbance)	Grading	1	5.400	0.054	0.00115
	Construction	40	76.000	2.160	---
Roads and Trails (7.353 acres)	Grading	1.5	1.824	0.019	0.000377
	Construction	1	0.436	0.012	---
Gen-tie Lines (5.094 acres for construction; 0.0084 acre for pole footprints)	Grading	1	0.0002	0.000004	0.000000
	Construction	3	0.000	0.000	---
Water Line (2.702 acres for construction; 0.0135 acre for trench)	Grading	1	0.2624	0.00001	0.00006
	Construction	1	0.092	0.003	---
Gas Line Corridor (7.298 acres for construction; 0.584 acre for trench)	Grading	1	0.534	0.0003	0.00011
	Construction	3	0.563	0.016	---
Project Soil Loss Estimates	**TOTAL**		**1701.3**	**38.3**	**0.065**

Notes:

1. *Soil losses (tons/acre/year) are estimated using RUSLE2 software available on line [http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_index.htm].*

- *The soil characteristics were estimated using RUSLE2 soil profiles corresponding to the mapped soil unit.*
- *Soil loss (R-factors) were estimated using 2-year, 6-hour point precipitation frequency amount for the nearest National Weather Service station to the EEP site [on line at http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html].*
- *Estimates of actual soil losses use the RUSLE2 soil loss times the duration and the affected area. The No Project Alternative estimate does not have a specific duration so loss is given as tons/year.*

2. *Acreages assume a 40-ft corridor for the access roadways and 50-ft corridors for the gas, water, and transmission line construction corridors. Outside of the project footprint, the gas line will have a 4-ft wide trench and the gen-tie lines will have poles every 750 feet with each pole having a 4 by 4-foot excavation footprint.*

Other Project Assumptions as follows:

- *About 75.5% of the entire ISEGS site will be disturbed.*
- *Overhead gen-tie lines will have 23 towers outside of project footprint. Each tower will have a 4-foot x 4-foot footprint.*
- *It is assumed that the grading/excavation for all the poles will be completed within 1 month and the entire installation will be completed within 3 months.*
- *It is assumed that grading for each site will take 5 months and construction will take 15 months according to construction schedule.*
- *It is assumed that grading for access roads will take 1.5 months and construction will take 1 additional month.*
- *It is assumed that grading for substation and storage and administration buildings will take 1 month and that construction will take an additional 3 months.*
- *It is assumed that grading of the active laydown area will take one month, then the site will be covered with temporary buildings and materials so soil loss will be negligible during a 40-month construction period (assumes Phase 1 and 2 done concurrently and Phase 3 done afterwards).*
- *It is assumed that the excavation for transmission poles and gas line trench will take 1 month each and that construction will take an additional 3 months.*
- *It is assumed that the excavation for water line trench will take 1 month each and that construction will take an additional 1 month.*

RUSLE2 Assumptions as follows:

- *100-ft slope length. Estimated soil unit slope is the midpoint of the minimum and maximum of the unit slope class.*

Construction *soil losses assume the following inputs: Management - Bare ground; Contouring - None, rows up and down hill;*

- *Diversion/terracing - None; Strips and Barriers - None.*

Grading *soil losses assume the following inputs: Management - Bare ground/rough surface; Contouring - None, rows up and down hill;*

- *Diversion/terracing - None; Strips and Barriers - None.*

Construction with BMP *soil losses assume the following inputs: Management - Silt fence; Contouring - Perfect, no row grade;*

- *Diversion/terracing - None; Strips and Barriers - 2 fences, 1 at end of RUSLE slope.*

No Project *soil losses assume the following inputs: Management - Dense grass, not harvested; Contouring - None, rows up and down hill;*

- *Diversion/terracing - None; Strips and Barriers - None.*

An updated estimate of soil erosion by wind was reported in Ivanpah SEGS Data Response set 1D. Table 5.11-5R from that report is duplicated below. Calculations of soil losses via wind erosion did not distinguish among soil types.

TABLE 5.11-5R
Estimate of Total Suspended Particulates Emitted from Grading and Wind Erosion

Emission Source	Acreage	Duration (months)	Unmitigated TSP (tons)	Mitigated TSP (tons)
Grading Dust:				
Project Site (all 3 Areas)	3730.28	5	320.571	112.200
Substation and Storage/Admin Buildings	39.94	1	0.686	0.240
Laydown Area	120.00	1	2.063	0.722
Roads and Trails	25.75	1.5	0.664	0.232
Gen-tie Lines (poles)	0.0044	1	0.00008	0.00003
Water Line (4-ft wide trench)	5.8315	1	0.10023	0.03508
Gas Line (4-ft wide trench)	11.859	1	0.204	0.071
Wind Blown Dust:				
Project Site	3613.52	15	171.642	60.075
Substation and Storage/Admin Buildings	39.94	20	0.000	0.000
Laydown Area	0.00	40	0.000	0.000
Roads and Trails	25.75	1	0.082	0.029
Gen-tie Line Corridor	0.0044	3	0.000	0.000
Water Line Corridor	5.83	1	0.018	0.006
Gas Line Corridor	11.86	3	0.563	0.197
Estimated Total			**496.6**	**173.8**

Notes:

All linear feature impacts noted above are for portions outside of the project areas footprints.

Project Assumptions:

Grading for each site will be completed in a 5-month period and that approximately 100% of the area will be disturbed.

Construction on each of the three project areas will extend an additional 15 months after grading.

Roadways will require 1.5 months for grading and additional 1 month to construct.

Grading at the substation and storage and administrative building areas will take 1 month followed by 3-month construction period.

Grading of active laydown area will take one month, then the site will be covered with temporary buildings and materials so dust emissions will be negligible during a 40-month construction period (assumes Phase 1 and 2 done concurrently and Phase 3 done afterwards).

Excavation of transmission line pole holes and gas line trench will take 1 month followed by a 3-month construction period.

The overhead gen-tie lines will have 23 new poles outside of the project footprint. Each pole will have a 4 by 4-foot area for a total impact permanent area of 0.008 acre.

Approximately 1/10th of the project site, substation and storage/administration building areas has bare soil exposure during the length of the construction period.

Approximately 1/2 of the transmission line and gas line corridors areas has bare soil exposure during the length of the construction period.

Data Sources:

PM10 Emission Factor Source: Midwest Research Institute, South Coast AQMD Project No. 95040, Level 2 Analysis Procedure, March 1996

PM10 to TSP Conversion Factor Source: Bay Area Air Quality Management District CEQA Guidelines, Assessing the Air Quality Impacts of Projects, December 1999.

SCAQMD CEQA Handbook (1993) Table 11-4 for mitigation efficiency rates (as summarized in Table 8.9-4)

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: ISEGS
Owner name: Bright Source
Field name: Popups sandy loam

Location: California\SanBernardino County\CA_San Bernardino_R20-22
Soil: sandy loam (l-m OM, slo perm)
Slope length (horiz): 99 ft
Avg. slope steepness: 17 %
T value: 3.0 t/ac/yr

Alternatives:

Description	*Management*	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss, t/ac/yr*
	Bare ground; rough surface	a. rows up-and-down hill	(none)	(none)	37
	Bare ground	a. rows up-and-down hill	(none)	(none)	17
	Dense grass; not harvested	a. rows up-and-down hill	(none)	(none)	0.071
	Silt fence	c. perfect contouring no row grade	2 Silt fences, 1 at end of slope	(none)	0.49

RUSLE2 Worksheet Erosion Calculation Record

Info:

Tract #: ISEGS
Owner name: Bright Source
Field name: Arizo gravelly loamy sand

Location: California\SanBernardino County\CA_San Bernardino_R20-22
Soil: 100 ARIZO GRAVELLY LOAMY SAND, 2 TO 9 PERCENT SLOPES\ARIZO gravelly loamy sand 85%
Slope length (horiz): 100 ft
Avg. slope steepness: 5.0 %
T value: 5.0 t/ac/yr

Alternatives:

Description	*Management*	*Contouring*	*Strips / barriers*	*Diversion/terrace, sediment basin*	*Cons. plan. soil loss, t/ac/yr*
	Bare ground; rough surface	a. rows up-and-down hill	(none)	(none)	11
	Bare ground	a. rows up-and-down hill	(none)	(none)	4.7
	Dense grass; not harvested	a. rows up-and-down hill	(none)	(none)	0.025
	Silt fence	c. perfect contouring no row grade	2 Silt fences, 1 at end of slope	(none)	0.13

Question 6: What is the potential stormwater capture area (in square miles) draining to Ivanpah 1, 2 and 3?

Watershed areas draining to Ivanpah 1, 2 and 3 were identified in Ivanpah SEGS Data Response 139a, Set 2B. Figure DR139a-1 from that data response set shows the watershed area draining to Unit 1 is 21 square miles; watershed area draining to Unit 2 is 6 square miles; watershed area draining to the substation is 4 square miles; and watershed area draining to Unit 3 is 12 square miles.