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DOCKET
11-AFC-2
DATE MAR 23 2012
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March 23, 2012

427930.DI.DR

Mike Monasmith
Senior Project Manager
Systems Assessment & Facility Siting Division
California Energy Commission
1516 Ninth Street, MS-15
Sacramento, CA 95814

Subject: Data Response, Set 1C-2
Hidden Hills Solar Electric Generating System (11-AFC-2)

Dear Mr. Monasmith:

On behalf of Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC, please find attached electronic copies of Data Response, Set 1C-2.

Hard copies will be sent out today. Please call me if you have any questions.

Sincerely,

CH2M HILL

John L. Carrier, J.D.
Program Manager

Encl.

c: POS List
Project file

Data Response 1C-2

Hidden Hills

Solar Electric Generating System

(11-AFC-2)

Application for Certification

Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC

March 2012

With Technical Assistance from

CH2MHILL®

IS061411043744SAC

Hidden Hills Solar Electric Generating System (HHSEGS)

(11-AFC-2)

Data Response, Set 1C-2
(Response to Data Request 88)

Submitted to the

California Energy Commission

Submitted by

Hidden Hills Solar I, LLC; and
Hidden Hills Solar II, LLC

March 23, 2012

With Assistance from
CH2MHILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833

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Attachments

DR88-1 Preliminary Delineation of Jurisdictional Waters of the State

Introduction

Attached is Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC (collectively, “Applicant”) response to the California Energy Commission (CEC) Staff’s data request number 88 for the Hidden Hills Solar Electric Generating System (HHSEGS) Project (11-AFC-2). The CEC Staff served this data request on November 17, 2011, as part of the discovery process for HHSEGS.

Biological Resources (88)

IMPACTS TO STATE JURISDICTIONAL WATERS

BACKGROUND

Pursuant to the Warren-Alquist Act, the Energy Commission issues Fish and Game Code Section 1600 Lake and Streambed Alteration Agreements in lieu of CDFG. Because staff will be responsible for verifying information in the agreement, staff requests additional data on existing state waters within the project site. Also, the AFC does not include a description of the anticipated direct, indirect, temporary, and permanent impacts for the temporary construction area and common area.

DATA REQUEST

88. Please delineate the state waters in the common area and temporary construction area and provide an updated state waters map and survey data (acreages) to staff. Please provide an explanation of what assumptions were made to determine what areas qualify as state waters.

Response: Potential waters of the State were delineated by URS Corporation in December 2011, and results (including tables and figures) are provided in the Preliminary Delineation of Jurisdictional Waters of the State. A copy of the report is provided as Attachment DR88-1. The delineation report concluded that 80 washes within the project site are potential waters of the State. These washes are shown in Figures 2A-2L of the report. Two of the 80 washes are also waters of the United States, as determined by the USACE. The report identifies the criteria that were used to determine what areas would qualify as nonfederal state waters. These criteria focused on the CDFG interpretation of jurisdictional limits and included any one of the following:

(1) At minimum, intermittent and seasonal flow through an objectively-defined bed or channel with banks and also supports fish or other aquatic life;

(2) A watercourse having a surface or subsurface flow regime that supports or has previously supported riparian vegetation or has indications of a zone of influence;

(3) Hydrogeomorphically distinct top-of-embankment to top-of-embankment limits (i.e., objectively-defined bed and bank);

(4) Outer ground cover and canopy extent of typical riparian associated vegetation beyond the top-of-bank that would be sustained by surface and/or subsurface waters of the watercourse.

In addition, wetlands located adjacent to a stream with an ordinary high water mark (OHWM) were considered to be in CDFG jurisdiction.

Please note that the attached jurisdictional delineation report identified other areas (such as pooling areas) that did not meet the CDFG jurisdictional criteria listed above; these areas were mapped as “non-jurisdictional waters.”

The Applicant met with the CDFG in March 2012 to discuss a draft of the URS Preliminary Delineation of Jurisdictional Waters of the State report. The attached version of the report includes revisions to the prior draft concluding that the alkaline soil areas in the temporary construction laydown area are not sinks or other water bodies. They are rather relict drainage features with the appearance of “inverted” topography, resulting from preferential erosion and soil loss from surrounding areas in the landscape, which result in the relict feature being topographically elevated compared to surrounding land surfaces. The CDFG also asked for additional information including maps indicating where test pits were dug as part of the delineation process and the location of special status plants in relation to the state jurisdictional and non-jurisdictional waters, and additional information on a few of the jurisdictional and non-jurisdictional waters identified in the report. This information will be submitted under separate cover.

Attachment DR88-1
Preliminary Delineation of Jurisdictional Waters of the State

R E P O R T

BRIGHTSOURCE ENERGY HIDDEN HILLS SOLAR PROJECT, INYO COUNTY, CA PRELIMINARY DELINEATION OF JURISDICTIONAL WATERS OF THE STATE

Prepared for

BrightSource Energy Inc.
410 S. Rampart Blvd, Suite 390
Las Vegas, NV 89145

URS Project No. 24096984.50010

Heather Rothbard
Staff Botanist/Wetland Scientist

Patrick J. Mock, PhD, CSE, CWB®
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March 20, 2012

URS

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SECTION 1 PROJECT BACKGROUND

BrightSource Energy, Inc. (BrightSource) is proposing to design, construct, and operate a net 500-megawatt (MW) solar electricity generating system (SEGS) utilizing a dry cooling system at the Hidden Hills Ranch (Project) site. The system will utilize a closed loop water transport system that will be super-heated by solar array into steam to drive a SEGS, which will generate clean, renewable energy.

The Project site is located approximately 40 miles west of Las Vegas, Nevada, along the Nevada-California state line, within Inyo County, California (Figure 1). The Project site includes approximately 3,000 acres of private land. A jurisdictional delineation of the Project site addressing federal jurisdiction was conducted by URS (Feb 2011) and approved by the United States Army Corps of Engineers (USACE, Dec 14, 2011). This determined the extent of jurisdictional wetlands and other waters of the United States (WUS) at the Project site (Appendix A). Waters of the State (WSC) were not addressed at that time.

The Project site is located in Pahrump Valley and is surrounded by both public and private lands. This region is in the Mojave Desert in southeastern California with the majority of the project site on the Calvada Springs, U.S. Geological Survey (USGS) 7.5 minute Quadrangle (USGS 1984) and minor areas to the north and southeast on the Mound Spring and Stump Spring Quadrangles (1984). Average rainfall in this region is 3 to 7 inches with mean annual air temperatures ranging from 61 to 68 degrees Fahrenheit (F) and a frost free period of 200 to 220 days (NRCS 2006). The highest annual temperature averages are in the months of July and August at 103.9 and 103.3 degrees F, respectively. December and January have the lowest average temperatures at 32 degrees F (WRCC 2010).

SECTION 2 REGULATORY BACKGROUND

2.1 SECTION 1600 *et seq* OF THE CALIFORNIA FISH AND GAME CODE, STREAMBED ALTERATION AGREEMENT

Section 1602(a) describes areas potentially subject to a Streambed Alteration Agreement (SAA):

> *1602 (a) An entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake, unless all of the following occur…*

Title 14 CCR 720 provides:

> *For the purpose of implementing Sections 1601 and 1603 of the Fish and Game Code which requires submission to the department of general plans sufficient to indicate the nature of a project for construction by or on behalf of any person, governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed of any river, stream or lake designated by the department, or will use material from the streambeds designated by the department, all rivers, streams, lakes, and streambeds in the State of California, including all rivers, streams and streambeds which may have intermittent flows of water, are hereby designated for such purpose.*

California Water Code Section 13050(e) defines the Waters of the State as:

" any surface water or groundwater, including saline waters, within the boundaries of the state."

Streams, including creeks and rivers, are defined at Title 14 CCR 1.72 as:

> *A stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks, this includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation.*

Lakes are defined at Title 14 CCR 1.56 as:

> *Lakes: Includes natural lakes or man-made reservoirs.*

In practice, the California Department of Fish and Game (CDFG) defines a bank not only by its vertical waterside face, but also by the horizontal or landward extent of the bank defined by the geometry of the bank profile, properties of the bank materials, and the riparian vegetation associated with the bank. Streams and lakes typically have defined banks that rise vertically above and horizontally away from the watercourse (streambed or basin), but banks may also be minor features. If water perennially, intermittently, or ephemerally flows through a given definable course (streambed) or fills a basin, the physical and biological evidence for the location of these waters at the highest level of confinement can be objectively identified, then this

evidence is used to define the limits of State jurisdictional waters for the Fish and Game Code section 1602 Streambed Alteration Agreement program.

CDFG defines riparian zones as a zone of influence adjacent to streams of lakes and estuarine-marine shorelines that are transitional between upland and aquatic ecosystems and that are distinguished by gradients in biophysical conditions, ecological processes, and biota.

Additionally, potential beneficial uses, like wildlife corridors and nesting habitat that may occur on site were evaluated.

California Department of Fish Game (CDFG) generally interprets the jurisdictional limits of waters of the State of California (WSC) to include any one of the criteria identified below.

(1) At minimum, intermittent and seasonal flow through an objectively-defined bed or channel with banks and also supports fish or other aquatic life.
(2) A watercourse having a surface or subsurface flow regime that supports or has previously supported riparian vegetation or has indications of a zone of influence.
(3) Hydrogeomorphically distinct top-of-embankment to top-of-embankment limits (i.e., objectively-defined bed and bank).
(4) Outer ground cover and canopy extent of typical riparian associated vegetation beyond the top-of bank that would be sustained by surface and/or subsurface waters of the watercourse.

The CDFG routinely asserts jurisdiction over wetlands areas that may be adjacent to a stream with evidence of water flow that demonstrate: a dominance of hydrophytic vegetation, hydric soils, or hydrology. Only one of these indicators needs to be presence for jurisdiction to be asserted.

2.2 PORTER-COLOGNE WATER QUALITY CONTROL ACT

In addition to CDFG regulatory authority, the Regional Water Quality Control Board (RWQCB) also regulates impacts to WUS and WSC under the Clean Water Act (CWA) Section 401 and the Porter-Cologne Water Quality Control Act (Porter-Cologne). WSC are defined in Porter-Cologne as “any surface water or ground water, including saline waters, within the boundaries of the state.” Although water quality issues related to impacts to waterways are addressed during a CWA Section 401 Water Quality Certification for WUS, should a channel be determined by the USACE to not be a WUS, Porter-Cologne Water Quality Control Act compliance would apply for placement of fill of any non-federal WSC regardless of size or properties of the drainage.

This report contains the results of a delineation of potential WSC that occur at the Project site and a description of those water features that may be subject to regulation by the CDFG under Section 1600 of the Fish and Game Code, and the RWQCB under Porter-Cologne.

SECTION 3 METHODS

Areas considered and assessed as potential WSC were evaluated by URS based on delineation practices that are in compliance with requirements of Section 1600 of the California Fish and Game Code. URS followed CDFG's usual practice to interpret the jurisdictional limits of state jurisdictional waters to include any one of the criteria identified in Section 2.1. Other methodology used to determine potential jurisdictional WSC followed those that were used to determine WUS, with focus on mapping outer ground cover and canopy extent of typical riparian associated vegetation beyond the top-of bank that would be sustained by surface and/or subsurface waters of the watercourse. The site reconnaissance survey (December 7, 8, 9, 13, 14, and 15, 2011) looked at previously delineated washes for WUS jurisdiction (February 2011), USGS topographic blue lines, and other features previously identified during the February 2011 field effort.

Within the boundaries of the Project Site, numerous east to west trending ephemeral washes were mapped during the February 2011 field reconnaissance for jurisdictional determination of WUS. The Study Area for the December 2011 field reconnaissance for jurisdictional determination of WSC included the Project Site, a 250-foot buffer around the Project Site (Figure 1) and the 182.9-acre Construction lay-down area to create an updated Study Area. Drainages mapped in February 2011 were re-mapped during the December 2011 field investigation. URS biologists gathered information on the physical parameters such as topographic demarcation, soil characteristics, and vegetation cover. Pedestrian surveys were conducted along previously mapped drainages and also around points of interest including sheet flow and ponding areas. Two points were collected at the outer extent of vegetation associated with each drainage and included two photos at each point (one upstream and one downstream) (Appendix B). In addition to these channels, all mapped pooling and ponding areas with wash-dependent vegetation were mapped as potential WSC. Soil within alkaline soils areas were examined for hydric soil characteristics and gleying. Data were recorded using a Trimble® Geo-XT sub-foot GPS. General characteristics of the wash, including average channel width, evidence of flow, and general vegetation were noted.

Field data were incorporated into a Geographic Information System (GIS) for subsequent analysis and mapping. Data points collected along transect lines were plotted on recent aerial photographs having one to two foot resolution, and drainage features within the survey area were manually digitized in to the GIS using the nearest reference location data to aid in the mapping.

SECTION 4 FINDINGS AND RESULTS

The Study Area contains the following vegetation communities: Mojave Creosote Bush Series, Mojave Creosote Bush-White Bursage Scrub, Mesquite Thicket, Desert Saltbush Scrub, Shadescale Scrub including the Saltgrass Series, and Disturbed/Developed lands as described in *A Manual of California Vegetation* (Sawyer and Keeler-Wolf, 2008). A complete list of the species observed within the Study Area is included in Appendix C. The predominant natural plant community is Creosote Bush-White Bursage Scrub Series. Mixed Saltbush Series is common on basin floors.

URS biologists reported no observable surface water within the project boundaries at the time of the investigation; however, evidence was documented of past recent surface water flows, including visible shelves and edges in washes, OHWMs, litter and debris, caking and cracking of surface soils, and vegetation disturbance. Other evidence observed was the heavy braiding of washes throughout the project site and characteristics of sheet and subsurface flows. The Property site contains many unnamed ephemeral washes. URS biologists determined that surface waters flowed southwest on the site, and ultimate northwest towards Pahrump Playa, which is not identified as a Traditionally Navigable Water (TNW) per USACE nomenclature.

Features for each drainage system include single, large channels with well-defined bed and banks, as well as broad, but sometimes weakly expressed, assemblages of shallow braided ephemeral channels. As shown in Table 1, a total of 28.33 acres (23.82 WSC acres within the 3,279.6-acre Project Site plus 4.51 WSC acres within the 318.9-acre 250-ft buffer area) that qualify for consideration as jurisdictional WSC. This includes 80 ephemeral washes, 6 of which are “blue lines” on USGS topographic maps, plus braided wash areas totaling 5.85 acres (Table 1). All the washes listed in Table 1 met one or more of the criteria discussed in Sections 2.1, and therefore they are proposed jurisdictional WSC (Figures 2a thru 2l). A total of 0.42 acre was previously delineated as federal Waters of the US and are included in the total WSC acreage (Drainages 24 and 50; See Figures 2C, 2D, 2E, 2G).

Table 1. Potential Waters of the State of California								
Wash ID Number	Acres	Length (feet)	Depth (feet)		Wash ID Number	Acres	Length (feet)	Depth (feet)
1	0.08	678	0.2		42	0.03	268	0.2
2	0.12	1135	0.2		43	0.07	681	0.2
3	0.11	1093	0.2		44	0.04	445	0.2
4	0.05	485	0.3		45	0.03	314	0.1
5	0.17	1410	0.2		46	0.03	347	0.3
6	0.05	582	0.1		47	0.03	343	0.6
8	0.10	905	0.2		48	0.12	1231	0.1
9	0.14	931	0.1		49	0.01	88	0.1
10	7.15	18048	0.3		50 *	1.97	3160	0.1
12	0.08	702	0.1		51	0.06	140	0.1
14	0.06	620	0.2		52	0.03	351	0.1
15	0.04	381	0.1		53	0.40	3448	0.2
16	0.04	420	0.2		55	0.15	612	0.1
17	0.06	562	0.2		56	0.17	570	0.6
18	0.08	799	0.5		57	0.18	1723	0.1
19	0.10	1078	0.2		59	0.18	364	0.2
20	0.06	632	0.1		60	1.11	1818	0.5
21	0.18	1849	0.4		61	0.45	546	0.2
22	0.07	572	0.2		62	1.18	766	0.2
23	0.03	283	0.5		63	0.98	2086	0.1
24 *	0.66	2840	0.5		64	0.03	333	0.2
25	0.62	3864	0.4		65	0.31	1568	0.6
26	0.38	3919	0.5		66	0.02	195	1.6
27	0.30	2952	0.3		67	0.07	690	0.2
28	0.08	729	0.6		68	0.06	583	0.2
29	0.34	994	0.5		69	0.14	1483	0.2
30	0.26	1314	0.5		70	0.22	1805	0.1
31	0.20	1877	0.3		71	0.04	391	0.1
32	0.30	994	0.2		72	0.02	269	0.1
33	0.19	524	0.2		73	0.09	928	0.9
34	0.12	1269	0.2		74	0.03	335	1.0
35	0.09	906	0.3		75	0.62	4767	0.0
36	0.11	1137	0.2		76	0.03	210	0.0
37	0.01	131	0.3		77	0.28	425	0.0
38	0.08	843	0.2		78	0.09	363	0.0
39	0.02	237	0.1		79	0.15	1299	0.0
40	0.04	394	0.2		80	0.46	735	0.0
41	0.01	101	0.1		Braided Wash	5.85	-	-
					Total Acres WSC:	**28.33**		

* Drainages 24 and 50 are also considered waters of the US (see Appendix A).

Several alkaline soil areas were identified during pedestrian transects within the Construction Lay-down Area (Figures 2k and 2l). These alkaline soil areas lack a clearly defined bed and bank, lack of riparian or wetland vegetation, and lack of clear adjacency to a feature with an OHWM. They exhibit hydrological conditions indicative of inundation over an extended period of time, i.e., caking and cracking of surface soils, an absence of vegetation in the bare area with upland vegetation around the edges, and a development of cryptobiotic crust (Appendix B, Photos 68 thru 72). Examination of soils within the alkaline soil areas indicated a lack of hydric soil characteristics or gleying. Dr. Geof Spaulding evaluated these alkaline soil areas and determined that these areas have perched topography and receive water from sheet flow that transverse the site from east to west and due to their perched topopography, drain to the surrounding vegetated upland areas (Appendix D). No defined channels, drainages, or washes supply water to these areas. The extent of the alkaline soil areas over the Construction Lay-down area is large and not all area were mapped. Sample areas were mapped to identify representative features of the alkaline soil areas (Figure 2b, 2d, 2f, 2k and 2l, Appendix B, Photos 68 thru 72). Due to their perched topography, these alkaline soil areas did not meet CDFG criteria for jurisdictional waters and were not included in this jurisdictional delineation of State Waters. See Appendix D for more detailed assessment of the alkaline soil areas.

SECTION 5 CONCLUSION

URS evaluated 80 drainage features and representative pooling and sheet flow areas. Based on these features, URS has developed the following conclusions:

- 80 washes within the Property are proposed as WSC and would likely be regulated by both CDFG and RWQCB. A total of 28.33 acres (23.82 acres within the Project Site, plus 4.51 acres within the 250-ft buffer area) are considered WSC.
- A total of 0.42 acre was previously delineated as federal Waters of the US and are included in the total WSC acreage (Drainages 24 and 50; See Figures 2C, 2D, 2E, 2G).
- Many alkaline soil areas were located on the western portion of the Project site. These alkaline soil areas lack a clearly defined bed and bank, lack of riparian or wetland vegetation, and lack of clear adjacency to a feature with an OHWM. The perched topography of these alkaline soil areas preclude inundation. These alkaline soil areas did not meet CDFG criteria for jurisdictional waters and were not included in this jurisdictional delineation of State Waters. See Appendix D for a detailed assessment of these areas.

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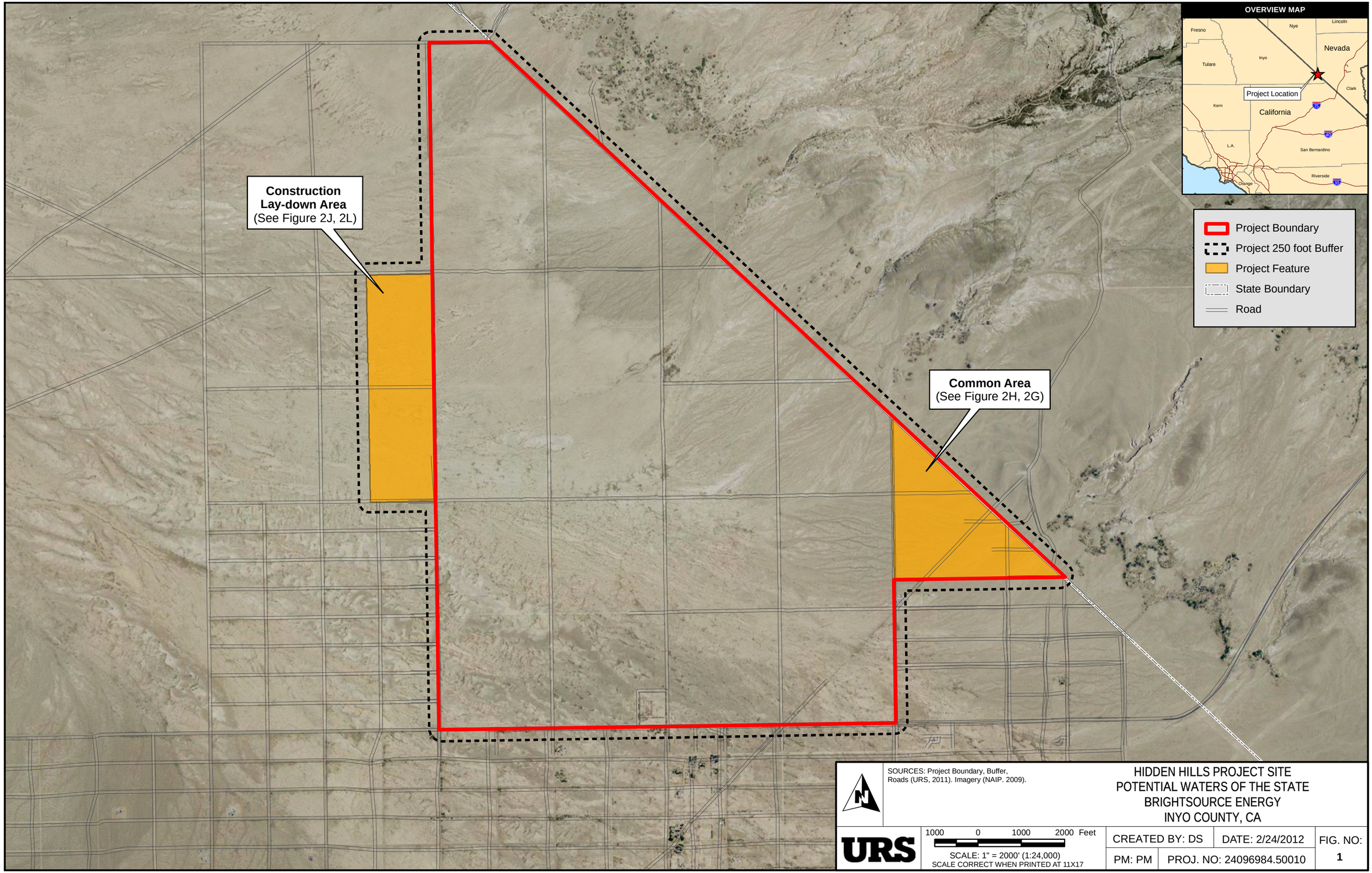

SOURCES: Project Boundary, Buffer, Roads (URS, 2011). Imagery (NAIP. 2009).

HIDDEN HILLS PROJECT SITE
POTENTIAL WATERS OF THE STATE
BRIGHTSOURCE ENERGY
INYO COUNTY, CA

URS

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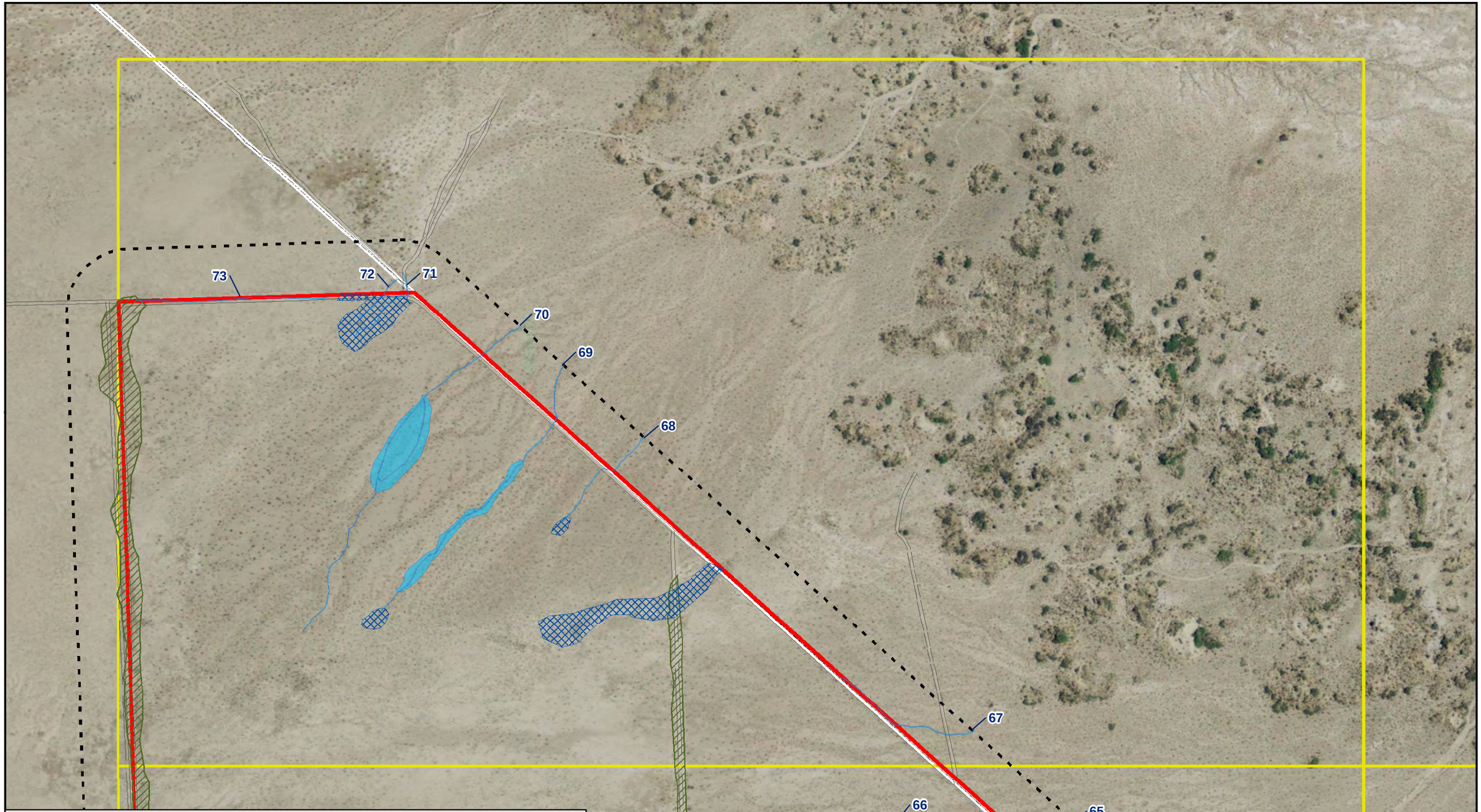


Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

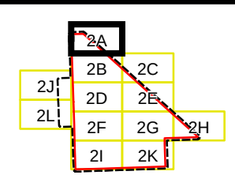
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

ID Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
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POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

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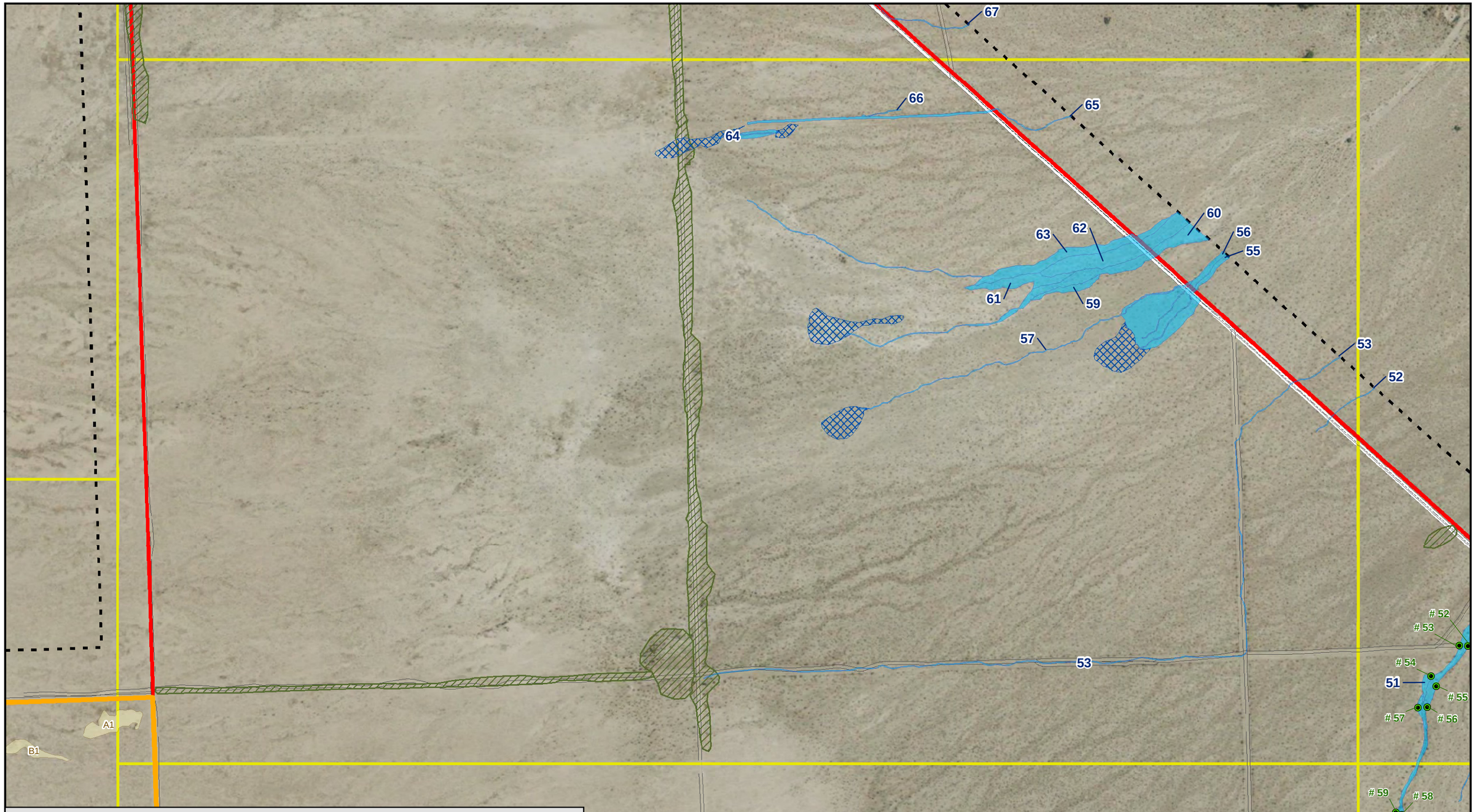

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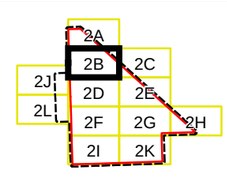

SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

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SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

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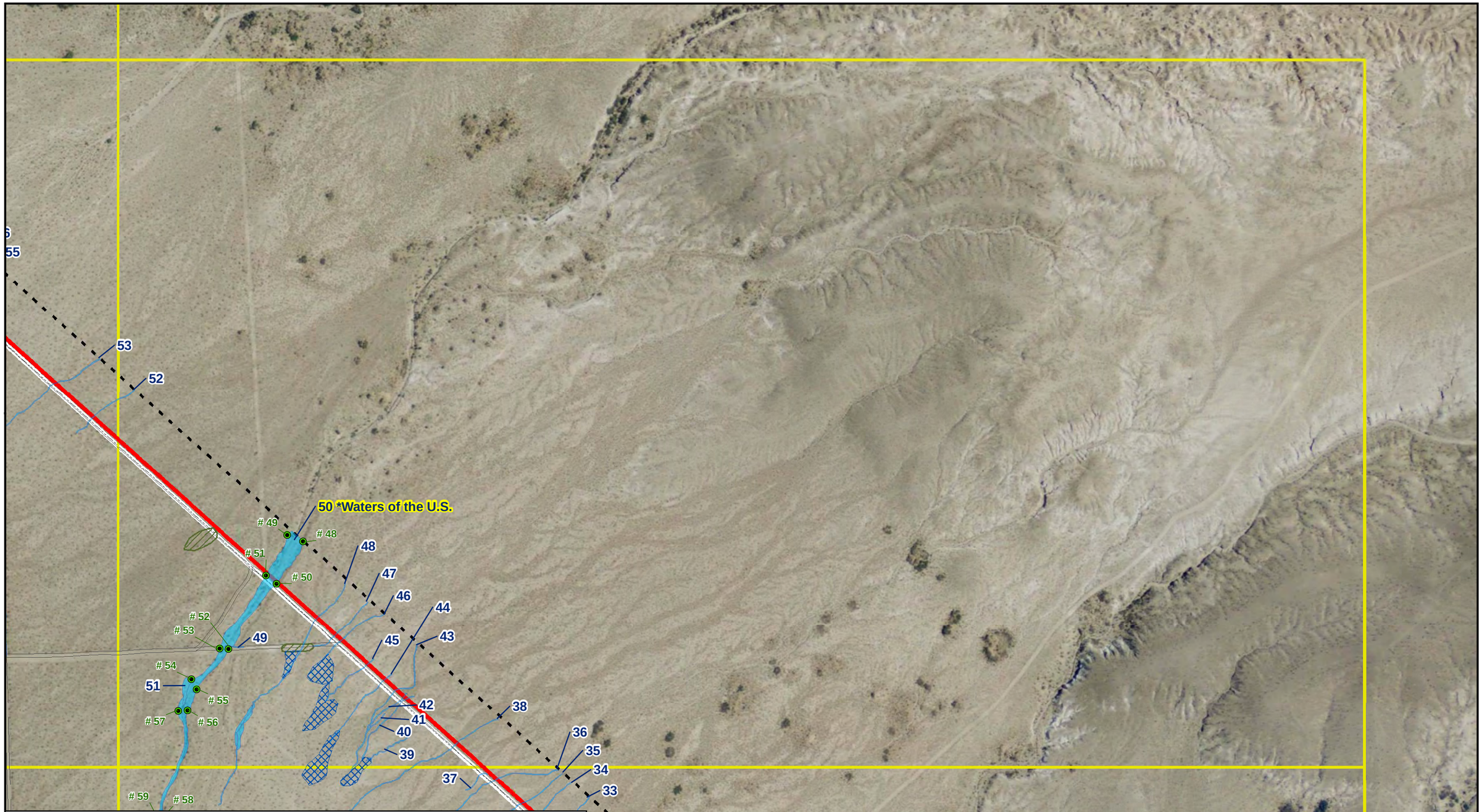


Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

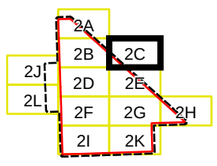
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2C
PM: PM	PROJ. NO: 24096984.50010	

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Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

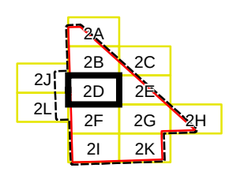
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2D
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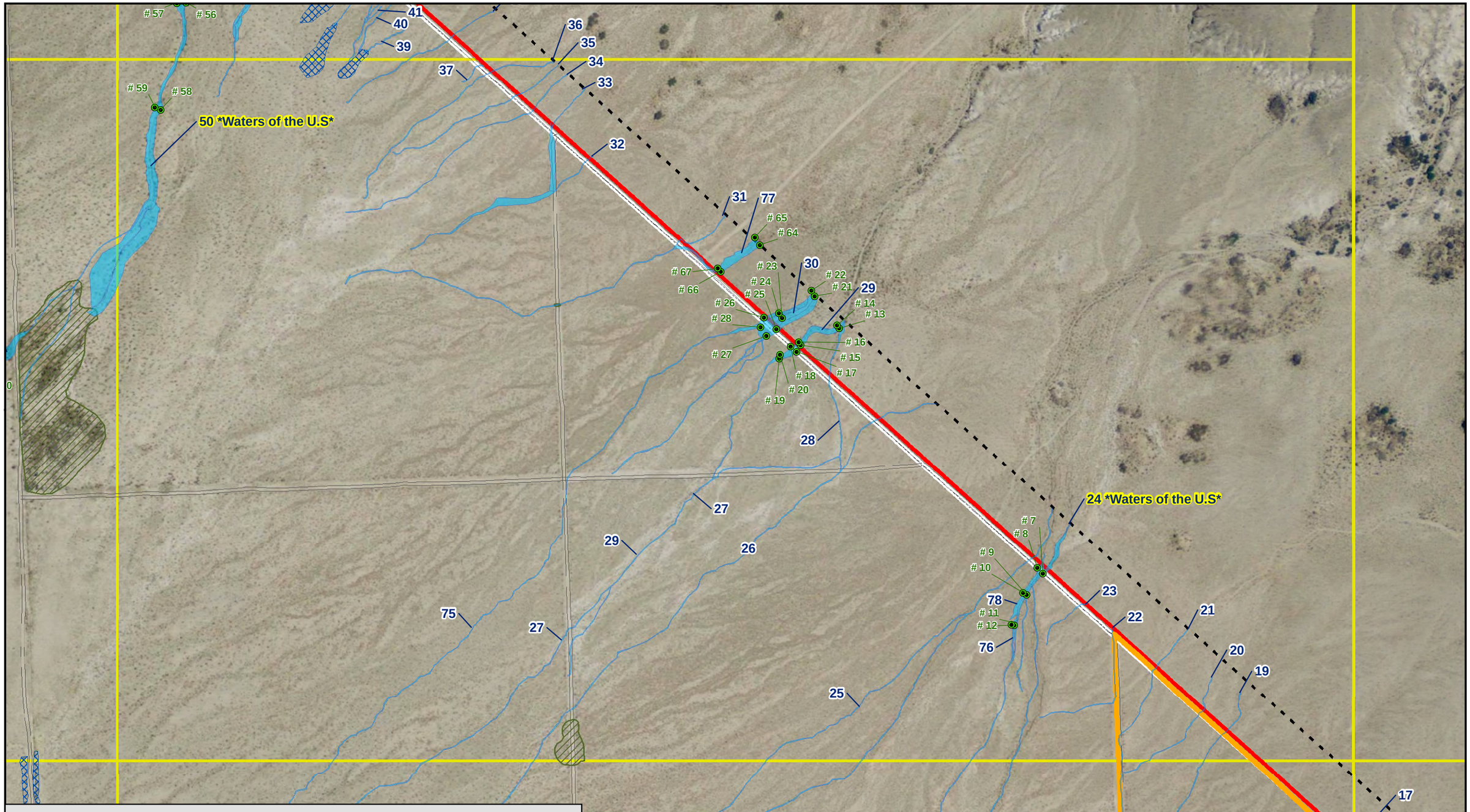


Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

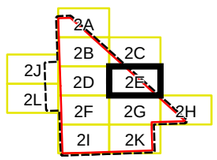
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet

SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2E
PM: PM	PROJ. NO: 24096984.50010	

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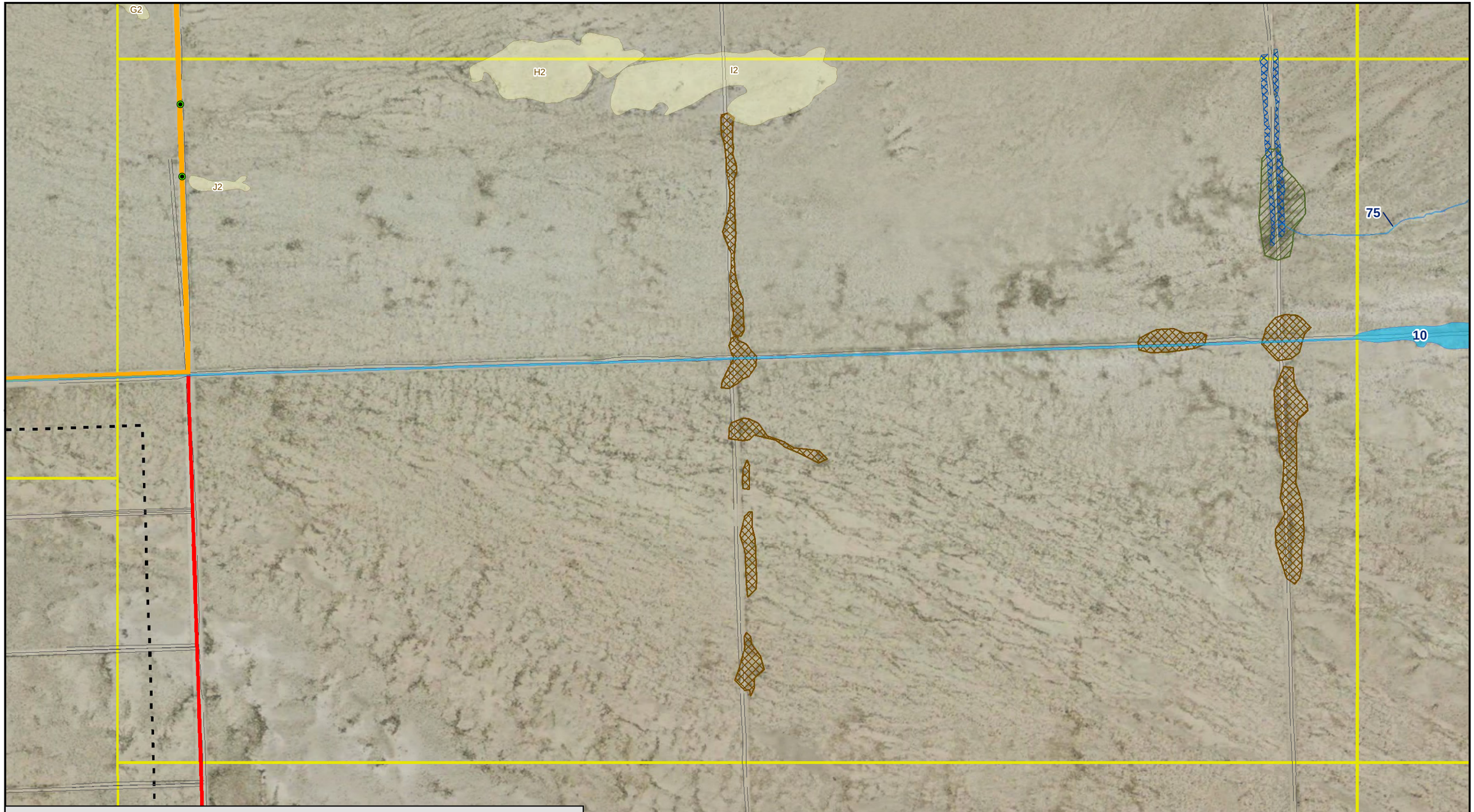


Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

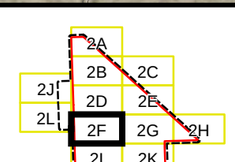
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

ID Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2F
PM: PM	PROJ. NO: 24096984.50010	

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Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

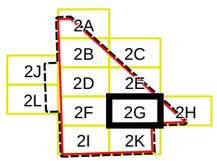
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

ID Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2G
PM: PM	PROJ. NO: 24096984.50010	

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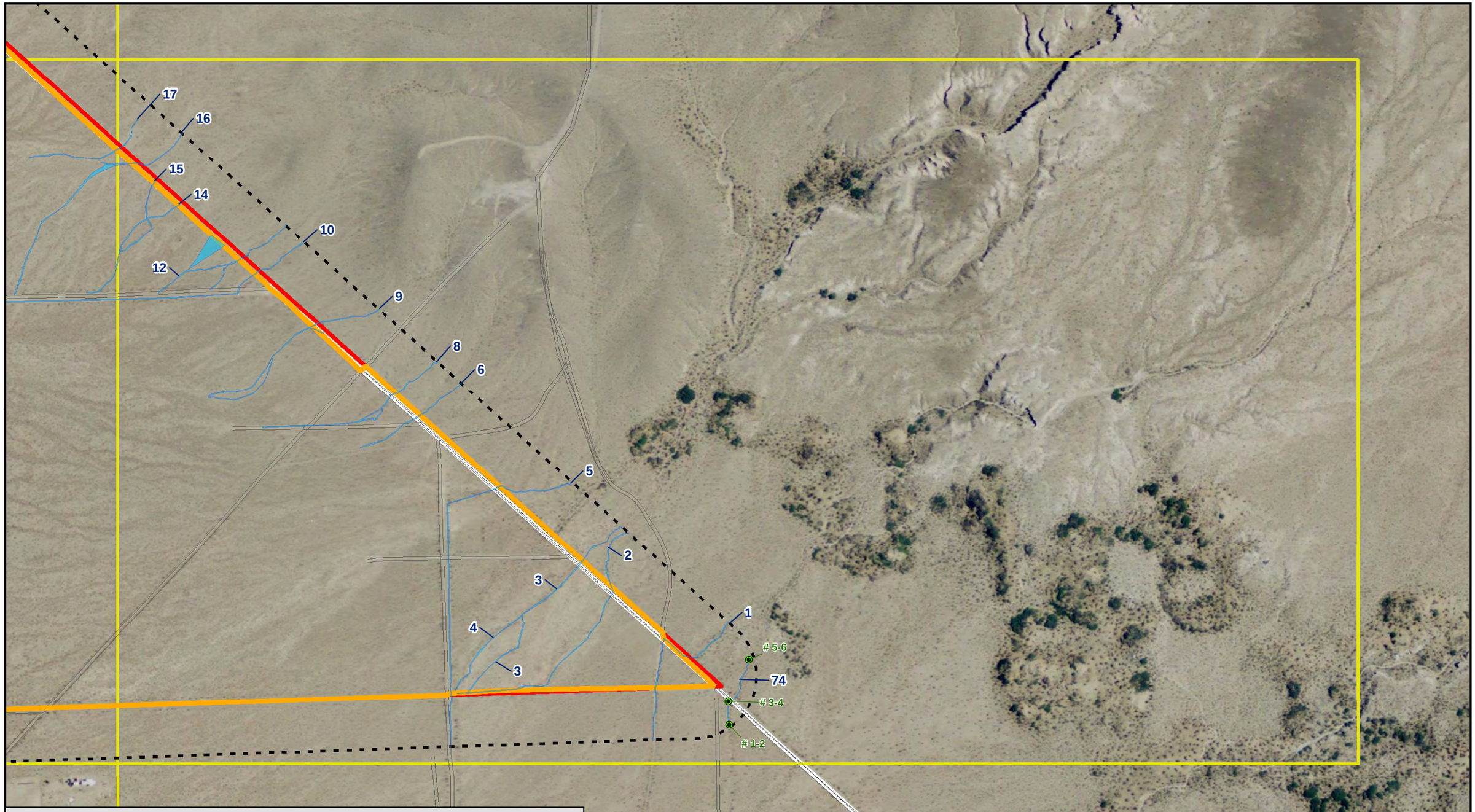


Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

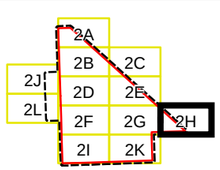
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet

SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2H
PM: PM	PROJ. NO: 24096984.50010	

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Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

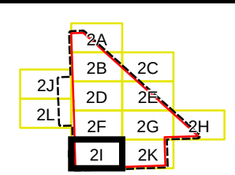
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2I
PM: PM	PROJ. NO: 24096984.50010	

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Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

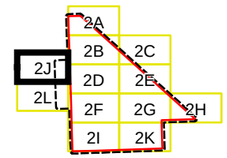
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

ID Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2J
PM: PM	PROJ. NO: 24096984.50010	

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Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

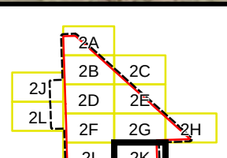
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

ID Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet
SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2K
PM: PM	PROJ. NO: 24096984.50010	

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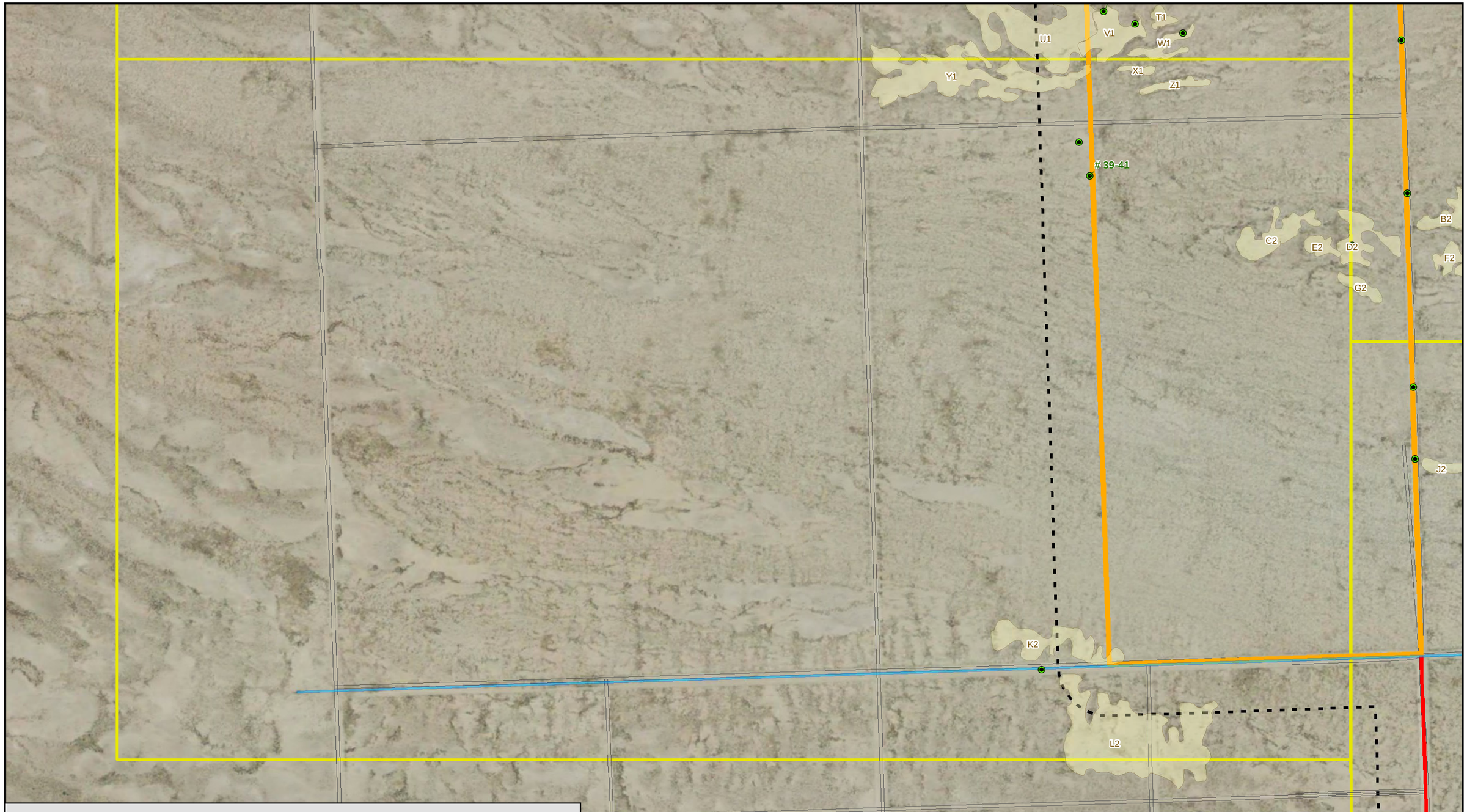


Project Boundary
Project 250 foot Buffer
Waters of the State Photograph Point

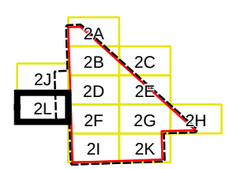
Waters of the State

Potential Waters of the State (No.) 28.3 ac.

Non-Jursidictional Waters

ID Alkaline Soil Area (ID) 48.7 ac.
Moist Pooling Area - 8.6 ac.
Pooling Area - 31 ac.
Sheet Flow Area - 9.5 ac.

Road
State Boundary
Map Sheet
Project Feature



SOURCES: Photo Points, Waters of the State, Alkaline Soils Braided Washes, Pooling Areas, Sheet Flow Areas, Roads, Project Boundary, Buffer, Map Sheet, Project Features (URS, 2011). Aerial (NAIP, 2010).

URS

225 0 225 450 Feet

SCALE: 1" = 450' (1:5,400)
SCALE CORRECT WHEN PRINTED AT 11X17

POTENTIAL WATERS OF THE STATE
HIDDEN HILLS
BRIGHTSOURCE ENERGY
INYO COUNY, CA

CREATED BY: DS	DATE: 3/20/2012	FIG. NO: 2L
PM: PM	PROJ. NO: 24096984.50010	

Path: G:\gis\projects\1577\24096984\map_docs\mxd\HiddenHills_FieldResults.mxd, diana_smith, 3/20/2012, 11:04:23 AM

DEPARTMENT OF THE ARMY
VENTURA REGULATORY FIELD OFFICE
2151 ALESSANDRO DRIVE, SUITE 110
VENTURA, CA 93001

December 14, 2011

REPLY TO
ATTENTION OF

Regulatory Division

Gary Kazio
BrightSource Energy Inc.
410 S. Rampart Blvd., Suite 390
Las Vegas, Nevada 89145

SUBJECT: Determination regarding Corps jurisdiction over interstate drainages on the Hidden Hills Ranch Project Site near Pahrump, Nevada

Dear Mr. Kazio:

I am responding to your request (File No. SPL-2011-00089-BAH) dated May 6, 2011 for a jurisdictional determination for BrightSource Energy's Hidden Hills Ranch Solar Project located in southeastern Inyo County, California near the town of Pahrump, Nye County, Nevada. We examined project information dated May 6, 2011 prepared by URS Corporation on your behalf, and conducted a site visit on May 31, 2011 by Regulatory project manager Bruce Henderson and Jean Paul Charpentier of URS Corporation. Based on this review and assessment of on-site conditions, we have determined the Hidden Hills Ranch Solar Project site contains waters of the United States pursuant to 33 C.F.R. §325.9, as well as additional drainage features we have determined to not be subject to Corps jurisdiction.

The Corps' evaluation process for determining if a Department of the Army permit would be required depends on whether the project is located within the Corps' geographic jurisdiction and if the proposed project includes an activity potentially regulated under Section 10 of the River and Harbor Act or Section 404 of the Clean Water Act. The project site is located immediately adjacent to the California/Nevada state boundary and drainage features that cross that boundary are identified as interstate waters pursuant to 33 C.F.R. 328.3(a)(2), provided they exhibit an ordinary high water mark. Of the interstate drainage features identified by URS Corporation as potentially jurisdictional, the May 31 site visit concluded that only two drainages, identified as Drainage 50-1 and Drainage 24-1, have an identifiable ordinary high water mark. These two drainages also demonstrated other characteristics to indicate they conveyed water at a somewhat greater frequency or duration, including supporting a vegetation community that differed from surrounding uplands and suggesting a wetter regime within the channels, and sorting of particle sizes within the drainage.

It is our understanding the solar energy project you propose would likely require maintenance and/or upgrading of the existing earthen roads, as well as potential road access within the project area. Your project may also require other utility infrastructure be installed. Therefore, we have determined your proposed project may involve a regulated activity located within the geographic jurisdiction of Section 404 of the Clean Water Act and a Section 404 permit would be required from our office.

This letter contains an approved jurisdictional determination for the Hidden Hills Ranch Solar Project site. If you object to this decision, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet (Appendix A) and Request for Appeal (RFA) form. If you request to appeal this decision you must submit a completed RFA form to the Corps South Pacific Division Office at the following address:

Tom Cavanaugh
Administrative Appeal Review Officer,
U.S. Army Corps of Engineers
South Pacific Division, CESPD-PDS-O, 2042B
1455 Market Street, San Francisco, California 94103-1399

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 C.F.R. Part 331.5, and that it has been received by the Division Office within 60 days of the date on the NAP. Should you decide to submit an RFA form, it must be received at the above address by February 13, 2012. It is not necessary to submit an RFA form to the Division office if you do not object to the decision in this letter.

This verification is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date. If you wish to submit new information regarding the approved jurisdictional determination for this site, please submit this information to Bruce Henderson at the letterhead address by February 13, 2012. The Corps will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination. A revised or reissued jurisdictional determination can be appealed as described above.

This determination has been conducted to identify the extent of the Corps' Clean Water Act jurisdiction on the particular project site identified in your request. This determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

If you have any questions, please contact Bruce Henderson of my staff at 805-585-2145 or via e-mail at Bruce.A.Henderson@usace.army.mil. Please be advised that you can now

comment on your experience with Regulatory Division by accessing the Corps web-based customer survey form at: http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

Aaron O. Allen, Ph.D.
Chief, North Coast Branch
Regulatory Division

Enclosures

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Gary Kazio, BrightSource Energy Inc.	File Number: SPL-2011-00089-BAH	Date: 12/14/2011

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

DISTRICT ENGINEER
Los Angeles District, Corps of Engineers
ATTN: Chief, Regulatory Division
P.O. Box 532711
Los Angeles, CA 90053-2325
Tel. (213) 452-3425

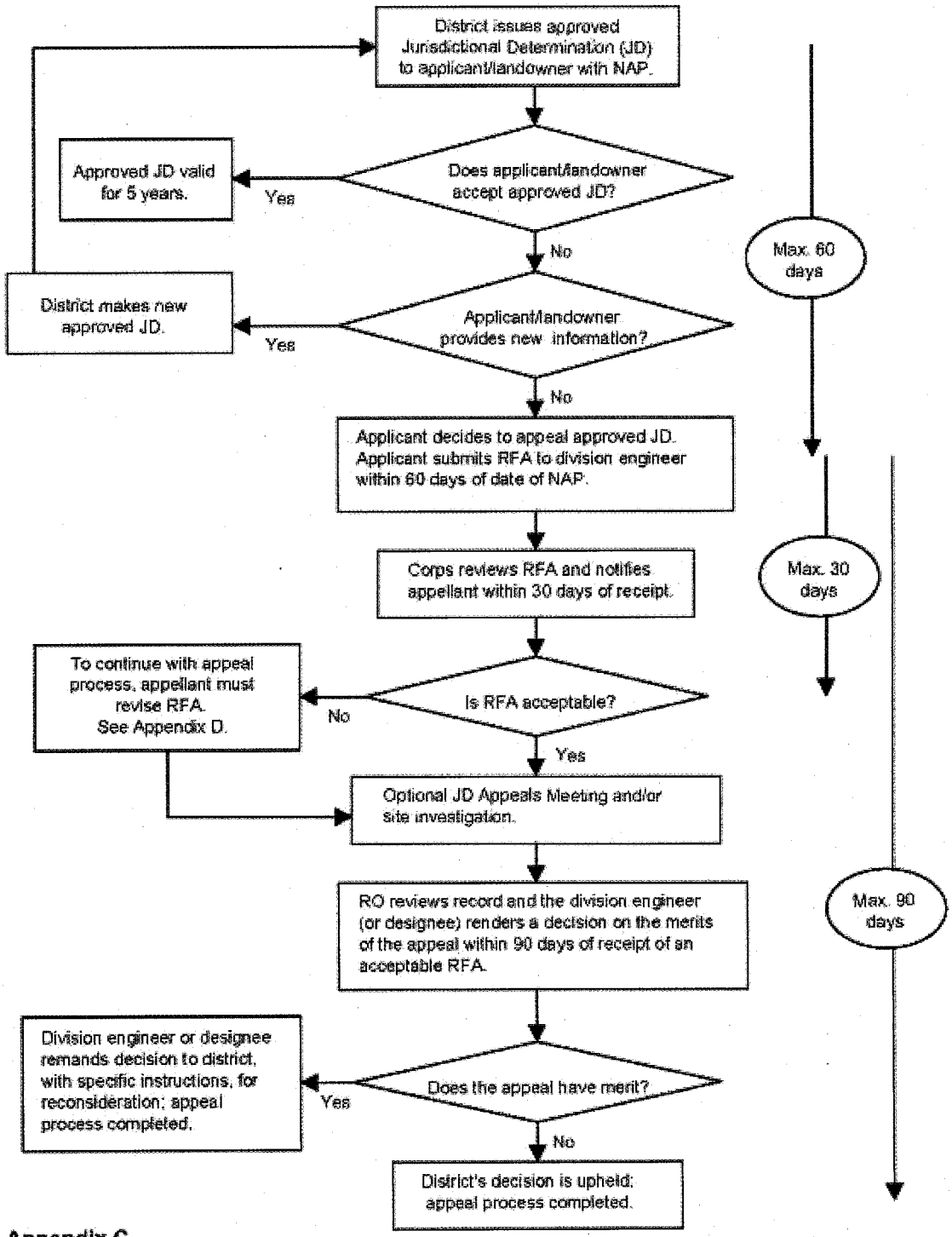
If you only have questions regarding the appeal process you may also contact:

DIVISION ENGINEER
South Pacific Division, Corps of Engineers
Attn: Tom Cavanaugh
Administrative Appeal Review Officer
South Pacific Division, CESPD-PDS-O, 2052B
1455 Market Street, San Francisco, California 94103-1399
Phone: (415) 503-6574 Fax: (415) 503-6646
Email: thomas.j.cavanaugh@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

Administrative Appeal Process for Approved Jurisdictional Determinations



Appendix C

BSE Hidden Hills Solar Project

Inyo County, California

Site Photographic Log – December 2011

Wash ID: 1

Photograph No. 1
Northerly view looking upstream

Wash ID: 1

Photograph No. 2
Southerly view looking downstream

Wash ID: 1

Photograph No. 3
Northeasterly view looking upstream

Wash ID: 1

Photograph No. 4
Southwesterly view looking downstream

Wash ID: 1

Photograph No. 5
Northeasterly view looking upstream

Wash ID: 1

Photograph No. 6
Southwesterly view looking downstream

Wash ID: 2

Photograph No. 7
View looking upstream

Wash ID: 2

Photograph No. 8
View looking downstream

Wash ID: 2

Photograph No. 9
View looking upstream

Wash ID: 2

Photograph No. 10
View looking downstream

Wash ID:2

Photograph No. 11
View looking upstream

Wash ID: 2

Photograph No. 12
View looking downstream

Wash ID: 3

Photograph No. 13
Northeasterly view looking upstream

Wash ID: 3

Photograph No. 14
Southwesterly view looking downstream

Wash ID: 3

Photograph No. 15
Northeasterly view looking upstream

Wash ID: 3

Photograph No. 16
Southwesterly view looking downstream

Wash ID: 3

Photograph No. 17
Northeasterly view looking upstream

Wash ID: 3

Photograph No. 18
Southwesterly view looking downstream

Wash ID: 3

Photograph No. 19
Northeasterly view looking upstream

Wash ID: 3

Photograph No. 20
Southwesterly view looking downstream

Wash ID: 4

Photograph No. 21
View looking upstream

Wash ID: 4

Photograph No. 22
View looking downstream

Wash ID: 4

Photograph No. 23
View looking upstream

Wash ID: 4

Photograph No. 24
View looking downstream

Wash ID: 4

Photograph No. 25
View looking upstream

Wash ID: 4

Photograph No. 26
View looking downstream

Wash ID: 4

Photograph No. 27
View looking upstream

Wash ID: 4

Photograph No. 28
View looking downstream

Wash ID: 5

Photograph No. 48
View looking upstream

Wash ID: 5

Photograph No. 49
View looking downstream

Wash ID: 5

Photograph No. 50
View looking upstream

Wash ID: 5

Photograph No. 51
View looking downstream

Wash ID: 5

Photograph No. 52
View looking upstream

Wash ID: 5

Photograph No. 53
View looking downstream

Wash ID: 5

Photograph No. 54
View looking upstream

Wash ID: 5

Photograph No. 55
View looking downstream

Wash ID: 5

Photograph No. 56
View looking upstream

Wash ID: 5

Photograph No. 57
View looking downstream

Wash ID: 5

Photograph No. 58
View looking upstream

Wash ID: 5

Photograph No. 59
View looking downstream

Wash ID: 5

Photograph No. 60
View looking upstream

Wash ID: 5

Photograph No. 61
View looking downstream

Wash ID: 6

Photograph No. 62
View looking upstream

Wash ID: 6

Photograph No. 63
View looking downstream

Wash ID: 7

Photograph No. 64
View looking upstream

Wash ID: 7

Photograph No. 65
View looking downstream

Wash ID: 7

Photograph No. 66
View looking upstream

Wash ID: 7

Photograph No. 67
View looking downstream

Alkaline Soils Area

Photograph No. 68
Northeasterly view of alkaline sink

Alkaline Soils Area

Photograph No. 69
Southwesterly view of alkaline sink

Alkaline Soils Area

Photograph No. 70
Example of cryptobiotic crust

Alkaline Soils Area

Photograph No. 71
Southeasterly view of alkaline sink

Alkaline Sink

Photograph No. 72
Example of caking and cracking of alkaline surface soils

Plant Species Observed on Property

Scientific Name	Common Name	Site Observations
GYMNOSPERMS		
Ephedraceae	Ephedra Family	
Ephedra nevadensis	Nevada joint fir	Infrequent throughout
MONOCOTS		
Liliaceae	Lily Family	
Allium sp.	Onion, garlic	Infrequent throughout
Poaceae	Grass Family	
Achnatherum hymenoides	Indian rice grass	Occasional in low-lying areas
Distichlis spicata	saltgrass	Infrequent only within moist areas
Pleuraphis rigida	galletta grass	Occasional in low-lying areas
EUDICOTS		
Asteraceae	Sunflower Family	
Ambrosia dumosa	white bur-sage	Frequent throughout
Bebbia juncea	sweetbush	Infrequent in low-lying areas
Gutierrezia microcephala	Sticky snakeweed	Frequent only within moist areas
Hymenloclea salsola	Cheese bush	Infrequent in low-lying areas
Brassacace	Mustard Family	
Stanleya pinnata	Princes' plume	Frequent only within moist areas
Cactaceae	Cactus Family	
Cylindropuntia echinocarpa	silver cholla, golden cholla	Infrequent throughout
Chenopodiaceae	Goosefoot Family	
Atriplex canescens	four-winged saltbush	Frequent throughout
Atriplex confertiflora	shadscale	Occasional throughout
Grayia spinosa	Spiny hop-sage	Occasional in low-lying areas
*Salsola tragus**	Russian thistle	Frequent throughout
Euphorbiaceae	Spurge Family	
Stillingia linearifolia	Linear-leaved stillingia	Infrequent in low-lying areas
Fabaceae	Legume Family	
Astragulous letiginousus	Freckled milkvetch	Frequent only within moist areas
Astragalus allochrous var. playanus	Halfmoon milkvetch	Infrequent only within moist areas
Hoffmannseggia glauca	Hog potato	Frequent only within moist areas
Prosopis glandulosa var. *torreyana*	honey mesquite	Frequent only within moist areas
Geraniaceae	Geranium Family	
*Erodium circutarium**	Red-stemmed filaree	Frequent only within moist areas
Malvaceae	Mallow Family	
Spherelcia ambigua var. robusta	Desert mallow	Frequent only within moist areas
Polygonaceae	Buckwheat Family	
Chorizanthe rigida	spiny-herb	Occasional throughout
Eriogonum inflatum var. inflatum	Desert trumpet	Frequent throughout

Plant Species Observed on Properties
Continued

Scientific Name	Common Name	Site Observations
Solanaceae	Nightshade Family	
Lycium cooperi	Cooper's boxthorn	Infrequent in low-lying areas
Viscaceae	Mistletoe Family	
Phoradendron californicum	mesquite mistletoe	Infrequent on Honey Mesquite
Zygophyllaceae	Caltrop Family	
Larrea tridentata	creosote bush	Frequent throughout

* Denotes non-native species.

Observations of Cryptogamic Crust in the Hidden Hills Solar Electric Generating System Project Area, Pahrump Basin

PREPARED FOR: Susan Strachan, Strachan Consulting
John Carrier, CH2M HILL

PREPARED BY: W. G. Spaulding, Ph.D., CH2M HILL

DATE: March 19, 2012

Background

At the request of the project team, this memorandum has been prepared to summarize my observations of cryptogamic crust (CGC), also known as cryptobiotic crust and *Tortula*, in the Hidden Hills Solar Electric Generating System (HHSEGS) project area in terms of its density and distribution. These observations are based on field experience in the project area and knowledge of areas where CGC is common and of the characteristic attributes of soils that favor CGC development.

Cryptogamic crust is a colonial organism that normally consists of algae, cyanobacteria, and fungi. It is dormant during dry periods and rehydrates and grows during infrequent periods of high soil moisture and humidity. It anchors otherwise friable desert soils that are subject to deflation in the windy desert environment. The microbiotic processes inherent to CGC also fix some nitrogen and carbon, which could enrich soils when the substrate remains stable.

This technical memorandum incorporates by reference CH2M HILL's prior technical memorandum entitled *Geomorphic Surfaces of the Pahrump Basin and the Absence of Alkali Sinks in the HHSEGS Project Area* dated March 14, 2012, which is attached for convenient reference. This discussion focuses on the western portion of the HHSEGS project area where surfaces are primarily composed of silts and clays constituting sediments of the carbonate-rich unit Qbf, or of an ephemeral late Holocene silt blanket which is discussed further below. The eastern portion of the project area, underlain principally by relatively unconsolidated Late Holocene sandy alluvium (Qa), does not generally afford suitable habitat for CGC development (see Figure DR101-1 in the attached technical memorandum) for the relative distribution of units Qbf and Qa).

Summary

The HHSEGS project area is located within the Pahrump Valley bolson, a relative flat basin that formed in the bottoms of valleys that have no outlet. The surface of the western portion of the project area, including the temporary construction area, is composed of fine-grained, clay rich basin fill (Qbf), and can be characterized as a complex pattern of barren areas separated by vegetated, very shallow (a few inches, usually) swales. These swales, in some areas, describe an anastomosing network of heavily vegetated, low-gradient drainages generally trending from east to west (see Photo 1; in the southwest portion of the project site fluvial reworking of the bolson surface has left a broader pattern of whalebacks and broad channels; see attachment). The surfaces of many of these swales are intensely bioturbated[1] (Photo 1), including relatively broad areas that are heavily churned by rodent burrowing

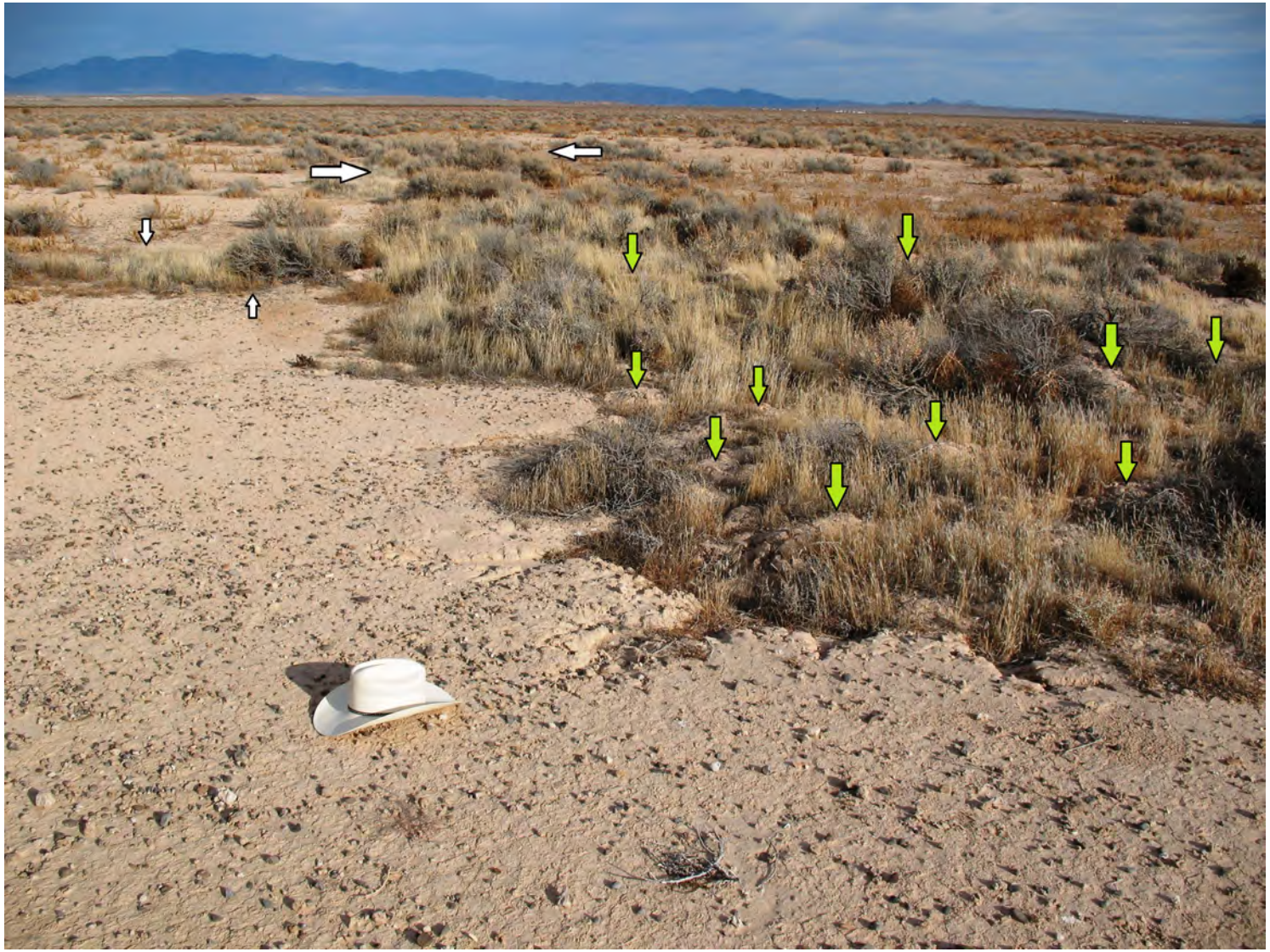
[1] Bioturbation is the process of churning of the soils column by animals or plants.

(Photo 2). The mounds of loose soil created resemble the size and shape of pocket-gopher (*Thomomys bottae*) burrow-mounds.

Because the high level of bioturbation precludes surface stability, a requirement for CGC development, many silt-rich surfaces in the project area do not provide favorable CGC habitat, and it is rare to absent. The inverted topographic surfaces on the other hand are stable, but they appear to be primarily composed of calcareous clays that also do not appear to be favorable substrate for CGC. Across most of the surfaces it is scarce to absent (e.g., Photo 1). It appears that either the physical or the chemical properties of this clay does not promote CGC development, a fact that appears to be evident by comparison of this type of surface with a surface that *does* support a development of CGC (Photo 3). Some areas of vegetated swales are not extensively disturbed by bioturbation. These undisturbed surfaces show that the swales appear to be filled with a gray eolian silt that provides good substrate for CGC (Photo 3). They are, however, limited in distribution (e.g., Photos 2 and 4).

Conclusions

Stable silt substrate, which provides relatively good habitat for CGC development, is not common in the project area. Available surface area is dominated by heavily churned soils, barren clay surfaces, and sandy alluvium in the eastern portions of the project area. While field work conducted to date has not focused on the distribution or density of CGC in the project area, observations made to date suggest that the stable silt substrate that favors its development (e.g., Photo 3) is rare in the project area. Therefore, CGC is not common in the area and is not an important factor in either surface stability or soil characteristics.



View southeast to Mt. Potosi (upper right) across the southern edge of an elevated clay-rich inverted topographic surface (area E-1 of URS Figure 2D). The silt-rich swale appears to describe a low-gradient drainage coming in from the upper left center (horizontal white arrows), and draining to the center-right of the image. A tributary appears to enter from the left (vertical white arrows). The swale is highly bioturbated (*?Thomomys*) and the vertical green arrows indicate only a portion of the relatively fresh burrow-mounds present. Neither the churned surface of the swale nor the barren clay surface provide good habitat for CGC. Hat for scale.

PHOTO 1

Hidden Hills Solar Electric Generating System

View east across surface of a shallow vegetated swale separating URS' areas E1 and L1 (URS Figure 2D).
Not the extensive churning of the soil. Hat for scale.

PHOTO 2

Hidden Hills Solar Electric Generating System

View showing the edge of a topographic high in foreground grading to a slightly lower vegetated swale in the background. The sediments of the inverted topography are mantled with a fine gravel lag of primarily tufa. The silts filing the swale in the background support a moderate to well developed CGC layer, discernable as the dark crust that becomes progressively thicker above the blue pencil in the center of this image. These substrates suitable for CGC are, however, limited in their distribution (see Photo 4).

PHOTO 3

Hidden Hills Solar Electric Generating System

Pan out image of same view in Photo 3, showing the relatively small area occupied by CGC, typical of the project area as a whole.

PHOTO 4

Hidden Hills Solar Electric Generating System

Attachment

Geomorphic Surfaces of the Pahrump Basin and the Absence of Alkali Sinks in the HHSEGS Project Area dated March 14, 2012

Geomorphic Surfaces of the Pahrump Basin and the Absence of Alkali Sinks in the HHSEGS Project Area

PREPARED FOR: Susan Strachan, Strachan Consulting
John Carrier, CH2M HILL

PREPARED BY: W. G. Spaulding, Ph.D., CH2M HILL

DATE: March 14, 2012

Background:

At the request of Susan Strachan and John Carrier I examined the draft report prepared by URS (2012). In particular I reviewed the maps showing Potential Waters of the State (ibid., Figures 2A through 2L) and, as requested, focused on those areas mapped as "Problematic Alkaline Sink Areas" in the figure legend. Since prior mapping of the surface geology and inventory of the habitats in the vicinity had not revealed the presence of "alkaline sinks" in the project area, I was asked whether these indeed constituted alkaline sinks and, if not, what are they since they appear to be rather distinctive, barren areas.

Findings

Prior surficial geological mapping of the HHSEGS Project area was accomplished to address Data Request (DR) – 101 requested of the Applicant by California Energy Commission (CEC) Staff (Figure DR101-1, attached). Comparison of the mapped surficial geology with the distribution of "problematic alkaline sink areas" (URS, 2012; Figures 2B, 2D, 2F, 2J, and 2L) showed that the alkaline sink areas are primarily developed on Quaternary basin fill (Qbf) thought to be Late Pleistocene or older in age. Additionally, two relatively large areas (mapped as K2 and L2 on URS Figure 2L) lie within an area where basin fill sediments support a mantle of younger fluvial gravels (Qf/Qbf; Figure DR101-1). This is chiefly in the southwestern portion of the project where landforms suggest sculpting by fluvial processes, perhaps during the terminal Pleistocene or early Holocene (>10,000 yr B.P.). To the north, where most problematic alkaline sinks have been mapped on Qbf, the surface of the basin appears unaffected by large scale fluvial events.

The sediments of Qbf range from calcareous clays and silts to limited sand strata, mantled by a discontinuous lag of older alluvial gravels. Tufa, calcium carbonate precipitated out of solution in high-bicarbonate groundwaters either upon emergence or in the phreatic zone, is common to abundant throughout on Qbf surfaces as a lag of nodules, or occasional shelves of tabular, lithified tufa that can extend for hundreds of feet. Paleontological and geoarchaeological assessments of this area led to the conclusion that this tufa is of Pleistocene age, and dates to at least the Late Wisconsin glacial age (>14,000 yr B.P.) when groundwater levels in the Pahrump Valley were higher, and artesian discharge much more extensive (Quade et al., 1995). The hosting sediments would, of course, be even older.

The exposures identified as problematic alkaline sink areas by URS (2012) had been noted before during remote imagery analysis of the area in support of both paleontological and geoarchaeological studies requested by CEC Staff. They were, however, not studied directly

because, at the conclusion of field surveys and geotechnical explorations, they were found to have no particular paleontological or archaeological sensitivity. On March 12, 2012, seven of these areas were visited: B2, E1, F2, I2, H1, H2, and L2 (see URS Figures 2D and 2L). All were found to possess the following characteristics:

- Although not totally barren, they are largely devoid of vegetation.
- The shrub species that do linger on these surfaces are the same that occur in the surrounding vegetation and, of these, shadscale (*Atriplex confertifolia*, a common, xerophytic species of saltbush) is by far the most common.
- The substrate of these areas is composed largely of massively bedded clay.
- The substrate of the surrounding vegetated areas appears to be dominated by silts.
- These areas are topographically higher, by several inches to several feet, than the surrounding vegetated areas.
- Being elevated above the surrounding topography, albeit by only inches in many cases, there are no drainages connected to these surfaces.

There was also some variability in the characteristics of each problematic alkaline sink area inspected. At L2, for example, tufa ledges are exposed over extensive areas or lie at shallow depth (Photo 1). Most of these surface lie only a few inches above the surrounding terrain but, at I2 (URS Figure 2F), the southeastern portion of the barren area is at least 2 feet above the surrounding terrain, and appears sculpted into a small yardang, which provides enough elevational relief for a modest rill to develop (Photos 2a, 2b). At surface I2, as well as at E-1 (URS Figure 2D), small rills can be found eroded on their margins that lead to immediately adjacent vegetated swales.

Interpretation

URS (2012) was correct to label these barren areas as *problematic* alkaline sink areas (emphasis added) because they are actually not sinks at all, but topographic highs. The relief is subtle in this area, but drainage is to the west-northwest toward Pahrump Dry Lake, about 3 miles distant. These areas are erosional remnants that stand a few inches to several feet above the surrounding landscape and, therefore, cannot function as sinks.

The genesis of these barren areas is explicable in terms of processes relatively common in arid bolsons. The Quaternary basin fill underlying this part of the project is heterogenous, and there are some areas that are dominated chiefly by clay-rich sediments. These are barren because clay is an effectively very arid substrate for plant species. Arguably the most xerophytic shrub in the area, shadscale, is the only perennial species common on these surfaces. Because clay prevents the growth of most plants, these areas are barren.

The clay comprising these barren areas is not the result of any recent ponding, or other recent hydrological phenomena, but it is sedimentary and present as a result of prior geological process. These may have varied, but all date to at least the last glacial age, and are likely considerably older than that. The extensive tufa ledges at L2 (URS Figure 2L) suggest paleospring discharge, and the clay sediments adjacent to the subtle tufa mounds in L2 suggest the former presence of pools that were typical near spring orifices (e.g., Quade at al.,

1995). In other areas, clay-rich sediment appears to have filled paleochannels, which nevertheless display their original orientation albeit in an inverted topographic relationship, now higher than the surrounding terrain (Photo 3). The inferred antiquity of these sediments is reinforced by the reconstructed direction of flow of the paleochannels constituting URS' areas E1, H1, I1, K1, L1, O1 (URS Figure 2D) (see red lines in Figure 1). They essentially point east-northeast and therefore *uphill* toward the Stateline Fault System (Scheirer et al., 2010). Tectonism has since obliterated whatever basin lay in that direction, and the valley's ultimate sink is now Pahrump Dry Lake with local drainage presently in the opposite direction, generally to the west. Speculatively, this would imply an older, Middle Pleistocene to Pliocene age (0.5 to 5 million yr) for these basin fill sediments (Qbf). Topography aside, the age of these clays therefore, is far older than any clays that could be attributed to recent or historical hydrological functions.

Conclusion and Recommendation

The "problematic alkali sinks" on the HHSEGS project site are not sinks in that they are elevated erosional remnants, chiefly comprised of clay. Much like a playa, the clay sediment prevents all but the most xerophytic of shrubs from growing upon it, and only a few of those are normally present. They are topographic highs, albeit often elevated by only a few inches above the surrounding terrain, and therefore, do not function hydrologically as sinks.

Should the hydrologic function of these "problematic alkali sinks" remain in question, a subset could be mapped with a total station to demonstrate their topographic relationship to the surrounding terrain, although careful inspection in the field alone can reveal these relationships (e.g., Photo 3).

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Quade, Jay, M. D. Mifflin, W. L. Pratt, W. McCoy, and L. Burckle (1995). Fossil spring deposits in the southern Great Basin and their implications for changes in water-table levels near Yucca Mountain, Nevada, during Quaternary time. *Geological Society of America Bulletin* 107:213-230.

Scheirer, D. S., D. S. Sweetkind, and J. J. Miller. 2010. Multiple Phases of Basin Formation along the Stateline Fault System in the Pahrump and Mesquite Valleys, Nevada and California. *Geosphere* 6(2): 93-129.

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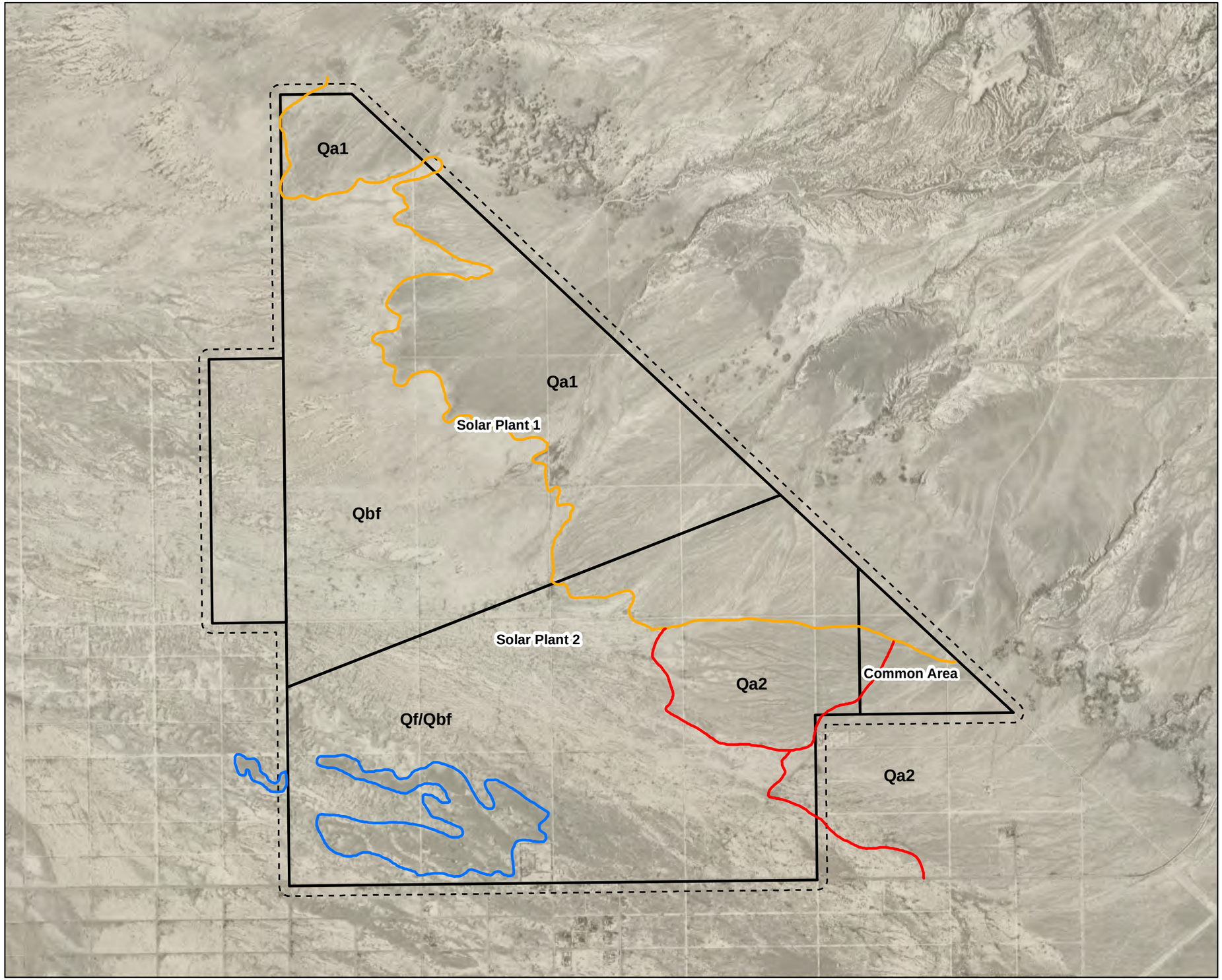

VICINITY MAP

LEGEND

- 200 ft Buffer
- HHSEGS Boundary
- Qa1
- Qa2
- Desert Pavement

Qa1 - Holocene alluvium from the northeast
Qa2 - Holocene alluvium from the east
Qf - Quaternary (Late Pleistocene and Holocene?) fluvial deposits
Qbf - Quaternary (Late Pleistocene or older) basin fill

N

0 900 1,800
Feet

Figure DR101-1
Land Surface Units
Hidden Hills Solar Electric Generating System

Enhanced satellite image of the area including “problematic alkali sink areas” E-1, H-1, I-1, L-1, K-1, N-1, O-1 (the high albedo areas; north is up).
The red lines sketch the approximate direction of flow of the paleochannels represented by these clay-rich erosional remnants.

FIGURE 1
Hidden Hills Solar Electric Generating System

A weathered lithoid tufa ledge exposed within area L2.
This ledge extends over at least 25 feet where it is partially exhumed by the grading of this road.

PHOTO 1
Hidden Hills Solar Electric Generating System

A rill cut into area I2 and draining from left to right (continued on Photo 2b).
Clipboard for scale is 13 inches high.

PHOTO 2a

Hidden Hills Solar Electric Generating System

The rill cut originating on area I2 shown in Photo 2a, above, as it debouches into a more densely vegetated area, and local base level. This relationship demonstrates that “problematic alkali sink area” I2 is not a sink.

PHOTO 2b

Hidden Hills Solar Electric Generating System

The edge of “problematic alkali sink area” E-1. Note the small rills eroding the edge of the elevated clay surface, and the topographically lower, well-vegetated surface into which they drain in the upper right.

PHOTO 3

Hidden Hills Solar Electric Generating System