Final Environmental Impact Statement
Thacker Pass Lithium Mine Project

Appendix G

Resource Summaries (Affected Environment)

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF TABLES

APPENDIX G. RESOURCE SUMMARIES

G.1 INTRODUCTION

This appendix provides affected environment information for various resources analyzed in the Final EIS. Affected environment information includes the information called out by the EIS resource specialists in sections G.1.1 through G.1.17, and the Resource Summaries provided in Section G.2 of this appendix.

G.1.1 Geology and Minerals

See Geology resource summary in Section G.2 of this appendix.

G.1.2 Water Quality and Quantity

See Water resource summary in Section G.2 of this appendix. Baseline hydrology reports are presented in **Appendix P**.

Table G.1. Water Rights

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
1	030A	0	0	0	01/00/00	Decreed	SPR	45N	34E	16	3.23	Irrigation	BUELL, JAMES R., V.M.D.
2	030A	0	0	0	01/00/00	Decreed	SPR	45N	34E	21	2.9	Irrigation	BUELL, JAMES R., V.M.D.
3	030A	0	0	0	01/00/00	Decreed	SPR	45N	34E	33	1.75	Irrigation	BUELL, JAMES R., V.M.D.
4	030A	0	0	0	01/00/00	Decreed	SPR	44N	34E	14	1.14	Irrigation	BUELL, JAMES R., V.M.D.
5	030A	0	0	0	04/17/26	Reserved	SPR	45N	34E	15	0.022	Other	BLM
6	030A	0	0	0		Vested	SPR	45N	34E	23	0.015	Stockwater	BELL, JOHN AND JHONA
7	030A	0	0	0		Vested	SPR	45N	34E	24	0.02	Stockwater	BELL, JOHN AND JHONA
8	030A	0	0	0		Vested	SPR	45N	34E	26	0.02	Stockwater	BELL, JOHN AND JHONA
9	030A	15622	0	5749	05/03/54	Certificate	UG	44N	34E	18	3.5	Irrigation	FRANK, ROSE M
10	030A	15690	0	6022	06/08/54	Certificate	UG	44N	34E	17	3.384	Irrigation (DLE)	KHAN, MOHAMMAD HUSSAIN
11	030A	15691	0	5663	06/08/54	Certificate	UG	44N	34E	17	3.5	Irrigation (DLE)	KHAN, MOHAMMAD HUSSAIN
12	030A	15735	0	6016	07/12/54	Certificate	UG	44N	34E	8	3.158	Irrigation	TOBIASSON FAMILY 1990 TRUST
13	030A	16375	0	7687	04/13/55	Certificate	UG	44N	34E	7	3.5	Irrigation (DLE)	M & W FAMILY TRUST
14	030A	16376	0	7537	04/13/55	Certificate	UG	44N	34E	7	3.5	Irrigation (DLE)	M & W FAMILY TRUST
15	030A	16409	0	7155	04/19/55	Certificate	UG	45N	34E	31	3.5	Irrigation (DLE)	COCKEYE LAND AND LIVESTOCK CO., INC.
16	030A	16864	0	7740	02/20/56	Certificate	UG	44N	34E	20	3.5	Irrigation (DLE)	TOBIASSON FAMILY 1990 TRUST
17	030A	17060	0	7160	10/01/56	Certificate	UG	44N	34E	9	2.761	Irrigation (DLE)	BUELL, JAMES R. V.M.D.
18	030A	17303	0	7686	06/13/57	Certificate	UG	44N	34E	6	3.5	Irrigation	ALLEN, CLYDE H. AND RODLYNN
19	030A	17331	0	7480	07/12/57	Certificate	UG	44N	34E	27	3.5	Irrigation	BUELL, JAMES R.,VMD
20	030A	17674	0	6025	09/29/58	Certificate	UG	44N	34E	6	3.5	Irrigation	MESTRE, RON & VELDA

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
21	030A	20085	0	8072	09/14/61	Certificate	UG	44N	34E	16	5.4	Irrigation (DLE)	BUELL, JAMES R.
22	030A	20445	0	6170	05/09/62	Certificate	UG	45N	34E	29	0.062	Stockwater	BUELL, JAMES R., V.M.D.
23	030A	20446	0	6083	05/09/62	Certificate	UG	44N	34E	35	0.016	Stockwater	BUELL, JAMES R., V.M.D.
24	030A	20452	0	6952	05/09/62	Certificate	SPR	44N	34E	2	0.011	Stockwater	BUELL, JAMES R. V.M.D.
25	030A	21310	0	8032	06/13/57	Certificate	UG	44N	34E	6	3.5	Irrigation	ALLEN, CLYDE H. AND RODLYNN
26	030A	21342	16373	7133	04/13/55	Certificate	UG	44N	34E	7	2.5	Irrigation	M & W FAMILY TRUST
27	030A	22063	16408	8039	04/19/55	Certificate	UG	45N	35E	31	2.5	Irrigation	COCKEYE LAND AND LIVESTOCK CO. INC.
28	030A	22529	0	6673	04/07/65	Certificate	UG	44N	34E	17	0.016	Stockwater	THE RANDOLPH L. SMITH FAMILY TRUST
29	030A	23615	15734	6459	01/17/67	Certificate	UG	44N	34E	8	3.5	Irrigation	LAWSON, LEONARD E. & KRISTA R.
30	030A	24703	17953	8197	04/27/59	Certificate	UG	44N	34E	5	4.73	Irrigation (DLE)	LOPEZ, JUAN AND MARTHA
31	030A	28341	0	8744	05/22/74	Certificate	UG	44N	34E	17	4	Irrigation	KHAN, MOHAMMAD HUSSAIN
32	030A	29727	24704	8745	04/21/59	Certificate	UG	44N	34E	5	3.24	Irrigation	RANDOLPH L. SMITH, AS TRUSTEE OF THE RANDOLPH L. SMITH FAMILY TRUST, DATED JAN. 1, 2006
33	030A	31030	15689	10424	06/08/54	Certificate	UG	44N	34E	16	3.5	Irrigation	TOBIASSON FAMILY 1990 TRUST
34	030A	34406	15735	11209	07/12/54	Certificate	UG	44N	34E	8	1.579	Irrigation	TOBIASSON FAMILY 1990 TRUST
35	030A	34919	0	11229	01/26/78	Certificate	UG	44N	34E	16	3.5	Irrigation	TOBIASSON FAMILY 1990 TRUST
36	030A	40582	28341	0	05/22/74	Permit	UG	44N	34E	17	1	Irrigation	KHAN, MOHAMMED HUSSAIN

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
37	030A	40583	15690	0	06/08/54	Permit	UG	44N	34E	17	1.705	Irrigation	KHAN, MOHAMMED HUSSAIN
38	030A	40584	28341	13957	01/06/93	Certificate	UG	44N	34E	17	1	Irrigation	THE RANDOLPH L. SMITH FAMILY TRUST
39	030A	40585	28341	13958	01/06/93	Certificate	UG	44N	34E	17	1	Irrigation	THE RANDOLPH L. SMITH FAMILY TRUST
40	030A	40586	15691	0	06/08/54	Permit	UG	44N	34E	17	1.75	Irrigation	KHAN, MOHAMMED
41	030A	45038	34919	11240	01/26/78	Certificate	UG	44N	34E	16	1.9	Irrigation	TOBIASSON FAMILY 1990 TRUST
42	030A	45764	0	0	06/09/82	Permit	UG	44N	34E	5	3.87	Irrigation	RANDOLPH L. SMITH, AS TRUSTEE OF THE RANDOLPH L. SMITH FAMILY TRUST, DATED JAN. 1, 2006
43	030A	50180	47222	12677	10/26/77	Certificate	UG	44N	34E	20	1.6875	Irrigation	TOBIASSON FAMILY 1990 TRUST
44	030A	66851	21342	17195	04/13/55	Certificate	UG	44N	34E	7	2.16	Irrigation	M & W FAMILY TRUST
45	030A	66852	21341	17196	04/13/55	Certificate	UG	44N	34E	7	2.5	Irrigation	M & W FAMILY TRUST
46	030A	70209	0	17939	07/09/03	Certificate	UG	44N	33E	1	1.114	Quasi-Municipal	HUMBOLDT COUNTY
47	030A	73918	23615	18512	01/17/67	Certificate	UG	44N	34E	8	0.2834	Irrigation	LAWSON, LEONARD E. & KRISTA R.
48	030A	78909	65640	18352	10/29/99	Certificate	UG	44N	34E	27	0.0155	Stockwater	JAMES R BUELL VDM
49	030A	80148	34407	0	10/26/77	Permit	UG	44N	34E	21	1.6875	Irrigation	TOBIASSON FAMILY 1990 TRUST
50	030A	80392	20442	19210	05/09/62	Certificate	UG	44N	34E	9	0.0309	Stockwater	BUELL, JAMES R VMD
51	030B	20451	0	6941	05/09/62	Certificate	SPR	43N	35E	5	0.006	Stockwater	BUELL, JAMES R. V.M.D.
52	033A	0	0	0	01/00/00	Decreed	STR	43N	37E	6	20.29	Irrigation	BRUMLEY REVOCABLE TRUST
53	033A	0	0	0		Vested	SPR	45N	34E	24	0.015	Stockwater	BELL, JOHN AND JHONA
54	033A	0	0	0		Vested	SPR	45N	34E	25	0.015	Stockwater	EARP, KEN H.

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
55	033A	0	0	0		Vested	SPR	45N	35E	34	0.015	Stockwater	BELL, JOHN AND JHONA
56	033A	0	0	0		Vested	SPR	44N	35E	20	0.015	Stockwater	FLORENCE M. YOUNGBERG TRUST
57	033A	0	0	0	12/31/04	Vested	SPR	44N	35E	26	0.015	Stockwater	BELL, JOHN AND JHONA
58	033A	0	0	0		Vested	SPR	44N	35E	29	0.015	Stockwater	FLORENCE M. YOUNGBERG TRUST
59	033A	0	0	0		Vested	SPR	44N	35E	36	0.015	Stockwater	BELL, JOHN AND JHONA
60	033A	0	0	0		Vested	SPR	44N	35E	36	0.015	Stockwater	BELL, JOHN AND JHONA
61	033A	0	0	0		Vested	SPR	44N	35E	26	0.015	Stockwater	BELL, JOHN AND JHONA
62	033A	0	0	0		Vested	SPR	44N	35E	28	0.015	Stockwater	BELL, JOHN AND JHONA
63	033A	0	0	0		Vested	SPR	43N	35E	1	0.015	Stockwater	BELL, JOHN AND JHONA
64	033A	0	0	0		Vested	SPR	44N	35E	35	0.015	Stockwater	BELL, JOHN AND JHONA
65	033A	0	0	0		Vested	SPR	44N	35E	34	0.015	Stockwater	BELL, JOHN AND JHONA
66	033A	2383	0	448	03/23/12	Certificate	STR	43N	35E	12	0.25	Irrigation	LENIZ, IGNACIO
67	033A	3567	0	1113	09/04/15	Certificate	STR	44N	36E	5	0.379	Irrigation	U.S. - BUREAU OF LANDMANGEMENT
68	033A	14775	0	5296	01/19/53	Certificate	UG	44N	37E	28	3	Irrigation	VAN DER HOEK, HANS AND KAREN
69	033A	17301	0	5750	06/12/57	Certificate	UG	44N	37E	21	3	Irrigation (DLE)	AMATO, CLINT AND REBECCA
70	033A	17589	14784	7079	01/20/53	Certificate	UG	44N	37E	28	3	Irrigation	EARP, DOYLE W. AND JEWELL R.; EARP, KENNETH H. AND DORIS N. EACH COUPLE HAS 1/2 INT
71	033A	17653	0	5686	09/05/58	Certificate	UG	44N	37E	4	2.5	Irrigation	WEITZ NEVADA LLC
72	033A	17939	0	5482	04/16/59	Certificate	UG	44N	37E	20	1.67	Irrigation (DLE)	WINNEMUCCA FARMS INC
73	033A	18506	0	5933	12/30/59	Certificate	UG	44N	37E	20	5.4	Irrigation	AMATO, ROBERT J. AND RHONDA M.
74	033A	21059	15606	7053	04/19/54	Certificate	UG	44N	37E	5	4	Irrigation	HOME RANCH, LLC

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
75	033A	21060	0	8129	02/14/63	Certificate	UG	44N	37E	5	0.416	Irrigation	HOME RANCH, LLC
76	033A	21351	0	6654	06/10/63	Certificate	UG	44N	37E	20	1.67	Irrigation	WINNEMUCCA FARMS INC
77	033A	21522	0	7455	09/12/63	Certificate	UG	44N	37E	33	2.7	Irrigation	AMATO, ROBERT J. AND RHONDA M.
78	033A	22007	0	7325	05/19/64	Certificate	UG	44N	37E	21	1	Irrigation	AMATO, CLINT AND REBECCA
81	033A	22849	0	7326	11/09/65	Certificate	UG	44N	37E	21	1	Irrigation	AMATO, CLINT AND REBECCA
82	033A	22945	17651	7456	09/03/58	Certificate	UG	44N	37E	33	1.33	Irrigation	AMATO, ROBERT J. AND RHONDA M.
83	033A	23310	0	7385	08/11/66	Certificate	STR	43N	37E	6	11.383	Irrigation	BRUMLEY REVOCABLE TRUST
84	033A	24617	20773	8528	10/12/62	Certificate	UG	44N	37E	6	1.4	Irrigation	HOME RANCH, LLC
85	033A	25465	14811	7701	01/30/53	Certificate	UG	44N	37E	33	2	Irrigation	HILL, DEBRA J.
86	033A	27161	26249	8964	08/09/71	Certificate	UG	44N	37E	29	4.728	Irrigation	VAN DER HOEK
87	033A	27696	0	9641	08/15/73	Certificate	UG	44N	37E	21	2.4	Irrigation	AMATO, CLINT AND REBECCA
88	033A	27698	25735	8322	07/29/70	Certificate	UG	45N	36E	36	0.011	Stockwater	BLM
89	033A	55081	0	14783	07/17/90	Certificate	UG	44N	37E	9	0.015	Stockwater	MADER, KIRK D. & MADONNA L (UDI 50%) AND FRANK AND LAVONNE MADER LIVING TRUST DATED 9/15/2008 (UDI 50%)
90	033A	78004	0	18091	02/11/09	Certificate	UG	45N	36E	36	0.0155	Stockwater	HOME RANCH LLC
91	033A	78005	0	18092	02/11/09	Certificate	UG	45N	36E	36	0.0155	Stockwater	BARTELL RANCH LLC
92	033A	78007	0	18094	02/11/09	Certificate	UG	43N	36E	4	0.0155	Stockwater	BARTELL RANCH LLC
93	033A	78630	0	18635	06/05/09	Certificate	UG	43N	37E	5	0.0155	Stockwater	HOME RANCH LLC
94	033A	78631	0	18636	06/05/09	Certificate	UG	44N	37E	30	0.0155	Stockwater	HOME RANCH LLC
95	033A	78632	0	18637	06/05/09	Certificate	UG	43N	36E	2	0.0155	Stockwater	HOME RANCH LLC
96	033A	78633	0	18638	06/05/09	Certificate	UG	43N	36E	14	0.0155	Stockwater	HOME RANCH LLC

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
97	033A	78634	0	18639	06/05/09	Certificate	UG	44N	36E	26	0.0155	Stockwater	HOME RANCH LLC
98	033A	78635	0	18640	06/05/09	Certificate	UG	44N	36E	34	0.0155	Stockwater	HOME RANCH LLC
99	033A	79742	0	19054	03/29/10	Certificate	SPR	44N	35E	1	0.0031	Stockwater	LYMAN N YOUNGBERG REVOCABLE TRUST
100	033A	79904	14775	0	01/19/53	Permit	UG	44N	37E	29	0.231	Irrigation	HANS AND KAREN L VAN DER HOEK
101	033A	79905	14776	0	01/19/53	Permit	UG	44N	37E	29	0.179	Irrigation	HANS AND KAREN L VAN DER HOEK
102	033A	79906	17589	0	01/20/53	Permit	UG	44N	37E	29	0.261	Irrigation	HANS AND KAREN L VAN DER HOEK
103	033A	79907	27161	0	08/09/71	Permit	UG	44N	37E	29	0.187	Irrigation	HANS AND KAREN L VAN DER HOEK
104	033A	82868	18506	0	12/30/59	Permit	UG	44N	37E	20	0.384	Irrigation	AMATO, CASEY AND GINA
105	033A	82869	18506	0	12/30/59	Permit	UG	44N	37E	20	0.566	Irrigation	WINNEMUCCA FARMS, INC.
106	033A	82871	21351	0	06/10/63	Permit	UG	44N	37E	20	0.3855	Irrigation	WINNEMUCCA FARMS INC.
107	033A	82873	17939	0	04/16/59	Permit	UG	44N	37E	20	0.3855	Irrigation	WINNEMUCCA FARMS INC.
108	033A	82875	79977	0	04/24/68	Permit	UG	44N	37E	20	0.4379	Irrigation	WINNEMUCCA FARMS INC.
109	033A	83754	0	0	04/21/14	Permit	UG	43N	36E	1	0.0077	Stockwater	BRUMLEY REVOCABLE TRUST
110	033A	83755	0	0	04/21/14	Permit	UG	43N	36E	12	0.0077	Stockwater	BRUMLEY REVOCABLE TRUST
111	033A	84176	20423	0	04/24/62	Permit	UG	43N	37E	6	4.583	Irrigation	BRUMLEY REVOCABLE TRUST
112	033A	84177	18954	0	06/21/60	Permit	UG	43N	37E	7	1.1342	Irrigation	BRUMLEY REVOCABLE TRUST
113	033A	84179	16756	0	10/05/55	Permit	UG	43N	37E	6	2.0056	Irrigation	BRUMLEY REVOCABLE TRUST
114	033A	84180	16756	0	10/05/55	Permit	UG	43N	37E	7	2.8964	Irrigation	BRUMLEY REVOCABLE TRUST
115	033A	84182	0	0	07/25/14	Permit	UG	43N	37E	6	0.0155	Stockwater	HOME RANCH LLC

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
116	033A	86913	0	0	02/01/17	Permit	SPR	45N	34E	12	0.1	Stockwater	BARTELL RANCH, LLC
117	033A	87006	79743	0	03/29/10	Permit	STR	44N	35E	1	1	Irrigation	LYMAN N. YOUNGBERG REVOCABLE TRUST
118	033A	87799	17301	0	06/12/57	RFA	UG	44N	37E	21	1.5	Irrigation	AMATO, CLINT AND REBECCA
119	033A	87800	22849	0	11/09/65	RFA	UG	44N	37E	21	0.5	Irrigation	AMATO, CLINT AND REBECCA
120	033A	87801	27696	0	08/15/73	RFA	UG	44N	37E	21	2.4	Irrigation	AMATO, CLINT AND REBECCA
121	033A	88501	21060	0	02/14/63	RFA	UG	44N	37E	5	0.416	Irrigation	HOME RANCH, LLC
122	033A	88502	24617	0	10/12/62	RFA	UG	44N	37E	6	1.4	Irrigation	HOME RANCH, LLC
123	033A	88503	21059	0	04/19/54	RFA	UG	44N	37E	5	4	Irrigation	HOME RANCH, LLC
124	033A	V11844	0		1/1/1873	Vested	SPR	45N	34E	12	0.084	Stockwater	BARTELL RANCH LLC
125	033A	V11792	0		1/1/1873	Vested	STR	45N	35E	8	0.084	Stockwater	BARTELL RANCH, LLC
126	033A	V11793	0		1/1/1873	Vested	STR	45N	35E	8	0.084	Stockwater	BARTELL RANCH, LLC
127	033A	V11791	0		1/1/1873	Vested	SPR	45N	35E	17	0.084	Stockwater	BARTELL RANCH, LLC
128	033A	V11789	0		1/1/1873	Vested	STR	45N	35E	34	0.084	Stockwater	BARTELL RANCH, LLC
129	033A	V11797	0		1/1/1873	Vested	SPR	45N	35E	24	0.084	Stockwater	BARTELL RANCH, LLC
130	033A	V11790	0		1/1/1873	Vested	SPR	45N	36E	18	0.084	Stockwater	BARTELL RANCH, LLC
131	033A	V11798	0		1/1/1873	Vested	SPR	45N	36E	18	0.084	Stockwater	BARTELL RANCH, LLC
132	033A	V11796	0		1/1/1873	Vested	SPR	45N	36E	16	0.084	Stockwater	BARTELL RANCH, LLC
133	033A	V11785	0		1/1/1873	Vested	SPR	45N	36E	21	0.084	Stockwater	BARTELL RANCH, LLC
134	033A	V11786	0		1/1/1873	Vested	SPR	45N	36E	29	0.084	Stockwater	BARTELL RANCH, LLC
135	033A	V11787	0		1/1/1873	Vested	SPR	45N	36E	29	0.084	Stockwater	BARTELL RANCH, LLC
136	033A	V11799	0		1/1/1873	Vested	SPR	45N	36E	29	1	Irrigation	BARTELL RANCH, LLC
137	033A	V11867	0		1/1/1873	Vested	SPR	44N	36E	17	0.084	Stockwater	BARTELL RANCH, LLC
138	033A	V11800	0			Vested	UG	44N	36E	14	0.038	Stockwater	BARTELL RANCH, LLC
139	033A	V00707	0			Vested	STR	44N	36E		0	Irrigation	BARTELL RANCH, LLC

Map ID	Basin	Application	Change App.	Certificate	Priority Date	Status	Source[1]	Township	Range	Section	Diversion Rate (CFS)	Type of Use	Owner of Record
140	033A	V11866	0		1/1/1873	Vested	SPR	44N	36E	28	1	Irrigation	BARTELL RANCH, LLC
141	033A	V11868	0		1/1/1873	Vested	SPR	44N	36E	28	0.084	Stockwater	BARTELL RANCH, LLC
142	033A	V11801	0			Vested	UG	43N	36E	4	0.038	Stockwater	BARTELL RANCH, LLC
143	033A	V11802	0			Vested	UG	43N	36E	4	0.038	Stockwater	BARTELL RANCH, LLC
144	033A	78006	0	18093		Certificate	UG	43N	36E	4	0.0155	Stockwater	BARTELL RANCH, LLC

Sources: Piteau 2019a; NDWR 2020

RFA = Ready for action; UG = Underground (i.e. groundwater); SPR = Spring; STR = Stream

G.1.3 Vegetation and Wetlands

G.1.3.1 Vegetation

Vegetation within the Project area is found in the Major Land Resource Area (MLRA) Great Basin Section of the Basins and Range Providence of the Intermontane Plateaus in the Western Range and Irrigated Region, (Humboldt Area MLRA 24 LRR D) (USDA 2006). Elevations in the Project area range from approximately 4,650 to 5,740 feet amsl. The average maximum temperature in Kings River Valley, located approximately five miles west of the Project area, is 91.6°F in July and the average minimum temperature is 16.3°F in January. The average annual precipitation is 8.47 inches and tends to peak in December and January in the form of snow (WRCC 2011).

Ecological site descriptions (ESD) were utilized to characterize the vegetation communities present within the Project area. Ecological sites are the basic component of a land-type classification system that describes ecological potential and ecosystem dynamics of land areas. An ecological site is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances (NRCS 2019).

Disturbance response groups (DRGs) are used to scale up ecological sites by grouping them according to their responses to natural or human-induced disturbances such as fire, drought, and grazing. DRGs consider precipitation zones, soil types, slope, elevation, and drainage to group sites. (Stringham et al. 2017)

The project area is dominated by sagebrush, intermixed with salt desert scrub and invasive grasslands and forb lands. Drainages, wetlands, and riparian creeks are found within the Project area. **Table G.2** below lists the vegetation communities and their associated acreages within the Project area.

Dominant upland vegetation species found within the Project area include: Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Ericameria nauseosa*), greasewood (*Sarcobatus vermiculatus*), shadscale saltbrush (*Atriplex confertifolia*), cheatgrass (*Bromus tectorum*), squirreltail (*Elymus elymoides*), Great Basin wild rye (*Leymus cinereus*), Sandberg bluegrass (*Poa secunda*), foxtail barley (*Hordeum jubatum*), clasping pepperweed (*Lepidium perfoliatum*), tall tumble mustard (*Sisymbrium altissimum*), and Russian thistle (*Salsola tragus*). Dominant wetland and riparian species include: cattail (*Typha latifolia*), watercress (*Nasturtium officinale*), duckweed (*Lemna* sp.), sedges (*Carex nebrascensis* and *C. praegracilis*), Arctic rush (*Juncus arcticus*), bluegrasses (*Poa pratensis* and *P. palustris*), willow (*Salix exigua* and *S. laevigata*), and Russian olive (*Elaeagnus angustifolium*).

The project areas has been burned by wildland fires since 1985. A large portion of the Project area was burned in 2000 covering an area of 3,400 acres within the south exploration area. In 2004 an area burned in the northeast corner of the Project area and in 2012, a small patch burned in the far eastern section of the Project area. Fires and grazing have resulted in the establishment of invasive annual-dominated vegetation (cheatgrass) in a large portion of the Project area.

Table G.2. Vegetation Communities Present within PoO, and North and South Exploration Areas

ESD/DRG	PoO Boundary	North Exploration	South Exploration	Total
025XY001NV: Moist Floodplain	5			5
025XY003NV: Loamy Bottom 8-14"	267	136	11	414
23 9: ARTRW8/ACTH7	714	---	88	802
24 1: ARTRW/ACTH7	8,971	1,356	5,852	16,180
24 2: ATCO-ARSP5/ELEL5-ACHY	332	---	---	332
24 7: ARTR2/HECO26-ACHY	29	---	---	29
24 9: ARTRT/LECI4	147	96	---	243
No Data	3	---	---	3
Total	**10,468**	**1,589**	**5,876**	**17,933**

Information and descriptions regarding the characteristics of the ESDs and DRGs are available in the Resource Summaries provided in Section G.2 of this appendix.

G.1.3.2 Wetlands and Riparian Areas

Thacker Creek, Pole Creek, and Crowley Creek are located within the Project area. These creek channels are flanked by the Kings River and Quinn River Valleys. Thacker Creek is a perennial channel and Pole Creek and Crowley Creek are ephemeral channels. Hydrologic connections of Thacker Creek to Kings River and Crowley Creek to Quinn River do not occur and both rivers are considered isolated in nature.

Thacker Creek and Crowley Creek are the principal streams that drain within the survey area. Both streams have been verified as isolated channels that do not reach the Kings River or Quinn River. Thacker Creek ends approximately 1.0 mile from the Kings River. Crowley Creek ends approximately 1.0 to 2.7 miles from the Quinn River depending on its flow path in a given year. Rangeland and irrigated/cultivated agricultural fields occur between the channel termini and the rivers. Isolation is also on a regional watershed-level scale. The Quinn River watershed is a closed basin watershed ending in the Black Rock Desert.

Two Approved Jurisdictional Determinations (AJD) from the U.S. Army Corps of Engineers (USACE) dated February 8, 2019, state the project area has no navigable waters of the U.S. and no waters of the U.S. Therefore, all wetland areas, including isolated wetland, impoundments,

and channels, within the project area are non-jurisdictional and not under the authority of section 10 of the Rivers and Harbors Act or section 404 of the Clean Water Act (USACE 2019).

Table G.3 presents details of the wetland and riparian areas located within the proposed Project area. See **Figure 4.3-1** in **Appendix A** for a map of the project aquatic resources.

Table G.3. Thacker Pass Project Aquatic Resources (Wetland and Riparian Areas)

Number of Stream Reaches or Wetland Polygons	Type	Cowardin Code[1]	Acres
9	Ephemeral Stream	R6	8.443
4	Intermittent Stream	R4SB	0.825
1	Perennial Stream	R3UB	0.144
1	Emergent Marsh Wetland	PEM1F	9.120
13	Seep/Spring Freshwater Forested/Shrub Wetland	PSS1C	8.103
7	Riverine Wetland	R4SB7	5.550
1	Freshwater Pond/Reservoir	PUBHh	3.777
8	Wet Meadow Seasonally Flooded	PEM1C	1.261
3	Temporary Wetland	RU6	0.270
47	**Total**		**37.493**

[1] See Redhorse 2018 resource summary report for descriptions of Cowardin Codes.

Information and descriptions regarding the characteristics of the wetlands and drainages within the Project area are available in the Resource Summaries provided in Section G.2 of this appendix.

G.1.4 Wildlife and Special Status Species

The Project area contains habitat for a variety of wildlife species typical of the Great Basin region, and is predominantly comprised of Inter-Mountain Big Basin Sagebrush shrubland, intermixed with salt desert scrub and invasive annual grasslands (see Section 4.4, *Vegetation and Wetlands*). Common wildlife species existing in the Project area include those typical of sagebrush habitats in northern Nevada, such as cottontail rabbits (*Sylvilagus* spp.), jackrabbits (*Lepus* spp.), coyote (*Canis latrans*), ungulates (such as mule deer, *Odocoileus hemionus*), and a variety of snakes, lizards, and birds.

The landscape within the Project area has historically been affected by wildfire; most recently over 2,600 acres were burned in a large fire in 2012. These fires have resulted in the propagation of an invasive annual-dominated vegetation community dominated by cheatgrass (*Bromus tectorum)*. LNC has completed several vegetation mapping and habitat characterization studies within the Project area. For additional information, refer to the results of these surveys summarized in the *Thacker Pass Project Vegetation Baseline Summary* (LNC 2019e) provided in this appendix.

Cliff and canyon habitat exists adjacent to the Project area. Aquatic habitat in the Project area is limited and includes intermittent and ephemeral streams, seeps and springs, stock ponds and wetlands. Wetlands in and adjacent to the project area consist of emergent marsh, seep/spring riparian wetlands, riverine wetlands, ponds/reservoirs, and temporary or seasonally flooded wetlands (Redhorse 2018). **Figure 4.5-1** shows the distribution of terrestrial wildlife habitats mapped in and around the Project area (**Appendix A**).

Ephemeral and intermittent features in the Project area, including seeps and springs, would not support fish; but may include invertebrates, such as chironomids or other dipteran species. Springsnails common to the region were collected from some of the seeps, springs and wetlands in and around the Project area (WRC 2018a; 2019a). Streams and wetlands in the vicinity of the Project area, including Thacker Creek and associated wetlands, are not known to contain fish species. For more information refer to results from baseline biological studies conducted in and around the Project area since 2008 in the *Thacker Pass Wildlife Impact Assessment* (Cedar Creek 2019e).

Migratory Birds

There are no federally endangered migratory bird species with potential to occur within the Project Area. USFWS designated Birds of Conservation Concern (BCC) species that have potential to occur within the Project area are Golden Eagle, Sage Thrasher (*Oreoscoptes montanus*), and Long-Billed Curlew (*Numenius americanus*) (USFWS 2018). Many raptors are identified by the BLM as sensitive species, or NDOW Species of Concern and are targeted for conservation as outlined by the Nevada Wildlife Action Plan (2012). See **Table H.1 (Appendix H**) for a complete list of special status migratory bird species with potential to occur in the Project area.

Four BLM special status migratory (non-raptor) species have been observed within the Project area during surveys: Brewer's Sparrow (*Spizella breweri*), Lewis's Woodpecker (*Melanerpes lewis*), Sage Thrasher, and Long-billed Curlew, and there is suitable breeding habitat available for these species in the Project area.

A variety of resident and migratory bird species (e.g., raptors and songbirds) have been identified as potentially occurring within the Project area. Active and inactive nests of Ferruginous Hawks (*Buteo regalis*), Red-tailed Hawks (*Buteo jamaicensis*), and other large and small raptors were observed in the habitats surrounding the Project, and on rock outcrops and canyon walls within one mile of the Project boundary. Sixty-one migratory bird species have been observed in the Project area during baseline surveys or reported by NDOW (Cedar Creek 2019a). A complete list of migratory birds potentially occurring in the Project area is provided in **Table H.2 (Appendix H).**

Big Game

Big game species are managed by NDOW, with specific range designations and migration corridors mapped across the entire state. The Project area occurs entirely within NDOW's Game Management Unit (GMU) 3 and Hunt Unit 31. Pronghorn antelope (*Antilocapra americana*),

mule deer (*Odocoileus hemionus*), and California bighorn sheep (*Ovis canadensis californiana*) distributions are mapped across portions of the Project area. There are no big game water developments in the Project area.

Mule deer in northern Nevada typically occupy sagebrush habitats that have an understory of native grasses and forbs, which provides both food for browsing and cover for fawns. Big sagebrush is a key grazing food for mule deer, which is present throughout the Project Area. NDOW's mule deer population estimate for Hunt Unit 31 increased slightly from 2018 (1,800 individuals) to 2019 (2,000 individuals). Fawn and buck ratios were reported as stable, with only minor fluctuations due to higher winter mortality. Population levels at this time are expected to remain relatively constant with existing habitat conditions (NDOW 2019a).

Mule deer use of the study area is primarily concentrated along the eastern portion of the Project area and along the foothills of the Double H and Montana Mountains. NDOW has mapped mule deer year-round habitat across the eastern portion and a small portion of the northwestern corner of the Project area. There is a small region of crucial winter habitat mapped northwest of the Project area, within four miles of the Project area (**Figure 4.5-5)**. There are no established mule deer movement corridors in or near the Project area.

Pronghorn are typically found in big sagebrush communities within northern desert shrubland habitats. Low sagebrush communities consisting of a mixture of sagebrush, shadscale, forbs and grasses are preferred. In northern Nevada, salt desert shrub communities are often used as a winter range (NDOW 2019a). The pronghorn antelope population in Hunt Unit 31 has remained stable, though the rest of the hunt units within GMU 3 have experienced a slight decline in populations compared to previous years (NDOW 2019a).

The Project area encompasses a variety of suitable habitats and seasonal ranges for pronghorn antelope. Low sagebrush (approximately 76 acres) and Inter-mountain Basins mixed salt desert shrub (approximately 989 acres) communities are present in small amounts in the Project area. NDOW has mapped portions within the Project area as winter range (**Figure 4.5-6**). There is also limited use habitat mapped in the Project area, which may be used by pronghorn throughout the year depending on forage availability and conditions. Winter range, summer range, limited use range, and year-round range are all found within a four-mile buffer.

Two pronghorn movement corridors lie within the Project area (**Figure 4.18-3**). Both corridors facilitate access between limited use and winter range habitat to the south of the Project area and winter range, summer range, and year- round habitat range to the north of the Project area.

Bighorn Sheep (*Ovis canadensis*) are a big game species known to occur in the Project area. They are also listed as a BLM Special Status Species and Species of Conservation Priority in the SWAP. Refer to the special status species section below (SSS- Bighorn Sheep) for additional details. Mountain lions (*Puma concolor*) are fairly common in northern Nevada and may occur in the Project area. In 2018, NDOW reported a genetically distinct population of transient mountain lions with a range that overlaps Hunt Unit 31 (NDOW 2019a).

Small Game

Small game species in the Project area include cottontail rabbit (*Sylvilagus* spp.), coyote (*Canis latrans*), golden-mantled ground squirrel (*Callospermophilus lateralis*), pygmy rabbit (*Brachylagus idahoensis*) (NDOW 2018), blacktailed jackrabbit (*Lepus californicus*) and mountain cottontail (*Sylvilagus nuttallii*) (SWCA 2019a). No furbearers have been reported in the Project area, however furbearer species that may occur within the area of analysis include fox (*Vulpes vulpes*) and bobcat (*Lynx rufus*). There are 16 small game water developments in the vicinity of the Project area (Cedar Creek 2019e).

Upland game birds observed in the Project area include American Crow (*Corvus brachyrhynchos*), California Quail (*Callipepla californica*), Chukar (*Alectoris chukar*), GRSG (*Centrocercus urophasianus*), and Mourning Dove (*Zenaida macroura*). Limited areas of wetland habitat for waterfowl populations occur in the Project area. For more information on small game species refer to the *Thacker Pass Project Wildlife Baseline Summary* (LNC 2019f) provided in this appendix.

Reptiles and Amphibians

Several species of reptiles and amphibians were observed in the Project area during baseline wildlife surveys. Reptiles that were reported by NDOW, or observed during baseline surveys include Great Basin rattlesnake (*Crotalus oreganus lutosus*), western terrestrial gartersnake (*Thamnophis elegans*), western rattlesnake (*Crotalus oreganus*), Great Basin gopher snake (*Pituophis catenifer deserticola*), sagebrush lizard *(Sceloporus graciosus*), desert horned lizard (*Phrynosoma platyrhinos*), and Pacific tree frog (*Pseudacris regilla*) (SWCA 2019a). These species occupy a wide variety of habitats and are most active during the summer and early fall months.

Special Status Species

Special status species are those that state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA, and those designated as sensitive and special status by the BLM (IM-NV-2018-003). In addition, there is a Nevada protected animal list (Nevada Administrative Code 501.100-503.104) that the BLM has incorporated, in part, into its sensitive species list. Please refer to **Table H.1 (Appendix H)** for the full list of protected species reported by USFWS, BLM, or NDOW as potentially occurring in the Project area, and refer to the *Thacker Pass Wildlife Baseline Summary* (LNC 2019f) in this appendix for additional information on the following special status species: Lahontan cutthroat trout (*Oncorhynchus clarkia henshawi;* LCT), bats, pygmy rabbits (*Brachylagus idahoensis*), Golden Eagles (*Aquila chrysaetos*), Burrowing Owls (*Athene Cunicularia*), and GRSG (*Centrocercus urophasianus*).

SSS – Migratory Birds and Raptors

Sixty-one migratory bird species have been observed in the Project area during baseline surveys or have been reported by NDOW. Most avian species observed are associated with sagebrush and grassland habitats. There are four BLM special status migratory (non-raptor) species that

have been observed within the Project area: Brewer's Sparrow (*Spizella breweri*), Lewis's Woodpecker (*Melanerpes lewis*), Sage Thrasher (*Oreoscoptes montanus*), and Long-billed Curlew (*Numenius americanus*). Sage Thrashers, and Long-billed Curlews are also designated by USFWS as BCC species (USFWS 2008).

The Project area contains suitable habitat for a variety of raptor species, many of which are associated with sagebrush and grassland habitats. Raptor species that potentially occur as residents or migrants within the Project area include eagles (golden), hawks (e.g., Red-tailed Hawk, Ferruginous Hawk, Swainson's Hawk, Sharp-shinned Hawk), falcons (e.g., Prairie Falcon, Merlin), owls (e.g., Long-eared Owl, Flammulated Owl, Western Screech Owl), Northern Harrier, and Turkey Vulture. Aerial raptor surveys were conducted within the Project area and a 10-mile buffer in 2018 (**Figure 4.18-4**). Twenty-three (23) active nests and 104 inactive nests were identified in the survey area. Nine (9) active nests were occupied by Golden Eagles (*Aquila chrysaetos*), 10 by Red-tailed Hawks (*Buteo jamaicensis*), 2 by Ferruginous Hawks (*Buteo regalis*) and 2 by Common Ravens (*Corvus corvax*) (Cedar Creek 2020a). Please refer to **Table H.2 (Appendix H)** for a full list of migratory bird and raptor species observed in and around the Project area since 2011, or as reported by NDOW.

SSS – Golden Eagles

Aerial and ground-based raptor nest surveys were completed by Wildlife Resource Consultants (WRC) within the Project area and up to a 10-mile buffer in 2018 and 2019 to record raptor and Golden Eagle nests and territories (WRC 2018b; 2019b). Although no Golden Eagle nests or nesting substrate occurs within the Project area, 76 nests within the survey area were classified as likely belonging to Golden Eagles, including six occupied nests (**Table G.4**). Nineteen Golden Eagle territories were identified within the survey area. Ten territories were classified as occupied based on the presence of an occupied nest, adults observed during early season ground surveys, or adults observed during aerial surveys, and nine territories were unclassified (**Figure 4.18-6**). Four of the Golden Eagle territories contain nests within two miles of the Project area. The closest occupied Golden Eagle nest surveyed in 2019 is approximately 1.5 miles from the southwest corner of the south Exploration PoO, and 3.1 miles from the mine PoO. The nest faces west, towards Kings River Valley, and is out of line-of-sight from the Project area (WRC 2019b).

Additional surveys for Golden Eagles were conducted by WRC from January through May 2020, within an approximately 2-mile buffer of the Project boundary. Based upon guidance from USFWS, surveys were focused on nests and territories at risk from Project activities, determined to be those within two miles of the Project boundary. A total 35 nests were identified in the survey area. Seventeen nests were identified as Golden Eagle nests. No new nests were identified during the 2020 surveys. Three nests were classified as occupied by Golden Eagles (Nest ID 16, 51, 87-A). Four Golden Eagle territories were classified as occupied (territories 5, 9, 16, and 17). Territories 9, 16, and 17 were confirmed to have occupied nests during 2020 breeding season.

Table G.4. Golden Eagle Nests Observed in Survey Area

Survey Parameter	2018 Raptor Survey	2019 Raptor Survey	2020 Raptor Survey
Total Golden Eagle Nests Observed	59[1]	76[1]	17[2]
Total Occupied (In-use) Nests	9	6	3
Total Nests within 1 mile of the PoO boundary	3	4	4
Occupied Nests within 1 mile of the Mine or Exploration PoO Boundary	1	0	1
Total Golden Eagle Territories within Survey Area	18	19	4
Occupied Territories	9	10	4

[1] This total reflects all nests observed in the survey area, which encompasses a 10-mile radius from the mine and exploration plan boundaries, with a south extension that is 20-miles from the Project area.

[2] This total reflects all nests observed within a 2-mile survey buffer from the mine and exploration plan boundaries.

SSS – Burrowing Owls

Ground-based Burrowing Owl surveys were completed in 2018 in the Project area (SWCA 2019a). Thirty-four (34) Burrowing Owls or their nests were detected at eight locations throughout the Project area and were found in all upland habitats, most frequently in unburned areas (**Figure 4.18-7, Appendix A**) (Cedar Creek 2020a). As presented in **Table G.5**, Burrowing Owl observations consisted primarily of individual adults, although one juvenile was observed. Several of the adults were observed in the same area.

Table G.5. Results of All Burrowing Owl Surveys within the Project Area

Survey Session	Juveniles	Adults	Detections
April 22-25	0	19	13
May 10-13	0	6	5
June 1-6	1	8	8
Total	**1**	**33**	**26**

Source: SWCA 2019a (Thacker Pass Project Wildlife Baseline Surveys Report)

SSS – Springsnails

Fifty-six sites were surveyed for springsnails between 2018 and 2019 within the Project area and a 20-mile radius. Potentially suitable habitat for springsnails was identified in 29 springs in Project area (WRC 2018a; 2019a). Two NDOW Species of Conservation Priority, Kings River pyrg (*Pyrgulopsis imperialis*) and turban pebblesnail (*Fluminicola turbiniformis*), were collected during surveys. Five spring locations fall within the maximum 10-feet drawdown isopleths (Piteau 2019), however only one spring (SP-033) has had any measurable discharge (0.95 gpm) and three locations are man-made stock ponds (SP-003, SP-015, SP-058).

SSS – Amphibians

Three BLM special status amphibian species have the potential to occur in the Project area (Columbia spotted frog (*Rana luteiventris*), northern leopard frog (*Lithonates pipiens*), and western toad (*Anazyrus boreas*). Columbia spotted frog is also listed as a federal candidate species under the ESA. Pacific tree frog (*Pseudacris regilla*) was incidentally observed in one spring (SP-048).

SSS – Reptiles

The desert horned lizard is a BLM special status species, and was observed in the Project area during field surveys (SWCA 2019a). Other reptiles listed by BLM or NDOW as special status species have the potential to occur in the Project area (**Table H.1, Appendix H**).

SSS – GRSG

The Project area lies within the GRSG Lone Willow Population Management Unit (PMU). Portions of the Project area are identified as Priority Habitat Management Area (PHMA), General Habitat Management Area (GHMA), and non-habitat for GRSG (**Figure 4.18-8, Appendix A**). PHMA is defined as BLM-administered lands identified as having the highest value to maintaining sustainable GRSG populations.

There are six known active lek sites within 3.1 miles of the Project area (Cedar Creek 2019c). There are no active leks within one mile of the Project area; however, sage-grouse activity has been documented within the Project area by NDOW, who reported 63 tracking locations generated by at least 30 radio-marked birds (Cedar Creek 2019d). During baseline surveys, one sage-grouse was observed in the Project area (SWCA 2019b).

GRSG habitat field sampling efforts conducted for the Project included surveying 113 transects in 15 sample units across approximately 49,165 acres. Sage-grouse habitat suitability varied throughout the analysis area and sagebrush ecosystems have been highly modified by wildfire and the subsequent infestation of invasive annual grasses, primarily cheatgrass. The northern portion of the analysis area has not been impacted by wildfire or other disturbances, and sagebrush assemblages are intact and non-fragmented. This area provides year-round suitable GRSG habitat, which is evidenced by the extant sagebrush, adjacent mesic habitats (i.e., wet meadows), and sign of GRSG use (SWCA 2019b).

Habitat located in the Project and Operations area has been considerably modified by recent and historical wildfires and contiguous infestations of invasive annual grasses, primarily cheatgrass. The landscape is generally devoid of large, extensive and healthy sagebrush assemblages, with patchy occurrences of sagebrush.

SSS – Bats

Bat species detected in and near the Project area during acoustic monitoring events included canyon bat (*Parastrellus hesperus*), Mexican free-tailed bat (*Tadarida brasiliensis*), Townsend's big eared bat (*Corynorhinus townsendii*), hoary bat (*Lasiurus cinereus*), western small-footed myotis (*Myotis ciliolabrum*), and long-eared myotis (*Myotis evotis*) (SWCA 2019a). There are no

roosts known to occur in the Project area, but bats were recorded near common foraging sites, which include wetlands, seeps, springs, creeks, and other wetted areas.

SSS – Bighorn Sheep

Bighorn sheep are listed as a BLM sensitive species, and a Species of Conservation Priority under the State Wildlife Action Plan. They are also a protected game animal in Nevada. Bighorn sheep occur in mesic to xeric, alpine to desert grasslands or shrub-steppe in mountains, foothills, or river canyons. California bighorn sheep (*O. canadensis californiana)* distributions occur in portions of the Project area and in a 4-mile buffer of the Project area. Bighorn sheep are typically found in the higher elevation terrain and slopes located in the mountains adjacent to the Project area and are not expected to utilize extensive habitat within the Project area. The northwestern corner of the mine plan and exploration plan boundary overlaps approximately 1,820 acres of NDOW-mapped California bighorn sheep range which supports the movement of the Double H Mountain bighorn sheep herd to mapped year-round bighorn sheep range located to the north and south of the Project area (see **Figure 4.5-4, Appendix A**). A radio collaring study of bighorn sheep conducted in the Project area by NDOW in 2010, showed that bighorn sheep use of the area supports NDOWs bighorn sheep distribution mapping (NDOW 2010). Bighorn sheep were not detected using habitat within the Project boundary (NDOW 2010).

The bighorn sheep herd in the Double H Mountains appears to be a healthy population of approximately 100 individuals (NDOW 2016). NDOW's California bighorn sheep population estimate for Hunt Unit 31 in 2019 was 130 individuals, compared to 140 individuals in 2018 (NDOW 2019a). Only five sheep were reported to have been successfully hunted in 2018 (NDOW 2019a). NDOW discovered indications of disease in the Montana Mountains California bighorn sheep population, located northwest of the Project area, in 2015 during routine capture and radio marking. To prevent the spread of an outbreak of pneumonia within the bighorn sheep herd, NDOW depopulated the Montana Mountain herd; therefore, there are likely no bighorn sheep presently in the Montana Mountains.

SSS – Plants

Special status plant species of concern to the USFWS, Nevada Natural Heritage Program (NNHP), and BLM (BLM 2017; NNHP 2001; USFWS 2018) have either been recorded in the vicinity or have suitable habitat within the Project area. These species are presented in **Appendix H**. SWCA Environmental Consultants performed a floristic survey within the Project area between May 15 and June 15, 2018, when special status plants are visible and identifiable (SWCA 2018a). One sensitive species, Crosby's buckwheat, was found within southwest corner of the south Exploration Plan area (see **Figure 4.18-11, Appendix A**). The population numbered roughly 50 to 100 plants distributed over approximately 5.3 acres. The population was located on north-facing volcanic slopes and outcrops (approximately 15 percent to 20 percent slope). Three other similar species of *Eriogonum* occur within or near the range of Crosby's buckwheat in Nevada and Southern Oregon: Prostrate buckwheat (*E. prociduum*), Cusick's buckwheat (*E. cusickii*), and whitewoolly buckwheat (*E. ochrocephalum* var. *calcareum*). Two other

species, windloving buckwheat (*Eriogonum anemophilum*) and lonesome milkvetch (*Astragalus solitaries*) were determined to have potential habitat within the Project area (SWCA 2018).

G.1.5 Soils

Affected Environment

Past mineral exploration in the CESA included the construction and use of exploration roads and drill sites associated with the Kings Valley Lithium Exploration PoO, the Far East NOI, a small test pit mined under existing authorizations, and the Quinn River Valley Test Well NOI. While mining activities were approved for the Kings Valley Clay Mine, which is in the Project area, only exploration activities were conducted (**Appendix B**). If the proposed PoO is approved, it will incorporate all existing disturbance (**Appendix B**). Other than infrastructure associated with mineral exploration activities, soils in the Project area are undisturbed.

Soils in the CESA are listed in **Table G.6**.

Table G.6. Soils in the CESA

Map Unit Symbol	Map Unit Name	Percent of Study Area
161	Bliss-Chiara association	1.3
217	Flue loam, 0-2% slopes	1.5
331	McConnel gravelly fine sandy loam, 2-8% slopes	0.0
335	McConnel very gravelly fine sandy loam, 0-2% slopes	8.9
338	McConnel-Pumper-Whirlo complex, 2-8% slopes	1.9
340	Boger-Soughe association	3.0
360	Needle Peak silt loam	0.4
452	Kingsriver loam, 0-2 percent slopes	0.0
453	Kingsriver loam, drained, 0-2% slopes	0.9
501	Enko loamy very find sand, 0-2% slopes	0.2
596	Trunk-Burrita association	4.8
727	Dewar-Midraw association	2.4
734	Kelk silt loam, occasionally flooded, 0-2% slopes	0.9
790	Rio King loam	0.1
946	Soughe-Rubble land complex, 30-75% slopes	0.1
962	Zevadez-Vanwyper association	6.4
1312	Dewar-Dacker association	61.3
1436	1436 Rodock loam, 0-2% slopes	1.3
1470	Zymans-Burrita-Devada association	4.5

G.1.6 Non-native and Invasive Plants

Affected Environment

The affected environment includes areas within the proposed Project area that could affect the establishment or spread of invasive plant species and noxious weeds. Noxious weeds in Nevada are regulated by the Nevada Department of Agriculture (NDA). Species presented in **Table G.7** and addressed in this section are taken from the State of Nevada Noxious Weeds (NDA 2012).

Table G.7. Nevada State Noxious Weed List by Category (NAC 555.010)

Common Name	Scientific Name
Category A Weeds	
African rue	*Peganum harmala*
Austrian fieldcress	*Rorippa austriaca*
Austrian peaweed	*Sphaerophysa salsula*
Black henbane	*Hyoscyamus niger*
Camelthorn	*Alhagi maurorum*
Common crupina	*Crupina vulgaris*
Dalmatian toadflax	*Linaria dalmatica*
Dyer's woad	*Isatis tinctoria*
Eurasian water-milfoil	*Myriophyllum spicatum*
Giant reed	*Arundo donax*
Giant salvinia	*Salvinia molesta*
Goats rue	*Galega officinalis*
Green fountain grass	*Pennisetum setaceum*
Houndstongue	*Cynoglossum officinale*
Hydrilla	*Hydrilla verticillata*
Iberian starthistle	*Centaurea iberica*
Klamath weed	*Hypericum perforatum*
Malta starthistle	*Centaurea melitensis*
Mayweed chamomile	*Anthemis cotula*
Mediterranean sage	*Salvia aethiopis*
Purple loosestrife	*Lythrum salicaria, L. virgatum & cultivars*
Purple starthistle	*Centaurea calcitrapa*
Rush skeletonweed	*Chondrilla juncea*
Sow thistle	*Sonchus arvensis*
Spotted knapweed	*Centaurea maculosa*
Squarrose knapweed	*Centaurea virgata*
Sulfur cinquefoil	*Potentilla recta*
Syrian bean caper	*Zygophyllum fabago*

Common Name	Scientific Name
Yellow starthistle	*Centaurea solstitialis*
Yellow toadflax	*Linaria vulgaris*
Category B Weeds	
Carolina horse nettle	*Solanum carolinense*
Diffuse knapweed	*Centaurea diffusa*
Leafy spurge	*Euphorbia esula*
Medusahead	*Taeniatherum caput-medusae*
Musk thistle	*Carduus nutans*
Russian knapweed	*Acroptilon repens*
Sahara mustard	*Brassica tournefortii*
Scotch thistle	*Onopordum acanthium*
White horse nettle	*Solanum elaeagnifolium*
Category C Weeds	
Canada thistle	*Cirsium arvense*
Hoary cress	*Cardaria draba*
Johnson grass	*Sorghum halepense*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Puncture vine	*Tribulus terrestris*
Salt cedar (tamarisk)	*Tamarix* spp.
Water hemlock	*Cicuta maculata*

Invasive plant species and noxious weed presence and potential for occurrence within the Project area were determined using the following methods:

- Review of Nevada State Noxious Weed list (NAC-555 2018; NDA 2012)
- Review of BLM WD Resource Management Plan (BLM WD RMP 2015)
- Field surveys (JBR 2011; SRK 2017; SWCA 2018a)

No designated noxious weeds species, as per NAC, were observed within the Project area during vegetation baseline survey, botanical survey, or the weed inventory. **Table G.8** below lists invasive, non-native species observed during the baseline weed inventories within and adjacent to the Project area. Also recorded in the table is the Risk Rating where actions are required to manage the species. The Risk Ratings are broken down as follows:

- None (0) – Proceed as planned.
- Low (1-10) – Proceed as planned. Initiate treatment on invasive weed populations that get established in the area.

- Moderate (11-49) – Develop preventative management measures for the location to reduce the risk of introduction or spread of invasive weeds into the area. The subject area will be monitored, and control provided for newly established populations of invasive weeds. Appropriate follow-up treatment for previously treated infestations will be identified.
- High (50-100) – Activities must be modified to reduce risk level through preventative management measures. Activities must provide for control of newly established populations of invasive weeds and provide for monitoring and follow-up weed treatment for previously treated infestations.

Table G.8. Invasive Weeds Recorded During Baseline Botanical Surveys and Risk Ratings

Common Name	Scientific Name	May 2017 Survey	June 2018 Survey	Risk Rating
Bull thistle	*Cirsium vulgare*		X	---
Hairy whitetop	*Cardaria pubescens*	X	X	25
Cheatgrass	*Bromus tectorum*	X	X	50
Western tansymustard	*Descurainia pinnata*	X	X	25
Russian thistle	*Salsola tragus*	X	X	25
Common dandelion	*Taraxacum officinale*		X	25
Desert madwort	*Alyssum desertorum*	X	X	25
Crossflower	*Chorispora tenella*	X	X	25
Prickly lettuce	*Lactuca serriola*	X	X	25
Bur buttercup/ Curveseed butterwort	*Ceratocephala testiculata*	X	X	25
Rough cocklebur	*Xanthium strumarium*		X	25
Clasping pepperweed	*Lepidium perfoliatum*	X		---
Tall tumble mustard	*Sisymbrium altissimum*	X		25

Sources: SRK 2017; SWCA 2018a

The risk rating of 50 for Cheatgrass indicates a need for an invasive weed control plan that includes treatment and monitoring over an extended period of time. The risk rating of 25 for the remaining invasive weed species indicates the need for development of preventative management measures to reduce the risk of introduction or spread into the area.

G.1.7 Rangeland Management

Affected Environment

The study area is the portion of the Crowley Creek, Pole Creek, and Kings River allotments within the Project boundary, which are administered by the BLM HRFO in Humboldt County, Nevada. The grazing allotments are managed in accordance with the Taylor Grazing Act of 1934, the FLPMA of 1976, the Public Rangelands Improvement Act of 1978, and the BLM Handbook H-4180-1. The BLM is mandated by the Public Rangeland Improvement Act of

1978 to "manage, maintain and improve the condition of the rangelands so that they become as productive and feasible for all rangeland values in accordance with management objectives and the land use planning process (43 U.S.C. §1901)."

Table G.9 summarizes existing grazing allotment acres and total forage availability within the grazing allotments in the study area (BLM 2019a). A total of 18,808 acres of designated grazing allotments are overlapped by the study area. The combined grazing allotments produce an estimated 1,659 Animal Unit Months (AUMs) within the study area which are grazed by cattle, wild horses, and wildlife. An AUM is defined as the amount of forage needed by an "animal unit" or a mature cow-calf pair for one month.

Table G.9. Grazing Allotment Acreages and Active AUMs

Grazing Allotment	Total Acres[1]	Number of Pastures[1]	Acres within Study Area[2]	Average Acres per AUM[3]	Active AUMs within Allotment[1]/ Study Area[4]
Crowley Creek	50,463	9	2,419	15	3,303 / 161
Kings Creek	79,195	13	3,342	7	12,192 / 477
Pole Creek	34,501	10	12,247	12	2,988 / 1,021
Total	**164,159**	**-**	**18,008**	**-**	**18,483 / 1,659**

[1] BLM 2019a
[2] Cedar Creek 2019c
[3] Derived by dividing total acres by active AUMs within the allotment.
[4] Derived by dividing acres within the study area by active AUMs within the study area.

Rangeland Improvements

Rangeland improvements within the proposed Project area include water developments (water pumps, pipelines, troughs, and guzzlers), corrals, fencing, and cattle guards. Existing rangeland improvement data is currently being compiled by the BLM and will be included in the analysis as it becomes available.

G.1.8 Air Quality and GHG Emissions

G.1.8.1 Affected Environment

A summary of air quality information related to the Proposed Action is presented in Section G.2 of this appendix, and additional information is provided in the following sections. The affected environment for existing air quality conditions can be characterized by estimated levels of emissions in the region, measured ambient pollutant concentrations, and visibility and acidic deposition levels in the region. Local meteorology provides further context for existing conditions.

G.1.8.2 Meteorology and Climate

The Project area is located in the north central region of the Basin and Range physiographic province in an area known as Thacker Pass, in terrain roughly 5,000 feet above sea level with

lower-lying agricultural valleys to the east and west. The Double H Mountains are located directly to the south and the Montana Mountains are located directly to the north. The Project area straddles the topographic divide separating the Kings River Valley hydrographic area and the Quinn River Valley hydrographic area.

Climatic conditions are arid, high desert with mild-cool winters and hot-dry summers. Average winter temperature is near freezing (32.5°F), with daily temperatures ranging from highs of about 50°F to lows of about 10°F. Summer temperatures range from highs of about 95°F to lows of about 50°F. Air moisture is generally arid, with relative humidity ranging from about 25 percent during summer to about 65 percent during winter (LNC 2019d).

Emissions – Criteria Pollutants

The EPA designates areas as "attainment" if measured concentrations of several common pollutants (known as criteria pollutants) are within the National Ambient Air Quality Standards (NAAQS). The project region is designated "unclassifiable" because insufficient monitoring data are available to support classification, but unclassifiable areas are treated as attainment for regulatory purposes.

The EPA maintains a national inventory of estimated emissions of criteria pollutants from many types of sources across the U.S. by state and county. This emissions inventory provides perspective on the contributions of emissions to existing air quality and their scale relative to the project. **Table G.10** summarizes the criteria pollutant emissions inventory for Nevada for 2014, which is the most recent year for which complete data are available.

Table G.10. Existing Criteria Pollutant Emissions

Pollutant	2014 Criteria Pollutant Emissions (tons per year)		
	Humboldt County	***State of Nevada***	***Humboldt County Percent of State***
Carbon Monoxide	33,112	727,001	4.6%
Nitrogen Oxides	7,866	94,481	8.3%
PM_{10}	16,169	178,618	9.1%
$PM_{2.5}$	2,544	39,628	6.4%
Sulfur Dioxide	7,456	16,178	46.1%
Volatile Organic Compounds	76,852	585,132	13.1%

Source: EPA 2019a

PM_{10} = particulate matter with an average aerodynamic diameter of 10 micrometers or less
$PM_{2.5}$ = particulate matter with an average aerodynamic diameter of 2.5 micrometers or less

G.1.8.3 Emissions – Hazardous Air Pollutants

Hazardous Air Pollutants (HAPs) are pollutants regulated by EPA because they are known to cause cancer or other serious health effects. The EPA maintains a national inventory of estimated emissions of criteria pollutants from many types of sources across the U.S. by state and county.

As with criteria pollutants, this emissions inventory provides perspective on the contributions of emissions to existing air quality and their scale relative to the project. **Table G.11** summarizes the HAP emissions inventory for Nevada for 2014, which is the most recent year for which complete data are available. In **Table G.11**, HAPs are listed in descending order of statewide emissions. In addition to the HAPs with highest emissions, lead and mercury emissions are shown. The HAPs that are listed individually comprise about 99 percent of the total HAP emissions in Nevada.

Table G.11. Existing HAP Emissions

Pollutant	2014 HAP Emissions			
	Humboldt County (tons per year)	***State of Nevada (tons per year)***	***HAP Percent of State***	***Humboldt County Percent of State***
Methanol[1]	10,825	151,698	67%	7%
Formaldehyde[1]	2,460	35,613	16%	7%
Acetaldehyde[1]	1,800	25,811	11%	7%
Toluene[1]	58	3,755	2%	2%
Xylenes[1] (Mixed Isomers)	37	2,176	1%	2%
Diesel Particulate Matter[1]	68	1,853	0.8%	4%
2,2,4-Trimethylpentane[1]	28	1,418	0.6%	2%
Benzene[1]	18	1,147	0.5%	2%
Hexane[1]	11	758	0.3%	1%
Hydrochloric Acid	496	620	0.3%	80%
Ethyl Benzene[1]	10	560	0.2%	2%
Lead[1]	0.29	5	0.002%	5%
Mercury[1]	0.16	0.72	0.0003%	22%
Other HAPs	117	2,408	1%	5%
Total All HAPs	**15,930**	**227,823**	**100%**	**7%**

Source: EPA 2019b

Note: Sum of individual values may not equal total due to rounding.

[1] Project has the potential to emit this HAP.

G.1.8.4 Emissions – GHGs

GHGs are gases that trap heat in the atmosphere and contribute to climate change. The EPA has not established NAAQS for GHGs. The major GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several industrial gases.

A GHG's ability to contribute to global warming is based on its longevity in the atmosphere and its heat-trapping capacity. Some GHGs, such as CH_4, react in the atmosphere relatively quickly (on the order of 12 years; see EPA 2019c); others, such as CO_2, typically last for hundreds of years or longer. GHGs also vary with respect to the amount of outgoing radiation absorbed by

each gas molecule relative to the amount of incoming radiation it allows to pass through (i.e., its level of radiative forcing). The impact of a given GHG species on global warming depends both on its radiative forcing and how long it lasts in the atmosphere.

Climate scientists have calculated a global warming potential (GWP) for each GHG that accounts for these effects. GWPs are calculated for each GHG for a specified time interval (typically 20 or 100 years). The GWP for CO_2 is assigned a value of 1, and GWPs for other gases are defined relative to CO_2. The GWP is the time-integrated direct (and potentially indirect) radiative forcing of an amount of a GHG species released instantaneously into the atmosphere relative to that of an equal amount of CO_2. GWP values allow for a direct comparison of the impacts of emissions of different GHGs. Emissions of different GHGs are typically calculated in terms of their CO_2 equivalent (CO_2e) emissions, defined as the weighted sum of the emissions of each GHG where the weights are the GWPs.

Because the GWP of a given GHG depends in part on the atmospheric lifetime of the GHG, GWP values depend on the time interval for which they are estimated. The GWP for a relatively short-lived GHG, such as CH_4, is larger over a short time period (for example, 20 years) as compared with a much longer time period (such as 100 years) because most of the CH_4 is removed from the atmosphere through oxidation well before 100 years have passed. Conversely, very long-lived GHGs have a 20-year GWP that is lower than the 100-year GWP because the time-integrated radiative forcing is less (relative to CO_2) over the shorter time interval.

The choice of time horizon depends on the type of application and policy context; hence, no single time horizon is optimal for all policy goals. The United Nations Framework Convention on Climate Change and its Kyoto Protocol adopted the 100-year GWP, and it is used widely as the default measure. The BLM uses the 100-year time interval because a majority of the climate change impacts derived from climate models are expressed toward the end of the century. Similarly, these models are often based on 100-year emission projections, such that providing a 1 to 1 comparison of the cumulative emissions provides for a more meaningful and understandable analysis.

In this report, CO_2e is calculated using the GWP of each gas on a 100-year time horizon. The GWPs of CO_2, CH_4, and N_2O are 1, 25, and 298, respectively, and are the values used by EPA (40 CFR Part 98, Table A-1).

The NDEP has developed estimates and projections of statewide GHG emissions (NDEP 2016a). **Table G.12** shows historical emissions estimates from all sectors. The state's two dominant sectors for GHG emissions are electricity generation and transportation, which in 2013 accounted for 34 percent and 33 percent, respectively, of the state's gross emissions. Forestry sector emissions have varied widely over time because of the occurrence of uncontrolled wildfires (NDEP 2016a).

Table G.12. Nevada Historical GHG Emissions by Sector

Sector	GHG Emissions (millions of short tons of CO_2 equivalent)							
	1990	***1995***	***2000***	***2005***	***2010***	***2011***	***2012***	***2013***
Electricity Generation	18.579435	20.135897	27.305321	28.894852	18.582742	15.641779	16.165376	16.693383
Transportation	10.810354	13.191344	16.63496	18.988392	15.555799	14.88339	15.495172	15.974677
Residential, Commercial, and Industrial	4.8953587	6.4463089	6.59953	7.5166519	7.5838928	6.6546455	6.6414178	7.5034242
Industrial Processes	1.3382043	1.7151944	2.5331084	2.8362436	3.5604613	3.7511609	3.7754118	3.9132005
Waste Management	0.8256302	1.1056169	1.525597	1.9929765	2.3633526	2.4350028	2.3545342	1.9301448
Agriculture	1.635828	1.7085805	1.809993	1.8033792	1.717399	1.7306267	1.7229105	1.5829172
Fossil Fuel Industry	0.4541517	0.5434388	0.6536698	0.8146071	0.8653134	0.9358612	0.9424751	0.9479866
Forestry[1]	-6.4496158	-8.8989486	-0.6999669	3.6916362	-6.7472395	-2.4063427	-0.36266	-5.2778603
Total Gross Emissions[2]	**38.538962**	**44.84638**	**57.061077**	**66.537636**	**50.22896**	**46.031363**	**47.097297**	**48.54463**
Total Net Emissions[3]	**32.088244**	**35.948534**	**56.36111**	**66.537636**	**43.48172**	**43.623918**	**46.734637**	**43.26677**

Source: NDEP 2016a

[1] Negative values indicate that the sector is a net sink for GHGs (sequesters carbon); positive values indicate that the sector is a net source of GHG emissions.
[2] Gross emissions are the sum of emissions from all sectors. Gross emissions include the forestry sector only in years when it is a source of GHG emissions.
[3] Net emissions are the sum of emissions from all sectors minus emission reductions (sinks). Net emissions include the forestry sector in all years.

G.1.9 Cultural Resources

G.1.9.1 Inventory of Cultural Resources

Cultural resources (e.g., archaeological or built-environment sites or districts) are normally identified and recorded during intensive field inventories. On BLM-administered land, an intensive pedestrian survey using transects spaced no more than 30 meters (approximately 100 feet) apart is considered a Class III inventory. Inventories of this nature meet the data adequacy standard for identifying and recording cultural resources if conditions within the APE allow for suitable inspection and meet or exceed inventory quality standards based on BLM consultation (BLM and Nevada SHPO 2014; BLM 2018). Once an inventory is complete and a technical report submitted, the BLM archaeologist reviews the report containing findings and NRHP eligibility recommendations for identified resources. After the BLM accepts the report and eligibility recommendations, they forward the report to the SHPO for concurrence on NRHP eligibility and project effects (BLM 2014).

A review of previous surveys and reports in the Thacker Pass Lithium Mine Project APEs reveals that 38 inventories have documented cultural resources in the area over the past 48 years (**Table J.1, *Previous Cultural Resources Inventories,* Appendix J**). The entirety of the Mining and Exploration direct effects APE and portions of the indirect effects APE have been subjected

to a Class III inventory. All Class III studies in the direct effects APEs meet baseline data adequacy standards. Together, the inventories identified over one thousand cultural resource sites and a large cultural district: the Thacker Pass Component of the Double H/Whitehorse Obsidian Procurement District (DHWOPD). The most recent work in the direct effects APEs occurred in 2019 as part of BLM Report CR2-3402. That inventory provided Class III coverage of 12,963 acres within the direct effects APE and synthesis of previous inventories, including hundreds of cultural resources within and around the Thacker Pass Component of the DHWOPD and covering an area of approximately 18,600 acres (Young et al. 2019). The BLM has accepted Young et al.'s (2019) CR2-3402 report as final and the results from that particularly large dataset are applied in this document.

Most of the documented cultural resources throughout the direct and indirect APEs are prehistoric lithic scatters associated with obsidian toolstone assay and reduction. Temporally diagnostic artifacts indicate the most common association is with the Middle Archaic Period, but the overall prehistoric chronology of the area spans from the Paleoindian Period to the Terminal Prehistoric Period. Although toolstone acquisition is the dominant activity, several sites also contain grinding implements and other indicators of long-term occupation. Historic-era resources and components are comparatively less common and include the residues of Civilian Conservation Corps (CCC) activity in the area, built environment linear features (roads and utility lines), and late nineteenth and early twentieth century ranching and homesteading pursuits (Young et al. 2019).

The recent Young et al. (2019) inventory and preceding works clearly demonstrate that past human activity in the area focused on obsidian toolstone collection and reduction within the Thacker Pass Component of the DHWOPD. The DHWOPD is a dis-contiguous archaeological district extending north and south of the Thacker Pass Project. Besides the Thacker Pass Component, the district includes the Moonshine Canyon, Pretty Moon Rock, Hoppin Spring Complex, Silver Site, and Sod House areas to the south and Jordan Meadows area to the north. Together, these components comprise a roughly 166,346-acre area within and around the McDermitt Caldera complex (Berg et al. 2008; Moore 1993; Young et al. 2008; 2019). The direct and indirect APEs overlap a portion of the Thacker Pass component of the DHWOPD.

Previous inventories identified 1008 resources within the direct and indirect APEs and established an obsidian procurement district that overlaps the APEs. The Mining directs effects APE encompasses 240 resources; the Exploration direct effects APE encompasses 608 resources; and the indirect effects APE encompasses 95 resources. Exceptionally large or linear resources, as well as small resources found along APE boundaries, may fall within multiple APEs. These occur where the two direct APEs intersect 27 resources; the direct APEs and indirect APE intersect 15 resources; and the indirect APE and the Exploration APE intersect 23 resources.

G.1.9.2 Resources Within the Mining Direct Effects APE

The Mining direct effects APE intersects a total of 280 resources. This includes 40 resources overlapping the Exploration direct effects APE and 13 resources overlapping the indirect APE.

Of these, 19 are historic properties eligible for the NRHP under Criterion D and rest within the Thacker Pass Component of the DHWOPD. All 19 historic properties are prehistoric lithic scatters, six of which contain somewhat more complex assemblages with grinding implements and evidence of prolonged occupation, and one of which contains a rock ring. The Exploration direct effects APE overlaps 10 of the historic properties, and the indirect effects APE also intersects three of those. The 19 NRHP-eligible resources contribute to the eligibility of the district. The remainder of the sites are ineligible for listing on the NRHP and do not contribute to the eligibility of the district.

G.1.9.3 Resources Within the Exploration Direct Effects APE

The Exploration direct effects APE intersects a total of 673 resources. This includes 40 resources overlapping the Mining direct effects APE (same overlapping resources noted in the Mining direct effects APE section above) and 38 resources overlapping the indirect APE. Of these, 34 are historic properties eligible for the NRHP under Criteria A and D. This count does not include 11 resources within the overlapping Mining direct effects APE accounted for above. Thirty-two of the resources are prehistoric and two are historic era. The historic-era resources consist of a CCC dump eligible under Criteria A and D (CrNV-21-1220) and the Lamb Homestead eligible under Criterion D (CrNV-02-10145). The remainder of the historic properties are lithic scatters: 21 composed of flaked stone artifacts, seven composed of assemblages with grinding implements and indicators of habitation, and four with a diversity of flaked stone tool artifact classes. The indirect effects APE overlaps five of the historic properties. The 32 NRHP-eligible prehistoric resources contribute to the eligibility of the Thacker Pass Component of the DHWOPD district. The remainder of the resources are ineligible for listing on the NRHP and do not contribute to the eligibility of the district.

G.1.9.4 Resources Within the Indirect Effects APE

The indirect effects APE intersects a total of 133 resources. This includes 14 resources in the overlapping Mining and Exploration direct effects APEs and 24 resources in the overlapping Exploration direct effects APE only (these resources are accounted for in the direct effects APE sections above). Removing the overlapping resources, the indirect effects APE intersects 95 resources, and of those, 15 are NRHP-eligible or have NRHP-eligible components and 14 remain unevaluated for the NRHP. The remainder of the resources are ineligible for listing on the NRHP. The eligible resources include 11 prehistoric resources eligible under Criterion D, three (3) multi-component resources with prehistoric components eligible under Criterion D (2) and historic-era components eligible under Criterion A (1), and one historic-era resource eligible under Criterion A. The two (2) eligible historic-era components are a CCC Wash House (CrNV-21-5414) and a CCC Camp (CrNV-02-10141). The eligible prehistoric components include 10 resources with diverse flaked stone tool assemblages, three habitation assemblages with grinding implements, and one complex habitation assemblage. Three (3) NRHP-eligible prehistoric resources in the indirect effects APE rest within the boundary of the Thacker Pass Component of the DHWOPD and contribute to the eligibility of the district.

The unevaluated resources within the indirect effects APE include 13 prehistoric lithic scatters with flaked stone tools and one multi-component lithic scatter overprinted with historic era refuse and debris. Unevaluated resources are treated as NRHP-eligible until an evaluation of the resource's significance can be completed. Two unevaluated resources within the indirect effects APE also rest within the DHWOPD.

The direct effects APEs intersect four architectural resources. These include a windmill/water tank system (CrNV-02-10160/S2364) and a dugout at the Lamb Homestead (CrNV-02-10145/B18182) in the Exploration direct effects APE (the indirect APE also overlaps the Lamb Homestead), and a transmission line (CrNV-02-10156/S2362) and State Route 293 (CrNV-02-10157/S2363) within both the Mining and Exploration direct effects APEs. The indirect effects APE also overlaps the highway and transmission line. One architectural resource rests solely within the indirect APE: a dam and reservoir (CrNV-02-10147/S2361) at the western end of Thacker Pass. All five of the architectural resources are individually ineligible for the NRHP, however, the dugout (B18182) does contribute to the overall eligibility of the Lamb Homestead (CrNV-02-10145) which is eligible for the NRHP under Criterion D (Young et al. 2019).

The Thacker Pass Obsidian Procurement Area is a 16,030-acre component of the larger DHWOPD straddled by the direct and indirect APEs. The Thacker Pass Component became an NRHP-eligible district through BLM-SHPO consultation in 2009 based on previous research and recommendations (Berg et al. 2008; Moore 1993; Young et al. 2008). The boundaries of the Thacker Pass Component have been revised over time, but the district itself remains a management framework for cultural resources studies in the region (Young et al. 2019: 66-74). During recent work within the Thacker Pass Component, Young et al. (2019) generated an up-to-date district form utilizing previous work and considering all resources located within the district boundary (including resources presented in the direct and indirect APE counts above) and assessing whether or not they contribute to the overall eligibility of the district. The resulting synthesis combined with a records review revealed that the district contains 873 archaeological resources and four architectural resources. Of the 873 archaeological resources, 52 are considered to be contributing the eligibility of the district under NRHP Criterion D, four remain unevaluated, and 817 are considered non-contributing. All cultural resources eligible under Criterion D, having regional data significance, are also contributing elements under Criterion D in the district (Young et al. 2019: 74). All four of the architectural resources are non-contributing to the eligibility of the district (Young et al. 2019).

G.1.10 Social and Economic Conditions

G.1.10.1 Affected Environment

The Project is located in Humboldt County, Nevada, approximately 63 miles north-northwest of the City of Winnemucca, Nevada. Humboldt County encompasses approximately 9,704 square miles and includes the unincorporated communities of Denio, Kings River, McDermitt, Orovada, and Paradise Valley. The closest incorporated city to the Project Area is Winnemucca.

Surrounding Native communities include Fort McDermitt Indian Reservation, Summit Lake Indian Reservation, and Winnemucca Indian Colony.

G.1.10.2 Population and Growth

Humboldt County's population increased 5.7 percent between 2010 and 2018, from 15,986 residents in 2010 to an estimated 16,904 residents in 2018 (USCB 2019d). The city of Winnemucca represents the largest portion of the county, accounting for 46 percent of the county's total population. Fort McDermitt Indian Reservation is the largest native community in the study area, with a population in 2018 of approximately 336 (USCB 2019d). **Table G.13** shows the population change from 2010 to 2018 in Humboldt County, Nevada, and the U.S.

Nevada's State Demographer makes population projections of five years at the county level. Humboldt County's population is projected to be 17,341 in 2024, an increase of 1.5 percent from 2019's population estimate of 17,079 (Office of the State Demographer for Nevada 2019). Assuming an average annual growth rate of 0.32 percent throughout the mine life, Humboldt County would be home to 19,709 people by 2066.

Table G.13. Population Growth, 2010-2018

Geography	2010	2018	Percent Change
Humboldt County	15,986	16,904	6%
Nevada	2,633,331	2,922,849	11%
United States	303,965,272	322,903,030	6%

Source: USCB 2019d

G.1.10.3 Age Distribution

Table G.14 shows the age distribution in Humboldt County, Nevada, and the United States in 2018 by the U.S. Census Bureau (USCB). Humboldt County has a slightly higher population between ages 0-4 (7 percent) than the state or nation, but a slightly lower elderly (65+) population (USCB 2019e).

Table G.14. Age Distribution, 2018

Geography	Total Population	Age 0-4 Population (percent)	Age 65+ Population (percent)
Humboldt County	16,904	7%	12%
Nevada	3,034,392	6%	16%
United States	327,167,439	6%	16%

Source: USCB 2019e

G.1.10.4 Race and Ethnicity

Table G.15 provides detailed summary information on racial and ethnic composition within Humboldt County, its census block groups (BGs), and the State of Nevada. Humboldt County, in general, has a lower percentage of minorities than the State of Nevada. The majority of the population is white, followed by Hispanic or Latino. Census blocks are the smallest geographic area for which the USCB collects decennial data. A BG is a combination of census blocks that is a subdivision of a census tract and consists of all census blocks whose numbers begin with the same digit in a given census tract (USCB, n.d.). The BGs within Humboldt County present wide variation within racial and ethnic groups. BG 105001, which contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation, has a 34 percent American Indian population. BG 107012, part of the Winnemucca area and encompasses most of the Winnemucca Indian Colony, has a 51 percent Hispanic population and 8 percent American Indian population.

Table G.15. Race and Ethnicity, 2017

Geography	Total Population	White Alone	Black Alone	American Indian Alone	Asian Alone	Pacific Islander Alone	Some Other Race Alone	Two or More Races	Hispanic (of any Race)	Total Minority Population
BG: 105001[1, a]	1,300	65%	0%	34%	0%	0%	0%	0%	8%	42%
BG: 105002[a]	2,108	87%	0%	1%	0%	0%	8%	4%	32%	37%
BG: 105003[2, a]	894	85%	5%	1%	0%	0%	4%	5%	11%	21%
BG: 105004[a]	1,259	90%	0%	0%	0%	0%	8%	2%	24%	28%
BG: 105005[a]	527	89%	5%	0%	0%	0%	6%	0%	33%	38%
BG: 106001[a]	1,295	93%	0%	3%	0%	0%	3%	0%	29%	32%
BG: 106002[a]	1,063	95%	0%	1%	0%	0%	1%	2%	10%	13%
BG: 107011[a]	804	92%	0%	0%	0%	0%	2%	6%	45%	51%
BG: 107012[a]	1,805	86%	0%	8%	2%	0%	2%	3%	51%	63%
BG: 107013[a]	981	95%	3%	2%	0%	0%	0%	0%	40%	44%
BG: 107021[a]	1,712	87%	0%	4%	0%	0%	3%	4%	9%	18%
BG: 107022[a]	1,162	91%	0%	0%	0%	0%	5%	4%	26%	29%
BG: 107023[a]	655	92%	0%	0%	0%	0%	3%	5%	36%	36%
Humboldt County[a]	17,088	88%	1%	5%	0%	0%	4%	3%	26%	34%
Nevada[b]	2,887,725	67%	9%	1%	8%	1%	10%	5%	28%	50%

Sources: [a] EJSCREEN (ACS Summary Reports), n.d.; [b] Headwaters Economics 2019

[1] This BG contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation.
[2] This BG contains part of the project area and encompasses the Summit Lake Reservation, the western part of the Fort McDermitt Indian Reservation, Denio, and Sulphur.

% = percent

G.1.10.5 Personal Income

The estimated per capita income and percent of households below the poverty level in 2017 are shown in **Table G.16**. Humboldt County's per capita income is 61 percent greater than BG 105001, the BG that contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation.

Table G.16. Per Capita Income and Low-Income Population, 2017

Geography	Per Capita Income	Low Income Population[1] (percent)
BG: 105001[2, a]	$18,130	26%
Humboldt County[a]	$29,215	14%
Nevada[b]	$28,450	10%

Sources: [a] EJSCREEN (ACS Summary Reports), n.d.; [b] USCB 2017a

[1] Low Income Population applies the percent of households earning less than $25,000 in the EJSCREEN ACS Summary Report. USCB threshold for poverty in 2017 was $25,094 for a family of four (USCB 2020).
[2] This BG contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation.

G.1.10.6 Local Economy and Employment

Mining is the largest source of employment in Humboldt County. In 2017, the mining industry accounted for over 20 percent of employment county-wide. Mining employment has grown 4 percent between 2010 and 2017, with many fluctuations throughout the intervening years (University of Nevada, Reno Center for Economic Development 2018-19). In 2018, there were 103 active mining operations in Nevada, producing $7.7 billion of gross proceeds of minerals, a 4 percent decrease from the prior year. The net proceeds of mineral taxes paid by the Nevada mining industry in 2018 was $126 million. Over 90 percent of net proceeds taxes were generated by gold/silver operations. An economic impact analysis of Nevada's mining industry found that, when direct, indirect, and induced economic impacts are considered, the industry supported nearly 30,000 jobs paying $2.4 billion in labor income and contributed nearly $6.3 billion to State Gross Domestic Product (GDP) in 2018. This accounted for over 4 percent of state economic output. Over a ten-year period (2008-2018) the mining industry reported an annual growth rate of negative 2.4 percent, significantly lower than the total industry average of 2.5 percent (Applied Analysis 2019).

Agriculture was the fourth largest sector for employment in 2017, accounting for over five percent of total employment. Total employment in the agricultural sector has decreased by one percent, with employment peaking in 2015 with 75575 jobs (University of Nevada, Reno Center for Economic Development 2018-19). In 2012 there were 359 farms in Humboldt County, with an average size of 2,253 acres, encompassing 808,872 acres of land. The County accounts for approximately 9 percent of the farms in the State, and nearly 14 percent of all farmland. The economic contributions of agriculture are significant in the state, with the market value of agricultural products sold in 2012 being over $135.3 million (USDA 2016).

Other top employment sectors in Humboldt County in 2017 include Government/Public Administration, Accommodation/Food Services, and Retail Trade. Humboldt County employment by occupation for 2010 to 2017 can be seen in **Table G.17**.

Table G.17. Humboldt County Total Employment by Occupation, 2010-2017

	2010	2011	2012	2013	2014	2015	2016	2017
Mining, Quarry, Oil/Gas Extraction	1,769	1,840	2,081	2,122	1,990	1,938	1,796	1,841
Government, Public Admin	1,511	1,494	1,523	1,532	1,575	1,553	1,549	1,582
Accommodation, Food Services	976	979	990	1,046	1,061	989	963	946
Retail Trade	923	963	997	1,004	980	953	913	929
Ag, Forestry, Fishing and Hunting	517	508	506	493	517	575	519	512
Construction	602	658	520	620	442	405	364	319
Health Care and Social Assistance	374	374	432	302	306	312	296	294
Transportation, Warehousing	172	168	222	226	229	248	260	276
Administrative and Support	347	419	460	428	356	308	279	272
Other Services (except Public Admin)	257	268	293	286	267	291	277	272
Manufacturing	264	252	286	292	255	245	258	263
Utilities	134	135	129	130	138	152	155	146
Professional, Scientific, Tech Services	118	152	155	134	110	118	127	128
Arts, Entertainment, and Recreation	115	115	110	104	118	121	124	128
Wholesale Trade	119	131	171	172	167	159	136	126
Finance and Insurance	74	77	80	82	84	68	69	71
Information	78	82	69	66	64	63	66	65
Real Estate and Rental and Leasing	47	42	41	49	52	48	56	59
Mgmt. of Companies/Enterprises	30	23	34	12	<10	17	17	28
Educational Services	18	20	14	17	19	19	19	19
Total	**8,445**	**8,700**	**9,113**	**9,117**	**8,730**	**8,582**	**8,243**	**8,276**

Source: University of Nevada, Reno Center for Economic Development 2018-19

G.1.10.7 Labor Force

Table G.18 presents the labor force and unemployment statistics for Humboldt County, BG 105001, which encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation, and Nevada. While unemployment in BG 105001 falls below both Humboldt County and Nevada, the percent of the population greater than 16 years of age in the labor force is a mere 47 percent compared to Humboldt's 70 percent.

Table G.18. Labor Force, 2017

	Population 16+ Years	In Labor Force	Employed	Unemployed	Unemployment Rate (percent)
BG: 105001[a]	991	463	434	29	6.3%
Humboldt County[a]	12,924	9,059	8,399	660	7.3%
Nevada[b]	2,292,486	1,465,320	1,341,358	116,285	8.0%

Sources: [a] EJSCREEN (ACS Summary Reports), n.d.; [b] USCB 2017a

The composition of the County's economy is shown in **Table G.19** which lists the top ten employers in Humboldt County. This table shows the prevalence of mining in the region, as four of the top ten employers are in the gold ore mining industry (Nevada DETR 2019).

Table G.19. Top Ten Employers in Humboldt County, 2010

Employer	City	Industry	Employees
Newmont Mining Corporation	Golconda	Gold Ore Mining	500-599
Humboldt County School District	Winnemucca	Elementary and Secondary Schools	500-599
Turquoise Ridge Joint Venture	Golconda	Gold Ore Mining	300-399
Goldcorp Marigold Mining Co	Valmy	Gold Ore Mining	200-299
Humboldt General Hospital	Winnemucca	General Medical & Surgical Hospitals	200-299
Humboldt County	Winnemucca	Executive & Legislative Offices Combined	200-299
Hycroft Resources & Dev Inc.	Winnemucca	Gold Ore Mining	100-199
Winners Hotel & Casino	Winnemucca	Casino Hotels	100-199
Parkers Model T	Winnemucca	Casino Hotels	100-199
Red Lion Inn & Casino	Winnemucca	Casino Hotels	100-199
Humboldt Human Development	Winnemucca	Vocational Rehabilitation Services	100-199
Timberline Drilling Inc.	Winnemucca	Support Activities for Metal Mining	100-199

Source: Nevada DETR 2019

G.1.10.8 Housing

Housing characteristics for Humboldt County, BG 105001, which encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation, and Nevada are presented in **Table G.20**. BG 105001 has a higher percentage of owner-occupied units than Humboldt County or Nevada, but also a higher vacancy rate than Humboldt County or Nevada.

Table G.20. Housing Characteristics, 2017

	BG 105001[a]		Humboldt County[a]		Nevada[b]	
	Value	**Percent**	**Value**	**Percent**	**Value**	**Percent**
Total Housing Units	832	100%	7,455	100%	1,220,422	100%
Occupied Housing Units	514	62%	6,261	84%	1,052,249	86%
Vacant Housing Units	318	38%	1,194	16%	168,173	14%
Owner-Occupied Units	411	80%	4,812	77%	582,614	55%

Sources: [a] EJSCREEN (ACS Summary Reports), n.d.; [b] USCB 2017b

G.1.10.9 Public Utilities and Services

Humboldt County has three types of public water systems that are regulated by the State of Nevada. These include Community Water Systems, Transient Non-Community Water Systems, and Non-Transient Non-Community Water Systems. Humboldt County's "Community Source Water Protection Plan" identified 19 Community, 12 Transient Non-Community, and 7 Non-Transient Non-Community public water systems wells across the County. Several mining facilities have related public water systems with oversight by the State of Nevada Bureau of Mining Regulation and Reclamation (Humboldt County 2016).

Most residents are served by Community Water Systems, such as municipal water systems operated by a county, town, or mobile park. There are seven Community Water System operators in Humboldt County including the McDermitt General Improvement District, City of Winnemucca, Star City Properties, Valmy Station Mobile Home Park, Orovada Water District, Gold Country Estates, and the Golconda General Improvements District. in the largest Community Water System operator in Humboldt County is the City of Winnemucca municipal water system. The system serves approximately 9,000 customers, in addition to hotels, motels, RV parks, and other businesses in the city. The system uses five deep water wells with capacities between 1,000 gpm and 3,500 gpm. (Humboldt County Planning Department 2012). The remaining developed areas in the County use Transient Non-Local Water Systems (e.g., convenience stores, restaurants, parks, camping resorts), or Non-Transient Non-Community Systems (e.g., schools and manufacturing facilities).

Similar to public water services, the Winnemucca municipal sewer system serves approximately 9,000 customers in addition to local businesses. A new, state of the art wastewater treatment plant went online in the fall of 2017. The new plant is expected to support the needs of the city for at least the next 20 years and was designed to readily allow for capacity expansion should the need arise. It is capable of handling 1.5 million gallons per day. McDermitt, Paradise Valley, and Orovada also have community lagoon sewage treatment facilities (Humboldt County Planning Department 2012).

There is a county landfill and four rural collection sites in Humboldt County for solid waste disposal. Two private collection companies serve the Winnemucca area, and the Winnemucca Area Solid Waste Management District is operated by a private contractor under the City and

Humboldt County (Humboldt County Planning Department 2012). The Humboldt County landfill is a Class I municipal waste area-fill disposal site, and is free for residential use, and has a fee for commercial waste disposal (Humboldt County 2019).

Law enforcement along State owned highways and roads is provided by the Nevada Highway Patrol. As a statewide criminal justice agency, the Nevada Highway Patrol also assists local governments with enforcing laws and regulations related to commercial vehicle safety (Nevada Department of Public Safety 2018). Within Humboldt County, law enforcement services are provided by the Humboldt County Sheriff's Office (HCSO). The HCSO is a full-service law enforcement agency that operates the jail, patrol, detectives, coroner, search and rescue, emergency 911 dispatch, and other community safety and protection programs (HCSO 2019). The city of Winnemucca also has its own police department, which has been serving the community for over 100 years. The department is comprised of multiple divisions including patrol, detective's bureau, emergency response, K-9 patrol, traffic motor unit, narcotics task force and crisis intervention. As of 2018, the department employs 23 full time sworn officers, 7 sworn reserve officers, 2 administrative personnel, 1 animal control officer a kennel technician (WPD 2019).

There are six fire stations in Humboldt County: Pueblo Fire District, McDermitt Fire Protection District, Orovada Volunteer Fire Department, Valmy Volunteer Fire Department, Winnemucca Rural Fire Department, and Winnemucca Volunteer Fire Department (FireDepartment.net 2019). The City of Winnemucca Volunteer Fire Department currently has 25 volunteers that undergo extensive and continuous training (City of Winnemucca 2019).

Humboldt General Hospital provides 24-hour emergency medical services throughout Humboldt County as well as a walk-in clinic, long term care, and other services. The current hospital staff includes 20 doctors. Additionally, the hospital offers a rural health clinic in Winnemucca as a part of the federal Rural Health Clinic program, which facilitates care through Medicare and Medicaid in rural communities (Humboldt General Hospital 2019). There is also a Nevada Community Health Nursing clinic located in Humboldt County. The clinic provides services at a low cost or using a sliding scale dependent on income. Services offered include cancer screening, vaccinations, and counseling (Nevada Cancer Coalition 2019).

The Humboldt County School District provides public educational services in the incorporated and unincorporated areas of Humboldt County. **Table G.21** presents educational attainment for the population greater than 25 years of age in Humboldt County, BG 105001, which encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation, and Nevada. BG 105001's population with less than a high school degree doubles the rate of Nevada. BG 105001's population with a bachelor's degree or more is less than half the rate of Nevada.

Table G.21. Educational Attainment, 2017

	Population 25+ Years	Less than High School Graduate	High School Graduate	Some College, No Degree	Associate Degree	Bachelor's Degree or Higher
BG: 105001[a]	928	27%	36%	28%	3%	9%
Humboldt County[a]	10,965	17%	35%	33%	7%	15%
Nevada[b]	2,063,180	13%	29%	25%	8%	25%

Sources: [a] EJSCREEN (ACS Summary Reports), n.d.; [b] USCB 2017c

% = percent

G.1.10.10 Public Finance and Current Fiscal Condition

Table G.22 presents the budget revenues and expenditures for Fiscal Year (FY) 2019 for Humboldt County. About 50 percent of County revenue stems from intergovernmental transfers, followed by property taxes. Such intergovernmental revenues may include sales, motor vehicle taxes, general service taxes, and gaming. Over 83 percent of revenues in the FY 2019 budget comes from taxes in intergovernmental transfers. Public safety and general government account for 32 percent of planned expenditures for FY 2019. Including other financing sources, the FY 2019 expenditures are still over $15.5 million greater than revenues (Humboldt County 2018).

Table G.22. Expenditures and Revenues in Humboldt County

	Actual Prior	Est. Current Budget	Budget	Proprietary Fund Budget	Total (Memo Only)
	FY17	***FY18***	***FY19***	***FY19***	***(Budget + Proprietary Fund)***
Revenues					
Property Taxes	$7,495,802	$6,398,353	$6,561,783		$6,561,783
Other Taxes	$1,445,658	$1,852,213	$925,000		$925,000
Licenses and Permits	$1,116,823	$1,000,000	$1,068,000		$1,068,000
Intergovernmental	$14,064,788	$11,922,709	$12,215,230		$12,215,230
Charges for Services	$933,866	$900,700	$844,800	$1,170,000	$2,014,800
Fines and Forfeits	$1,268,649	$865,000	$1,028,000		$1,028,000
Miscellaneous	$1,152,019	$906,800	$1,236,500	$2,500	$1,239,000
Total Revenues	**$27,477,605**	**$23,845,775**	**$23,879,313**	**$1,172,500**	**$25,051,813**
Expenditures/Expenses					
General Government	$6,038,364	$7,928,024	$7,312,688		$7,312,688
Judicial	$4,682,352	$5,629,511	$6,456,800		$6,456,800
Public Safety	$8,948,155	$10,283,755	$10,730,233		$10,730,233
Public Works	$4,338,525	$5,509,900	$5,025,940		$5,025,940
Sanitation				$989,602	$989,602
Health	$322,887	$308,154	$358,154		$358,154
Welfare	$619,068	$941,844	$845,937		$845,937
Culture and Recreation	$2,236,037	$4,663,287	$3,158,206	$360,725	$3,518,931
Community Support	$1,673,048	$2,679,615	$4,485,706		$4,485,706
Intergovernmental Exp.	$899,507	$1,059,000	$1,068,501		$1,068,501
Contingencies		$350,000	$350,000		$350,000
Debt Service					
Principal	$569,060				
Interest C	$8,515				
Total Expenditures/ Expenses Excess of Revenues Over (Under)	**$30,335,518**	**$39,353,090**	**$39,792,165**	**$1,350,327**	**$41,142,492**
Revenue – Expenditures	($2,857,913)	($15,507,315)	($15,912,852)	($177,827)	($16,090,679)
Total Other Financing Sources	**$351,050**	**-$59,641**	**$351,675**	**($351,675)**	
Revenue + Other Financing Sources – Expenditures	**($2,506,863)**	**($15,566,956)**	**($15,561,177)**	**($529,502)**	

Source: Humboldt County 2018

G.1.10.11 Economic Activity and Fiscal Effects of the Mine

There is currently no economic or fiscal impacts related to the mine because it has not yet been built. Sections 4.12.1.1, *Direct and Indirect Effects*, and 6.12, *Cumulative Effects*, discuss the anticipated economic and fiscal effects of the proposed action, as well as any anticipated impact to quality of life in the study area. Section 4.13, *Environmental Justice*, discusses the potential effects of the proposed action on any low income and minority populations in the study area.

G.1.10.12 Livestock Grazing

The grazing allotments in the study area shown in **Table G.9** produce an estimated 1,659 active AUMs and 18,483 in the total allotment. The direct economic value of cattle grazing in a specific area can be estimated based on the actual grazing use of the area in AUMs and the value of an AUM. 16 AUMS are required to produce a marketable cow, therefore, the average value of an AUM can be estimated based on the value of cattle production per bred cow divided by 16, and adjustive for cow-calf operations. Using values from 2014 to 2018, this produces a five-year average adjusted value of producer per AUM of $65.69. These calculations are shown in **Table G.23**.

Table G.23. Value of an AUM for Cattle Production ($2018)

Year	Value of Production per Bred Cow[1]	AUMs per Cow[2]	Value of Production per AUM	CPI	Deflated Value of Producer per AUM	Cow Calf Adjustment[3]	Adjusted Value of Production per AUM
2014	$1,076.00	16	$67.25	0.94	$71.33	1.2	$85.60
2015	$1,015.79	16	$63.49	0.94	$67.26	1.2	$80.71
2016	$704.62	16	$44.04	0.96	$46.08	1.2	$55.29
2017	$710.20	16	$44.39	0.98	$45.47	1.2	$54.57
2018	$697.14	16	$43.57	1.00	$43.57	1.2	$52.29
						5-year Average	**$65.69**

Sources: [1] USDA ERS 2020; [2] Workman 1986; [3] NASS 2017

Based on the estimated 1,659 active AUMs in the study area, grazing generates over $108,981 annually of direct economic value. This value represents only a portion of the overall contribution of livestock production to the local economy. This figure reflects the market value of the time cattle spend grazing on federally-administrated lands, and not the indirect and induced impacts of grazing.

It is also important to note that the social values associated with preserving the presence and practice of livestock grazing in the region is not monetized. Such values include maintaining the rural landscape of the region and the role of BLM grazing lands in the ongoing support of Nevada's ranching families.

G.1.11 Environmental Justice

G.1.11.1 Affected Environment

Table G.24 presents environmental justice indicators for Humboldt County, all census BGs within Humboldt County, and the state of Nevada. **Figure G.1** presents Humboldt County divided into census tracts and BGs. Census blocks are the smallest geographic area for which the USCB collects decennial data. A BG is a combination of census blocks that is a subdivision of a census tract and consists of all census blocks whose numbers begin with the same digit in a given census tract (USCB, n.d.). BG is the smallest geography type generated by EPA's EJSCREEN. EJSCREEN is an environmental justice mapping and screening tool that presents environmental and demographic information (EPA 2017). The environmental justice analysis examines the analysis area at the BG level.

Table G.24. Environmental Justice Indicators, 2017

Geography	Low Income Population[1]	Minority Population	American Indian Population	Hispanic Population
BG: 105001[2, a]	**26%**	42%	**34%**	8%
BG: 105002[a]	7%	37%	1%	32%
BG: 105003[3, a]	4%	21%	1%	11%
BG: 105004[a]	7%	28%	0%	24%
BG: 105005[a]	9%	38%	0%	33%
BG: 106001[a]	12%	32%	3%	29%
BG: 106002[a]	**29%**	13%	1%	10%
BG: 107011[a]	5%	51%	0%	**45%**
BG: 107012[a]	**30%**	**63%**	8%	**51%**
BG: 107013[a]	17%	44%	2%	**40%**
BG: 107021[a]	5%	18%	4%	9%
BG: 107022[a]	5%	29%	0%	26%
BG: 107023[a]	**20%**	36%	0%	36%
Humboldt County[a]	14%	34%	5%	26%
Nevada[b]	10%	50%	1%	28%

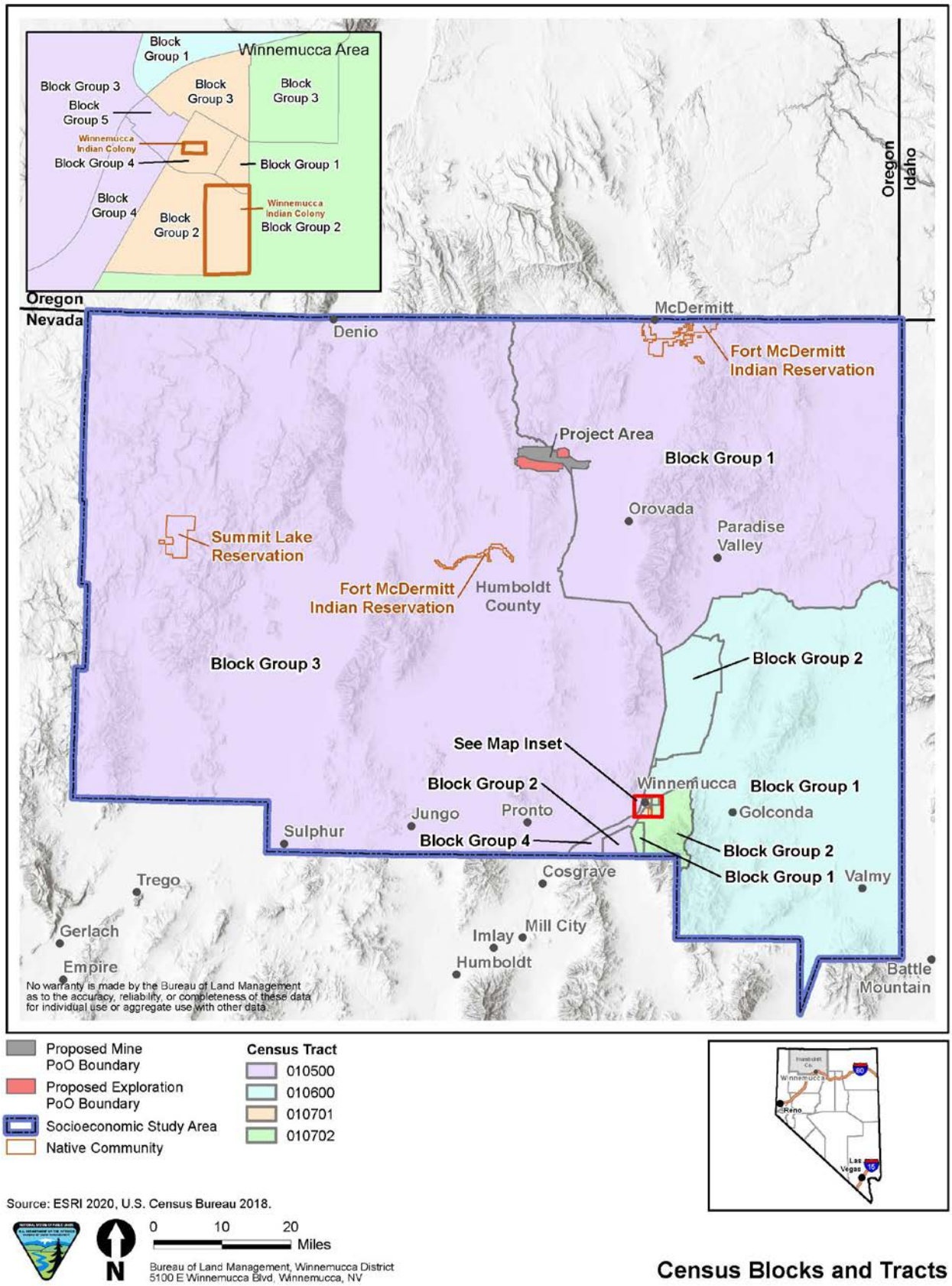
Sources: [a] EJSCREEN (ACS Summary Reports), n.d.; [b] Headwaters Economics 2019

[1] Low Income Population applies the percent of households earning less than $25,000 in the EJSCREEN ACS Summary Report. USCB threshold for poverty in 2017 was $25,094 for a family of four (USCB 2020)
[2] This BG contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation.
[3] This BG contains part of the project area and encompasses the Summit Lake Reservation, the western part of the Fort McDermitt Indian Reservation, Denio, and Sulphur.

Note: Potential environmental justice populations are identified in **bold**.

% = percent

Figure G.1. Humboldt County: Census Tracts and BGs



G.1.11.2 Minority Population

The Council on Environmental Quality (CEQ) provides the following definition of the term "minority": American Indian or Alaska Native, Asian, Pacific Islander, Black, and Hispanic. The guidance also instructs agencies to consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. In addition, impacts should also be assessed on Indian tribes (CEQ 1997).

Table G.24 presents environmental justice indicators on racial and ethnic composition within Humboldt County, its census BGs, and the State of Nevada. **Table G.15** provides more detailed information. Humboldt County, in general, has a lower percentage of minorities than the State of Nevada. The BGs within Humboldt County present wide variation within racial and ethnic groups. BG 105001, which contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation, has a 34 percent American Indian population. BG 107012, part of the Winnemucca area and encompasses most of the Winnemucca Indian Colony, has a 51 percent Hispanic population and 8 percent American Indian population (EJSCREEN, n.d.).

The percentage of American Indian residents in Humboldt County (4.7 percent) is slightly higher than the state average (1.1 percent). This is partly attributable to the presence of the Fort McDermitt Indian Reservation, Summit Lake Indian Reservation, and Winnemucca Indian Colony. The American Indian population in BG 105001, which contains part of the project area and encompasses the Fort McDermitt Indian Reservation, McDermitt, and Orovada, has a 34 percent American Indian population and exceeds the 10-percentage point threshold for a "meaningfully greater" minority population. Minority populations are identified whenever either of the following criteria was met: where the minority population is greater than 50 percent of the area's total population, or where the percentage of the minority population is meaningfully greater (ten percentage points higher) than the percentage in the general population or an appropriate comparison area.

After applying the analysis criteria to the data presented above, the study found that there are two minority populations within the area of analysis. American Indian populations are elevated above the state of Nevada baseline populations within BG 105001, and Hispanic populations are elevated above the state of Nevada baseline populations within BGs 107011, 107012, and 107013 (the Winnemucca area).

G.1.11.3 Low-Income Population

The CEQ environmental justice guidance instructs agencies to consider low-income populations to be those below the poverty thresholds from USCB. Similar to the identification of minority populations, the guidance also instructs agencies to consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect (CEQ 1997).

For the purposes of this analysis, similar criteria were used for the identification of low-income populations as was used for the identification of minority populations. Low-income populations were identified whenever either of the following criteria was met: where persons in poverty status are greater than 50 percent of the area's total population, or where the percentage in poverty is meaningfully greater (ten percentage points higher) than the percentage in the general population or an appropriate comparison area.

As seen in **Table G.24,** low income populations in BG 105001, which contains part of the project area and encompasses McDermitt, Orovada, and part of the Fort McDermitt Indian Reservation, BG 106002, BG 107012, and BG 107023 are more than 10 percentage points higher than the state of Nevada.

G.1.12 Lands and Realty

G.1.12.1 Affected Environment

The nearest residential communities to the proposed Project area are Orovada (20 miles southeast) and Winnemucca (62 miles southeast).

The WD ROD/RMP specifically states the following goal, action and objective:

Goal: Make federal mineral resources available to meet domestic needs. Encourage responsible development of economically sound and stable domestic minerals and energy production, while assuring appropriate return to the public. Ensure long-term health and diversity of the public lands by minimizing impacts on other resources, returning lands disturbed to productive uses, and preventing unnecessary or undue degradation to public lands.

Action: Public lands would remain open and available for mineral exploration and development, subject to the provisions of FLPMA Section 204.

Objective: Manage mineral material operations to provide for the mineral and energy needs of the nation, while assuring compatibility with and protection of other resources.

The WD ROD/RMP has designated the land that would be occupied by the proposed Project as lands to be retained and as a right-of-way (ROW) exclusion area.

Land uses within and adjacent to the study area include mining, livestock grazing, recreation, and wildlife habitat. **Table G.25** identified the existing BLM land use authorizations within the study area.

Table G.25. Administrative Land Use Authorizations within the Study Area

Serial Number	Type of Authorization	Acres
NVN 002695	NDOT Material Site	160.0
NVN 002773	Federal Highway	752.7
NVN 060463	Telecom Right-Of-Way	680.0
NVN 085255	Surface Exploration Plan	75.0
NVN 089149	Lyman Youngberg Water Pipeline	2.4
NVN 060463	Surface Mine Plan	114.0
NVN 093578	Free Use – Government	5.0
NVN 094328	Community Pit	5.1
NVN 094355	Negotiated Sales	5.0
NVN 094510	Surface Mining NOI	3.5
NVN 095388	Surface Mining NOI	4.7
NVN 095396	Surface Mining NOI	1.5
NVN 095618	Transmission Line	254.9
NVN 096592	Surface Mining NOI	0.2
NVN 096620	Negotiated Sales	4.3
NVN 097372	Negotiated Sales	4.3

Source: Cedar Creek 2019b

LNC has the following five existing authorizations within the study area:

- Kings Valley Clay Mine PoO;
- Kings Valley Lithium Exploration PoO;
- 293 South NOI;
- Far East NOI; and
- Quinn River NOI.

G.1.13 Noise

G.1.13.1 Affected Environment

The PoO area is located in a rural mountainous region of northern Nevada. Wildlife species occurring in the surrounding area are typical of species found in the Great Basin ecoregion (Cedar Creek 2019a). A noise survey of leks in the area measured median ambient levels in the range of 18 to 26 dBA L_{50}. A detailed summary of existing noise levels within the proposed Project area is presented in the Noise resource summary in Section G.2 of this appendix.

G.1.14 Visual Resources

G.1.14.1 Affected Environment

Scenic quality is the measure of the visual appeal of a unit of land. Section 102(a) of the Federal Land Policy and Management Act (FLPMA) (1976), states that "…the public lands are to be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values." Section 103(c) identifies "scenic values" as one of the resources for which public land should be managed. Section 201(a) states that "the Secretary shall prepare and maintain on a continuing basis an inventory of all public lands and their resources and other values (including scenic values)…". Furthermore, Section 101(b) of the National Environmental Policy Act requires that measures be taken to ensure that aesthetically pleasing surroundings be retained for all Americans.

The scenic features of the Winnemucca District are generally characteristic of the Great Basin area of the western US. Gold and brown hills diffuse into steep rugged mountains. Alkali flats and low desert brush dominate the valley lowlands, allowing expansive views from the valleys to the surrounding mountains. The higher elevations support sagebrush, juniper, and pinyon pine, which provide visual diversity and contrasting darker color along ridgelines in the distant background. Vegetation grows low and evenly on the valley floor and primarily consists of monochromatic desert brush. The dominant natural features in the Winnemucca District includes steep rugged mountains, volcanic highlands and table lands, expansive valleys, dune fields, springs (hot and cold), streams, the Humboldt River, Little Humboldt River, Kings River, and Quinn River and associated floodplains and marshes.

The Thacker Pass Project area is located south of the Montana Mountains, with a physiography characterized by rolling topography trending eastward and slopes generally ranging from one percent to five percent. Vegetation consists of low-lying sagebrush and grasslands. Much of the area is heavily covered with cheat grass. The Project Area contains numerous ephemeral drainages, five seasonal springs, and limited reaches of intermittent surface waters. Thacker Creek is a perennial creek and lies directly west of the Project Area. Pole Creek and Crowley Creek are intermittent creeks lying northeast of the Project Area. Livestock grazing is the primary land use in the study area and within the Project area. The surrounding area was determined not to be a designated recreation area, however recreation including hunting, camping and off-road vehicle use takes place within the study area along Pole Creek Road and on the Montana Mountains, north of the Project area. Agriculture is prominent in areas surrounding the Study and Project area, including the Kings River Valley to the west and the Quinn River Valley to the east.

G.1.15 Wastes, Hazardous and Solid

G.1.15.1 Affected Environment

The layout of the proposed plant site is shown on **Figure 2.4 (Appendix A)** of the PoO. The process plant site would be accessible by two roads off SR 293.

U.S. 95 and SR 293 would be used for transportation of materials to/from the site. The access road to the east would be reserved for reagent deliveries (e.g., sulfur, quicklime, limestone, caustic soda, soda ash) to the facility, while the access road to the west would allow access to the main parking lot and other plant facilities.

Bulk chemicals and supplies would typically be transported to the site on trucks via U.S. 95 and SR 293 from Winnemucca. Trucks transporting materials to/from the site may be loaded/offloaded via an existing rail terminal in Winnemucca during Phase I of the mine operation.

The affected environment includes historical operations on the site that may have resulted in land disturbances or generation of legacy waste disposal. LNC has permitted and performed mineral exploration activities within the Project area since 2008. Associated mineral exploration facilities include drill sites and access roads. Disturbance onsite which was created, or is active, after October 1, 1990, includes exploration roads and drill sites associated with the ongoing LNC drilling campaign and a small test pit mined under existing authorizations. Existing roads within the Project area include county and four-wheel drive roads that access the Project. These roads have not been altered other than by maintenance activities and minor repairs since January 1, 1981.

The Kings Valley Clay Mine was authorized by the BLM but never fully developed by LNC. There have been no other previous mining operations on the site with the exception of a small test pit mined by LNC for exploration. There is no evidence of existing landfills or of previous hazardous materials spills on site, or of waste generation or disposal on site other than that associated with the authorized clay mine operation.

Federal, State, and local regulations are established for the management, storage, transport, and disposal of hazardous materials and solid and hazardous wastes that would be applicable to the Project. Regulations applicable to the Project include, but are not be limited to:

- MSHA regulations (30 CFR 1-199) including 30 CFR Subchapter K—Metal and Nonmetal Mine Safety and Health (30 CFR 56.1; 30 CFR 58.1);
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 CFR 300) including National Oil and Hazardous Substances Pollution Contingency Plan requirements;
- Oil Pollution Prevention (40 CFR 112) including Spill Prevention, Control, and Countermeasures (SPCC) Plan requirements;
- Resource Conservation and Recovery Act (RCRA) (40 CFR 258-272) applicable to management, storage, transport, and disposal of solid and hazardous wastes;

- NRS Chapter 459 – Hazardous Materials including NRS 459.700 – Handling of Hazardous Materials and NRS 459.400 – Disposal of Hazardous Waste;
- NAC Chapter 444 – Sanitation, including NAC 444.731-444.737, Minimum standards; reduction or waiver of requirements for Class III Landfills.

Vendors transporting hazardous materials to/from the site on public roads would be subject to Federal *Hazardous Materials Regulations* (49 CFR Subchapter C) and Nevada Handling of Hazardous Materials regulations (NRS 459.700) applicable to hazardous materials and oil transportation. LNC management of hazardous materials would be subject to 49 CFR Subpart B, *Preparation of Hazardous Materials for Transportation*. Motor carriers transporting hazardous materials in Nevada are required to register with the NDOT and obtain a permit for the transportation of hazardous materials in Nevada in accordance with the provisions of NRS 459.7052.

G.1.16 Recreation

G.1.16.1 Affected Environment

The study area consists entirely of BLM-administered lands that support recreational activities. The BLM plans and manages recreation and visitor services in accordance with BLM Manual 8320 and Handbook H-8320-1. The BLM Manual states "the BLM's recreation planning process is an outcome-focused management approach that stresses the management of recreation settings to provide opportunities that allow visitors and local communities to achieve a desired set of individual, social, economic, and environmental benefits."

BLM Manual 8320 and BLM Handbook H-8320-1 also provide direction and details on the Special Recreation Management Areas and Extensive Recreation Management Areas. Specific objectives within BLM Manual 8320 include (BLM 2011):

- Provide for visitor safety, resource protection, and to address resource use conflicts
- Plan for recreation and visitor services on an interdisciplinary basis in concert with other resources or resource programs to facilitate visitors' freedom to pursue a variety of outdoor recreation activities and attain a variety of outcomes
- Emphasize recreation and visitor services by managing for specific recreation opportunities and settings on a sustained or enhanced long-term basis
- Improve the long-term management of recreation settings, facilities, and public access on BLM-managed lands and waters

Recreational opportunities within the study area range from intensive vehicle-oriented activities to non-motorized activities in a more primitive setting. Recreation activities consist of dispersed recreation, including OHV use, rock collecting, photography, hunting, camping, wildlife viewing, hiking, horseback riding, and mountain biking.

The BLM WD Office permits 17 outfitter and guide commercial special recreation permits. (SRPs). These 17 permittees operate as commercial businesses providing guided hunting services within the WD, with 7 of the 17 permittees actively providing guided hunting services in NDOW unit 031, primarily hunting mule deer.

The dispersed nature of recreation activities within the area of analysis precludes availability of specific user data for individual recreation activities except hunting. Mule deer and pronghorn antelope are the predominant big game species sought by hunters. The area of analysis includes mule deer distribution and is adjacent to or within pronghorn antelope distribution. The NDOW regulates big game hunting through a quota system and tags are sold for each big game species in the various hunt units. The Baseline Study Area is within Hunt Unit 31. According to the NDOW mule deer hunt returns for 2018, there were 289 mule deer tags for hunt (available tags at season opener) within Hunt Unit 31. According to the 2018 NDOW pronghorn antelope hunt returns for Hunt Unit 31, there were 191 tags for hunt. Approximately 50 percent of the tags resulted in a successful harvest. The Baseline Study Area is also likely used for hunting upland game species and furbearers.

G.1.17 Native American Religious Concerns

G.1.17.1 Affected Environment

The assessment area for Native American Religious Concerns is Humboldt County consistent with social and economic conditions presented in Section 4.11. This area is the traditional territory of the Northern Paiutes and Western Shoshone.

The BLM engages government-to-government tribal consultation as it relates to the Proposed Action. Information provided in the following sections is based on the following episodes of consultation:

- BLM consultation letters transmitted in December 2019 to tribal representatives at the Fort McDermitt Paiute and Shoshone Tribe, Summit Lake Paiute Tribe, and Winnemucca Indian Colony;
- BLM in-field meeting and project discussion at Thacker Pass with tribal members of the Fort McDermitt Paiute and Shoshone Tribe on October 3, 2018;
- Ethnographic background derived from BLM literature searches and ethnographic studies considered important by the regional Native American communities presented in Young et al. (2019:43-45);
- Consultation between the BLM and the Fort McDermitt Paiute and Shoshone Tribe and the Summit Lake Paiute Tribe during the Kings Valley Clay Mine (KVCM) Project Environmental Assessment (EA; DOI-BLM-NV-W010-2013-0046-EA) in 2014 (BLM 2014).

G.2 RESOURCE SUMMARIES

AIR QUALITY SUMMARY

THACKER PASS - LITHIUM NEVADA

REGULATORY FRAMEWORK

FEDERAL CLEAN AIR ACT

The Federal Clean Air Act (CAA) and subsequent Clean Air Act Amendments (CAAA) of 1990 authorized the regulation of air emissions from stationary and mobile sources. Specifically, the CAA and CAAA of 1990 requires the EPA to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare, as well as to regulate emissions of hazardous air pollutants.

CRITERIA AIR POLLUTANTS

Based on the CAA and CAAA of 1990, the EPA has established NAAQS for pollutants known as "criteria" pollutants that are harmful to public health or the environment. NAAQS have been set for ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than 10 and 2.5 microns in diameter (PM10 and PM2.5), and lead (Pb). Air pollutant concentrations that exceed the NAAQS constitute a risk to human health. State specific Ambient Air Quality Standards (AAQS) have also been developed by the Nevada Division of Environmental Protection (NDEP) and are defined in NAC 445B.22097. Table 1 summarizes the currently applicable National and Nevada AAQS standards.

TABLE 1

SUMMARY OF NATIONAL AND NEVADA AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS

POLLUTANT	AVERAGING PERIOD	NAAQS	NEVADA AAQS
O_3 (PPB)	8-Hour	70	70
NO_2 (PPB)	1-Hour	100	100
	Annual	53	53
SO_2 (PPB)	1-Hour	75	75
	3-Hour	500	500
CO (PPM)	1-Hour	35	35
	8-Hour	9	9
PM10 (µG/M3)	24-Hour	150	150
PM2.5 (µG/M3)	24-Hour	35	35
	Annual	12	12
PB (µG/M3)	3-Month	0.15	0.15

Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m3).

Source: USEPA, NAC 445B.22097

[1] Nevada AAQs for 8-hour CO is 6 ppm for areas at or greater than 5000 feet.

HAZARDOUS AIR POLLUTANTS

In addition to the criteria pollutants listed above, the CAA requires the EPA to regulate toxic air pollutants, or hazardous air pollutants (HAPs), that are known to cause or are suspected to cause cancer or other serious health effects or adverse environmental impacts. The EPA has identified 187 specific chemical substances that are potentially hazardous to human health and set emission standards to regulate the amount of those substances that can be released by individual facilities or by specific industrial sources. The EPA has issued rules covering 80 categories of major industrial sources, as well as categories of smaller sources. Controls are usually required at the source to limit the release of these toxics into the atmosphere.

ATTAINMENT AND NON-ATTAINMENT AREAS

Classifications for geographic regions known as air quality management areas (AQMAs) have been developed by the EPA. Under these classifications, each criteria pollutant within a portion of an AQMA is classified as "in attainment" if the ambient concentrations of the pollutant are below the NAAQS or as "non-attainment" if the levels of ambient air pollution exceed the NAAQS. Each criteria pollutant is monitored separately. For nonattainment areas, state and local governments must develop comprehensive plans to reduce pollutant concentrations below the NAAQS and maintain compliance. AQMAs that do not have enough ambient air monitoring data are designated as "unclassifiable" and are treated as in attainment for regulatory purposes. The region in vicinity of and including the Thacker Pass Project is classified as unclassifiable for all criteria air pollutants.

PREVENTION OF SIGNIFICANT DETERIORATION

AIR QUALITY SUMMARY

THACKER PASS - LITHIUM NEVADA

Prevention of Significant Deterioration (PSD) applies to any new stationary source or major modification to an existing stationary source that emits or has the potential to emit any pollutant regulated under the CAA above the PSD threshold emission rate, typically 250 tons per year (ton/yr), where the source is located in an AQMA classified as in attainment or unclassifiable. PSD requires installation of the best available control technology (BACT), an air quality analysis, an additional impacts analysis, and public involvement.

Because sulfuric acid plants are a listed source category under 40 CFR Part 52.21, PSD would apply to the sulfuric acid plant at the proposed Thacker Pass Project if the emissions of any regulated air pollutant (e.g., SO_2, NOX, CO, VOC, PM10, PM2.5, H_2SO_4 mist, H_2S) from the sulfuric acid plant exceed 100 ton/yr (as opposed to the typical 250 ton/yr).

NEW SOURCE PERFORMANCE STANDARDS

New Source Performance Standards (NSPS) are standards established by the EPA under authority from the CAA for categories of new or modified stationary sources of air pollution. NSPS include emission standards, equipment specifications, and/or measurement requirements.

NSPS Subpart H includes standards for sulfuric acid plants. The Subpart H emission standards are as follows:

- *Sulfur dioxide: 2 kg sulfur dioxide per metric ton of acid produced (4 lb per ton), the production being expressed as 100 percent H_2SO_4*
- *Acid mist: 0.075 kg acid mist, expressed as H_2SO_4, per metric ton of acid produced (0.15 lb per ton), the production being expressed as 100 percent H_2SO_4*
- *Opacity: 10 percent opacity*

FEDERAL OPERATING PERMIT

The CAAA of 1990 introduced an operating permit program to ensure compliance with the CAA and enhance the EPA's ability to enforce the Act. The Federal Operating Permit Program, known as the Title V program, requires that major sources of air pollutants obtain a Title V permit. To be classified as a major source, a stationary facility must emit more than 100 tons per year of any pollutant regulated under the CAA, 10 tons per year of any single HAP, or 25 tons per year of any combination of HAPs.

FEDERAL OPERATING PERMIT

The CAA delegates primary responsibility for air pollution control to state governments. State governments, in turn, may delegate this responsibility to local governments or regional organizations. The NDEP has the following thresholds for various air quality permit types:

- ***Class I*** *– For facilities that emit more than 100 tons per year of any regulated air pollutant, emit more than 25 tons per year total HAPs, emit more than 10 tons per year of any one HAP, are a PSD source, are a major maximum achievable control technology (MACT) source, or are otherwise subject to Title V*
- ***Class II*** *– For facilities that emit less than 100 tons per year of any regulated air pollutant, emit less than 25 tons per year total HAPs, and emit less than 10 tons per year of any one HAP*
- ***SAD*** *– For surface area disturbance greater than five acres*

The proposed Thacker Pass Project is anticipated to require a Class II Permit.

AIR QUALITY SUMMARY

THACKER PASS - LITHIUM NEVADA

AFFECTED ENVIRONMENT

LOCAL CLIMATE AND METEOROLOGY

The Thacker Pass Project area is situated in the north central region of the Basin and Range physiographic province in an area known as Thacker Pass, in terrain roughly 5,000 feet amsl with lower-lying agricultural valleys to the east and west. The Double H Mountains are located directly to the south and the Montana Mountains are located directly to the north. The Thacker Pass Project area straddles the topographic divide separating the Kings River Valley hydrographic area and the Quinn River Valley hydrographic area.

An onsite meteorological station (Thacker Pass station) was installed in August 2011 and has continuously collected data through to the present day. Climatic conditions are arid, high desert with mild-cool winters and hot-dry summers. Average winter temperature is near freezing (32.5°F), with daily temperatures ranging from highs of about 50°F to lows of about 10°F. Summer temperatures range from highs of about 95°F to lows of about 50°F. Air moisture is generally arid, with relative humidity ranging from about 25% during summer to about 65% during winter.

Table 2 summarizes average wind speed, average temperature at ground level, and average temperature at 32.8 feet from January 2012 through December 2018.

Long-term data has been assessed to characterize overall climate conditions. The nearest long-term meteorological measurement station is in Winnemucca, Nevada, located about 60 miles south-southeast of the Project location. Long-term climate data is summarized in Table 3.

TABLE 2

METEOROLOGICAL DATA JAN. 2012 - DEC. 2018
THACKER PASS METEOROLOGICAL STATION

MONTH	AVERAGE WIND SPEED (MPH)	AVERAGE TEMP. (°F)	AVERAGE TEMP. (°F) 32.8 FT
JANUARY	6.84	32.13	32.80
FEBRUARY	8.18	35.81	36.29
MARCH	8.98	41.98	42.26
APRIL	9.46	47.04	47.15
MAY	7.99	55.68	55.79
JUNE	8.66	67.00	66.87
JULY	9.01	76.82	76.72
AUGUST	8.47	74.43	74.58
SEPTEMBER	8.24	64.81	65.15
OCTOBER	7.51	51.80	52.47
NOVEMBER	7.45	40.15	40.85
DECEMBER	7.48	29.58	30.17

TABLE 3

WINNEMUCCA WSO AIRPORT CLIMATE SUMMARY
1/1/1897 TO 12/31/2005

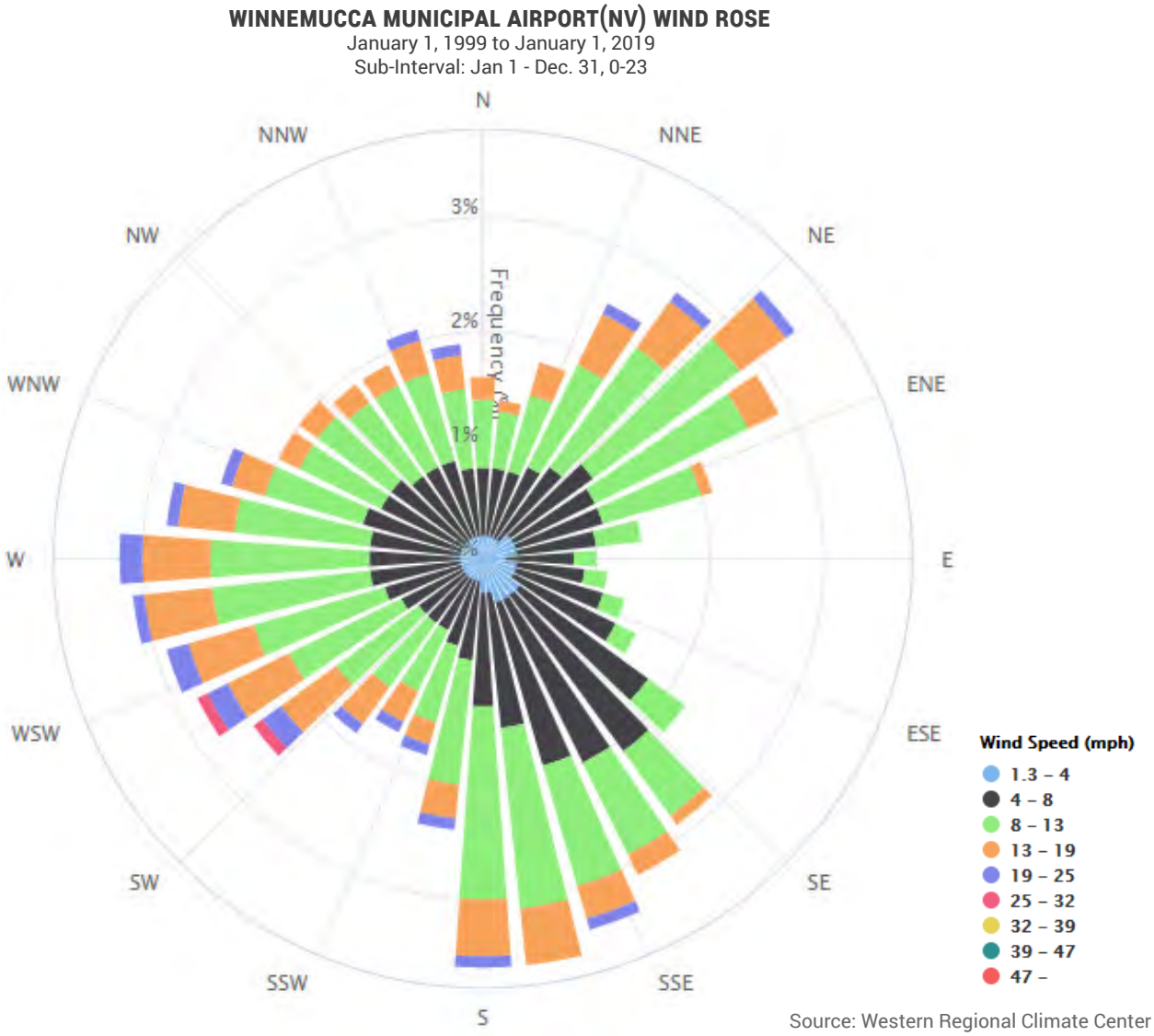
METEOROLOGICAL PARAMETER	MEASURED VALUE
ANNUAL AVERAGE MAX. TEMPERATURE (°F)	64.8
ANNUAL AVERAGE MIN. TEMPERATURE (°F)	33.1
ANNUAL AVERAGE TOTAL PRECIPITATION (IN.)	8.29
ANNUAL AVERAGE TOTAL SNOWFALL (IN.)	16.5
ANNUAL AVERAGE TOTAL SNOW DEPTH (IN.)	0
Source: Western Regional Climate Center	

AIR QUALITY SUMMARY

THACKER PASS - LITHIUM NEVADA

Figure 1 shows wind speed and direction at the Winnemucca Municipal Airport over a 20-year period, from 1999 to 2019. Wind speed and direction is shown in a wind rose diagram, which defines the wind direction as the direction which the wind is blowing. The length of each bar indicates the frequency of occurrence in each wind direction, and the shading indicates a differentiating wind speed

FIGURE 1



Source: Western Regional Climate Center

REFERENCES

Summary of the Clean Air Act https://www.epa.gov/laws-regulations/summary-clean-air-act

Criteria Air Pollutants https://www.epa.gov/criteria-air-pollutants

NAAQS Table https://www.epa.gov/criteria-air-pollutants/naaqs-table

Hazardous Air Pollutants https://www.epa.gov/haps

NAAQS Designation Process https://www.epa.gov/criteria-air-pollutants/naaqs-designations-process

Prevention of Significant Deterioration https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information

New Source Performance Standards https://www.law.cornell.edu/cfr/text/40/part-60

Nevada Air Quality Operating Permit https://ndep.nv.gov/air/permitting

Winnemucca WSO Airport Climate Data https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?nvwinn

Winnemucca Municipal Airport Wind Rose https://www.wcc.nrcs.usda.gov/climate/windrose.html

CULTURAL SUMMARY

THACKER PASS - LITHIUM NEVADA

REGULATORY FRAMEWORK

The National Historic Preservation Act (NHPA) of 1966, as amended, and the Archaeological Resources Protection Act (ARPA) of 1979, as amended, are the primary laws regulating cultural resource preservation. NHPA and ARPA together provide a structure for federal agencies to follow when evaluating effects on Historic Properties listed or eligible for listing in the NRHP.

Section 106 of the NHPA requires federal agencies to take into account the effects of their undertakings on Historic Properties and affords the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. Project-related actions may adversely affect any site, structure, or object that is, or can be, included in the NRHP. These regulations, codified 36 CFR 60.4, provide criteria to determine if a site is eligible and apply to all federal undertakings and all cultural (archaeological, cultural, and historic) resources.

ARPA provides protection to archaeological resources and sites on public and Indian lands for the present and future benefit of the people. The intent of ARPA is to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources.

AFFECTED ENVIRONMENT

The cultural inventory area for the Thacker Pass Project includes an approximately 18,686-acre area between the Double H and Montana Mountains. In this area, cultural resources (e.g., archaeological or built-environment sites or districts) are identified and recorded during intensive field surveys of the project cultural inventory area. Intensive pedestrian surveys using transects spaced no more than 30 meters (approximately 100 feet) apart is considered a Class III inventory. Inventories of this nature are the standard for identifying and recording cultural resources, if conditions within the cultural inventory area allow for adequate visual inspection (i.e., when ground surface cover, such as snow or vegetation, no longer exceeds 25%; BLM 2012, 2014). Once fieldwork is complete, the BLM archaeologist reviews a technical report presenting inventory findings and NRHP eligibility recommendations for resources identified within the cultural inventory area. After the BLM determines the report is acceptable, they consult with the Nevada State Historic Preservation Office SHPO on BLM's determination of NRHP eligibility and project effects. (BLM 2014).

The approximately 18,686-acre direct effects cultural inventory area has been subjected to 35 Class III inventories resulting in complete coverage of the entirety of the cultural inventory area. The sequence of work included approximately 5,476 acres of inventory between 1972-2017 (less 160 acres of private land) followed by a large 12,963-acre survey in 2018 which completed the study of the entire Thacker Pass Project cultural inventory area (Table 1). During the most recent iteration of work, Young et al. (2018) summarized all previous cultural resource documentation and evaluations for the 18,686-acre cultural inventory area and generated a full accounting of cultural resource sites and historic properties. Based on the compilation past and current Class III inventory results, 968 prehistoric and historic-era cultural resources (not including categorically ineligible isolated finds) have been documented and evaluated for inclusion on the NRHP (Young et al. 2018: 152). The vast majority of the resources are prehistoric sites comprised of obsidian debitage scatters indicative of local toolstone assay within the Double H/Whitehorse Obsidian Procurement District, a NRHP-eligible district (Berg et al. 2009; McCabe et al. 2012). Other prehistoric sites include assemblages with a relatively small number of flaked and/or ground stone tools evincing a diversity of activity beyond toolstone acquisition. The historic-era resources are mostly comprised of sites related to homesteading/ranching, transportation, or mid-nineteenth-century work by the Civilian Conservation Corps.

Of all the sites documented and evaluated in the 18,686-acre cultural inventory area, 39 are recommended eligible, or were previously determined eligible, for listing on the NRHP (Table 2). Thirty-four of these are NRHP-eligible prehistoric resources recommended or determined eligible under Criterion D, four sites are NRHP-eligible historic-era resources recommended or determined eligible under Criteria A and/or D, and one multi-component resource contains historic-era and prehistoric components each recommended NRHP-eligible under Criterion D. All 35 of the resources with NRHP-eligible prehistoric components are also eligible as contributing elements to the Double H/Whitehorse Obsidian Procurement District; the other prehistoric assemblages are considered non-contributing to the eligibility of the Double H/Whitehorse Obsidian Procurement District.

CULTURAL SUMMARY

THACKER PASS - LITHIUM NEVADA

TABLE 1

Previous Inventories in the Thacker Pass Project Area – 18,686 Acres		
AGENCY NO. (CR2-)	***DATE***	***TITLE***
0060	1972	Archaeological Reconnaissance of the Black Rock Desert
0131	1977	USGS Geothermal Notice of Intent #N2-20-77
0215	1978	Thacker Pass Fenceline
0588	1981	Trout Well Pipeline Extension and Troughs
0592	1981	Crowley Short Fence
0641	1981	Conoco Assessment Work, Notice of Intent Mining Clearance.
0937	1984	Crowley Creek Hydrostudy Maintenance
1263	1996	Pole Creek Pipeline Extension
1265	1996	Twin Springs
1280	1996	Double H Water Development Project
1282	-	(no info)
1298	1997	Middle Lyle Creek Division Fence
1429	2001	Double H Fire Rehab Class II
1430	2001	Double H Fire Rehab Class III
1443	2002	A Class III Cultural Resources Inventory for the Proposed Phase IV of Oregon-Idaho Utilities Communication = System, Northern Humboldt County, Nevada
1454	2001	Winnemucca Green Strips Groups II and III, Humboldt County
1484	2002	Class III Cultural Resources Inventory of the Buffalo and Thacker Pass Greenstrips Project 2002, Humboldt County, Nevada
1519	2004	Sentinel Fire Rehabilitation
1561	2006	Sentinel Rock Pit
1578	2007	Sentinel Rock Diversion Ditch Road Improvements
2264	1988	Bengoa Pipeline
2274	-	(no info)
2313	1989	Bengoa Pipeline Extension
2337	1989	Four Potential Material Pits in the Vicinity of Orovada, Humboldt County, Nevada
2433	1993	Archaeological Survey of SR 293 Kings River Road from Orovada to Kings River Valley (SR 293 HU 00.00 to 23.99). NDOT report no. HU86-078R.
2971	2007	A Cultural Resources Inventory of Drill Pads and Associated Access Routes for Proposed Lithium Exploration, Thacker Pass, Humboldt County, Nevada
3003	2008	A Class III Cultural Resources Inventory of 1,230 Acres for the Western Energy Development Corporation Thacker Pass Lithium Exploration Project, Humboldt County, Nevada
3122	2011	A Class III Cultural Resource Inventory of the Kings Valley Lithium Project Expansion, Humboldt County, Nevada
3135	2011	Class III Cultural Resource Inventory for the Montana Mountains Fuel Project, Humboldt County, Nevada
3157	2012	A Class III Inventory of a 2,256-Acre Parcel for Western Lithium's Kings Valley Lithium Project, Humboldt County, Nevada
3196	2012	A Cultural Resources Inventory of 5,192 Acres for the Montana Mountains Cooperative Fuels Treatment, Humboldt County, Nevada
3283	2015	A Class III Cultural Resources Inventory of 2,280 Acres for the Montana Mountains Sagebrush Ecosystem Restoration Project, Humboldt County, Nevada
3337	2016	A Class III Inventory of the Quinn River Valley Water Well Notice, Humboldt County
3377	2017	Class III Cultural Resource Inventory of 500 Acres for the Montana Mountain Fire Sagebrush Ecosystem Restoration Project, Humboldt County, Nevada

CULTURAL SUMMARY

THACKER PASS - LITHIUM NEVADA

TABLE 2

Historic Properties of the Thacker Pass Project Area – 18,686 Acres				
BLM NO. (CRNV-02-)	***COMPONENT***	***SITE TYPE***	***ELIGIBILITY CRITERION***	***OBSIDION DISTRICT CONTRIBUTING***
1216	Prehistoric	SFSA	D	Y
1220	Historic	CCC dump	A, D	N
1226	Prehistoric	SFSA	D	Y
5412	Prehistoric	CHA	D	Y
5414	Historic	CCC wash house	A	N
7313	Prehistoric	CFSA	D	Y
7315	Prehistoric	CFSA	D	Y
7318	Prehistoric	SFSA	D	Y
8594	Prehistoric	SFSA	D	Y
8595	Prehistoric	SFSA	D	Y
8596	Prehistoric	SFSA	D	Y
8615	Prehistoric	SFSA	D	Y
8645	Prehistoric	SFSA	D	Y
10025	Prehistoric	SHA	D	Y
10027	Prehistoric	SHA	D	Y
10141	Historic	CCC camp	A	N
10145	Historic	Lamb Homestead	D	N
10176	Prehistoric	Rock Features/SFSA	D	Y
10195	Prehistoric	SFSA	D	Y
10201	Prehistoric	SFSA	D	Y
10250	Prehistoric	SHA	D	Y
10289	Prehistoric	SFSA	D	Y
10293	Prehistoric	CFSA	D	Y
10355	Prehistoric	SFSA	D	Y
10409	Prehistoric	SFSA	D	Y
10637	Prehistoric	SFSA	D	Y
10705	Prehistoric	SHA	D	Y
	Historic	Jump Homestead	D	N
10745	Prehistoric	SFSA	D	Y
10769	Prehistoric	SFSA	D	Y
10798	Prehistoric	SFSA	D	Y
10799	Prehistoric	SFSA	D	Y
10811	Prehistoric	CFSA	D	Y
10813	Prehistoric	SHA	D	Y
10816	Prehistoric	CFSA	D	Y
11544	Prehistoric	SHA	D	Y
11546	Prehistoric	SHA	D	Y
11568	Prehistoric	SHA	D	Y
13080	Prehistoric	SHA	D	Y
13357	Prehistoric	SFSA	D	Y

Notes: BLM – Bureau of Land Management
CCC – Civilian Conservation Corps
CFSA – Complex Flaked Stone Assemblage
SFSA – Simple Flaked Stone Assemblage
CHA – Complex Habitation Assemblage
SHA – Simple Habitation Assemblage

REFERENCES CITED

Berg, A., P. Barker, and K. Manske. 2009. A Class III Cultural Resources Inventory of 1,230 Acres for the Western Energy Development Corporation, Thacker Pass Lithium Exploration Project, Humboldt County, Nevada. ASM Affiliates, Reno, Nevada. Submitted to Winnemucca District Office of the BLM, Winnemucca, Nevada.

Bureau of Land Management (BLM). 2012. Guidelines and Standard for Archaeological Inventory. Fifth Edition, January 2012. United States Department of the Interior Bureau of Land Management Nevada State Office.

Bureau of Land Management (BLM). 2014. State Protocol Agreement between the Bureau of Land Management, Nevada, and the Nevada State Historic Preservation Officer for Implementing the National Historic Preservation Act. Revised December 22, 2014. BLM Nevada State Office, Reno.

McCabe, A., S. Neidig, S. Rice, and D. C. Young. 2012. A Class III Inventory of a 2,256-Acre Parcel for Western Lithium's Kings Valley Lithium Project, Humboldt County, Nevada. Far Western Anthropological Research Group, Inc., Carson City, Nevada. Submitted to Winnemucca District Office of the BLM, Winnemucca, Nevada.

Young, D. Craig, Albert Garner, Jerome King, Erik Martin, Allen McCabe, Eric Obermayr, and Sharon Waechter. 2018. DRAFT Class III Inventory of 12,963 Acres for Lithium Nevada's Thacker Pass Project, Humboldt County, Nevada. Far Western Anthropological Research Group, Inc., Carson City, Nevada. Submitted to Winnemucca District Office of the BLM, Winnemucca, Nevada.

Environmental Justice Summary

THACKER PASS - LITHIUM NEVADA

Environmental Justice

Environmental justice concerns the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (BLM Land Use Planning Handbook).

The Area of Analysis for Environmental Justice consists of Humboldt County and includes the city of Winnemucca and the census designated places (CDP) of Orovada and McDermitt, which are the primary geographic areas likely to experience direct or indirect social or economic effects from the proposed action and alternatives.

US EPA suggests a screening process to identify environmental justice concerns. The two-step process includes:

- *Does the potentially affected community include minority or low-income populations?*
- *Are the environmental impacts likely to fall disproportionately on minority or low-income members of the community?*

Data to describe existing conditions within Humboldt County and City of Winnemucca were obtained through the USEPA's EJSCREEN online mapping tool, and through the Headwaters Economics online Economic Profile System (EPS).

- *EPS data is utilized to characterize baseline EJ populations within the state of Nevada ; and*
- *EJSCREEN summarizes U.S. Census Bureau 2013-2017 American Community Survey Data to characterize the demographic indicators of the populations within the areas of analysis*

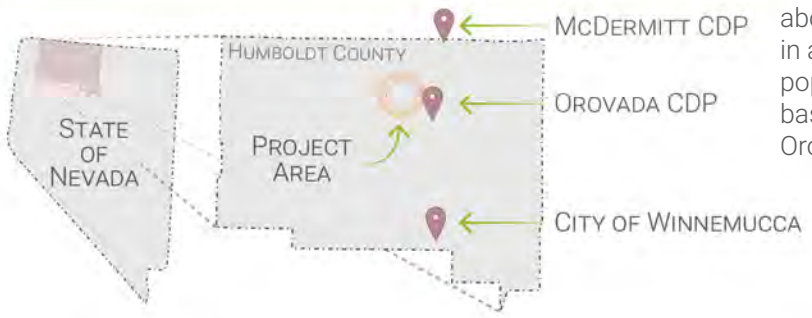
EJ Populations

EJ Populations are present within the area of analysis when demographic data either:

- *Exceeds 50 percent; or*
- *is ten percentage points or more above the reference population*

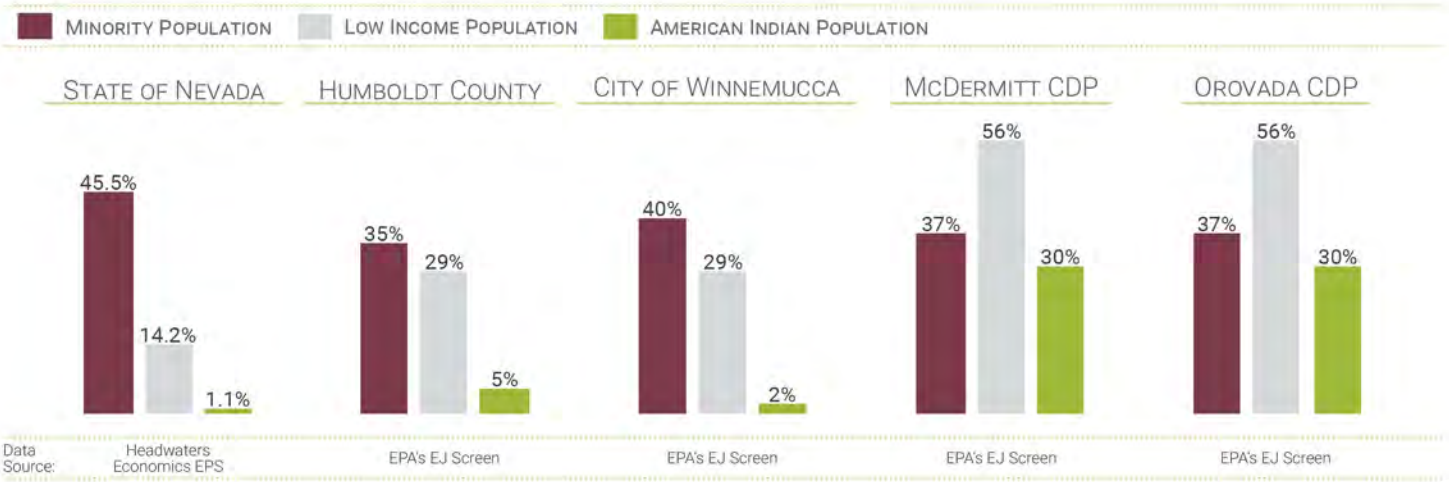
There are no minority populations within the area of analysis. Low income populations are elevated above the state of Nevada baseline populations in all geographic areas analyzed. American Indian populations are elevated above the state of Nevada baseline populations within the McDermitt CDP and Orovada CDP.

Areas of Analysis



Environmental Justice Indicators

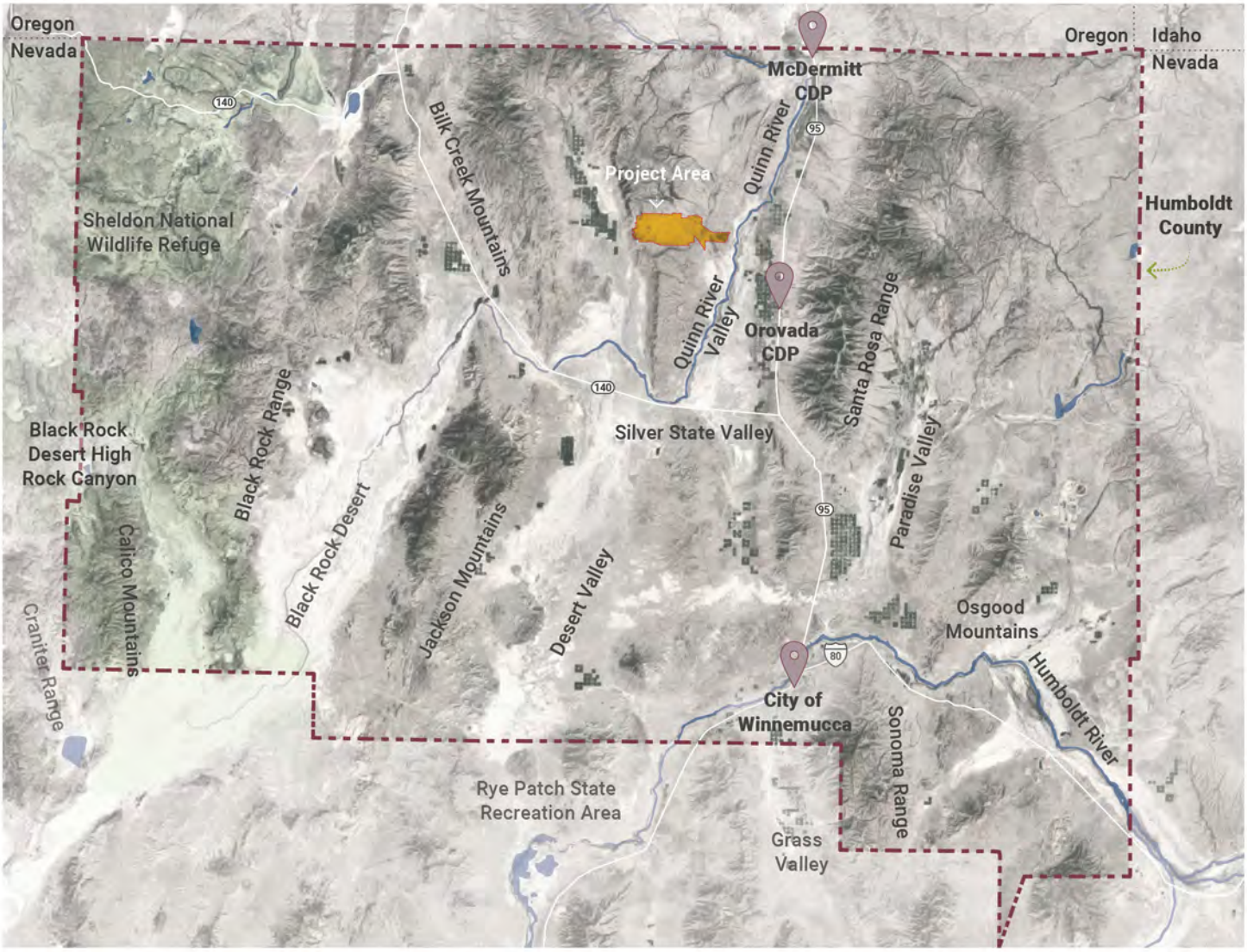
*Note: Updated information regarding Environmental Justice Indicators is presented in FEIS Section G.1.11.



Environmental Justice Summary

Thacker Pass - Lithium Nevada

Figure 1



Area of Analysis of Environmental Justice Summary

Project Area

0 7.5 15 22.5 30 Miles

N

THACKER PASS - LITHIUM NEVADA

EXISTING CONDITIONS

Physiographic and Topographic Setting

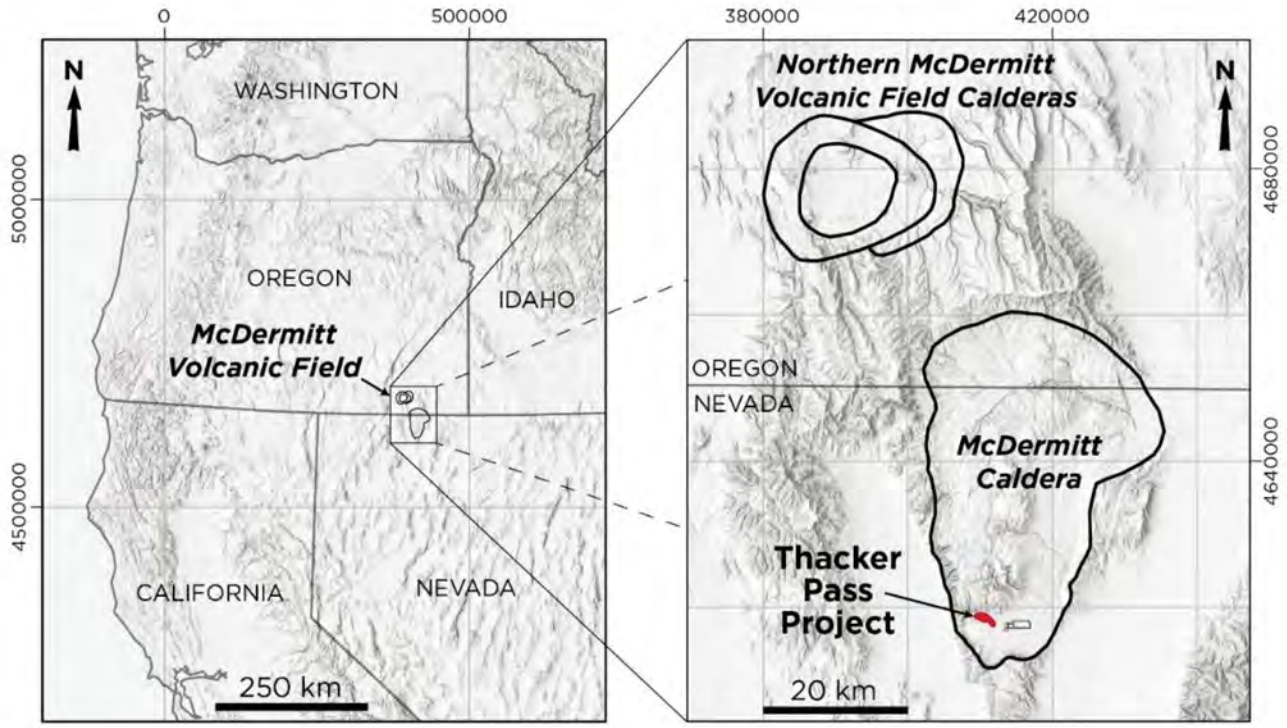
The Proposed Action is located in north-central Nevada at the northern end of the Basin and Range tectonic province. This province stretches from southern Oregon to Mexico and is characterized by a series of extension-related normal faults trending roughly north-south resulting in a repetitive series of mountain ranges separated by valleys. The Thacker Pass Project area is bounded to the north by the Montana Mountains; to the south by the Double H Mountains; to the west by the Kings River Valley; and to the east by the Quinn River Valley.

Site Geology

The Thacker Pass Project is located within McDermitt Volcanic Field (Figure 1), a volcanic complex containing four large calderas (or "supervolcanoes") that formed in the middle Miocene. Volcanic activity in the McDermitt Volcanic Field was contemporaneous with voluminous effusion of the earliest stages of the ~16.6 – 15 Ma Columbia River flood basalt lavas of Oregon, Nevada, Idaho, and Washington associated with impingement of the Yellowstone plume head (Coble and Mahood, 2012; Benson et al., 2017a). Plume head expansion underneath the lithosphere resulted in crustal melting and surficial volcanism along four distinct radial swarms (Benson et al., 2017a). The McDermitt Volcanic Field is located within the southeastern-propagating swarm of volcanism from Steens Mountain into north-central Nevada. The Thacker Pass Project is located within the largest and southeasternmost caldera of the McDermitt Volcanic Field, the McDermitt Caldera.

Figure 1

MAPS SHOWING THE LOCATION OF THE MCDERMITT VOLCANIC FIELD, MCDERMITT CALDERA, AND THACKER PASS PROJECT



GEOLOGY & MINERALS SUMMARY

THACKER PASS - LITHIUM NEVADA

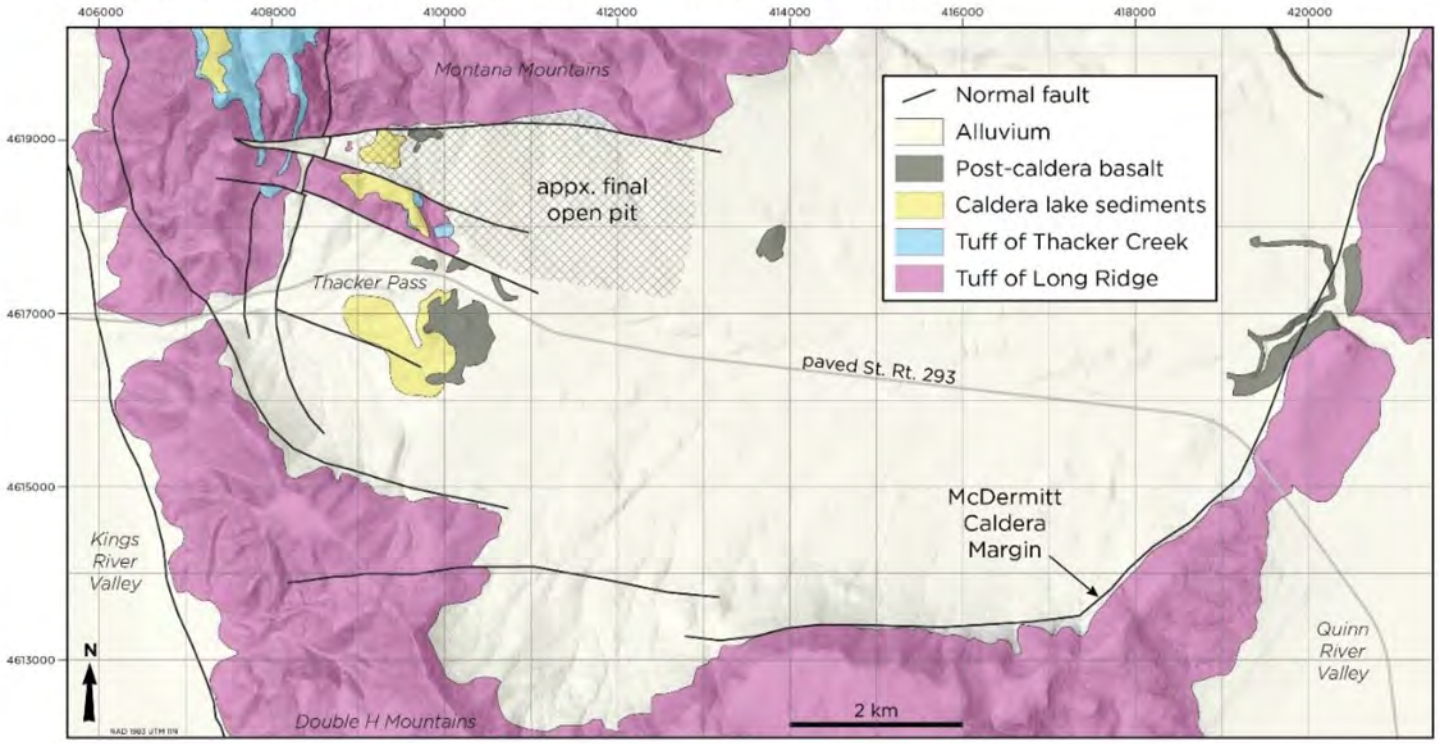
The ~30 x 45 km keyhole-shaped McDermitt Caldera formed on eruption of the trachytic to rhyolitic Tuff of Long Ridge at ~16.33 Ma. Rytuba and McKee (1984) and Conrad (1984) initially interpreted the McDermitt Caldera as a composite collapse structure formed on piecewise eruption of four different ignimbrites from a single magma chamber. Recently, Henry et al. (2017) refined the stratigraphy to a singular ignimbrite they call the McDermitt Tuff (herein called the Tuff of Long Ridge to avoid confusion). Regional reconnaissance work by Benson et al. (2017a) indicates that there was one large laterally-extensive and crystal-poor (<3 % feldspar) caldera-forming eruption (Tuff of Long Ridge), though other smaller-volume tuffs are exposed close to the vent and their eruptions and concomitant collapses may have contributed to the peculiar shape of the caldera. An estimated ~500 km3 of ignimbrite ponded within the caldera during the eruption, with ~500 km3 spreading out across the horizon up to 60 km from the caldera (Benson et al., 2017a).

Prior to collapse of the McDermitt Caldera at 16.33 Ma, volcanism in the northern portion of the McDermitt Volcanic Field and locally small volumes of lavas erupted near the present-day Oregon-Nevada border. These lavas and the flood basalts are exposed along walls of the McDermitt Caldera and are ~16.5 Ma to ~16.3 Ma years old (Benson et al., 2017a; Henry et al., 2017). One of these lavas is a metaluminous biotite-bearing rhyolite lava just west of the caldera that is the host for uranium mineralization of the Moonlight Mine.

Following eruption of the Tuff of Long Ridge, the newly-identified crystal-rich (~15% feldspar and quartz) Tuff of Thacker Creek erupted along the western ring fracture zone of the McDermitt Caldera (Figure 2). The vents for this relatively small eruption are spectacularly exposed along Thacker Creek, where two approximately 20-meter-wide tuff dikes crosscut the intracaldera facies of the Tuff of Long Ridge. From this vent area, the Tuff of Thacker Creek mostly flowed north atop intracaldera Tuff of Long Ridge, though a small volume flowed south into the caldera basin. The magmatic resurgence associated with this eruption resulted in a series of small (~50 m maximum offset) normal faults radiating out from the vent area.

FIGURE 2

GEOLOGICAL MAP OF THE THACKER PASS PROJECT, NORTH-CENTRAL NEVADA



THACKER PASS - LITHIUM NEVADA

Following these eruptions, a large lake formed in the caldera basin. Associated caldera lake sediments that host the Thacker Pass deposit were deposited on top of the horsts and grabens formed during the faulting associated with the Tuff of Thacker Creek. The lake captured sediments that were eroded from the surrounding drainage areas. Though no ash layers have been dated within the associated lacustrine sediments, it is estimated that sedimentation was active for ~100,000 years given that nearby Miocene caldera lakes lasted approximately this long (Coble and Mahood, 2012; Benson et al., 2017a).

Contemporaneous with caldera lake sedimentation, minor-volume icelanditic, rhyolitic, and basaltic lavas erupted from small vents throughout the McDermitt caldera (Henry et al., 2017). Thin basaltic lava flows are intercalated with caldera lake sediments in drill cores and show evidence for interaction with wet sediments, suggesting that caldera lake sedimentation occurred for the duration of post-caldera volcanism.

Mineralogy and Mineralization

Lithium mineralization in the Thacker Pass Project is entirely contained within the lacustrine sediments of the McDermitt Caldera. These sediments are partially exposed at the surface, though occurs largely beneath alluvial cover at Thacker Pass. The sedimentary section, which has a maximum drilled thickness of about 160 m, consists of alternating layers of claystone and volcanic ash with sparse interbedded basaltic lava flows. The claystone comprises 40% to 90% of the section. In many intervals, the claystone and ash are intimately intermixed. The claystones are variably brown, tan, gray, bluish-gray and black whereas the ash is generally white or very light gray. Individual claystone-rich units may be recognized over lateral distances of more than 152 m although unit thickness can vary by as much as 20%. Ash-rich layers are more variable and appear to have some textures that suggest reworking. All units exhibit finely-graded bedding and laminar textures that imply a shallow lacustrine depositional environment.

Surficial oxidation persists to depths of 15 m to 30 m in the moat sedimentary rock. Oxidized claystone is brown, tan, or light greenish-tan and contains iron oxide, whereas the ash is white with some orange- brown iron oxide. The transition from oxidized to unoxidized rock occurs over intervals as much as 4.5 m thick.

The moat sedimentary section at Thacker Pass overlies intracaldera Tuff of Long Ridge. A zone of weakly to strongly silicified sedimentary rock, the Hot Pond Zone (HPZ), occurs at the base of the sedimentary section above the Tuff of Long Ridge in most of the cores retrieved from the Thacker Pass deposit. Both the HPZ and the underlying Tuff of Long Ridge are generally oxidized.

Most of the moat sedimentary rocks drilled in the Thacker Pass basin contain high lithium contents (> 100 ppm). Intervals that consist mostly of ash have lithium contents of less than 800 ppm whereas intervals dominated by claystone contain more lithium (>1,000 ppm). Many intervals have very high lithium contents (>4,000 ppm). Intervals with extreme lithium contents (>8,000 ppm) occur locally.

There is no change in lithium content across the boundary between oxidized and unoxidized rock; however, the highest lithium grades generally occur in the middle and lower parts of the sedimentary rock section.

The lithium content of the Thacker Pass deposit claystone can generally be predicted by the color and texture of the rock, as well as the amount of admixed ash. Intervals with the highest lithium grades (>4,000 ppm) generally contain gray to dark-gray or black claystone with less than 10% ash. Intervals of bluish-gray claystone with low ash content have moderate lithium content (generally 2,500 to 3,000 ppm). Intervals of light-colored claystone (e.g., tan, light gray, greenish-tan) have lower lithium grades (generally 1,500 to 2,500 ppm). Intervals of mixed claystone and ash are common and have variable lithium contents (generally 1,500 to 3,000 ppm) depending on the type of claystone and proportion of ash present.

Clay in the Thacker Pass lithium deposit includes two distinctly different types on the basis of chemistry and X-ray diffraction (XRD) spectra. Clay with XRD spectra that are indicative of smectite occurs at relatively shallow depths in the deposit (Figure 3). An illite-type clay occurs at moderate to deep depths in the moat sedimentary section and locally occurs in intervals that contain as much as 8,000 ppm lithium, higher than any analyzed hectorite. A relatively thin layer of mixed smectite-illite clay is found between the smectite and illite-type clay.

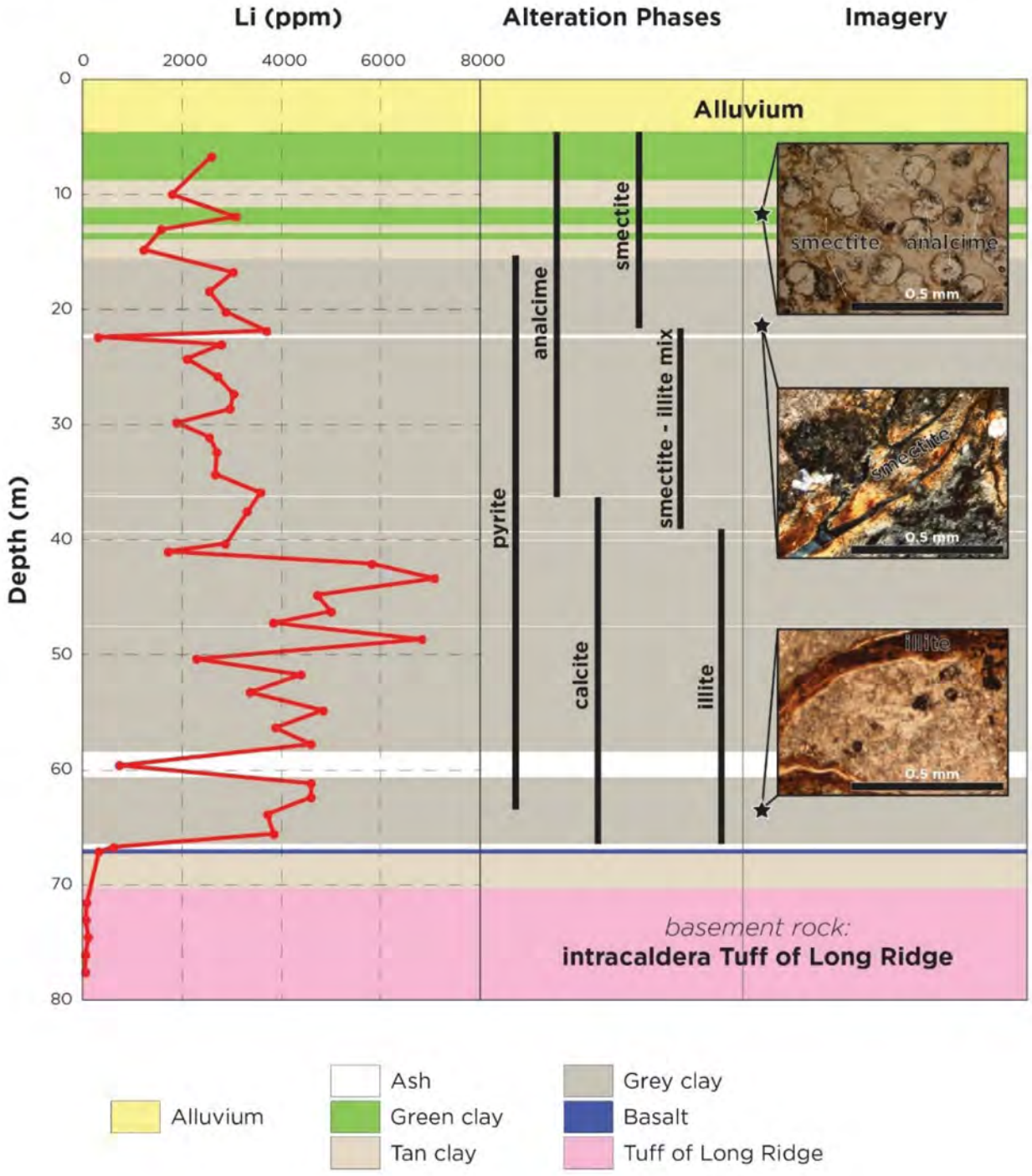
Other minerals in the Thacker Pass deposit claystone include calcite, quartz, K-feldspar, plagioclase, dolomite, and fluorite. Pyrite and bitumen occur in the claystone below near-surface oxidized rock. Ash beds in the Thacker Pass deposit contain quartz and feldspar with local analcime, and minor clay and pyrite. Zeolite minerals are typically present in the north part of the caldera, but analcime is the only zeolite present in the Thacker Pass Deposit.

GEOLOGY & MINERALS SUMMARY

THACKER PASS - LITHIUM NEVADA

FIGURE 3

ASSAY RESULTS, MINERALOGY, AND SIMPLIFIED GEOLOGICAL LOG FOR HOLE WLC-048 OF THE THACKER PASS LITHIUM DEPOSIT, NORTHERN NEVADA



GEOLOGY & MINERALS SUMMARY

THACKER PASS - LITHIUM NEVADA

Faulting and Seismicity

Aside from caldera-related faults, the only major faults near the Thacker Pass Project are associated with Basin and Range extension. These faults began to form around 12 Ma, when the North American lithosphere began its extension in this area (Colgan et al., 2006; Lerch et al., 2008). Faulting was accommodated along reactivated ring fractures of the western McDermitt Caldera and the minor intra-caldera normal faults associated with the Tuff of Thacker Creek. This uplift sped up the weathering and erosion of rocks within the caldera, especially the relatively soft Li-enriched caldera lake sediments atop the topographically high resurgent dome in the Montana Mountains.

No significant modern seismic activity has been recorded near the Thacker Pass Project.

Paleontology

Lacustrine sediments within the McDermitt Caldera are not ideal for paleontological occurrences. During the formation of the Caldera, fauna would not have been drawn to the area due to volcanic activity. In addition, the historic waters of the caldera lake would have presumed been too acidic for mammalian or reptilian preferred consumption. No significant fauna fossils have been found within the caldera lake sediments of the McDermitt Caldera. The surrounding caldera rim volcanic materials are not likely to have preserved a paleontological record. Throughout geological drilling of the Thacker Pass Project, occasional flora fossils in the form of deciduous plant debris (from probable wind blown) have, on occasion, been identified in geological core samples.

Utilizing the BLM Winnemucca District Office paleontological data base and the Potential Fossil Yield Classification (PFYC) System, the it has determined that the project is located in lacustrine sediments and falls within a Class 2 area with "Low" potential for paleontology (not likely to contain paleontological resources). The surrounding volcanics are located in a Class 1 area with "Very Low" potential for paleongology (geological units that are not likely to contain recognizable paleontological resources).

REFERENCES CITED

Benson, T. R., Mahood, G. A., & Grove, M. (2017a). Geology and 40Ar/39Ar geochronology of the middle Miocene McDermitt volcanic field, Oregon and Nevada: Silicic volcanism associated with propagating flood basalt dikes at initiation of the Yellowstone hotspot. Geological Society of America Bulletin, 1–25.

Benson, T. R., Coble, M. A., Rytuba, J. J., & Mahood, G. A. (2017b). Lithium enrichment in intracontinental rhyolite magmas leads to Li deposits in caldera basins. Nature Communications, 8(1).

Coble, M. A., & Mahood, G. A. (2012). Initial impingement of the Yellowstone plume located by widespread silicic volcanism contemporaneous with Columbia River flood basalts. Geology, 40(7), 655–658.

Colgan, J. P., Dumitru, T. a., McWilliams, M., & Miller, E. L. (2006). Timing of Cenozoic volcanism and Basin and Range extension in northwestern Nevada: New constraints from the northern Pine Forest Range. Geological Society of America Bulletin, 118(1–2), 126–139.

Conrad, W. K. (1984). The mineralogy and petrology of compositionally zoned ash flow tuffs, and related silicic volcanic rocks, from the McDermitt Caldera Complex, Nevada-Oregon. Journal of Geophysical Research, 89(B10), 8639–8664.

Henry, C. D., Castor, S. B., Starkel, W. A., Ellis, B. S., Wolff, J. A., Laravie, J. A., … Heizler, M. T. (2017). Geology and evolution of the McDermitt caldera, northern Nevada and southeastern Oregon, western USA. Geosphere, 13(4), 1–47.

Lerch, D. W., Miller, E., McWilliams, M., & Colgan, J. (2008). Tectonic and magmatic evolution of the northwestern Basin and Range and its transition to unextended volcanic plateaus: Black Rock Range, Nevada. Geological Society of America Bulletin, 120(3–4), 300–311.

Rytuba, J. J., & McKee, E. H. (1984). Peralkaline Ash Flow Tuffs and Calderas of the McDermitt Volcanic Field, Southeast Oregon and North Central Nevada. Journal of Geophysical Research, 89, 8616–8628.

LAND USE SUMMARY

THACKER PASS - LITHIUM NEVADA

LANDS & REALTY

Land uses within and adjacent to the area of analysis include mining and mineral exploration, livestock grazing, recreation, and wildlife habitat.

LAND OWNERSHIP

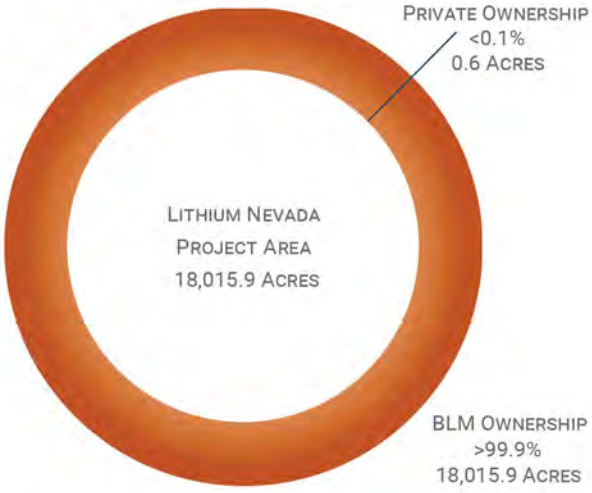
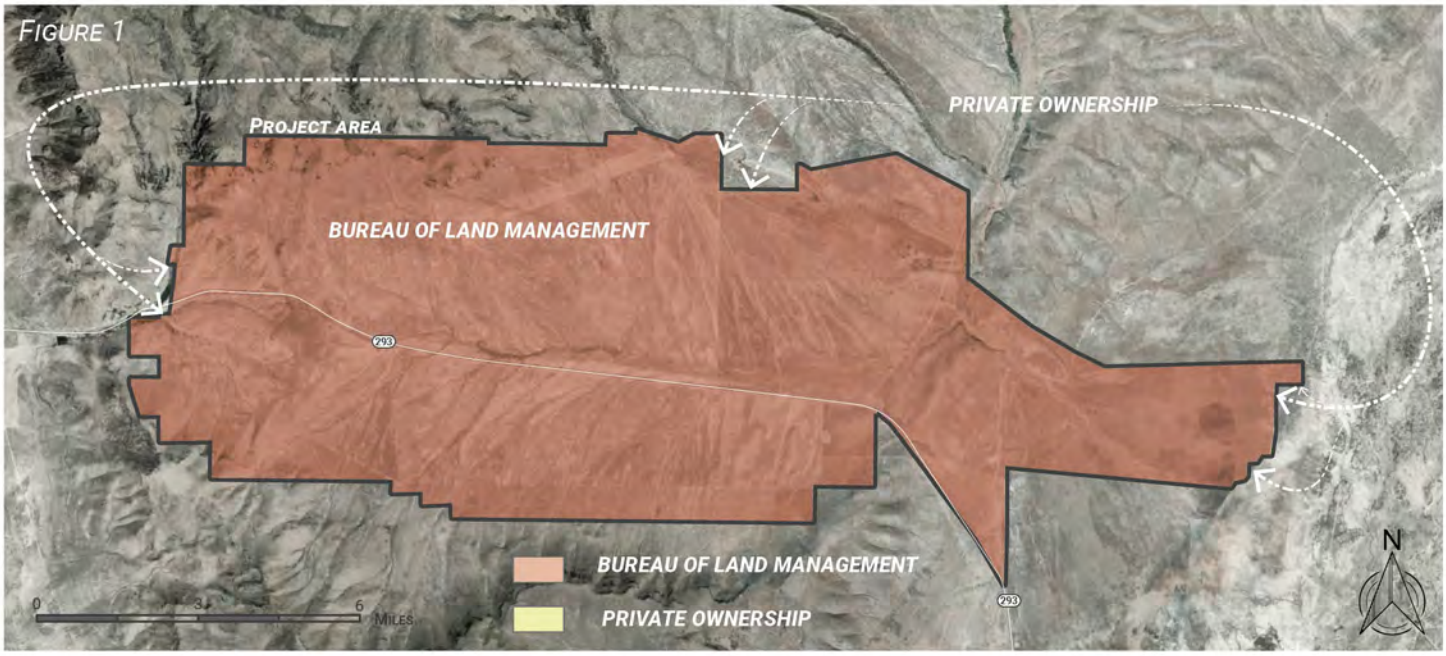


TABLE 1

ADMINISTRATIVE LAND USE AUTHORIZATIONS WITHIN OR IMMEDIATELY ADJACENT TO THE STUDY AREA		
SERIAL NUMBER	**TYPE OF AUTHORIZATION**	**ACRES**
NVN 002695	NDOT MATERIAL SITE	160.0
NVN 002773	FEDERAL HIGHWAY	752.7
NVN 060463	TELECOM RIGHT OF WAY	680.0
NVN 085255	SURFACE EXPLORATION PLAN	75.0
NVN 089149	LYMAN YOUNGBERG WATER PIPELINE	2.4
NVN 060463	SURFACE MINE PLAN	114.0
NVN 093578	FREE USE - GOVERNMENT	5.0
NVN 094328	COMMUNITY PIT	5.1
NVN 094355	NEGOTIATED SALES	5.0
NVN 094510	SURFACE MINING NOI	3.5
NVN 095388	SURFACE MINING NOI	4.7
NVN 095396	SURFACE MINING NOI	1.5
NVN 095618	TRANSMISSION LINE	254.9
NVN 096592	SURFACE MINING NOI	0.2
NVN 096620	NEGOTIATED SALES	4.3
NVN 097372	NEGOTIATED SALES	4.3
EXISTING BLM LAND USE AUTHORIZATIONS OR ROWS WITHIN OR ADJACENT TO THE STUDY AREA		

LAND OWNERSHIP

FIGURE 1



LAND USE SUMMARY

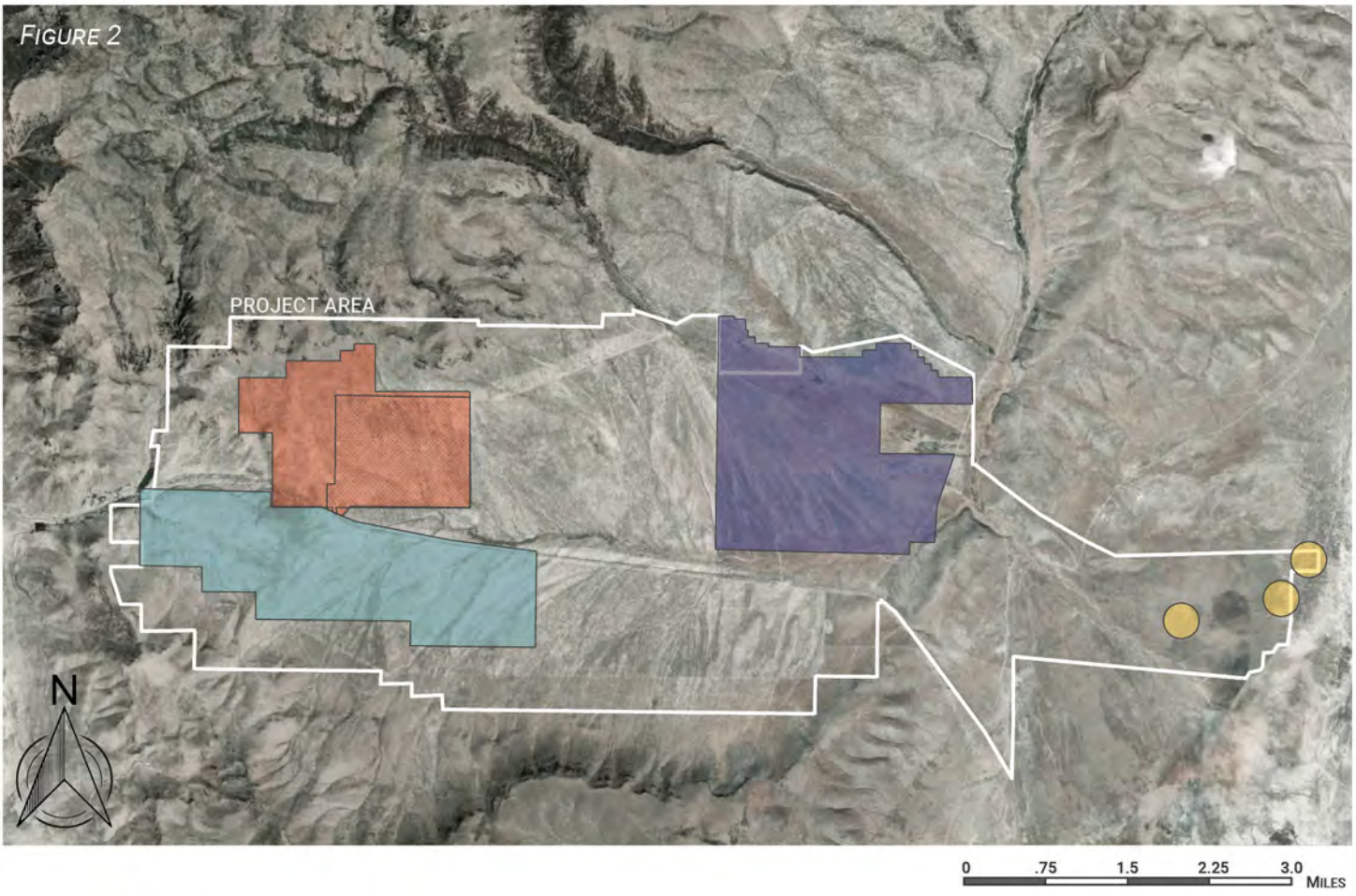
THACKER PASS - LITHIUM NEVADA

Mining & Mineral Exploration

Lithium Nevada has 5 existing authorizations.

- *Kings Valley Clay Mine Plan of Operations*
- *Kings Valley Lithium Exploration Plan of Operations*
- *293 South Notice of Intent*
- *Far East Notice of Intent*
- *Quinn River Notice of Intent*

MINE OWNERSHIP



NOISE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

ACOUSTIC FUNDAMENTALS

Sound is measured in units of decibels (dB). Within the usual range of environmental noise levels, loudness can be approximated by A-weighted sound levels. A-weighting refers to an adjustment technique that simulates human perception of sound. There is a strong correlation between A-weighted sound levels (expressed as dBA) and the way the human ear perceives sound.

The decibel scale is logarithmic, not linear. In other words, two sound levels 10 dB apart differ in acoustic energy by a factor of 10. When the standard logarithmic decibel is A-weighted, an increase of 10 dBA is generally perceived as a doubling in loudness. For example, a 70 dBA sound is half as loud as an 80 dBA sound, and twice as loud as a 60 dBA sound.

A common statistical tool to measure noise levels is the average, or equivalent, sound level (Leq), which corresponds to a steady-state A-weighted sound level containing the same total energy as a time varying signal over a given time period (usually one hour). The L(n) is the sound level exceeding a described percentile over a measurement period. For instance, an hourly L50 is the sound level exceeded 50 percent of the time during the measurement period. The L90 is the sound level exceeded 90 percent of the time during the noise measurement period.

Examples of the Noise Levels Associated with Common Noise Sources are the following :

[1] SOURCE: CALTRANS, TECHNICAL NOISE SUPPLEMENT, TRAFFIC NOISE ANALYSIS PROTOCOL. SEPTEMBER 2013.

STUDY AREA AND RECEPTORS

Noise monitoring was conducted for the purpose of characterizing baseline noise levels near Greater sage-grouse leks. Four leks within 5 kilometers of the proposed Project boundary were chosen as locations to conduct noise monitoring. These leks are referred to as the Crowley Lek, Montana Lek, Pole Creek Lek, and Thacker Creek Lek. Noise levels near each lek were measured by 2 monitors per lek for 24 hours per day, from May 2 to June 12, 2018. The average number of hours recorded per location was 607 hours (25 days).

The lek sites are located north of the Project area in the Montana mountains. The leks are remote and often situated in exposed areas in low sagebrush vegetation communities, such as on a hillside or plateau summits.

CURRENT SOURCES OF NOISE

Natural sounds, including wind, insects, song birds, and sage-grouse vocalizations, were notable sources of noise throughout the monitoring sites. Aircraft overflights were also noted in the noise recordings. Variations in wind speeds, in particular, can have a dramatic effect on noise levels. Livestock activity, especially near Crowley Creek, was observed during noise monitor placement though noise levels from livestock did not appear to affect noise recordings.

NOISE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

NOISE MONITORING RESULTS

The lek noise monitoring data was corrected for instrumentation noise floor, and reported for three time periods: during Greater sage-grouse lekking hours (4:00 a.m. to 9:00 a.m.), night time (6:00 p.m. to 10:00 a.m.), and all hours (0000 – 2400). Statistical summaries of each time period are shown in Tables 1.

All sites exhibited typical daily patterns, with lower sound levels during evening and early morning hours, and elevated levels during daytime hours. Peaks in sound levels between 0400 and 0700 were likely sounds of Greater sage-grouse display. There was generally little variation in noise levels between monitoring sites. Up to a 10-fold difference was recorded in maximum baseline noise measurements during lekking hours between the Montana lek (exhibiting some of the loudest noise levels), and Pole Creek lek (exhibiting the lowest noise levels).

The mean baseline sound level for all four locations, using the Leq metric, all hours (0000-2400), was 32 dBA. "Ambient" noise levels, defined by NDOW as sound levels in the absence of anthropogenic influence, approximated (according to NDOW) by L90, averaged 15.6 dBA for all hours of the day, and 13.3 dBA during lekking hours.

Noise Level Measurement Key

Leq	is the average sound level or "equivalent continuous sound level" over a period of time
L10	is the sound level that was exceeded 10% of the time during the measurement period
L50	is the sound level that was exceeded 50% of the time during the measurement period
L90	is the sound level that was exceeded 90% of the time during the measurement period
LMIN	is the minimum sound level measured
LMAX	is the maximum sound level measured

GREATER SAGE-GROUSE (GRSG) LEK LOCATIONS & STATUS

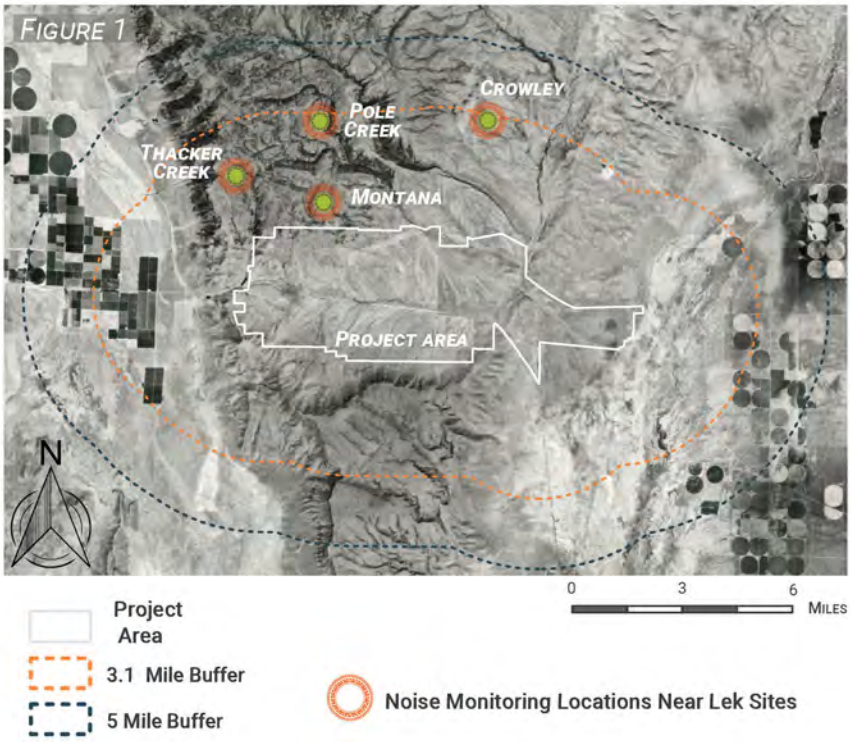


TABLE 1

BASELINE NOISE LEVELS							
TIME OF DAY	SITE	NOISE LEVEL MEASUREMENT (dBA)					
		Leq	L10	L50	L90	LMIN	LMAX
AVERAGE FOR ALL HOURS OF THE DAY	CROWLEY	32.2	34.2	25.7	19.1	11.8	53.9
	MONTANA	32.4	32.9	22.4	14.9	7.5	57.2
	POLE CREEK	31.0	33.6	21.9	13.1	5.3	52.9
	THACKER CREEK	31.9	32.9	22.1	15.4	9.7	56.0
DURING LEKKING HOURS (4:00 A.M. TO 9:00 A.M.)	CROWLEY	32.2	33.6	23.5	15.8	7.8	56.0
	MONTANA	36.1	35.7	23.6	14.3	5.4	61.1
	POLE CREEK	32.9	35.3	18.4	8.7	3.7	54.7
	THACKER CREEK	34.4	34.7	22.2	14.3	8.5	58.7
DURING NIGHT TIME (6:00 P.M. TO 10:00 A.M.)	CROWLEY	31.3	33.1	4.8	18.7	11.9	52.6
	MONTANA	30.8	31.3	21.0	13.4	7.2	55.1
	POLE CREEK	29.2	31.5	19.2	11.1	5.1	51.2
	THACKER CREEK	30.8	31.5	20.8	14.4	9.1	54.9

Paleo Resource Summary

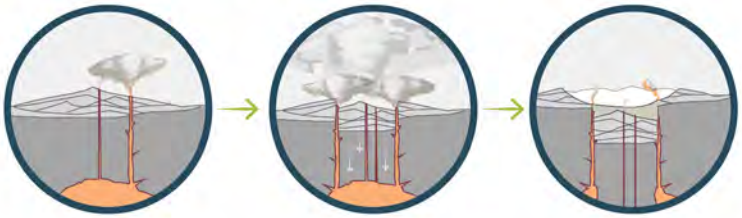
THACKER PASS - LITHIUM NEVADA

Paleo Resources

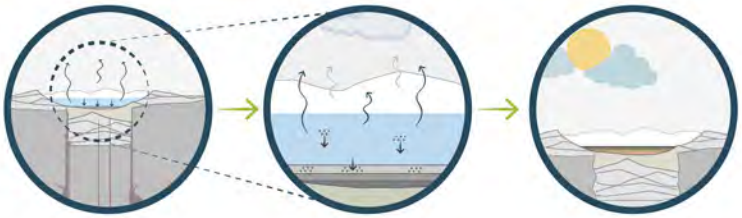
At the Thacker Pass Project site, the lithium deposits targeted for mining are hosted within lacustrine sedimentary geologic formations, a type of alluvial deposit, of the McDermitt Caldera. Lacustrine sediments within the McDermitt Caldera are not ideal for paleontological occurrences. During the formation of the Caldera, fauna would not have been drawn to the area due to volcanic activity. In addition, the historic waters of the caldera lake are presumed to have been too acidic for mammalian or reptilian preferred consumption. No significant fauna fossils have been found within the caldera lake sediments of the McDermitt Caldera. The surrounding caldera rim volcanic materials are not likely to have preserved a paleontological record. Throughout geological drilling of the Thacker Pass Project, occasional flora fossils in the form of deciduous plant debris (from probable wind blown) have, on occasion, been identified in geological core samples.

Utilizing the BLM Winnemucca District Office paleontological data base and the Potential Fossil Yield Classification (PFYC) System, it has determined that the project is located in lacustrine sediments and falls within a Class 2 area with "Low" potential for paleontology (not likely to contain paleontological resources). The surrounding volcanics are located in a Class 1 area with "Very Low" potential for paleontology (geological units that are not likely to contain recognizable paleontological resources)

McDermitt Caldera Formation



Lacustrine Sedimentary Geological Formation



POTENTIAL FOSSIL YIELD CLASSIFICATION (PFYC) SYSTEM

Class 1 – Very Low

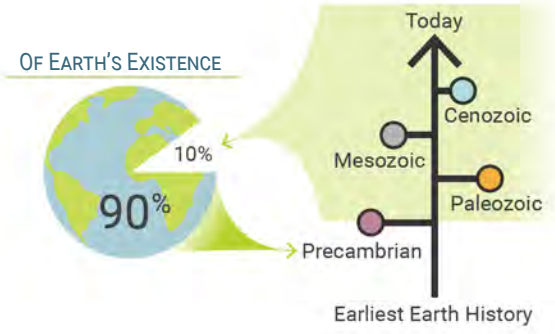
Geologic units that are not likely to contain recognizable paleontological resources. Units assigned to Class 1 typically have one or more of the following characteristics:

- *Geologic units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.*
- *Geologic Units are Pre*cambrian in age.

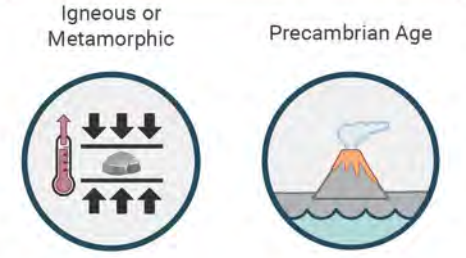
Class 2 – Low

Geologic units that are not likely to contain paleontological resources. Units assigned to Class 2 typically have one or more of the following characteristics:

- *Field surveys have verified that significant paleontological resources are not present or are very rare.*
- *Units are generally younger than 10,000 years before present.*
- *Recent aeolian deposits.*
- *Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely.*



Class 1 – Very Low



Class 2 – Low

RANGE RESOURCES SUMMARY

THACKER PASS - LITHIUM NEVADA

Federal Regulation

The BLM administers public land grazing in accordance with the Taylor Grazing Act of 1934, and currently manages public land in a manner aimed at achieving and maintaining rangeland health. The regulations require that the BLM manage livestock grazing on public lands under the principles of multiple use and sustained yield. To accomplish this, rangeland has been broken down into controllable land areas called allotments to manage both short- and long-term objectives for livestock grazing. Allotments are leased to permittees for a defined period of time. They are evaluated periodically by the BLM to determine whether management goals are being met. If an allotment is determined to not be meeting the standards, or making significant progress towards meeting the standards, for rangeland health, the BLM identifies opportunities and methods needed to improve rangeland health.

The BLM is also mandated by the Public Rangeland Improvement Act of 1978 to "manage, maintain and improve the condition of the rangelands so that they become as productive and feasible for all rangeland values in accordance with management objectives and the land use planning process (43 U.S.C. §1901)." The BLM administers livestock grazing through permits and leases, which authorize a certain amount of AUMs for a specific type of livestock during specific dates, and other related terms and conditions. An AUM is the amount of forage needed to sustain one cow, or its equivalent, for a period of one month AUMs can be permitted for other livestock types using an animal unit equivalents.

Existing conditions for rangeland resources within the Baseline Study are described below. Rangeland resources include forage availability and watering locations for livestock, locations of range improvements (e.g., wells, troughs, pipelines, fence lines), and the permitted livestock numbers grazing within allotments.

ANIMAL UNIT MONTH (AUM)

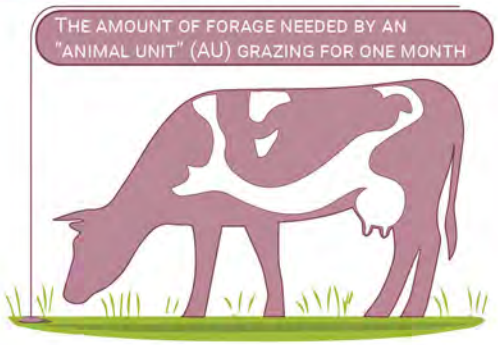
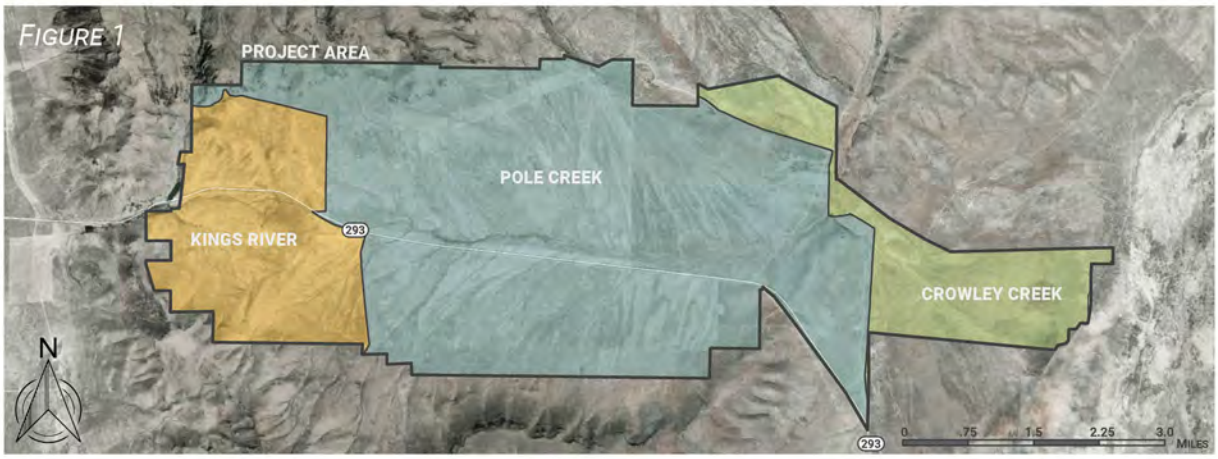


TABLE 1

ALLOTMENTS WITHIN THE PROJECT AREA				
Allotment	*Project Area Total Acres*	*Allotment Acres*	*Active AUMs*	*Number of Pastures*
Crowley Creek	2,419	50,463	3,424	9
Pole Creek	12,247	34,501	2,988	10
Kings River	3,342	79,195	12,192	13
TOTAL	**18,808**	**164,159**	**18,604**	-

GRAZING ALLOTMENTS

FIGURE 1



RECREATION SUMMARY

THACKER PASS - LITHIUM NEVADA

BLM Recreation Planning Process

BLM Manual 8320 and BLM Handbook H-8320-1 are designed to assist in the planning and management of recreation and visitor services on public lands and adjacent waters. BLM Manual 8320 states,

> *"the **BLM's recreation planning process is an outcome-focused management approach that stresses the management of recreation settings to provide opportunities that allow visitors and local communities to achieve a desired set of individual, social, economic and environmental benefits".***

BLM Manual 8320 and BLM Handbook H-8320-1 also provide direction and details on the Special Recreation Management Areas and Extensive Recreation Management Areas. Specific objectives within BLM Manual 8320 include (BLM, 2011):

- *"Provide for visitor safety, resource protection, and to address resource use conflicts"*
- *"Plan for recreation and visitor services on an interdisciplinary basis in concert with other resources or resource programs to facilitate visitors' freedom to pursue a variety of outdoor recreation activities and attain a variety of outcomes"*
- *"Emphasize recreation and visitor services by managing for specific recreation opportunities and settings on a sustained or enhanced long-term basis"*
- *"Improve the long-term management of recreation settings, facilities, and public access on BLM-managed lands and waters"*

Recreation within the Project Area

Recreational opportunities within the area of analysis range from intensive vehicle-oriented activities to non-motorized activities in a more primitive setting. Recreation activities include dispersed recreation, including OHV use, rock collecting, photography, hunting, camping, wildlife viewing, hiking, horseback riding, and mountain biking.

Commercial outfitter and guide special recreation permits

The Winnemucca District Office of the BLM permits 16 outfitter and guide commercial special recreation permits (SRPs). These 16 permittees operate as commercial businesses providing guided hunting services within the Winnemucca District, with 7 out of the 16 permittees actively providing guided hunting services in NDOW unit 031, primarily hunting Mule Deer.

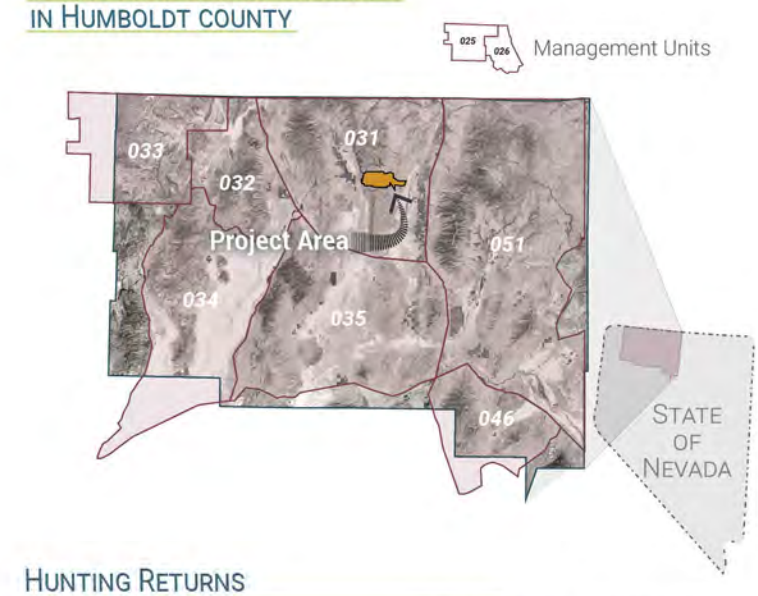
RECREATION SUMMARY

THACKER PASS - LITHIUM NEVADA

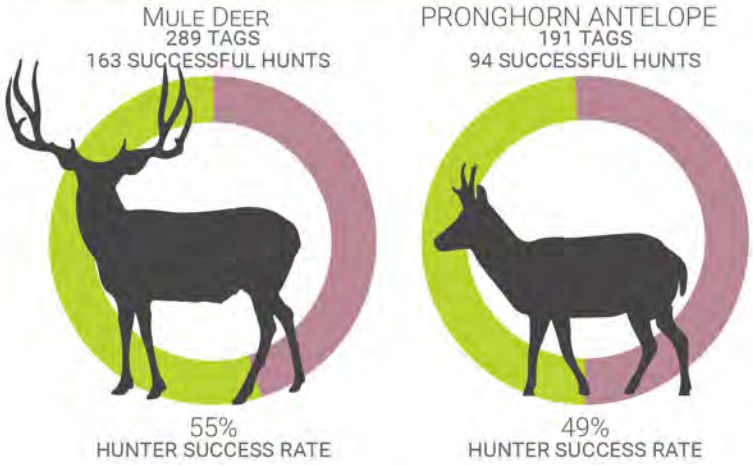
Recreational hunting

The dispersed nature of recreation activities within the area of analysis precludes availability of specific user data for individual recreation activities except hunting. Mule deer (Odocoileus hemionus) and pronghorn antelope (Antilocapra americana) are the predominant big game species sought by hunters. The area of analysis includes mule deer distribution and is adjacent to or within pronghorn antelope distribution. The NDOW regulates big game hunting through a quota system and tags are sold for each big game species in the various hunt units. Big game harvests vary from season to season depending on the game population, number of hunters, and other environmental factors that may affect hunting, such as extended periods of inclement weather during a hunting season. The Baseline Study Area is within Hunt Unit 31. According to the NDOW mule deer hunt returns for 2018 (main hunt returns and the Junior hunt returns), there were 289 mule deer tags for hunt (available tags at season opener) within Hunt Unit 31, and there were 163 successful hunters. This is equivalent to a 55 percent hunter success rate for mule deer. According to the 2018 NDOW pronghorn antelope hunt returns for Hunt Unit 31, there were 191 tags for hunt, and there were 94 successful hunters. This is equivalent to a 49 percent hunter success rate for pronghorn antelope. The Baseline Study Area is also likely used for hunting upland game species and furbearers.

Hunting Management Units in Humboldt County



Hunting Returns



BUREAU OF LAND MANAGEMENT (BLM). 2010. GUIDELINES FOR A QUALITY BUILT ENVIRONMENT, FIRST EDITION. U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT. DECEMBER 2010.

SOCIAL & ECONOMIC SUMMARY

THACKER PASS - LITHIUM NEVADA

EXISTING CONDITIONS

The study area for social and economic values includes Humboldt County, with focus on the City of Winnemucca, Nevada. The proposed Project would generate public revenue directly for Humboldt County. It is anticiapted that the majority of the Project workforce would reside in Humboldt County and specifically in the City of Winnemucca, Nevada.

Humboldt County is the oldest county in Nevada that has built its economy around agriculture, mining, and tourism. Agriculture leads the state with over 100,000 acres under cultivation, while sustainable tourism is supported through gaming, abundant outdoor recreation opportunities, and excellent hunting and fishing. Mining has been a cornerstone since the beginning with rich mineral deposits of gold, dolomite, opal, purified wood and silver. Today, Humboldt County is working towards expanding its overall mineral mining portfolio to include lithium. Large deposits of lithium have been identified in the McDermitt Caldera area that presents a unique opportunity to develop a significant supply to satisfy increasing market demands.

Proposed Operations

The USGS has identified the McDermitt Caldera (Kings Valley Lithium deposit) as among the world's most highly mineralized calderas which contain significant deposits of lithium in smectite and illite clays. Further, the USGS identifies the Kings Valley lithium resource as potentially critical to the United States development of a clean energy economy as defined in the American Recovery and Reinvestment Act (USGS 2016).

HUMBOLDT COUNTY KEY DEMOGRAPHIC TRENDS

	2010	*2016*	*% CHANGE*
POPULATION	15,986	17,091	+6.9%
MEDIAN AGE	36.6	35.2	-3.8%
VETERANS	1,366	1,119	-18.1%
HOUSEHOLDS	6,087	6,174	+1.4%
FAMILIES	4,153	4,112	-1.0%
HOUSING UNITS	7,109	7,223	+1.6%
HOUSING UNITS OCCUPIED	6,087	6,174	+1.4%
HOUSING UNITS VACANT	1,022	1,049	+2.6%
EDUCATION: HIGH SCHOOL OR LESS	5,569	5,602	+0.6%
EDUCATION: POST HIGH SCHOOL	4,624	5,192	+12.3%
POPULATION BELOW POVERTY LEVEL	5,071	4,888	-3.6%

To date, at least five distinct lithium deposits have been discovered by Lithium Nevada Corp. within the McDermitt Caldera. Currently, one deposit is proposed for development; containing at least 234 million short tons at a grade of 0.665 percent lithium (USGS 2016).

Methodology

Social and economic characteristics of a community are one of the first steps in understanding how a community may respond to change. Understanding current social and economic trends provide a baseline analysis used for assessing economic development projects and community planning efforts.

Economic impacts for the development of a new lithium mine, lithium processing plant and sulfuric acid plant in Humboldt County were estimated using a Humboldt County hybrid IMPLAN economic impact model (IMPLAN Group. LLC, 2016). IMPLAN stands for "Impact Analysis for Planning" and is a commonly used analytical software tool to estimate socioeconomic impacts initially developed by researchers at the U.S. Forest Service. The IMPLAN software is an input-output based model that describes the inter-industry relationships between industries and commodity purchases within a local economy.

KEY SOCIAL TRENDS BETWEEN 2010 AND 2016:

- *Total population increased 6.9%*
- *Hispanic/Latino population increased over 20%*
- *Median age decreased 3.8% primarily because of an 11% increases in population ages 19 and under*
- *Housing unit inventory and occupied housing increased 1.6% and 1.4% respectively. Vacant housing inventory increased 2.6%*
- *Median housing value increased 8% to $165,100*
- *Post high school education increased 12.3%, while education high school or less increased .06%*
- *Populations below poverty level decreased 3.6%*
- *The percentage of the total population at or under the poverty level deceased from 12.7% to 11.8%*

SOCIAL & ECONOMIC SUMMARY

THACKER PASS - LITHIUM NEVADA

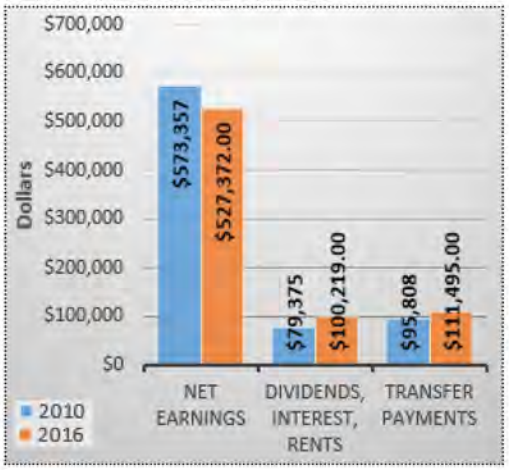
KEY SOCIAL TRENDS BETWEEN 2010 AND 2016:

- *Total employment has declined 1.9%, while labor force increased 9.1% and unemployment rate decrease 14.4% to 7.7%*
- *Top four employment sectors include mining; government; accommodations & food service; and retail trade accounting for nearly 64% of all employment*
- *Top four occupations include construction & extraction; office & administrative support; installation, maintenance, and repair; and transportation and material moving. These occupations account for 40% of all jobs*
- *Average earnings and median household income increased 2.2% and 9.8%, respectively*
- *Personal income decreased 1.3%, mainly influenced by a 62.1% decrease in proprietors' income*
- *Significant increases in dividends, interest rents and transfer payments at 26.3% and 16.4%, respectively*

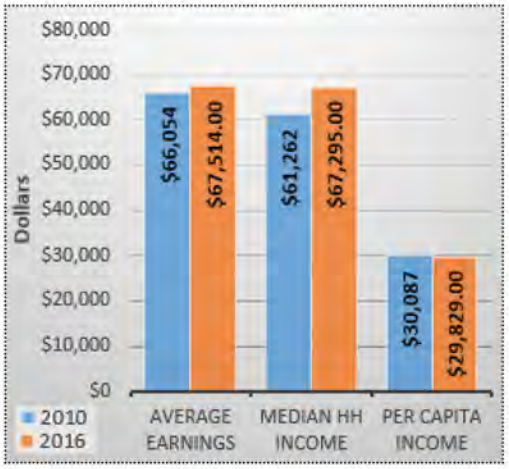
HUMBOLDT COUNTY KEY ECONOMIC TRENDS			
	2010	*2016*	*% CHANGE*
EMPLOYMENT	8,447	8,281	-1.9%
LABOR FORCE	8,218	8,968	9.1%
UNEMPLOYMENT RATE	9.0%	7.7%	-14.4%
AVERAGE EARNINGS	$66,054	$67,514	+2.2%
MEDIAN HH INCOME	$61,262	$67,295	+9.8%
PERSONAL INCOME	$748,540	$739,086	-1.3%
NET EARNINGS	$573,357	$527,372	-8.0%
DIR*	$79,375	$100,219	+26.3%
TRANSFER PAYMENT	$95,808	$111,495	+16.4%
PER CAPITA INCOME	$30,0857	$29,829	-0.8%

SOURCE: US CENSUS/AMERICAN FACT FINDER, BUREAU OF ECONOMIC ANALYSIS, &
*DIR = DIVIDENDS, INTEREST, RENTS

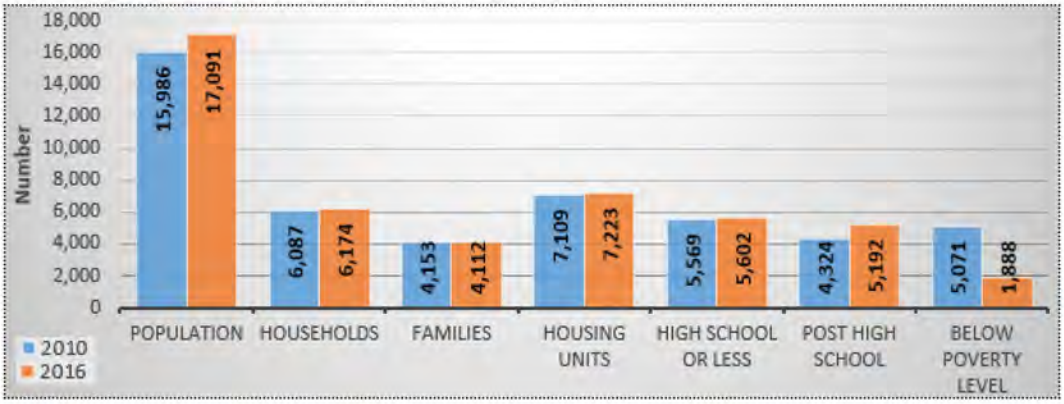
PERSONAL INCOME TRENDS



KEY ECONOMIC TRENDS



HUMBOLDT COUNTY KEY DEMOGRAPHIC TRENDS



REFERENCES CITED

IMPLAN Group, LLC. (2016). IMPLAN System data and software). 16740 Birkdale Commons Parkway, Suite 206, Huntersville, NC 28078, www.IMPLAN.com

USGS 2016. Geology and Mineral Resources of the Sheldon-Hart Mountain National Wildlife Refuge Complex (Oregon and Nevada), the Southeastern Oregon and North-Central Nevada, and the Southern Idaho and Northern Nevada (and Utah) Sagebrush Focal Areas. By Peter G. Vikre, Mary Ellen Benson, Donald I. Bleiwas, Joseph P. Colgan, Pamela M. Cossette, Jacob DeAngelo, Connie L. Dicken, Ronald M. Drake II, Edward A. du Bray, Gregory L. Fernette, Jonathan M.G. Glen, Jon E. Haacke, Susan M. Hall, Albert H. Hofs tra, David A. John, Stephen Ludington, Mark J. Mihalasky, James J. Rytuba, Brian N. Shaffer, Lisa L. Stillings, John C. Wallis, Colin F. Williams, Douglas B. Yager, and Lukas Zürcher. Chapter B of Mineral Resources of the Sagebrush Focal Areas of Idaho, Montana, Nevada, Oregon, Utah, and Wyoming. Edited by Warren C. Day, Thomas P. Frost , Jane M. Hammarstrom, and Michael L. Zientek. Scientific Investigations Report 2016-5089-B. U.S. Department of the Interior, U.S. Geological Survey. Version 1.1, October 28, 2016

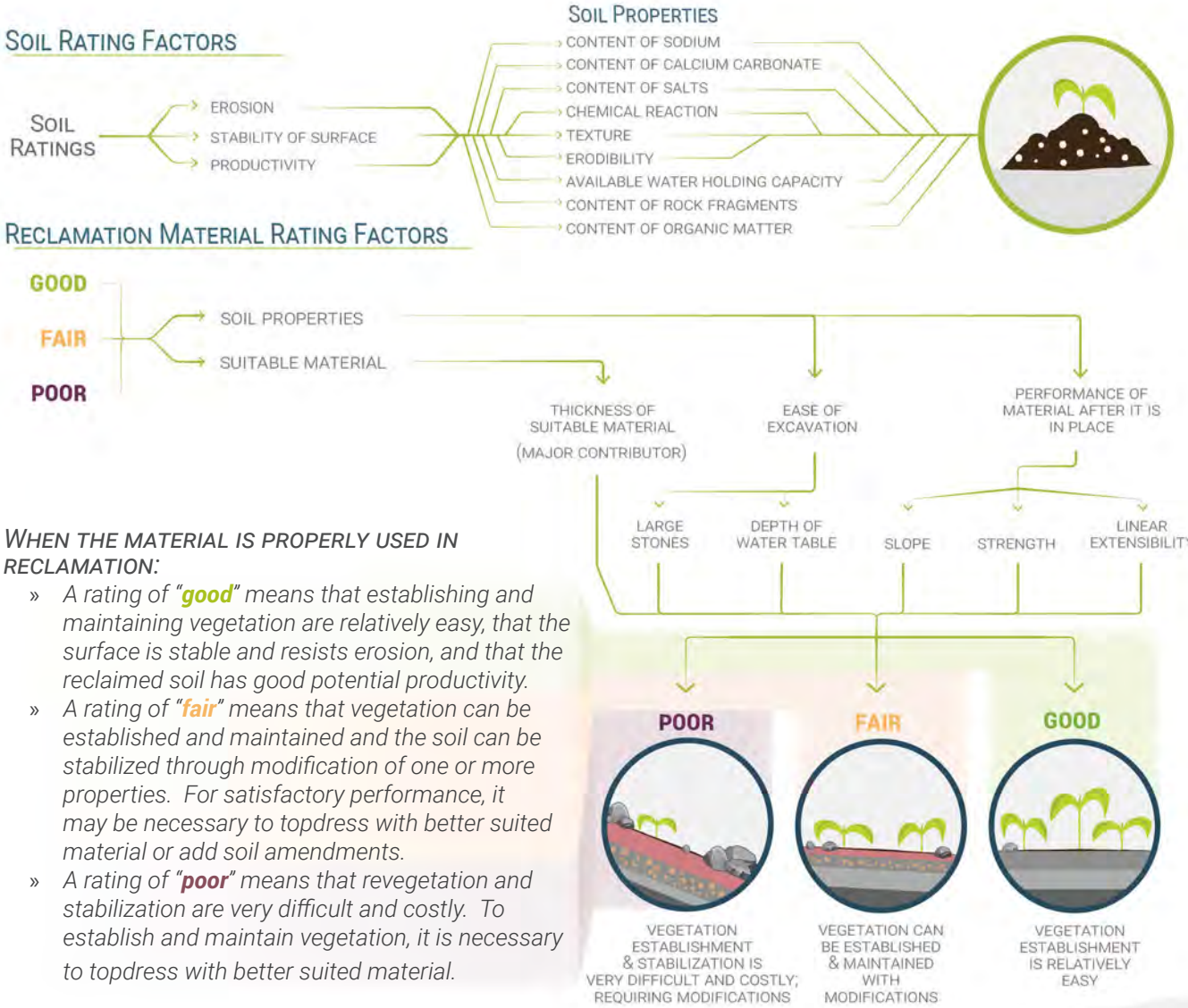
Soils Baseline Summary

THACKER PASS - LITHIUM NEVADA

Natural Resources Conservation Service Land Use Interpretations

Source of Reclamation Material

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reclaimed soil. These properties include the content of sodium, salts, and calcium carbonate; chemical reactions; available water holding capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility. The soils are rated "good," "fair," or "poor" as potential sources of reclamation material. The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential). Normal compaction, minor processing, and other standard construction practices are assumed.



When the material is properly used in reclamation:

- *A rating of "**good**" means that establishing and maintaining vegetation are relatively easy, that the surface is stable and resists erosion, and that the reclaimed soil has good potential productivity.*
- *A rating of "**fair**" means that vegetation can be established and maintained and the soil can be stabilized through modification of one or more properties. For satisfactory performance, it may be necessary to topdress with better suited material or add soil amendments.*
- *A rating of "**poor**" means that revegetation and stabilization are very difficult and costly. To establish and maintain vegetation, it is necessary to topdress with better suited material.*

Soils Baseline Summary

THACKER PASS - LITHIUM NEVADA

Natural Resources Conservation Service Land Use Interpretations

Erosion Potential

Water Erosion Hazard

The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe;

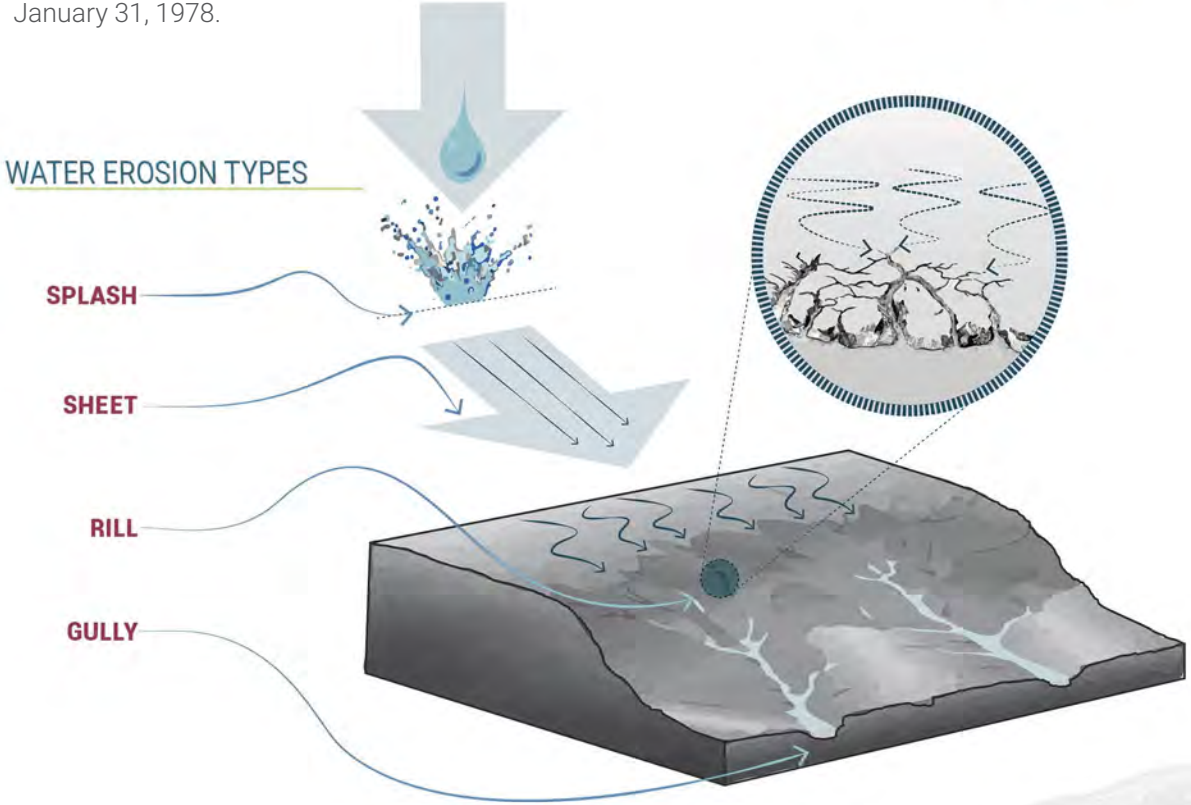
- **Slight:** *erosion is unlikely under ordinary climatic conditions;*
- **Moderate:** *erosion is likely and that erosion-control measures may be needed;*
- **Severe:** *erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and*
- **Very Severe:** *significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.*

Wind Erodibility Group

Wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to a rating group from one to eight. One are the most susceptible to wind erosion and those assigned to group eight are the least susceptible.

Prime Farmland

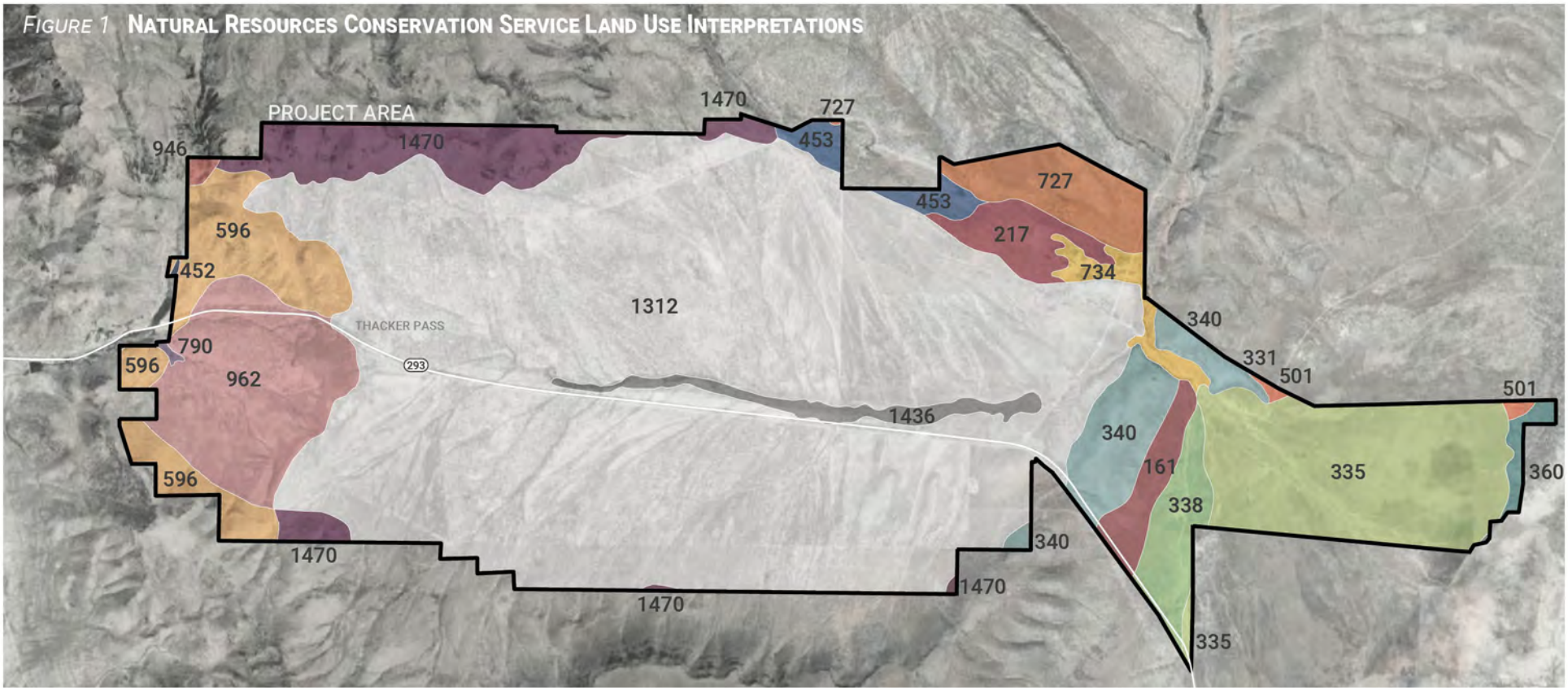
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.



Soils Baseline Summary

THACKER PASS - LITHIUM NEVADA

Figure 1 **Natural Resources Conservation Service Land Use Interpretations**



NATIONAL RESOURCE CONSERVATION SERVICE SOILS MAP

N

0 0.3 0.6 0.9 1.2 Miles

Project Area

Map Unit Symbol • Series Name

- 1312 • Dewar-Dacker association
- 1436 • Rodock loam
- 1470 • Zliss-Chiara association
- 161 • Bliss-Chiara association
- 217 • Flue loam
- 331 • McConnel gravelly fine sandy loam
- 335 • McConnel very gravelly fine sandy loam
- 338 • McConnel-Pumper-Whirlo complex
- 340 • Boger-Soughe association
- 360 • Needle Peak silt loam
- 452 • Kingsriver loam
- 453 • Kingsriver loam - drained
- 501 • Enko loamy very fine sand
- 596 • Trunk-Burrita association
- 727 • Dewar-Midraw association
- 734 • Kelk silt loam - association
- 790 • Rio King loam
- 946 • Soughe-Rubble land complex
- 962 • Zevadez-Vanwyper association

Soils Baseline Summary

THACKER PASS - LITHIUM NEVADA

TABLE 1 **Natural Resources Conservation Service Land Use Interpretations**

SOILS EXTENT SUMMARY & LAND USE INTERPRETATIONS - BASELINE STUDY AREA

Map Unit Symbol (MUSYM)	Map Unit Name	Acres (US)	Percent of Baseline Study Area	Farmland Classification	Source of Reclamation Material	Water Erosion Hazard	Wind Erodibility Group
161	Bliss-Chiara association	226	1.3%	Not Prime Farmland	Poor	Moderate	3
217	Flue loam, 0-2% slopes	278	1.5%	Farmland of Statewide Importance	Poor	Slight	5
331	McConnel gravelly fine sandy loam, 2-8% slopes	0.4	0.0%	Farmland of Statewide Importance	Poor	Slight	5
335	McConnel very gravelly fine sandy loam, 0 2% slopes	1,596	8.9%	Not Prime Farmland	Fair	Slight	6
338	McConnel-Pumper-Whirlo complex, 2-8% slopes	336	1.9%	Farmland of Statewide Importance	Poor	Slight	5
340	Boger-Soughe association	548	3.0%	Not Prime Farmland	Poor	Slight	6
360	Needle Peak silt loam	75	0.4%	Prime Farmland if Irrigated and Reclaimed of Excess Salts and Sodium	Poor	Slight	6
452	Kingsriver loam, 0 to 2 percent slopes	5	0.0%	Farmland of Statewide Importance	Fair	Slight	5
453	Kingsriver loam, drained, 0-2% slopes	166	0.9%	Prime Farmland if Irrigated and Reclaimed of Excess Salts and Sodium	Fair	Slight	5
501	Enko loamy very fine sand, 0-2% slopes	29	0.2%	Farmland of Statewide Importance	Poor	Slight	2
596	Trunk-Burrita associaiton	868	4.8%	Not Prime Farmland	Fair	Moderate	8
727	Dewar-Midraw association	433	2.4%	Not Prime Farmland	Poor	Slight	6
734	Kelk silt loam, occasionally flooded, 0-2% slopes	168	0.9%	Prime Farmland if Irrigated and Reclaimed of Excess Salts and Sodium	Fair	Slight	6
790	Rio King loam	11	0.1%	Prime Farmland if Irrigated	Fair	Slight	5
946	Soughe-Rubble land complex, 30-75% slopes	26	0.1%	Not Prime Farmland	Poor	Very Severe	7
962	Zevadez-Vanwyper association	1,161	6.4%	Not Prime Farmland	Fair	Moderate	5
1312	Dewar-Dacker association	11,049	61.3%	Not Prime Farmland	Poor	Moderate	3
1436	Rodock loam, 0-2% slopes	237	1.3%	Not Prime Farmland	Fair	Slight	5
1470	Zymans-Burrita-Devada association	803	4.5%	Not Prime Farmland	Poor	Moderate	8
Total		18,016	100.0%				

TRANSPORTATION SUMMARY

THACKER PASS - LITHIUM NEVADA

REGULATORY FRAMEWORK

The transportation system in the vicinity of the proposed Thacker Pass Project consists of a network of roads that are maintained by either NDOT, BLM, or Humboldt County.

The Nevada Department of Transportation (NDOT) is responsible for the planning, construction, operation, and maintenance of roads highways and bridges which make up the state highway system. In fulfilling these responsibilities, NDOT has in place a resource document entitled Access Management System and Standards. It states, "The purpose of these standards is to regulate access onto state highways in order to protect the health, safety and welfare of the public, to maintain the highway rights-of-way, and to preserve the functional level of State highways while meeting the needs of the motoring public." A permit for Occupancy of NDOT rights-of-way is required for access onto any street, road, or highway that is in the State highway system, whether for a temporary event, permanent utility, or other development work. An encroachment permit must be approved by and obtained from NDOT prior to the commencement of any type of work within a State right-of-way.

Roads that are not owned and maintained by NDOT are under the jurisdiction either BLM or Humboldt County, and have similar requirements. State Route (SR) 293 and US Highway (US) 95 are within the NDOT state highway system. Pole Creek Road and roads in the vicinity of the Quinn River Production Well are under the jurisdiction of BLM.

LOCATION AND ROAD DESCRIPTION

The Thacker Pass Project is in Humboldt County, Nevada, about 60 miles north-northwest of Winnemucca, about 20 miles west-northwest of Orovada, and 20 miles due south of the Oregon border. The mine site can be accessed from State Route (SR) 293, about 19 miles west of the junction with US Highway (US) 95.

US-95

US-95 in Humboldt County, Nevada, from Winnemucca to the Oregon border, has a functional classification of Other Principal Arterial. This is a non-interstate principal arterial road. Rural principal arterial systems consist of a connected rural network of continuous routes having the following characteristics:

- *Serve corridor movement having trip length and travel density characteristics indicative of substantial statewide or interstate travel*
- *Provide an integrated network without stub connections except where unusual geographic or traffic flow conditions dictate otherwise*

SR-293

SR-293 in Humboldt County, Nevada has a functional classification of Major Collector. Rural major collectors generally serve travel of primarily intracounty rather than statewide importance and constitute those routes on which predominant travel distances are shorter than on arterial routes. On average, more moderate speeds may be typical. The rural major collector should have the following characteristics:

- *Provide service to any county seat not on an arterial route, to the larger towns not directly served by the higher systems, and to other traffic generators such as consolidated schools, shipping points, county parks, etc*
- *Link the places mentioned above with nearby larger towns or cities, or with routes of higher classification*
- *Serve the more important intracounty travel corridors*

KEY INTERSECTIONS

There is one key intersection that will be used for the Thacker Pass Project: US-95 and SR-293 in Orovada. The intersection at US-95 and SR-293 contains local traffic and truck traffic for hay bale deliveries. The Orovada Elementary School is located near this intersection.

CRASH DATA

Crash data from 2015-2017 was collected from NDOT's Traffic Safety website for US-95 and SR-293 in Humboldt County. SR-293 had four crashes in 2015. No crashes were recorded in 2016 or 2017. One of the four crashes on SR-293 was due to a deer in the road. Factors that lead to the other three crashes are unknown. Three of the four crashes recorded were injury crashes. There were zero fatalities.

A total of 118 crashes were recorded on US-95 from Winnemucca to the Oregon border from 2015 through 2017. Twenty-one of the 118 crashes were injury crashes and five of the 118 crashes were fatalities. Four of the five fatality crashes occurred when it was dark in areas without enough lighting. There are no other known highway factors that contributed to these crashes. Nine of the 21 injury crashes occurred when it was dark without enough lighting. One of the 21 injury crashes occurred when it was dark with enough lighting. Other causes of both day and nighttime crashes are wet or icy weather or deer or cattle in the road.

HIGHWAY CAPACITY AND SPEEDS

Current traffic volumes are generally low relative to the design capacity for both US-95 and SR-293. Traffic volumes on US-95 have increased by about 8% between 2012 and 2016. Traffic volumes in summer months are approximately double that of winter months.

Table 1

Average annual daily traffic count (AADT). Shaded cells are estimated

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
SITE	Location	Location	AADT	AADT	AADT	AADT	AADT	AADT	AADT	AADT	AADT
0118	SR293, Kings Valley Rd. 4 miles west of US95	140	130	120	160	120	200	150	150	100	150
0111	SR293, Kings Valley Rd. 1 mile west of US95	370	340	330	340	290	400	350	300	250	320
0194	US95, 1.5 mi N of SR140	1,800	1,600	1,700	1,700	1,600	1,700	1,700	1,700	1,700	2,100
0110	US95 2 miles south of SR140	1,700	1,600	1,600	2,000	2,000	2,100	2,000	1,900	2,000	2,500
0186	US95, 3.1 mi S of SR290 to Paradise Valley	2,500	2,300	2,300	2,500	2,500	2,600	2,500	2,500	2,500	3,000

Source: http://epubs.nsla.nv.gov/statepubs/epubs/16867-2016.pdf

Table 2

AVERAGE DAY VEHICLE CLASSIFICATION DISTRIBUTION REPORT FOR US95

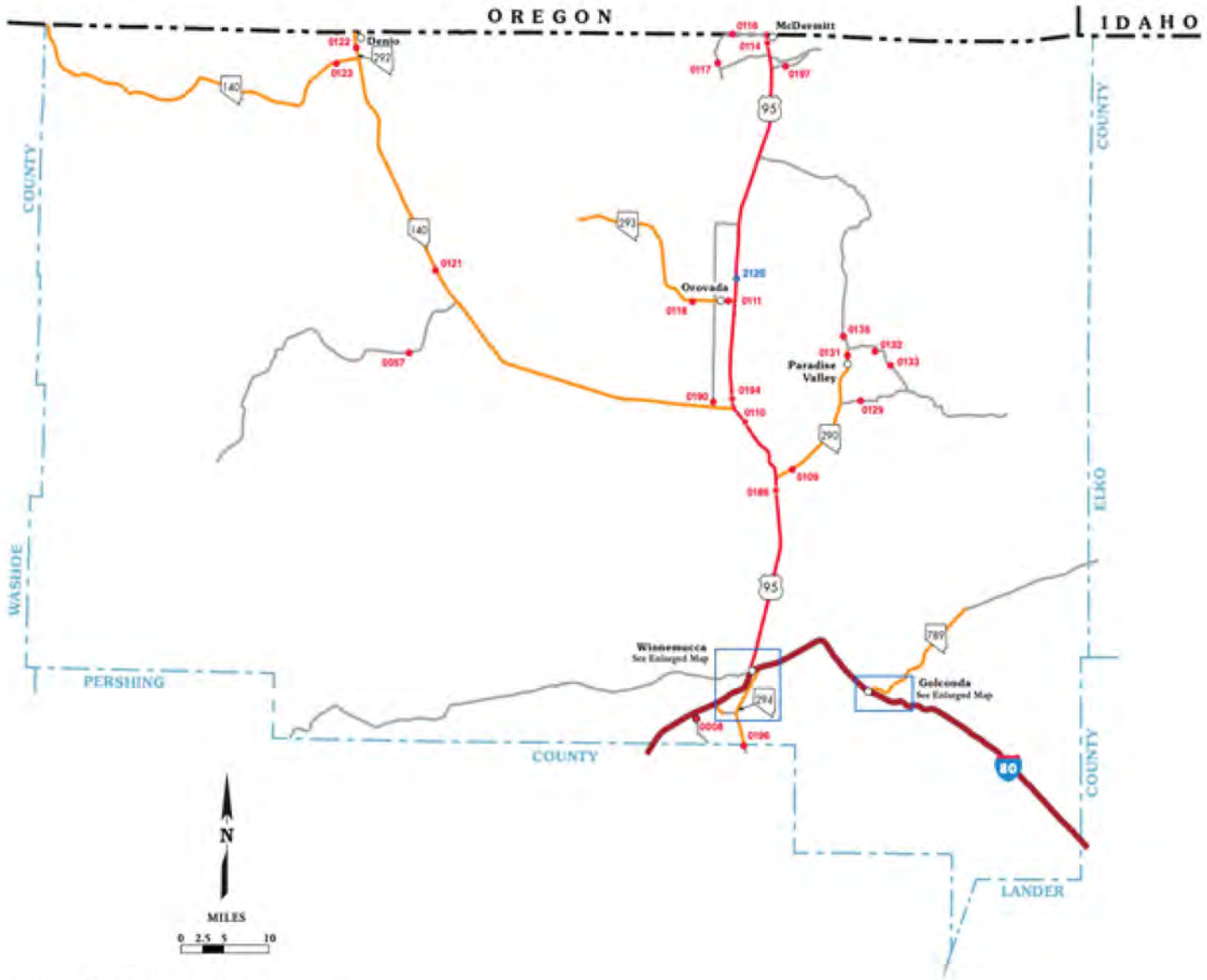
			Light Trucks			Heavy Trucks						
						Multi-Trailer			Semi-Trailer			
Route	From	To	Bus	2x	3+ ax	4 ax	5 ax	6ax	5 ax	6 ax	7 ax	Year
US95	SR290	SR140	15	53	6	62	313	6	13	2	29	2016
US95	SR140	Idaho	18	89	4	47	294	5	12	4	25	2016

Source: http://epubs.nsla.nv.gov/statepubs/epubs/16867-2016.pdf

THACKER PASS - LITHIUM NEVADA

FIGURE 1

REGIONAL MAP SHOWING TRAFFIC ROUTES AND TRAFFIC COUNT LOCATIONS



THACKER PASS - LITHIUM NEVADA

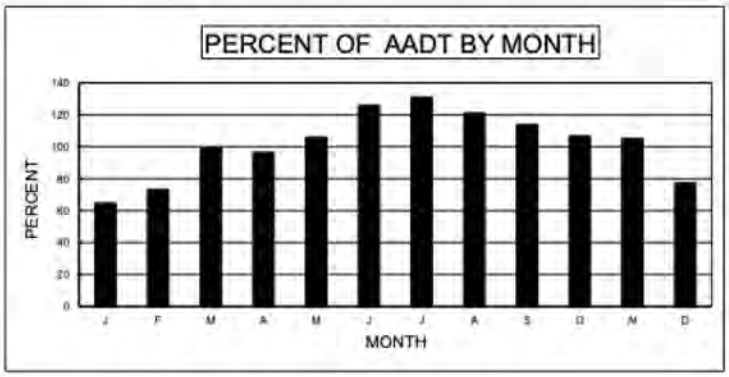
FIGURE 2

HISTORICAL TRAFFIC VOLUME DISTRIBUTIONS ON US-95

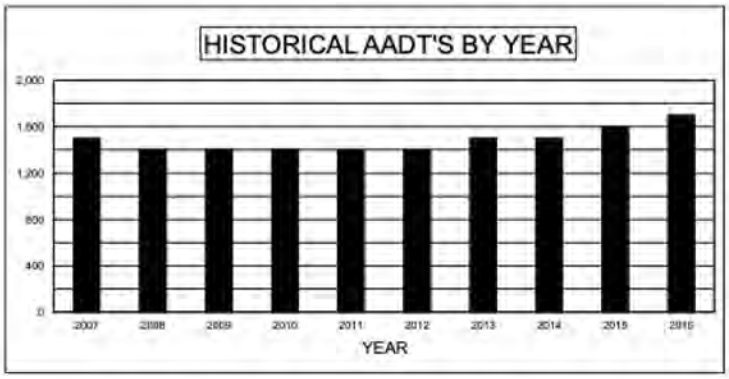
ATR 0132120

US-95 0.2 MI. N. OF SR-293 (KINGS RIVER VALLEY RD)

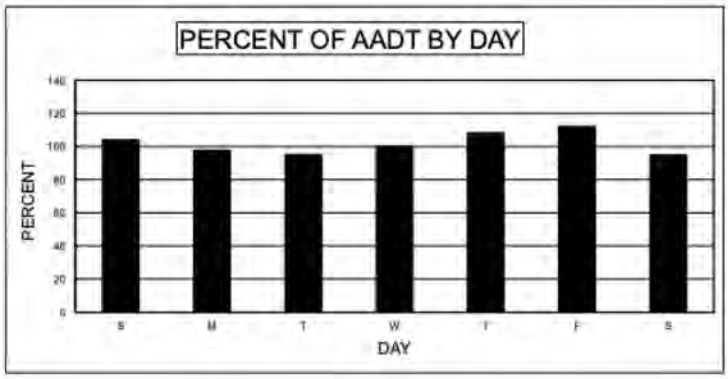
MONTHLY PERCENT		
MONTH	MADT	% OF AADT
JANUARY	1,102	64.8%
FEBRUARY	1,247	73.4%
MARCH	1,688	99.3%
APRIL	1,641	96.5%
MAY	1,801	105.9%
JUNE	2,140	125.9%
JULY	2,227	131.0%
AUGUST	2,060	121.2%
SEPTEMBER	1,935	113.8%
OCTOBER	1,817	106.9%
NOVEMBER	1,787	105.1%
DECEMBER	1,316	77.4%



HISTORICAL RECORD		
YEAR	AADT	% OF PREVIOUS YEAR
2016	1,700	106.3%
2015	1,600	106.7%
2014	1,500	100.0%
2013	1,500	107.1%
2012	1,400	100.0%
2011	1,400	100.0%
2010	1,400	100.0%
2009	1,400	100.0%
2008	1,400	93.3%
2007	1,500	93.8%



DAY OF WEEK		
DAY	ADT	% OF AADT
SUN	1,768	104.0%
MON	1,663	97.8%
TUE	1,618	95.2%
WED	1,702	100.1%
THU	1,840	108.2%
FRI	1,905	112.1%
SAT	1,615	95.0%
AVG WEEKDAY	1,706	100.3%
AVG WEEKEND	1,692	99.5%



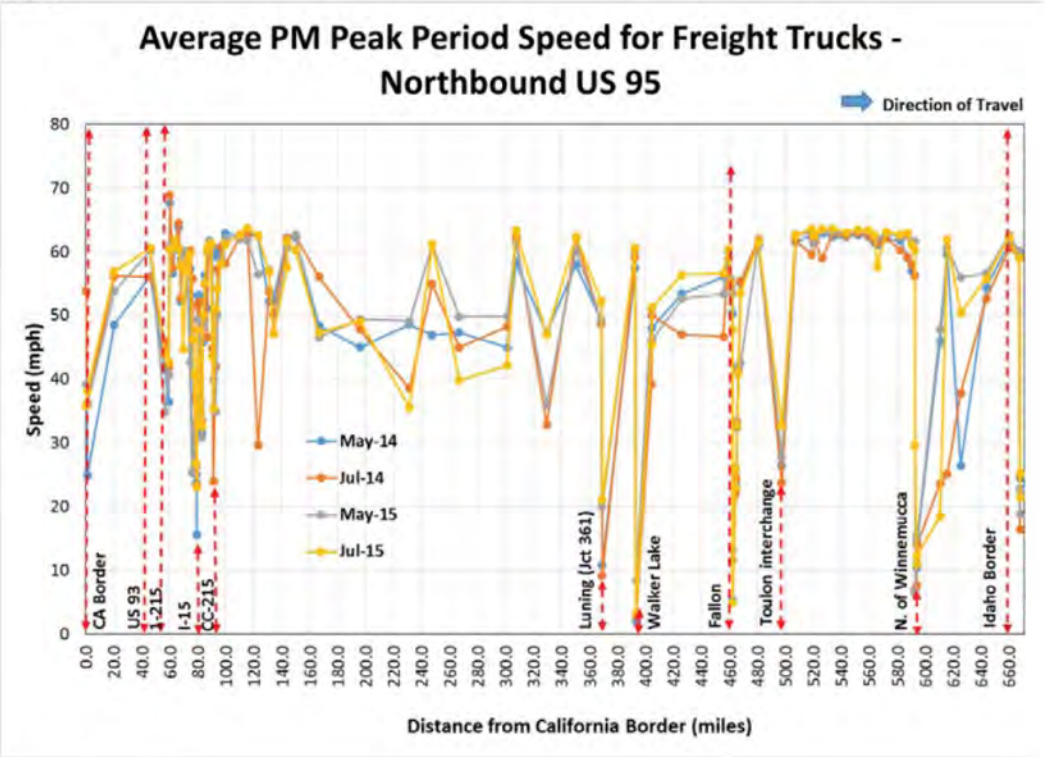
PERCENT DESIGN HOUR VOLUME (DHV) IS OF ANNUAL AVERAGE	12.8%
PERCENT HIGH DIRECTION IS OF DHV	56.8%

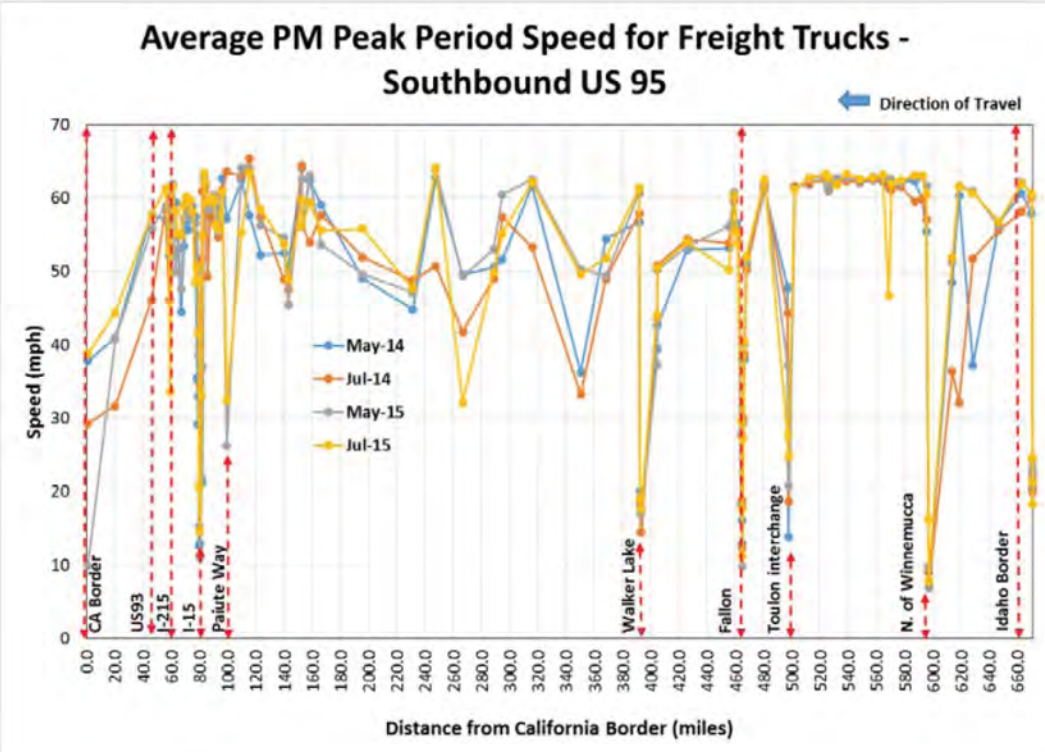
SOURCE: HTTP://EPUBS.NSLA.NV.GOV/STATEPUBS/EPUBS/1687-2016.PDF

FIGURE 3

TRAFFIC SPEEDS ON US-95

US 95





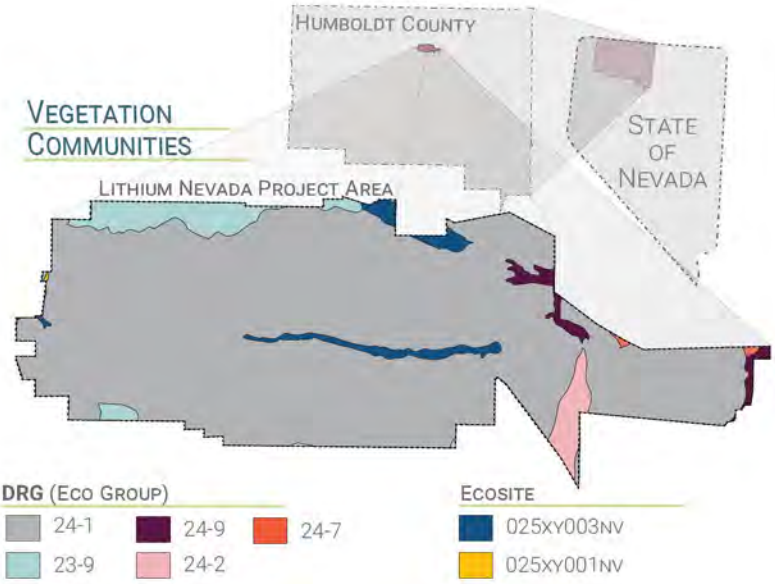
VEGETATION BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

The Botanical Baseline Basics

Disturbance response groups (DRGs) are ecological sites that are grouped together according to their response to natural or human disturbances, such as fire, drought, and grazing that cause them to reach the same endpoint or "'state". DRGs consider precipitation zones, soil types, slope, elevation, drainage, local knowledge, published literature to sort pre-existing ecological sites into groups to form DRGs.

States are stable, long-term ecological conditions that are produced on a site. States are usually composed of several plant community phases, which vary based on species composition and production. Community phases further characterize each state by plant community composition, bare ground, and dominant overstory and understory.



Lithium Nevada Vegetation Communities Associated with DRG's

5 DRG areas and 2 undesignated areas were mapped within the project area during baseline evaluation in 2018 by SWCA.

TABLE 1

Vegetation Communities Associated with DRG's

DRG	Ecosite	Modal Site	All Soils on Site		Ecosite Description	Observed Dominant Sepcies	Acres	Vegetation State
23-9	R023XY006NV	Loamy 8-10	Granitic Loam 10-12, Granitic Loam 8-10, Loamy Slope 10-14, Loamy 10-12, Droughty Loam 8-10	Granitic South Slope 9-12, Loamy Fan 10-12, Granitic Fan 8-10, Sandy 8-12, Channery Hill 8-10, Stony Slope 8-10	"ARTRW8/ACTH7 Wyoming big sagebrush / Thurber's needlegrass"	cheatgrass, Great Basin wild rye, and tall tumble mustard. Shrubs were sparse but present.	802	4.1
24-1	R024XY005NV	Loamy 8-10	Droughty Loam 8-10, South Slope 8-12, Shallow Loam 10-14, Sandy Loam 8-10	Stony Slope 6-10, Loamy 10-12, Steep North Slope 10-12, Shallow Loam 8-10	"ARTRW/ACTH7 Wyoming big sagebrush / Thurber's needlegrass"	Wyoming big sagebrush, rabbitbrush, clasping pepperweed, and cheatgrass.	16,186	4.1 & 4.2
24-2	R024XY002NV	Loamy 5-8	Loamy Slope 5-8, Shallow Silty 8-10, Shallow Silty 5-8, Gravelly Loam 5-8	---	"ATCO-ARSP5/ ELEL5-ACHY shadscale saltbush - bud sagebrush / squirreltail - Indian ricegrass"	cheatgrass, Sandberg bluegrass, Great Basin wild rye, tall tumble mustard, and Russian thistle. Shrubs were sparse but present.	336	4.1
24-7	R024XY017NV	Sandy 8-10	Dunes 6-10, Sandy 5-8, Sodic Dunes	---	"ARTR2/HECO26-ACHY big sagebrush / needle and thread - Indian ricegrass"	cheatgrass and foxtail barley.	29	4.1
24-9	R024XY006NV	Dry Floodplain	Gravelly Fan	---	"ARTRT/LECI4 Great Basin basin big sagebrush / Great Basin wild rye"	Wyoming big sagebrush, willow, cheatgrass, Indian ricegrass, and Great Basin wild rye.	243	4.1
---	***R025XY003NV***	Loamy Bottom 8-14	---	---	---	---	414	---
---	***R025XY001NV***	Moist Floodplain	---	---	---	willow, Russian olive, sedges, Arctic rush, and cattail.	5	---

VEGETATION BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

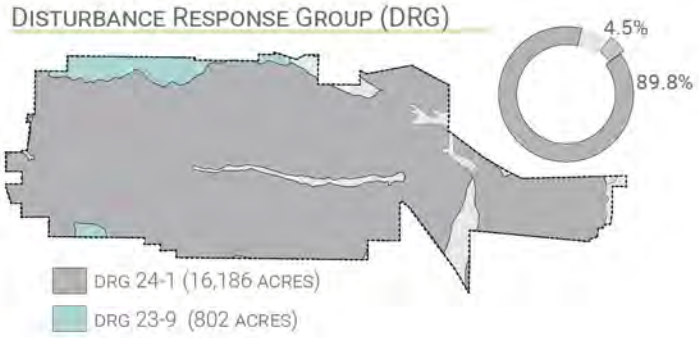
DRG MODAL SITE ECOSITE

*(**DRG 24-1**) LOAMY 8–10" (024XY005NV)*

- *16,186 acres*
- ***Current Condition**: Annual State Community Phase 4.1 and 4.2; encourages a more frequent fire interval and perpetual invasive grassland state*
- ***Soils**: Dewar-Dacker association (fine sandy and gravely clay loams); well-drained with little water-holding capacity in root zone*
- ***Expected** to be dominated by Thurber's needlegrass (Achnatherum thurberianum) and Wyoming big sagebrush (Artemisia tridentata var. wyomingensis)*
- ***Disturbance**: Grazing pressure, introduced annuals, and high severity fire caused a transition from the expected sagebrush/perennial grass mosaic to and invasive grassland with sprouting shrubs*
- ***Observed** grass species in 2018 included cheatgrass (Bromus tectorum), squirreltail (Elymus elymoides), Great Basin wild rye (Leymus cinereus), and Sandberg bluegrass (Poa secunda). The most common forbs consisted of clasping pepperweed (Lepidium perfoliatum) and tall tumble mustard (Sisymbrium altissimum). The dominant shrubs found on-site include Wyoming big sagebrush, yellow rabbitbrush (Chrysothamnus viscidiflorus), rubber rabbitbrush (Ericameria nauseosa), and greasewood (Sarcobatus vermiculatus)*
- ***Disturbance**: Fires have occurred on this site in 1985, 2000, 2004, and 2012*
- ***Also observed** were small patches of dense Wyoming big sagebrush, with Sandberg bluegrass and cheatgrass in the understory*

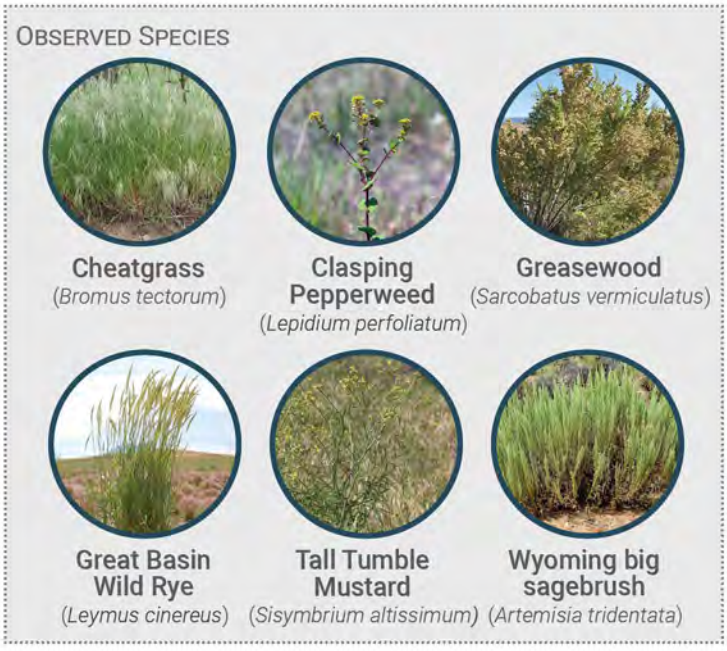
*(**DRG 23-9**) LOAMY 8–10" (023XY006NV)*

- *802 acres*
- ***Current Condition**: Annual State: Community Phase 4.0 (majority annual grasses with some sprouting shrubs); a tree state is possible but not present. The rock outcrops of this site have the potential for sensitive species*
- ***Soils**: Rockier than DRG 24-1 above*
- ***Expected** to be dominated by Thurber's needlegrass and Wyoming big sagebrush mosaic. Utah juniper (Juniperus utahensis) may also be present but not dominant*
- ***Observed** grass species in 2018 included cheatgrass and Great Basin wild rye. The most common forb was tall tumble mustard. Shrubs found in this site were sparse but included Wyoming big sagebrush, silver sagebrush (Artemisia cana), and greasewood.*
- ***Observed Cover**: 47% Grasses, 7% Shrubs*



(DRG 24-1)

(DRG 23-9)



VEGETATION BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

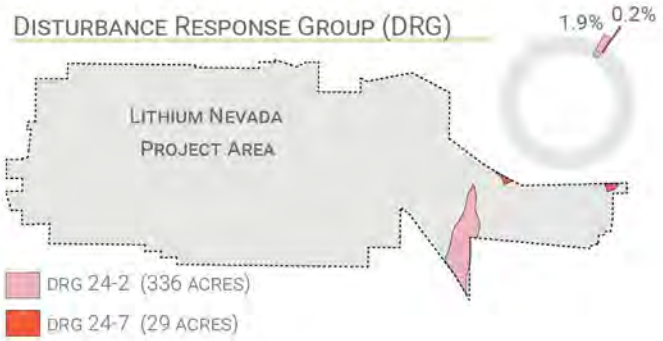
DRG Modal site Ecosite

(**DRG 24-2**) Loamy 5–8" (024XY002NV)

- *336 acres*
- ***Current Condition**: Annual State: lower-elevation salt scrub ecosystem*
- ***Soils**:*
- ***Expected** to be dominated by shadscale saltbrush (Atriplex confertifolia), budsage (Artemisia spinescens), and Indian ricegrass (Achnatherum hymenoides)*
- ***Disturbance**: Excessive herbivory and fire have depleted the perennial grasses and palatable shrub component*
- ***Observed** grass species in 2018 included cheatgrass, v, Great Basin wild rye and foxtail barley (Hordeum jubatum). Forbs were primarily tall tumble mustard, Russian thistle (Salsola tragus), and clasping pepperweed. Shrubs found in this site were sparse but included rabbitbrush, Wyoming big sagebrush, shadscale saltbrush, and greasewood*
- ***Observed:** Site is often stabilized with forge kochia (Bassia prostrata)*
- ***Observed Cover**: 82% Grasses*

(**DRG 24-7**) Sandy 8–10" (024XY017NV)

- *29 acres*
- ***Current Condition**: Annual State; Transition between the upland 8–10" loamy site and the salt scrub greasewood flats*
- ***Soils**:*
- ***Expected** to be dominated by a mosaic of Wyoming big sagebrush and Indian ricegrass*
- ***Disturbance**: Fire and legacy grazing have reduced this site to an annual dominated site with trace amounts of perennial grasses and sprouting shrubs*
- ***Observed** grass species in 2018 include cheatgrass was the most common, followed by foxtail barle*
- ***Observed Cover**: 90% Grasses*



(**DRG 24-2**)

(**DRG 24-7**)

PHOTO SOURCES:
CLASPING PEPPERWEED - HANK JORGENSEN
CHEATGRASS - CHRIS EVANS
GREASEWOOD - STEVENSON INTERMOUNTAIN SEED
GREAT BASIN WILD RYE - MATT LAVIN
TALL TUMBLE MUSTARD - MONTEREY WILDFLOWERS
WYOMING BI SAGEBRUSH - USFWS MOUNTAIN PRAIRIE FLICKR

VEGETATION BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

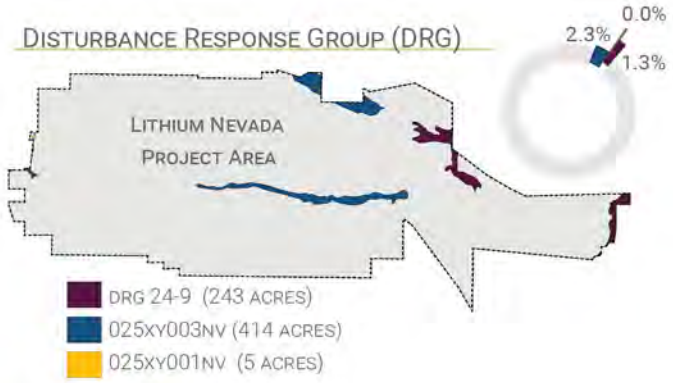
DRG MODAL SITE ECOSITE

(**DRG 24-9**) DRY FLOODPLAIN (024XY006NV) & LOAMY BOTTOM 8–14" (**025XY003NV**)

- ***243 acres*** *of Dry Floodplain and* ***414 acres*** *of Loamy Bottom*
- ***Current Condition****: Annual State Community Phase 4.1; The ephemeral drainages, wetlands, and riparian creeks are dominated by two ecological sites ; the dry floodplain and loamy bottom site (024XY006NV) and wetland/riparian communities (025XY003NV)*
- ***Soils****:*
- ***Expected*** *to be dominated by Great Basin wild rye and Great Basin big sagebrush (Artemisia tridentata var. tridentata) with Western wheatgrass (Pascopyron smithii) as a common subdominant species. - (Stringham et al. 2017)*
- ***Disturbance****: Area has been affected by high severity fire*
- ***Observed*** *grass species in 2018 include cheatgrass, Indian ricegrass, Sandberg bluegrass, and Great Basin wild rye. Shrubs consisted of Wyoming big sagebrush, willow (Salix sp.), and yellow rabbitbrush*
- ***Observed****: Pockets of a sagebrush/Great Basin wild rye mosaic (Community Phase 4.2) exists within this site*
- ***Observed Cover****: 55% Grasses and 17% Shrubs*

MOIST FLOODPLAIN (025XY001NV)

- *5 acres*
- ***Current Condition****: Annual State The wetland/riparian community; dominant along Crowley Creek, Pole Creek, and Thacker Creek*
- ***Soils****:*
- ***Hydrology****: These areas had running water at the time of the survey with isolated pockets of permanent water. Though water likely does not flow year-round, the water table is close enough to the surface throughout these drainages to support hydrophytic vegetation*
- ***Observed*** *wetland speices included cattail (Typha latifolia), watercress (Nasturtium officinale), and duckweed (Lemna sp.)*
- ***Observed*** *riparian species include willow (Salix exigua and S. laevigata) and Russian olive (Elaeagnus angustifolium)*
- ***Observed*** *herbaceous species include sedges (Carex nebrascensis and C. praegracilis), Arctic rush (Juncus arcticus), and bluegrasses (Poa pratensis and P. palustris)*
- ***Observed Cover****: NOT DISCUSSED IN TEXT*



(DRG 24-9)

(025XY001NV)

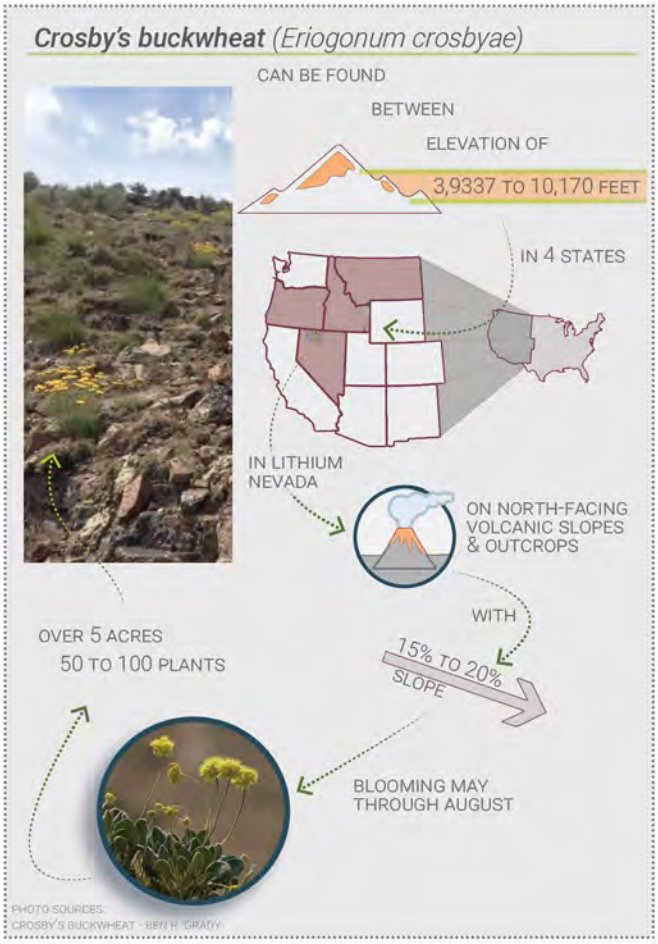
PHOTO SOURCES:
DUCKWEED - SARAH M AND FRANKLIN H
FIELD SEDGE - ANTHONY VALOIS
SANDBERG BLUEGRASS - J. MOREFIELD
NARROW LEAVED WILLOW - S. SAMPSON
RED WILLOW - JAMES BAILEY
INDIAN RICEGRASS - UNKNOWN

VEGETATION BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

Sensitive Plant Species

- *Special status plant species of concern to the U.S. Fish and Wildlife Service (USFWS), Nevada Natural Heritage Program (NNHP), and BLM have either been recorded in the vicinity or have suitable habitat within the project area. - (BLM 2017; NNHP 2001; USFWS 2018)*
- ***One BLM sensitive species**, Crosby's buckwheat (Eriogonum crosbyae), was found within the project area*
  - *Listed as a Federal Species of Concern and BLM Sensitive in Nevada*
  - *Low, matted perennial, growing from a woody caudex with matted stems that flowers from May through August*
  - *Found in between elevations of 3,937 to 10,170 feet above mean sea level in Idaho, Montana, Nevada, and Oregon on white tuffaceous shale volcanic outcrops, metamorphic rock outcrops, or basaltic or granitic sandy flats, washes, slopes, and ridges*
  - *Associated vegetation communities include shadscale saltbrush and sagebrush or high-elevation sagebrush to alpine tundra communities, juniper, or montane conifer woodlands*
  - *As currently defined, Crosby's buckwheat is widely scattered in valley bottoms, foothills, and mountaintops in central Idaho and western Montana and is disjunct to southwestern Idaho, southeastern Oregon, northwestern Nevada, and Elko County, Nevada. - (Oregon Department of Agriculture n.d. [2018])*
- ***One distinct population** of Crosby's buckwheat is on the southwest boundary of the project area*
  - *The population numbered approximately 50 to 100 plants over approximately 5.3 acre*
  - *The population was found on north-facing volcanic slopes and outcrops (approximately 15% to 20% slope)*
  - *The slope was dominated by mountain big sagebrush (Artemisia tridentata var. vaseyana), and yellow rabbitbrush. Grasses included cheatgrass, Sandberg bluegrass, and bluebunch wheatgrass (Pseudoroegneria spicata). Herbs included Hooker's balsamroot (Balsamorhiza hookeri), rayless daisy (Erigeron aphanactis), and fernleaf bisquitroot (Lomatium dissectum)*
- *Three other similar species of Eriogonum occur within or near the range of Crosby's buckwheat in Nevada and Southern Oregon*
  - *Prostrate buckwheat (E. prociduum), Cusick's buckwheat (E. cusickii), and whitewoolly buckwheat (E. ochrocephalum var. calcareum)*
  - *Prostrate buckwheat is distinguished from Crosby's buckwheat by its glabrous scapes*
- *Two other species were determined to have potential habitat within the project area*
  - *Windloving buckwheat (Eriogonum anemophilum) and Lonesome milkvetch (Astragalus solitaries)*



Noxious Weeds and Invasive, Non-Native Species

- ***No noxious weeds** were observed in the project area (June 2018)*
- ***11 invasive non-native species** were observed*
  - *Cheatgrass - most extensively established invasive species within the project area and occurred on all aspects of slopes, ranging from gentle to steep*
  - *Bull thistle (Cirsium vulgare), hairy whitetop (Cardaria pubescens), Western tansy mustard (Descurainnia pinnata), Russian thistle, common dandelion (Taraxacum officinale), desert madwort (Alyssum desertorum), crossflower (Chorispora tenella), prickly lettuce (Lactuca serriola), bur buttercup (Ceratocephala testiculata), and rough cocklebur (Xanthium strumarium)*
  - *All species tended to occur in disturbed open areas, along roadsides and other clearings, near springs, and in other similar areas where native vegetation was sparse or previously removed*

Visual Resource Summary

THACKER PASS - LITHIUM NEVADA

The visual resources study area boundary was defined using watershed boundaries (based on USGS HUC 10-Digit watershed delineations). The HUC10 watershed was used for the visual resource boundary because the limits of the watershed typically coincide with mountain crests and topographic highpoints. Beyond these crests and highpoints, topography generally begins to block views of the area within the watershed.

A Visual Resource Management (VRM) system was devised by the BLM to protect the quality of scenic resources on public lands. The VRM system provides the basis of the methods used to assess and characterize the existing aesthetic conditions and visual sensitivity within the area of analysis. BLM Winnemucca's 2015 Resource Management Plan (RMP) includes a VRM Class map, and corresponding objectives to manage public land actions and activities to provide protection of visual values and scenic quality of existing landscapes.

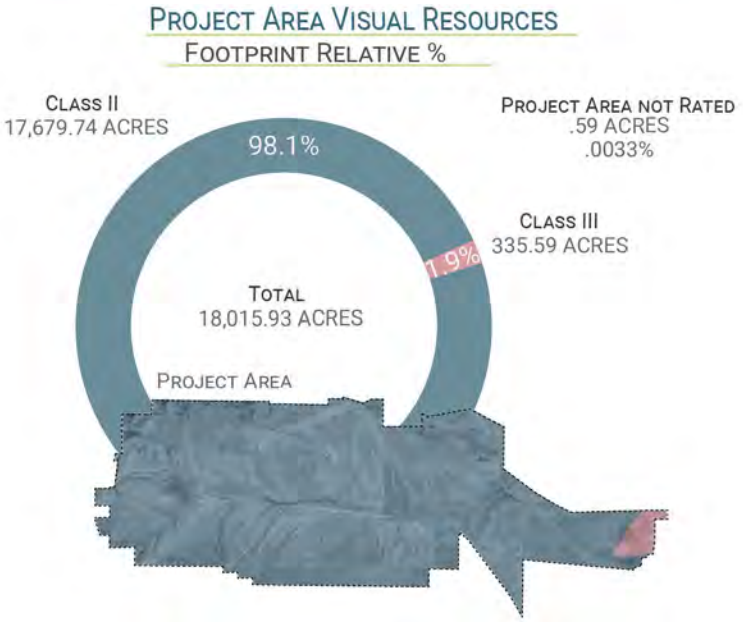
Areas are divided into VRM Classes with established management objectives (see table below). The process to produce the VRM Class occurs in two stages (inventory stage and analysis stage), and involves:

- *Rating the visual appeal of an area*
- *Measuring public sensitivity and concern for scenic quality*
- *Determining whether the area is visible from representative or selected key travel routes and/or locations*

Visual Resource Summary

THACKER PASS - LITHIUM NEVADA

The Project Area boundary overlies two HUC10 watershed boundaries. Overlaying the VRM Class map from the 2015 RMP, the Project Area is comprised of VRM Class II and Class III regions. Most of the Project Area is rated Class II (approximately 98%). The Project Area has many human-made features including existing roads, a powerline, livestock fencing, improved springs, and residential and agricultural infrastructure. Portions of the landscape have been altered by wildland fire which resulted in a reseeding effort. Livestock grazing is a primary land use across the majority of the Project Area. Areas north of the Project Area include natural, undisturbed mountainous areas with rock outcroppings. Areas in the central, southern, and eastern portions of the Project Area are predominantly rangeland utilized for grazing.



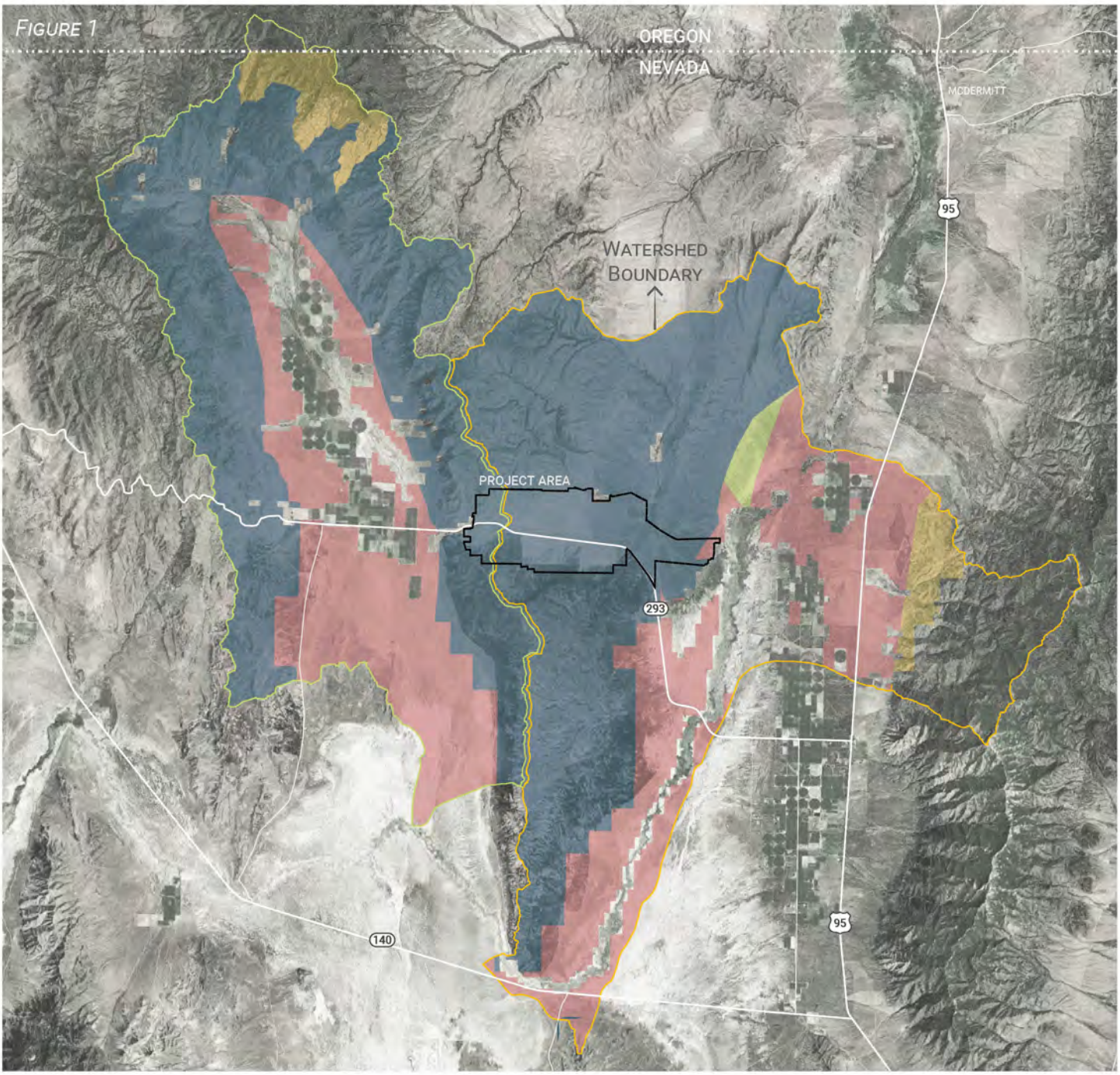

Lithium Nevada

TABLE 1 **BUREAU OF LAND MANAGEMENT VRM CLASS OBJECTIVES**

VRM Class	*Objective*
Class I	The existing character of the landscape should be preserved. Class I provides room for natural ecological changes, and does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	The existing character of the landscape should be retained. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Changes must repeat the basic elements of from, line, color, and texture found in the predominant natural fractures of the characteristic landscape.
Class III	The existing character of the landscape should be partially retained. The level of change to the characteristic landscape should be moderate. Management activities may retain the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	Class IV provides for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and repeating the basic elements.

Visual Resource Summary

THACKER PASS - LITHIUM NEVADA



VISUAL RESOURCE CLASSES

VISUAL RESOURCE CLASS

- I
- II
- III
- IV

WATERSHEDS

- Crowley Creek-Quinn River Watershed
- Kings River Watershed

PROJECT Area

N

05 2.5 7.5 10 MILES

Lithium Nevada

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND
MANAGEMENT

WATER RESOURCE SUMMARY

THACKER PASS - LITHIUM NEVADA

INTRODUCTION

This document summarizes hydrologic baseline data characterizing the groundwater and surface water systems adjacent to the Thacker Pass Project (TPP). The objectives of the baseline data collection are as follows:

- *Collect hydrologic data to accurately characterize baseline conditions for groundwater and surface water systems*
- *Summarize hydrologic data (i.e. water levels, stream baseflows, spring discharge, and water quality)*
- *Develop the conceptual framework for groundwater and geochemical impact models*

Continuous hydrologic data collection commenced in 2011 and has gradually expanded in scope through present day. The chronology of data collection occurred across 5 main field campaigns between 2011 and 2018 which evolved around an expanding project layout.

HYDROLIC SETTING

The Thacker Pass Project straddles the topographic divide separating the Kings River Valley hydrographic basin (Rio King Subarea) and the Quinn River Valley hydrographic basin (Orovada Subarea) (Figure 1). Topography surrounding the mine is typical of the Basin and Range province, consisting of narrow, short mountain ranges with moderate to high relief. The ranges are separated by broad valleys composed of basin fill and lacustrine deposits.

Climate

An onsite meteorological station (Thacker Pass Station) was installed in August 2011 and has continuously collected data to the present day. Project climatic conditions are arid, high desert with mild-cool winters (temperatures ranging from highs of ~50°F to lows of ~10°F) and hot-dry summers (temperatures range from highs of ~95°F to lows of ~50°F). Air moisture is generally arid, with relative humidity ranging from ~25% during summers to ~65% in winter.

The mean annual precipitation (MAP) recorded at the Thacker Pass Station is approximately 12.22 inches per year (Table 1), with monthly measured precipitation rates shown in Figure 3. The average monthly precipitation ranges between 0.32 inches (July) and 1.63 inches (December).

Site specific potential evaporation rates (PET) were calculated using Penman-Monteith equation validated by the American Society of Civil Engineers standards (ASCE-EWRI, 2004). Average annual PET rates are 59.6 in/yr, with the highest periods of evaporation occurring during July (9.9 inches). Winter months are calculated to have 1.4 inches to 2.2 inches of evaporation, which is an important difference from pan evaporation data, which freezes and underestimates evaporation during the winter.

Table 1

Average monthly precipitation and PET (2011-2018)

Month	Thacker Pass Station Precipitation (in)	Calculated PET (in)
January	1.35	1.5
February	0.83	2.2
March	1.32	3.7
April	1.21	4.9
May	1.59	6.1
June	0.56	8.6
July	0.32	9.9
August	0.39	8.7
September	0.88	6.4
October	1.02	3.9
November	0.91	2.4
December	1.84	1.4
Total	12.22	59.6

SURFACE WATER

Streams

Perennial and ephemeral surface water locations are located near Thacker Pass Project include Thacker Creek, Pole Creek, Rock Creek, and Crowley Creek (Figure 2). Thacker Creek is a perennial stream fed by springs and is located nearest to the Thacker Pass Project. Pole, Rock, and Crowley Creeks are ephemeral streams whose headwaters reside in the Montana Mountains and ultimately discharge to Quinn River Basin. Stream flow is episodic except for the upper reaches of Crowley Creek which is perennial. Because the proposed mine plan does not affect the watershed of any nearby perennial or ephemeral streams, no impacts to the surface water runoff / interflow component of streamflow are anticipated. Therefore, the only potential impact to the streams is from the groundwater component of baseflow, if the cones of depression associated with dewatering and mining propagate to stream channels.

In April 2018, three (3) surface water monitoring gage locations were established in Crowley Creek, Upper Thacker Creek, and Lower Thacker Creek to assess baseflow conditions, ET consumption, and monitor stream responses to storm events. Stations were continuously monitored through May 2019 and flow data is summarized in Table 2. Key conceptual stream flow conclusions are discussed as follows:

- *Discharge varies seasonally in Crowley Creek, peaking in March to April and tapering off during summer months. Dry, no flow conditions were observed from July through November 2018 corresponding to peak ET consumption. Flow resumed in late November, likely due to reduced evapotranspiration demand from upstream vegetation (Figure 3). The stream bed froze during early December 2018, producing several anomalous high-pressure readings from ice confinement which was corrected in the dataset*
- *Flow in Upper Thacker Creek, peaked in spring months (~220 gpm) and tapered off during summer months (<5 gpm). Upper Thacker station was perennial, indicative of groundwater supplied baseflow. Baseflow estimates are ~66.3 gpm (Figure 4). Summer declines in flow are attributed to increased evapotranspiration demand in riparian meadows upgradient of the station and along the channel banks*
- *Flow at Lower Thacker Creek is also perennial, with smaller seasonal variation than at the Upper Thacker monitoring station (Figure 5). Spring time flows are ~270 gpm to 330 gpm during March and April with baseflow rates estimated to be 234 gpm. The stream section between the Upper and Lower Thacker monitoring stations is a gaining reach, increasing by 120 gpm to 190 gpm throughout the year. This reach is fed by multiple smaller springs (SP-012, SP-029, SP-030, SP-031, SP-034, SP-041, SP-057), but also is supported by groundwater inflow to the channel as the spring contributions alone are insufficient. In this sense, Thacker Creek and surrounding springs are conceptually apart of a single large spring complex, supporting baseflow in Thacker Creek*

Table 2

Thacker Pass Project stream flow summary

Station	Units	Crowley Creek	Upper Thacker	Lower Thacker
Stream Type	-	Ephemeral	Perennial	Perennial
Average Flow	GPM	1289	65.2	218
Baseflow	GPM	492	66.3	234
ET consumption	GPM	>492	53.7	93.8
Peak Flow	GPM	>50,000	840	905

THACKER PASS - LITHIUM NEVADA

Seeps and springs

A review of the Thacker Pass Project AOI and of potential seeps and springs from previous surveys, aerial photography, and topographic maps identified 56 seeps and springs within an expanded spring survey boundary (Figure 6). Thirty-six (36) seeps and springs were identified from prior seep and spring surveying including 22 seeps and springs which have been sufficiently characterized with at least four consecutive quarters of data collection and do not require continued monitoring as described in the workplan (Piteau, 2018). The remaining 14 previously monitored seeps and springs have been chosen for continued monitoring because they represent important water supplies or the prior baseline surveys were less than four quarters. There are also 20 new potential seeps/springs identified for monitoring (16 locations identified in 2018 and 2 locations identified in 2019). Thus a total of 34 locations were begun on a quarterly basis starting in Q1 2018 as part of the baseline data collection program. The compilation of spring survey data, has led to the following set of conclusions for the dataset of 56 seeps and springs extending back to June 2011.

- *Ten (10) identified seep and spring locations are not truly expressions of groundwater and should not be classified as springs (BLM-01, BLM-05, BLM-06, SP-003, SP-007, SP-015, SP-017, SP-018, SP-025, and SP-053). These locations are generally developed stock ponds, pipelines from upgradient springs, or runoff catchments. In some cases, there has never been evidence of a groundwater expression (BLM-01, BLM-05, BLM-06, SP-003, SP-025)*
- *Twenty-four (24) springs are classified as ephemeral (Figure 6), note one location (SP-053) is combined. Discharge peaks during Q2 and the site becomes dry during Q3 or Q4. The majority of the springs in Pole and Rock Creeks are ephemeral, such that the creeks do not flow perennially. In particular, the headwater of Rock Creek is seasonally dry as observed at SP-056, which was a surface water monitoring location. These include seeps and springs identified in 2019 (SP-058, SP-059, SP-060, and SP-061) because no evidence of surface discharge was observed during 2018*
- *Twenty-one (21) springs are classified as perennial (Figure 6). These springs with the greatest potential for groundwater related impacts are found along the Thacker Creek spring system*
- *Water chemistry is generally Ca-HCO3 type or Na-HCO3 type (Figure 7). Higher elevations springs in the headwaters of Rock Creek, and the spring near Thacker Creek tend to be more calcium-rich, while springs near Pole Creek and the Double H mountains are slightly more sodium-rich. Some analysis spring locations are SP-001, which was a stock watering trough location, and BLM-02*
- *Water chemistry analyses indicate that the majority of springs exceed Nevada Reference Values (NRVs) for arsenic. Of the 114 samples collected, 76 (67%) have exceeded the 0.01 mg/L NRV for arsenic. This is representative of background groundwater chemistry conditions derived from host rock which is primarily volcanic tuff, claystone, or basalt and conducive to leaching arsenic. Arsenic concentrations are consistently elevated in the Thacker Creek spring system with an average concentration of ~0.04 mg/L and exceedances at every spring, indicating an elevated arsenic background condition*

GROUNDWATER

Groundwater monitoring

Groundwater piezometric levels have been monitored through a series of 10 grouted-in piezometers, 9 active monitoring wells, and 3 production wells located across the Thacker Pass Project (Figure 8). Initial monitoring wells were drilled in 2011, 5 of which continue to function as monitoring wells. Four (4) additional monitoring wells and 9 grouted in piezometers were drilled in 2018. Two production wells have been drilled and tested in Thacker Pass. An additional grouted-in piezometer and production well were drilled in Quinn River Valley to evaluate feasibility of mine production water from the alluvial aquifer.

WATER RESOURCE SUMMARY

THACKER PASS - LITHIUM NEVADA

Groundwater levels in Thacker Pass are shown in Figure 8. Water levels tend to reside between 4,625 ft amsl to 5,034 ft amsl across the Thacker Pass Project and open pit area. Highest water levels are observed at WSH-7 (~ 5,285 ft amsl) which was drilled north of the principle E-W fault. Western water levels decline to an elevation of ~4,625 ft amsl (PZ18-05), which is approximately 20 ft higher than the headwaters of Thacker Creek (4,604 ft amsl). To the east water levels decline to 4,513 ft amsl at MW18-02 which serves as the down gradient monitoring point. Key observations from water levels are summarized as follows:

- *Water level data indicates the groundwater divide is shifted ~3,500 ft east of the hydrographic divide. The groundwater divide corresponds with a corridor of elevated water levels from WSH-7 (5,285 ft amsl), PH-1 (5,034 ft amsl), and WSH-17 (4,861 ft amsl) which are compartmentalized by minor faults (Figure 8). Groundwater west of PH-1 discharges towards Thacker Creek and ultimately Kings River Valley. Groundwater east of PH-1 discharges towards Crowley Creek and Quinn River Valley.*
- *Stair-stepping water levels across the minor faults (WSH-11 to WSH-17 to WSH-13) is further evidence for characterizing minor faults as hydraulic barriers. Over 100 ft of head difference occurs between WSH-17 and WSH-11 or WSH-13 which is a steep gradient*
- *Faults compartmentalizing the groundwater system in the open pit vicinity is confirmed by direct pumping of PH-1, which encountered hydraulic barriers during testing. Likewise, the continuous drainage of WSH-17 suggests the borehole intercepted the fault barrier and is slowly re-equilibrated to the lower hydrologic block.*
- *Steep groundwater gradients occur south of the E-W fault as evidenced by the contrast in water levels between WSH-7 (5,285 ft amsl) versus WSH-8 and MW18-04 (4,827 ft amsl). Contrast in permeability along the E-W fault is attributable to juxtaposing of volcanic tuff to the north (Tuff of Long Ridge) and claystone/ash sediments south*
- *Water levels have remained steady through time with the exception of WSH-17 (Figure 9). Most monitoring locations equilibrate in a period of months and then remain steady through time. Recharge is thus interpreted as predominantly bedrock percolation from higher and wetter elevations rather than from infiltration of surface runoff. The absence of surface water channels passing through the Thacker Pass Project suggests little to no runoff recharge occurs in the Thacker Pass Project*
- *Although water levels in the Thacker Pass Project show no seasonal variation, spring flows in Pole and Rock Creeks exhibit strong seasonal trends. Discharge at SP-039 in Pole Creek seasonally peaks in April and May and is dry by mid-summer. The strong seasonal response suggests stream channels can behave as transmissive bedrock corridors, hydraulically well connected along trend to upgradient recharge zones but poorly connected laterally to adjacent bedrock*
- *Groundwater levels across the claystone/ash sediments are generally flatter ranging from 0.007 ft/ft to 0.014 ft/ft. In volcanic tuff, groundwater levels are steeper, ~0.025 ft/ft suggesting lower transmissivity of materials*
- *Open pit mining is anticipated to begin at the north-western side of the pit, above the water table. As mining progresses to the east and south, the open pit will intercept the water table. The greatest saturated thickness is anticipated to be ~ 400 ft near PH-1*

Groundwater chemistry ranges from Ca/Na – HCO_3 to Ca/Na – SO_4 types, showing nearly equal components of calcium and sodium cations (Figure 7). Major ion chemistry of monitoring wells is similar to that of seeps and springs, with the exception that they are slightly enriched with regard to sodium. Monitoring well locations tend to have higher overall concentrations of constituents, but in similar proportions with springs and seeps. Chemistry correlation between monitoring wells and springs supports that springs, where they have perennial flow, are expressions of the groundwater system, and are recharged by younger groundwater with shorter flow paths and residence times.

WATER RESOURCE SUMMARY

THACKER PASS - LITHIUM NEVADA

In highly transmissive drainage corridors the residence time from recharge to spring flow is very short and ephemeral.

Minor ion composition of groundwater possesses elevated background concentrations of several constituents (arsenic, fluoride, iron, manganese) which exceed Nevada Reference Values for drinking water (NRVs or Profile I). Average water chemistry is provided in Table 3 and the frequency of NRV exceedances is summarized in Table 4 (note only constituents with minimum 10% exceedance frequency are summarized). A description of the background concentrations for key elements is as follows:

- *Arsenic: Elevated concentrations of arsenic, relative to NRVs, is ubiquitous and naturally occurring across the Thacker Pass Project as a background condition (Figure 10). It is the most abundant exceedance to NRVs, occurring 81% of the time in wells and 67% in springs (Table 4). Elevated concentrations of arsenic are found at most springs, including the Thacker Creek complex and in range front springs in Kings River Valley*
- *Fluoride: Approximately 35% of groundwater monitoring well samples are found to have elevated fluoride concentrations across the Thacker Pass Project (Table 4). Exceedances occur more frequently in the WSH-series of monitoring wells in the footprint of the proposed pit. The spatial distribution of fluoride suggests the element may be a leached product in claystone/ash beds*
- *Iron: Iron occasionally exceeds NRVs across the Thacker Pass Project. Iron exceedances occurred more frequently in springs than in wells, inferring that near surface weathering of minerals may be affecting spring chemistry*
- *Manganese: Manganese exceeds NRVs primarily in Thacker Creek (SP-010, SP-011, SP-033, and SP-034) where concentrations range from <0.01 mg/L to 1.5 mg/L. Other locations in the Thacker Pass Project are below NRVs, with an occasional exception such as SP-002*

TABLE 3

AVERAGE WATER CHEMISTRY*

PARAMETER	UNITS	NRVS	MW 18-01	MW 18-02	MW 18-03	MW 18-04	PH-1	WSH-03	WSH-11	WSH-13	WSH-14	WSH-17	TW 18-02	QRPW 18-01 DIS	QRPW 18-01 TOTAL
NUMBER OF SAMPLES	-	-	5	5	5	5	4	5	5	18	4	17	1	1	1
PH	PH	6.5-8.5	7.58	7.54	7.69	7.17	7.92	8.44	7.92	8.27	7.81	8.02	7.28	8.21	8.18
BICARBONATE (HCO_3)	MG/L	-	112	143	150	65	190	260	225	208	207	176	140	110	120
CARBONATE (CO_3)	MG/L	-	0.1	0.1	0.1	0.1	0.1	1.8	0.1	1.9	0.1	0.1	0.1	0.1	0.1
HYDROXIDE (OH)	MG/L	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.10	0.1	0.1	0.1
CHLORIDE	MG/L	250	22	95	7	14	73	68	43	27	130	33	12	24	24
FLUORIDE	MG/L	4	0.26	1.56	1.50	0.19	1.64	2.96	4.31	5.05	1.40	4.02	0.72	-	-
SULFATE	MG/L	250	23	77	27	16	63	6	41	44	61	37	19	-	-
NITRATE + NITRITE NITROGEN	MG/L	10	1.03	0.98	0.13	0.19	0.11	0.08	0.07	0.11	0.07	0.01	0.01	-	-
TKN	MG/L	-	0.04	0.27	0.26	0.04	0.07	0.45	0.01	0.15	0.01	0.17	0.04	-	-
TOTAL NITROGEN	MG/L	10	1.15	1.26	0.34	0.33	0.11	0.11	0.11	0.33	0.11	0.11	0.05	-	-
TDS	MG/L	500	201	450	230	137	407	412	332	331	502	286	220	-	-
ALUMINUM	MG/L	0.2	0.03	0.005	0.05	0.11	0.005	0.26	0.005	0.03	0.005	0.005	0.01	0.01	0.01
BARIUM	MG/L	2	0.02	0.08	0.08	0.04	0.09	0.00	0.06	0.05	0.08	0.06	0.05	0.002	0.002

WATER RESOURCE SUMMARY

THACKER PASS - LITHIUM NEVADA

AVERAGE WATER CHEMISTRY*

Parameter	Units	NRVs	MW 18-01	MW 18-02	MW 18-03	MW 18-04	PH-1	WSH-03	WSH-11	WSH-13	WSH-14	WSH-17	TW 18-02	QRPW 18-01 Dis	QRPW 18-01 Total
Number of Samples	-	-	5	5	5	5	4	5	5	18	4	17	1	1	1
pH	pH	6.5-8.5	7.58	7.54	7.69	7.17	7.92	8.44	7.92	8.27	7.81	8.02	7.28	8.21	8.18
Beryllium	mg/L	0.004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Bismuth	mg/L	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Boron	mg/L	-	0.01	0.26	0.06	0.01	0.24	0.38	0.22	0.87	0.25	0.35	0.01	0.17	0.17
Cadmium	mg/L	0.005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00012	0.0001	0.0001	0.00001	0.0001	0.0001
Calcium	mg/L	-	31.8	44.5	29.8	15.6	47.5	3.0	26.2	12.0	53.8	21.1	31.0	27.0	27.0
Chromium	mg/L	0.1	0.001	0.003	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cobalt	mg/L	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Copper	mg/L	1	0.004	0.004	0.004	0.004	0.01	0.01	0.01	0.01	0.01	0.024	0.004	-	-
Gallium	mg/L	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-	-
Iron	mg/L	0.3	0.03	0.04	0.04	0.10	0.02	0.10	0.02	0.020	0.013	0.021	0.28	0.044	0.047
Lithium	mg/L	-	0.01	0.06	0.08	0.01	0.20	0.28	0.35	0.22	0.26	0.22	0.01	0.01	0.01
Magnesium	mg/L	-	11.0	16.0	8.5	4.3	25.0	1.2	21.5	8.4	31.4	11.8	6.7	5.6	5.5
Manganese	mg/L	0.1	0.007	0.006	0.035	0.021	0.010	0.018	0.051	0.026	0.001	0.052	0.083	0.001	0.001
Molybdenum	mg/L	-	0.002	0.002	0.05	0.002	0.08	0.01	0.01	0.08	0.03	0.02	0.002	0.002	0.002
Nickel	mg/L	-	0.003	0.003	0.003	0.003	0.001	0.001	0.001	0.002	0.001	0.002	0.003	0.003	0.003
Phosphorus	mg/L	-	0.05	0.05	0.05	0.05	0.05	0.45	0.05	0.05	0.05	0.05	0.05	-	-
Potassium	mg/L	-	1.5	3.8	4.0	2.6	3.3	2.2	1.2	1.3	3.3	1.1	1.6	7.0	7.0
Scandium	mg/L	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-	-
Silver	mg/L	0.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0001	0.001	0.001
Sodium	mg/L	-	17	80	33	19	46	152	62	111	65	71	35	41	41
Strontium	mg/L	-	0.1	0.2	0.2	0.1	0.9	0.01	0.6	0.3	0.8	0.4	0.1	0.2	0.2
Tin	mg/L	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Titanium	mg/L	-	0.01	0.01	0.01	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Vanadium	mg/L	-	0.00	0.03	0.001	0.001	0.02	0.001	0.01	0.01	0.02	0.01	0.001	0.01	0.01
Zinc	mg/L	5	0.02	0.002	0.01	0.03	0.04	0.02	0.001	0.00	0.001	0.00	0.002	0.002	0.002
Mercury	mg/L	0.002	0.00002	0.00002	0.00002	0.0002	0.0001	0.00001	0.00001	0.0001	0.00001	0.00008	0.00001	0.00001	0.00001
Antimony	mg/L	0.006	0.0003	0.0003	0.002	0.000	0.005	0.000	0.000	0.002	0.002	0.0003	0.0003	0.0003	0.0003
Arsenic	mg/L	0.01	0.011	0.024	0.043	0.004	0.034	0.001	0.027	0.003	0.018	0.028	0.016	0.001	0.001
Lead	mg/L	0.015	0.0003	0.0003	0.0003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Selenium	mg/L	0.05	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Thallium	mg/L	0.002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Uranium	mg/L	0.03	0.001	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0001	-	-

* Geometric average calculated

THACKER PASS - LITHIUM NEVADA

Table 4

SUMMARY OF GROUNDWATER EXCEEDANCE						
	Wells (75 total samples)			Springs (114 total samples)		
Constituent	No. Exceedance Samples	Percentage (%)	Key Wells	No. Spring Exceedances	Percentage (%)	Key Springs
Aluminum	5	7%	25	23	22%	SP-036, SP-040, SP-050
Antimony	5	7%	PH-1, WSH-13, WSH-14	0	0%	
Arsenic	61	81%	Most wells	76	66%	SP-011, SP-010, SP-012, SP-041
Fluoride	26	35%	WSH-series wells	0	0%	SP-051
Iron	5	7%	PH-1, MW18-04	26	22%	SP-050, SP-011, SP-010, SP-040
Manganese	1	1%		17	15%	SP-033, SP-011, SP-010, SP-054

Hydrogeologic testing

Hydrogeologic testing was carried out to characterize hydrogeologic parameters (transmissivity, hydraulic conductivity, and storage) through a series tests spanning all field investigation campaigns. Hydrogeologic testing locations are shown in Figure 11. An overview of hydrogeologic tests performed at the Thacker Pass Project is as follows:

- *Packer tests: Packer tests occurs over a short time frame and interval, calculated values for rock transmissivity are considered localized points and tend to present lower transmissivity values reflective of primary matrix transmissivity*
- *Injection / airlift recovery tests: The tests represent radial rock transmissivities at distances of several to tens of feet from the borehole, thus still a localized test but provide an integrated response across the borehole*
- *Long term pumping tests: These tests measure the overall groundwater response to pumping across a wide field, including boundary effects, and thus they provide the greatest measure of characterization for a groundwater system. Three long term pumping tests were performed for the Thacker Pass Project:*
  - *PH-1 constant rate pumping test for a period of ~56 hours. Pumping fluctuated from 60 gpm to 95 gpm and was limited by increased drawdown in the borehole as the cone of depression intersected nearby hydraulic barriers associated with minor faults in the claystone / ash unit. Drawdown was only observed in the pumping well*
  - *QRPW18-01 constant rate test operated for a period of 72 hours at a rate of 2516 gpm. Approximately 28.86 ft of drawdown occurred in the pumping well and 13.45 ft of drawdown in nearby piezometer PZ17-01 (radial distance of 24.3 ft)*
  - *TW18-02 constant rate test was operated for a period of 35 days at an average rate of 58 gpm. Drawdown was observed at several monitoring locations including PZ18-07, PZ18-09, and MW18-03. It is important to note drawdown was not observed, or could not be differentiated at piezometers located adjacent to Thacker Creek (PZ18-05) or piezometers in the vicinity of the pit (PZ18-01 and PZ18-08). The lack of groundwater response indicates compartmentalization between the pit, the southwest basin, and Thacker Creek*

THACKER PASS - LITHIUM NEVADA

The overall program analyzed results of 32 separate analyses, which are grouped into 5 hydrogeologic units and summarized in Table 5. The testing and characterization program led to several key conclusions pertaining to the Thacker Pass Project hydrogeologic system:

- *The presence of faults has compartmentalized groundwater units as evidenced by the pumping tests conducted at PH-1 and TW18-02. The corridor of N-S minor faults is responsible for the elevated groundwater levels encountered while drilling WSH-5, WSH-6, WSH-17, and PH-1. The PH-1 pumping test was affected by nearby hydraulic barriers, accelerating the rate of drawdown. During the TW18-02 pumping test, NW – SE trending vent faults (and the uplifted block of volcanic tuff) hydraulically separated the pit area monitoring locations from the production well. Compartmentalization will affect the resulting geometry of drawdown during mine operations*
- *Thacker Creek was hydraulically insulated from the TW18-02 pumping test by geologic contacts and N-S trending vent faults. This compartmentalization will reduce or possibly prevent impacts from mine dewatering*
- *The basal ash unit in the southwest basin was the primary flow conduit for groundwater during the TW18-02 pumping test. The basal ash beds had approximately an order of magnitude higher transmissivity and hydraulic conductivity values than the more common claystone/ash beds near the open pit which have a greater abundance of clay*
- *QRPW18-01 is located in a very transmissive alluvial aquifer. Water production from QRPW18-01 will be sustainable at a rate of 4,000 gpm and is capable of satisfying the water requirements for the project*

Table 5

SUMMARY OF HYDROGEOLOGIC TESTING

		Transmissivity			Hydraulic Conductivity			Storage Coefficient		
Geology	**# of tests**	**Max**	**Min**	**Mean[1]**	**Max**	**Min**	**Mean[1]**	**Max**	**Min**	**Mean[1]**
Tuff	7	10.3	0.81	2	0.068	0.009	0.019	--	--	--
Claystone/ ash	11	952	0.35	68	2.8	0.016	0.3	0.043	2.39E-02	2.91E-02
Basalt	2	2409	2	69	4.05	0.011	0.61	--	--	--
Alluvium	2	28107	26472	26935	52.5	51	51.4	1.67E-01	4.07E-04	9.00E-03
Basal ash	10	1900	1.11	320.7	3.90	0.22	1.58	4.60E-02	7.13E-06	5.17E-04

[1] Geometric mean

THACKER PASS - LITHIUM NEVADA

CONCEPTUAL MODEL

The Thacker Pass Project resides along the hydrographic basin divide between Kings River Valley and Quinn River Valley. Therefore, of necessity the conceptual model must extend into both hydrographic basins, although the basins themselves are hydrologically separate. The conceptual hydrogeologic model domain and boundaries are shown in Figure 12. The conceptual model domain is sufficiently large to identify potential groundwater related impacts related to mining operations by placing boundary conditions beyond the effects of project pumping with the Thacker Pass Project placed in the center. From east to west, the model spans approximately 37 miles, and from north to south it spans approximately 14 miles.

Hydrogeologic Units

Geologic units were grouped and subdivided into unique hydrogeologic units (HGUs) or zones of similar properties. Conceptual HGUs are summarized in Table 6 and a brief description of key HGUs is provided as follows.

- *Quinn River Valley (QRV)-Basement McDermitt Tuff: The majority of the Montana mountains is comprised of undifferentiated McDermitt Tuff, also referred to as the Tuff of Long Ridge. Tuff thickness varies between 0 to over 2,000 ft, such as is found in the Montana mountains. McDermitt tuff is stratigraphically lower than claystone/ash sedimentary units and is the basement HGU in the Montanas*
- *Older alluvium (Quinn River and Kings River Valleys): Older alluvium sediments are exposed along the basin margins. The alluvium is highly variable and is composed of unconsolidated sand, silt, and clay. Older alluvium is composed of paleo-channels and floodplains, ancient alluvial fans, and basin fill. Older alluvium pinches out at the basin margins, reducing the unit's thickness and transmissivity. Both older and younger alluvium units have horizontal hydraulic conductivity values several times larger than vertical hydraulic conductivity*
- *Basin fill alluvium (Quinn River and Kings River Valleys): Basin fill alluvium transitions from the basin margins towards the basin center and are formed by bulk alluvial, younger alluvial fans, and floodplain deposits. Materials are comprised of sub-angular gravels, sands, and silts, with generally < 30% fine-grain content. Basin fill is incised by younger reworked alluvium and pinches out towards the basin margins*
- *Thacker Pass claystone/ash: The claystone unit is dominantly composed of moat sediments in the form of clays, lithified claystone, and ash. Thin beds of volcanic ash, ranging from less <1ft to 5 ft in thickness are regularly interbedded within claystone deposits. Ash beds are comprised of well sorted fine to coarse-grained lapilli sands and are the primary flow conduits in the unit. The claystone unit is approximately 300 ft to 400 ft thick in the Thacker Pass Project. This unit hosts the Li-rich hectorite clays which compose the ore body and is the unit in which open pit mining will occur*
- *Thacker Pass basal ash: The basal ash unit is found in the Southwest basin, south of Silica Hill and lies stratigraphically below the claystone/ash unit. Basal ash is primarily composed of rhyolitic volcanic lapilli ranging from 50 ft to 200 ft thick. Claystone is interbedded in the ash, but less abundant than in the claystone/ash unit. Thus, vertical hydraulic conductivity is limited by thin interbeds of claystone and several times lower than horizontal hydraulic conductivity*
- *Thacker Pass volcanic tuff: Volcanic tuff (primarily the Tuff of Long Ridge or McDermitt Tuff) is located stratigraphically below the claystone/ash unit. The top of the lithic tuff is a lithified, competent silicic volcanic rock which serves as the boundary between claystone and tuff. Groundwater flow principally occurs through secondary fractures and along structural features. The overall permeability and storage are quite low, even after accounting for fractures. Lithic tuff represents the deepest bedrock unit encountered by exploration drilling*

THACKER PASS - LITHIUM NEVADA

Table 6

SUMMARY OF HYDROGEOLOGIC UNITS					
Lithology Unit	Kh Range (ft/d)	Kv Ratio	Ss Range (1/ft)	Sy Range	Source
QRV-Basement McDermitt Tuff	1x10-4 – 1x10-1	1 - 10	1x10-7 – 1x10-5	0.01 – 0.005	2018 Testing
QRV-Regional Basalt	1x10-2 – 10	1	1x10-7 – 1x10-5	0.04 – 0.01	2018 Injection / recovery tests
QRV-Rhyolitic flows and younger intrusive rocks	1x10-4 – 1x10-1	1 - 10	1x10-7 – 1x10-5	0.01 – 0.005	2018 Testing
QRV-Dacite	1x10-4 – 1x10-1	1 - 10	1x10-7 – 1x10-5	0.01 – 0.005	Literature estimates
QRV-Jurassic granite	1x10-4 – 1x10-2	1	1x10-7 – 1x10-5	0.01 – 0.005	Literature estimates
QRV-Undifferentiated rhyolite flows, lavas, tuffs	1x10-4 – 1x10-1	1 - 10	1x10-7 – 1x10-5	0.01 – 0.005	2018 Testing
QRV-Winnemucca fmn: Shale, siltstone, sandstone and carbonate	1x10-3 – 1x100	1 - 100	1x10-7 – 1x10-5	0.01 – 0.005	Literature estimates
QRV - Older alluvium	1x10-1 – 1x101	1 - 100	1x10-6 – 1x10-4	0.17 – 0.03	Water Resource Bulletin 34
QRV – Basin fill alluvium	2x101 – 1x102	1 - 100	1x10-6 – 1x10-4	0.20 – 0.05	QRPW18-01 pumping test
QRV- Younger alluvium / gravel beds	2x101 – 2x102	1 - 10	1x10-6 – 1x10-4	0.20 – 0.05	Recharge boundary observed in QRPW18-01
Thacker Pass - Alluvium	1x10-1 – 1x101	1 - 100	1x10-6 – 1x10-4	0.17 – 0.03	Literature estimates
Thacker Pass – Claystone/ash	5x10-2 – 5x100	1 - 1000	1x10-7 – 1x10-5	0.04 – 0.01	2018 Testing
Thacker Pass Basal ash	1x10-1 – 5x100	1 - 100	1x10-6 – 1x10-5	0.04 – 0.01	2018 Testing
Thacker Pass – Volcanic tuff	9x10-3 – 1x100	1 - 10	5x10-7 – 5x10-5	0.01 – 0.005	2018 Testing
Thacker Pass - Basalts	1x10-2 – 10	1	1x10-7 – 1x10-5	0.04 – 0.01	2018 Testing
Thacker Pass - Drainages	1x10-1 – 1x100	1 - 10	1x10-6 – 1x10-5	0.01 – 0.005	2018 Testing
KRV – Undifferentiated rhyolite flows, lavas, tuffs	1x10-4 – 1x10-1	1 - 10	1x10-7 – 1x10-5	0.01 – 0.005	2018 Testing
KRV - Older alluvium	1x10-1 – 1x101	1 - 100	1x10-6 – 1x10-4	0.17 – 0.03	Water Resource Bulletin 31
KRV – Basin fill alluvium,	5x100 – 1x102	1 - 100	1x10-6 – 1x10-4	0.20 – 0.05	Water Resource Bulletin 31
KRV – Younger alluvium, playa	2x101 – 2x102	1 - 10	1x10-6 – 1x10-4	0.20 – 0.05	Analogous QRPW18-01 pumping test

K_H – Horizontal hydraulic conductivity
K_V – Vertical anisotropy (Kh / Kz)
S_S – Specific storage
S_Y – Specific yield

THACKER PASS - LITHIUM NEVADA

Recharge

Recharge in Quinn River and Kings River Valleys begins in mountain blocks with elevations above 5,000 ft amsl, and is distributed to the alluvial basin via two processes (Huxel, 1966 and Malmberg, 1966):

- *Deep Bedrock recharge representing precipitation and snowmelt percolation in bedrock mountain blocks*
- *Runoff Recharge derived from infiltration of surface water runoff as it flows across alluvium material along basin margins*

NDWR resource bulletins reports estimate total recharge for Quinn River Valley to be ~ 25,000 afy in the Orovada Subarea of Quinn River (Huxel, 1966) and 16,800 afy in the Rio King subarea of Kings River Valley. Scaling recharge components using an area weighted basis yields a total recharge rate of 22,972 afy across the Thacker Pass Project conceptual model and is summarized in Table 7.

Discharge

Groundwater discharge from Quinn River and Kings River Valleys occurs primarily through four processes:

- *Evapotranspiration through phreatophytes*
- *Irrigation pumping*
- *Seeps and springs*
- *Groundwater outflow to adjacent basins*

Prior to the 1950s, discharge occurred primarily through evapotranspiration of phreatophytes. However, with the increase in agricultural production during the 1950s and 1960s irrigation pumping is the largest component of groundwater discharge. During 2018 approximately 62,038 afy and 17,125 afy were pumped from Quinn River and Kings River Valley respectively. Water level decline in the basins over the past 30 years is indicative of the changing proportions of increasing irrigation pumping and declining evapotranspiration.

Components for groundwater discharge are summarized in the conceptual model water balance in Table 8. More detailed discussion of discharge components is provided in Piteau, 2019.

Table 7

CONCEPTUAL MODEL RECHARGE SUMMARY

Basin	*Orovada Subarea*	*Rio King Subarea*	*Quinn River – Conceptual Model[1]*	*Kings River – Conceptual Model[2]*
Runoff Recharge	18,000	15,900	11,066	407
Deep Bedrock Recharge	7,000	900	4,304	7,195
Total	25,000	16,800	15,370	7,602

Table 8

Conceptual model water balance				
	Quinn River Conceptual Model		Kings River Conceptual Model	
	Conceptual Model (afy)[1]	Area (acres)	Conceptual Model (afy)[1]	Area (acres)
Inflows				
Basin Recharge	15,370	248,620	7,600	86,492
Runoff Recharge	11,070		7,195	
Deep Recharge	4,300		405	
AG Return Flow	8,7002		1,500	
GW-Inflow	30,9803		0	
Total	55,050		9,100	
Outflows				
Phreatophytes	3,790	10,260	1,405	4,335
AG Pumping	34,780	34,780	6,000	9,942
Springs	150		350	
GW outflow	16,320		1,345	
Surface Water Outflow	0		0	
Total	55,050		9,100	

[1] Rounded to nearest 10 afy

[2] Assumed to as 25% irrigation pumping

[3] Approximately 25,600 afy is attributed to the Quinn River (USGS, 2018)

REFERENCES CITED

ASCE-EWRI, 2004 Standards UC Davis.

Huxel J.R, C.J., Parkes, 1966. Effects of Irrigation Development on the Water Supply of Quinn River Valley Area, Nevada and Oregon 1950-64. Water Resource Bulletin No. 34.

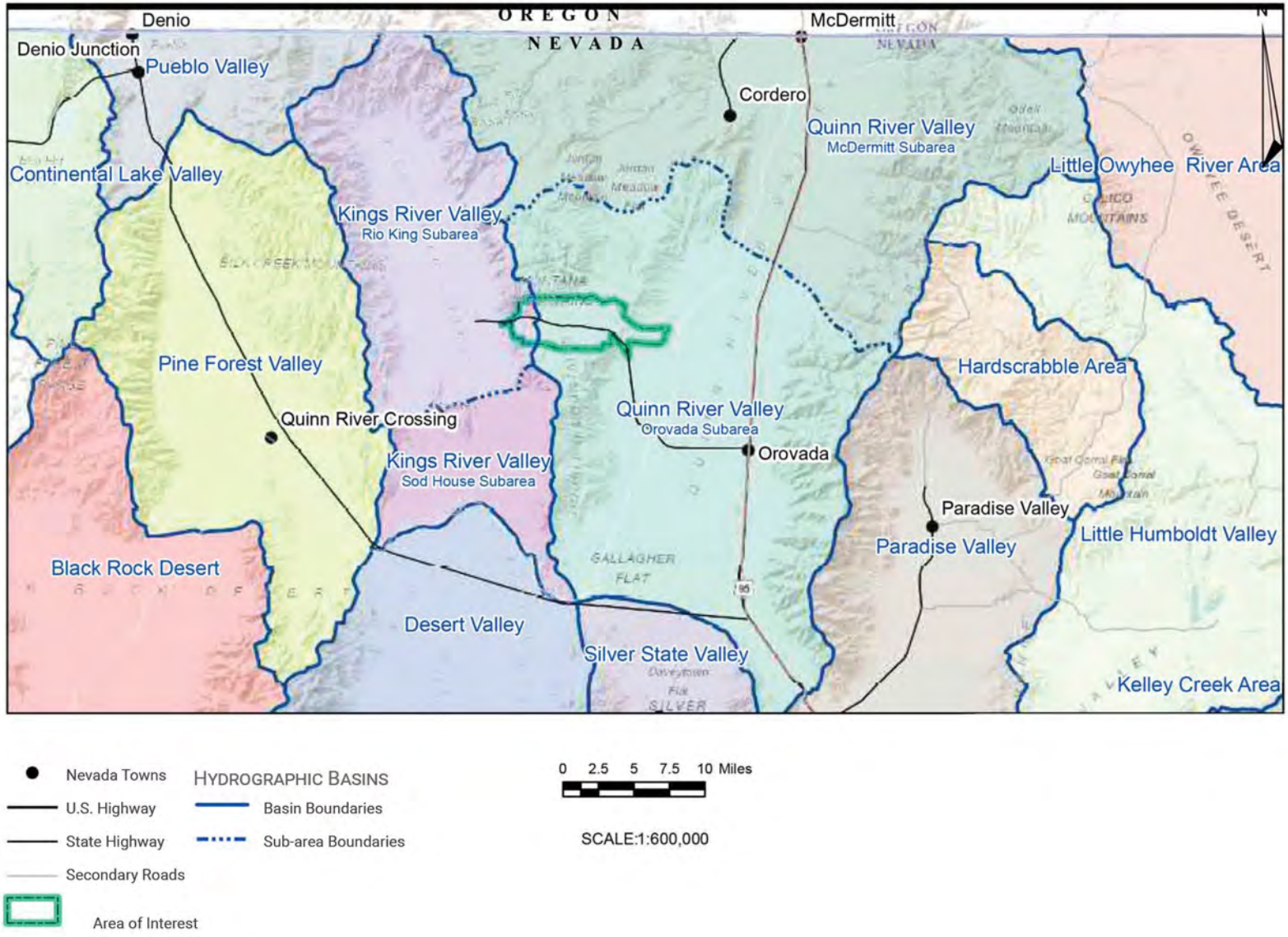
Malmberg, G. T., Worts, G. F., 1966. Water Resources Bulletin No. 31. The Effects of Pumping on the Hydrology of Kings River Valley, Humboldt County, Nevada, 1957-64.

Piteau Associates, 2019. Thacker Pass Project Hydrogeologic Baseline Hydrologic Data Collection Report. June 2019.

WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

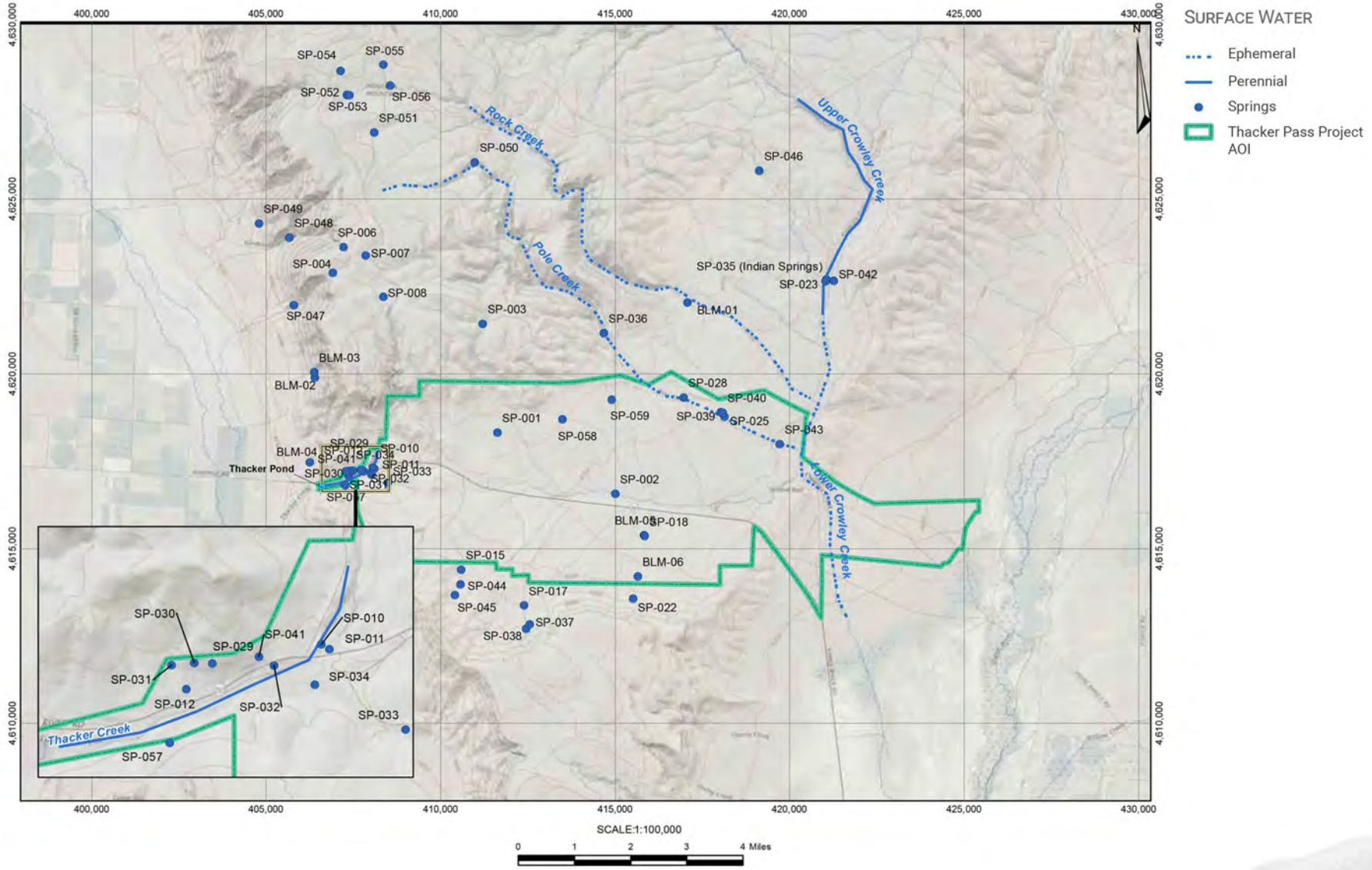
FIGURE 1: HYDROGRAPHIC BASIN BOUNDARIES



WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

FIGURE 2: SURFACE WATER AND SPRING LOCATION MAP

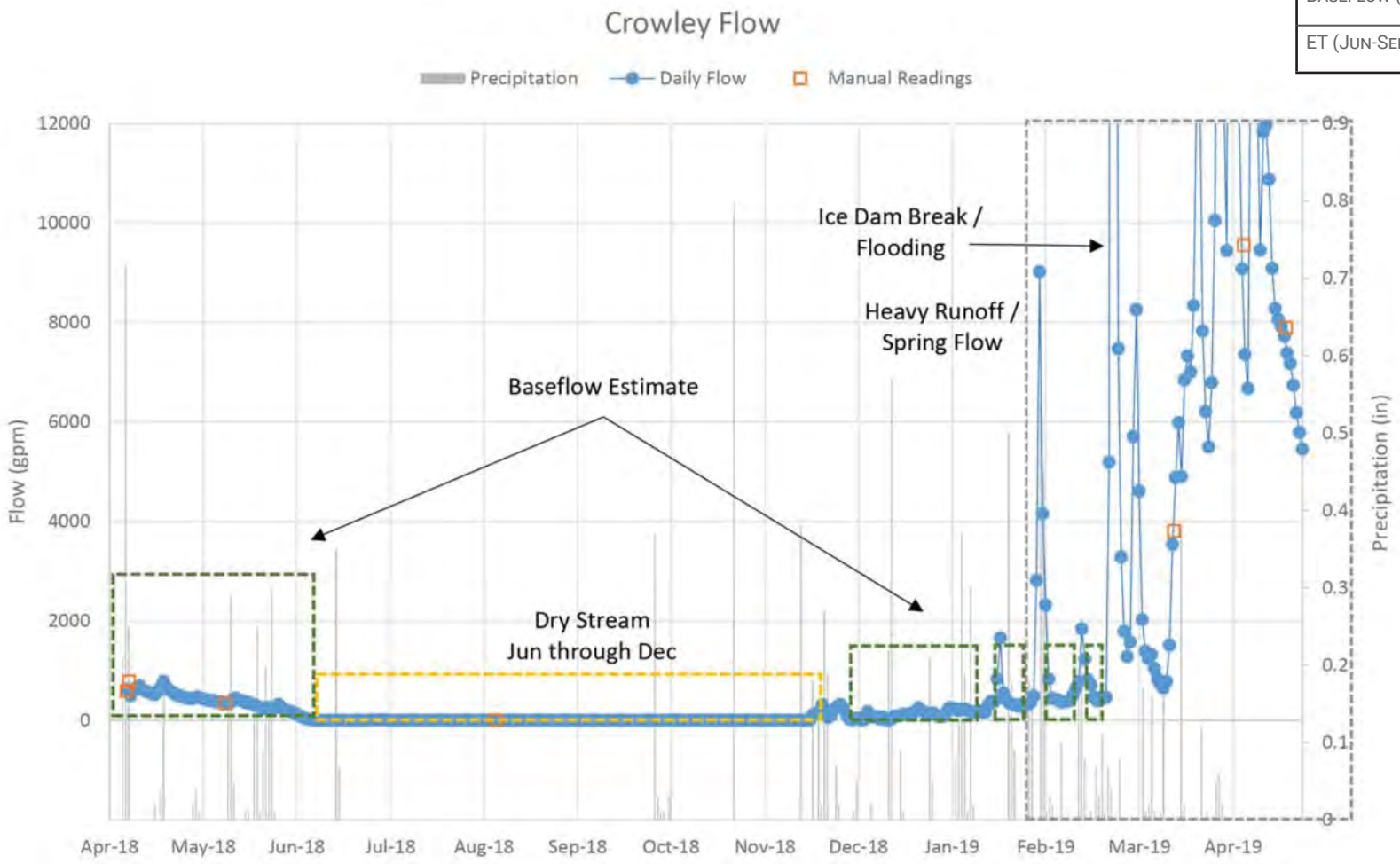


WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

Flow Data	Rate	Units
Annual Avg.	1289	gpm
Baseflow (Dec-Mar)	491.7	gpm
ET (Jun-Sep)	-491.7	gpm

FIGURE 3: CROWLY STATION FLOW HYDROGRAPH

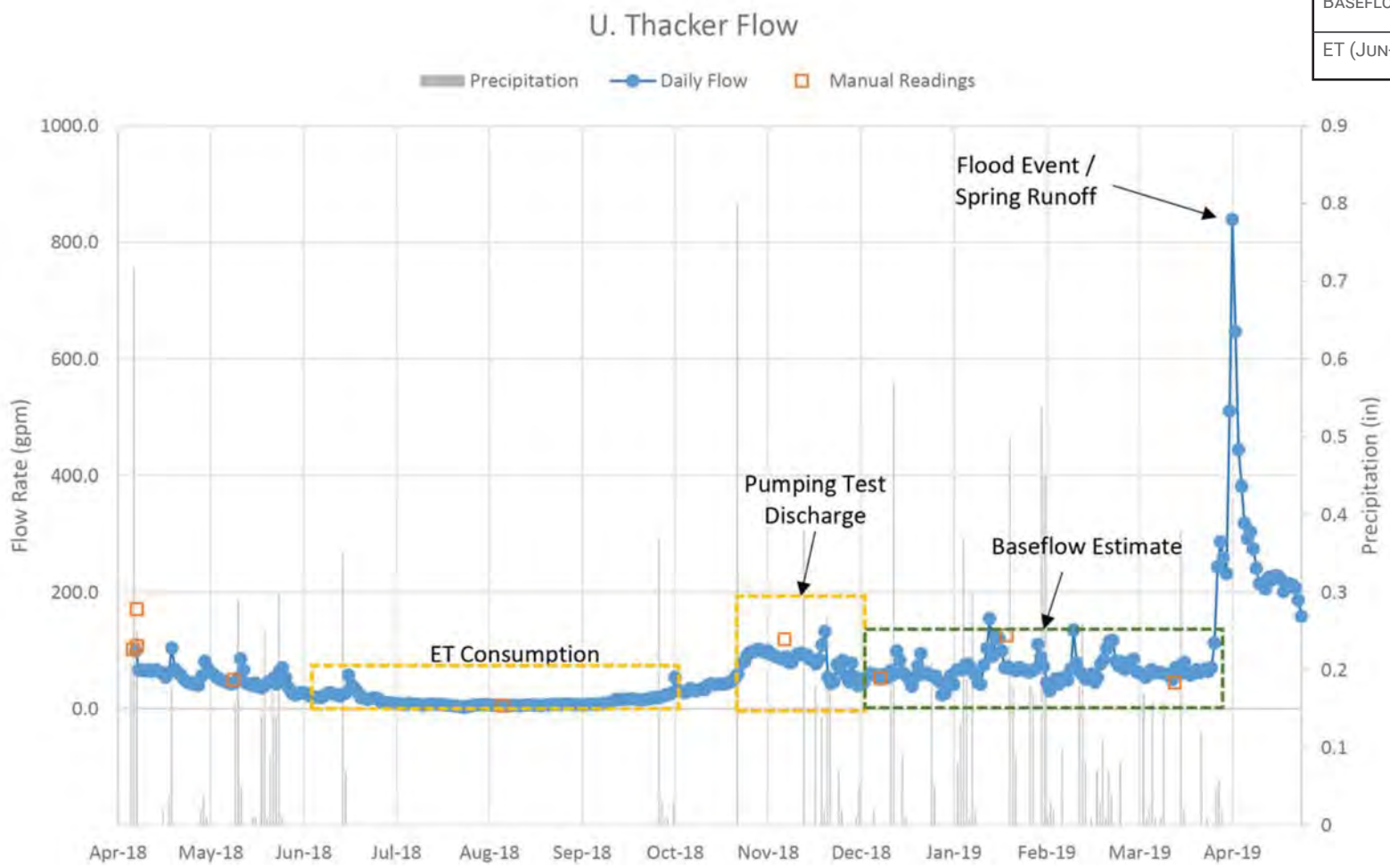


WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

Flow Data	Rate	Units
Annual Avg.	65.2	GPM
Baseflow (Dec-Mar)	66.3	GPM
ET (Jun-Sep)	-53.7	GPM

FIGURE 4: UPPER THACKER STATION FLOW HYDROGRAPH

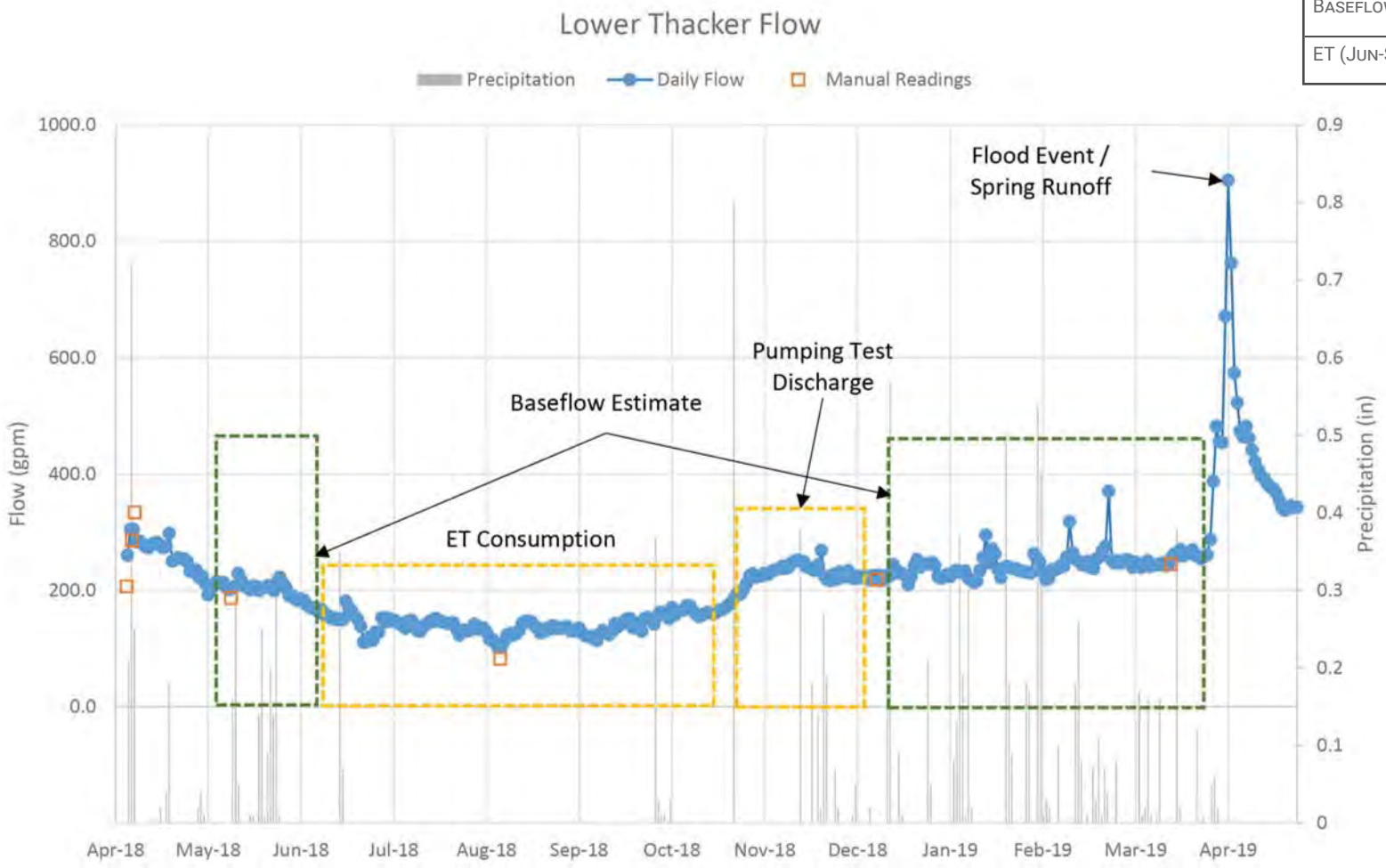


WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

Flow Data	Rate	Units
Annual Avg.	218	GPM
Baseflow (Dec-Mar)	234	GPM
ET (Jun-Sep)	-93.8	GPM

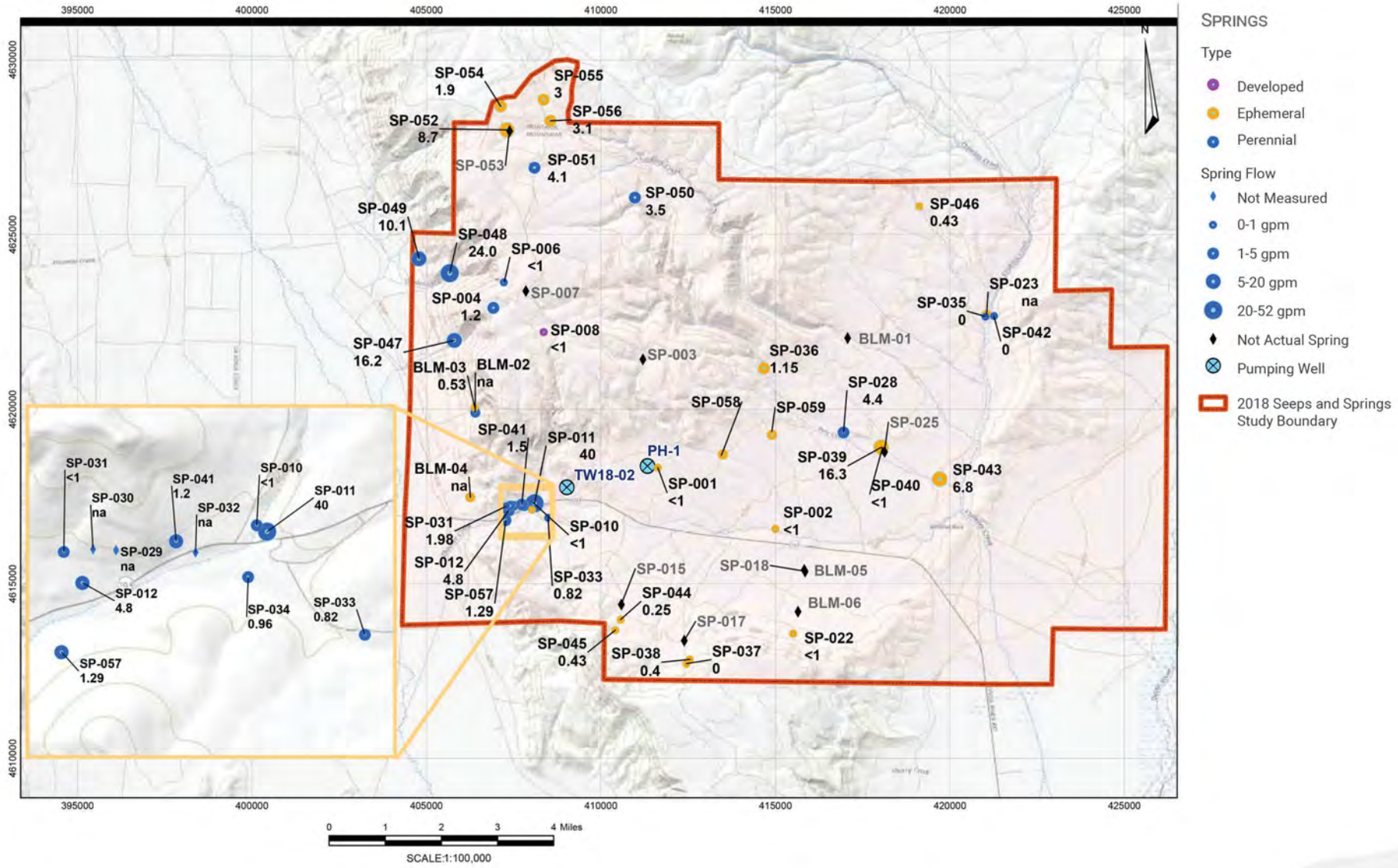
FIGURE 5: LOWER THACKER STATION FLOW HYDROGRAPH



WATER RESOURCE SUMMARY: FIGURES

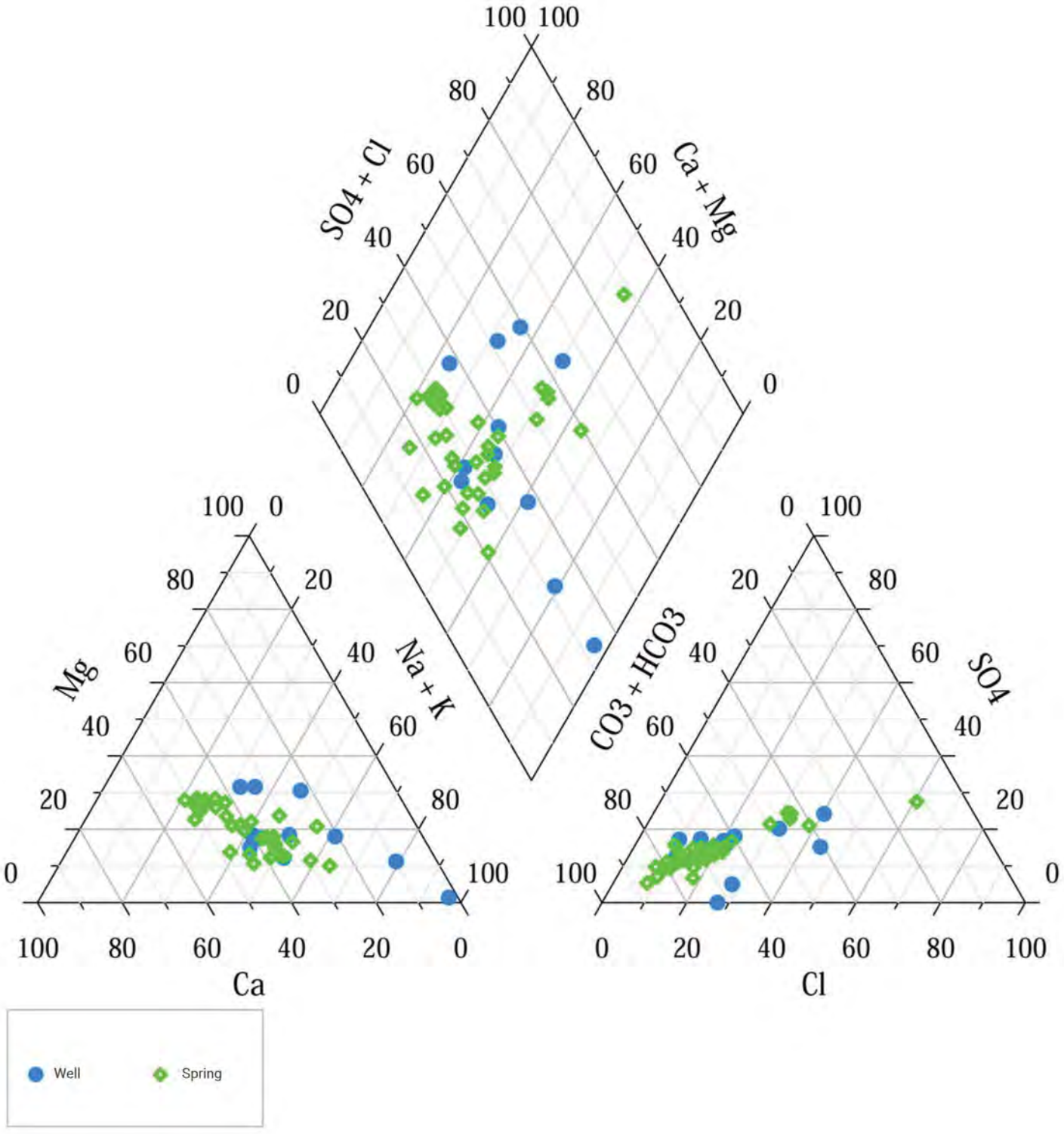
THACKER PASS - LITHIUM NEVADA

FIGURE 6: SEEPS AND SPRINGS: AVERAGE FLOW RATES



THACKER PASS - LITHIUM NEVADA

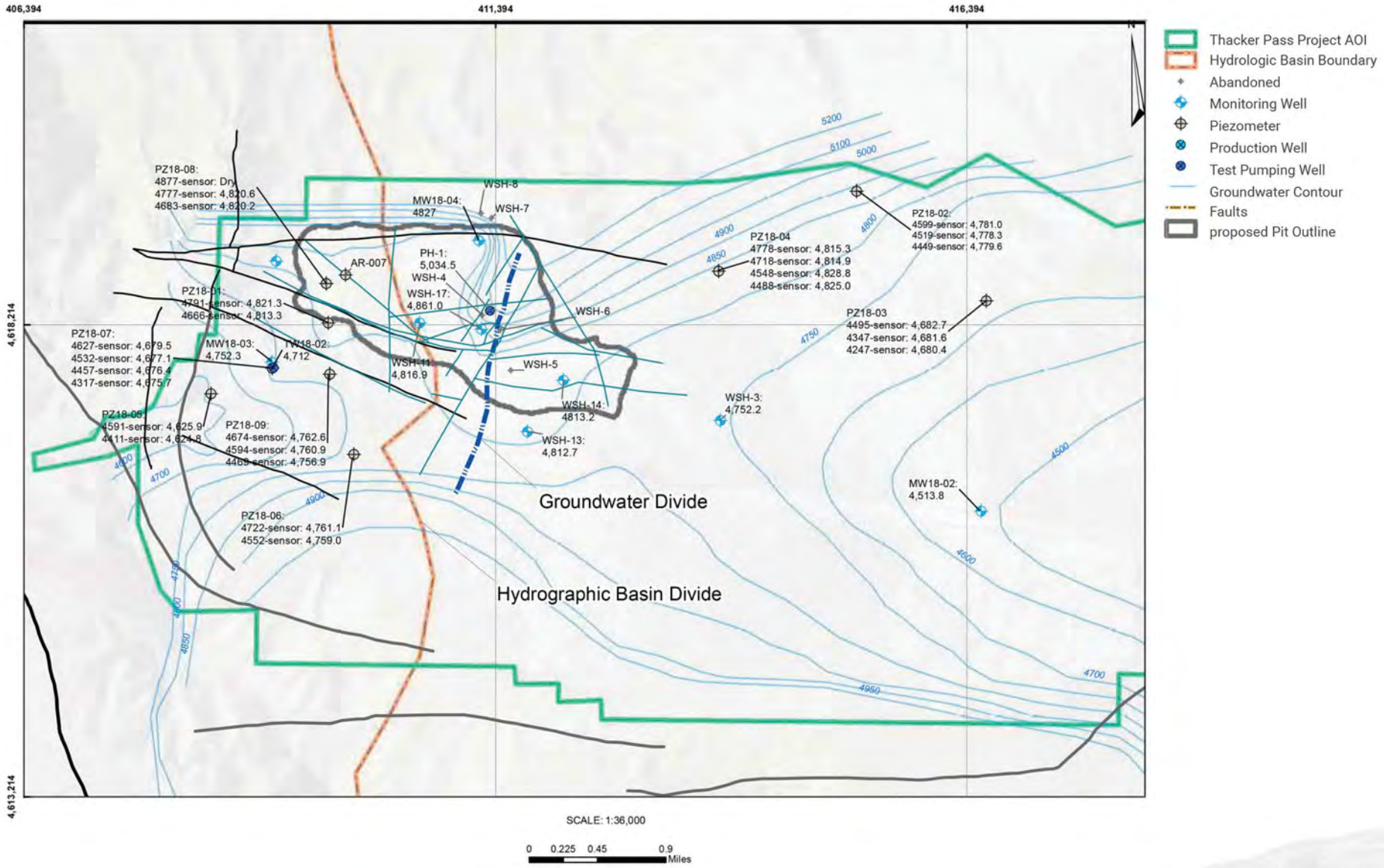
FIGURE 7: GROUNDWATER AND SPRING PIPER DIAGRAM



WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

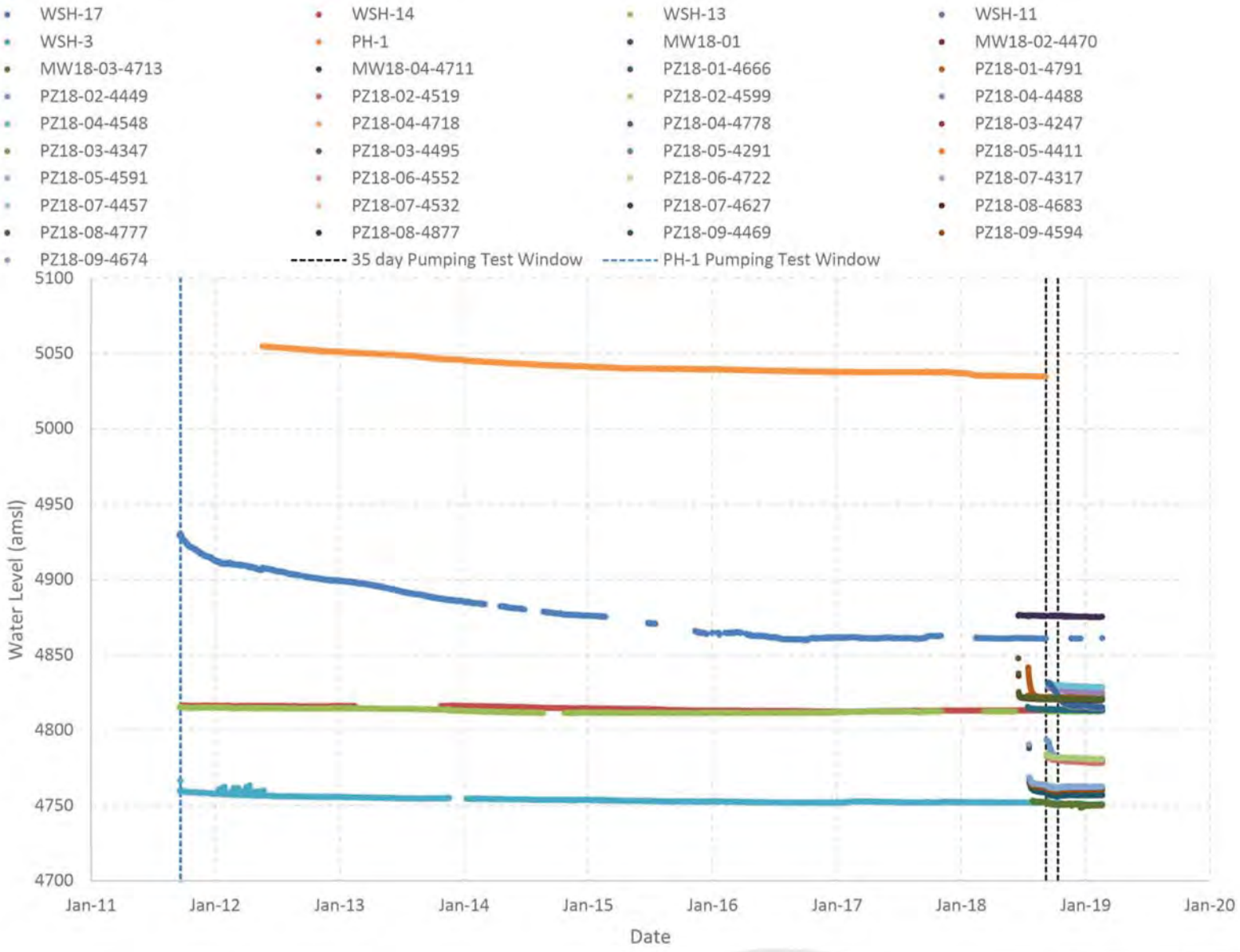
FIGURE 8: THACKER PASS GROUNDWATER LEVELS



WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

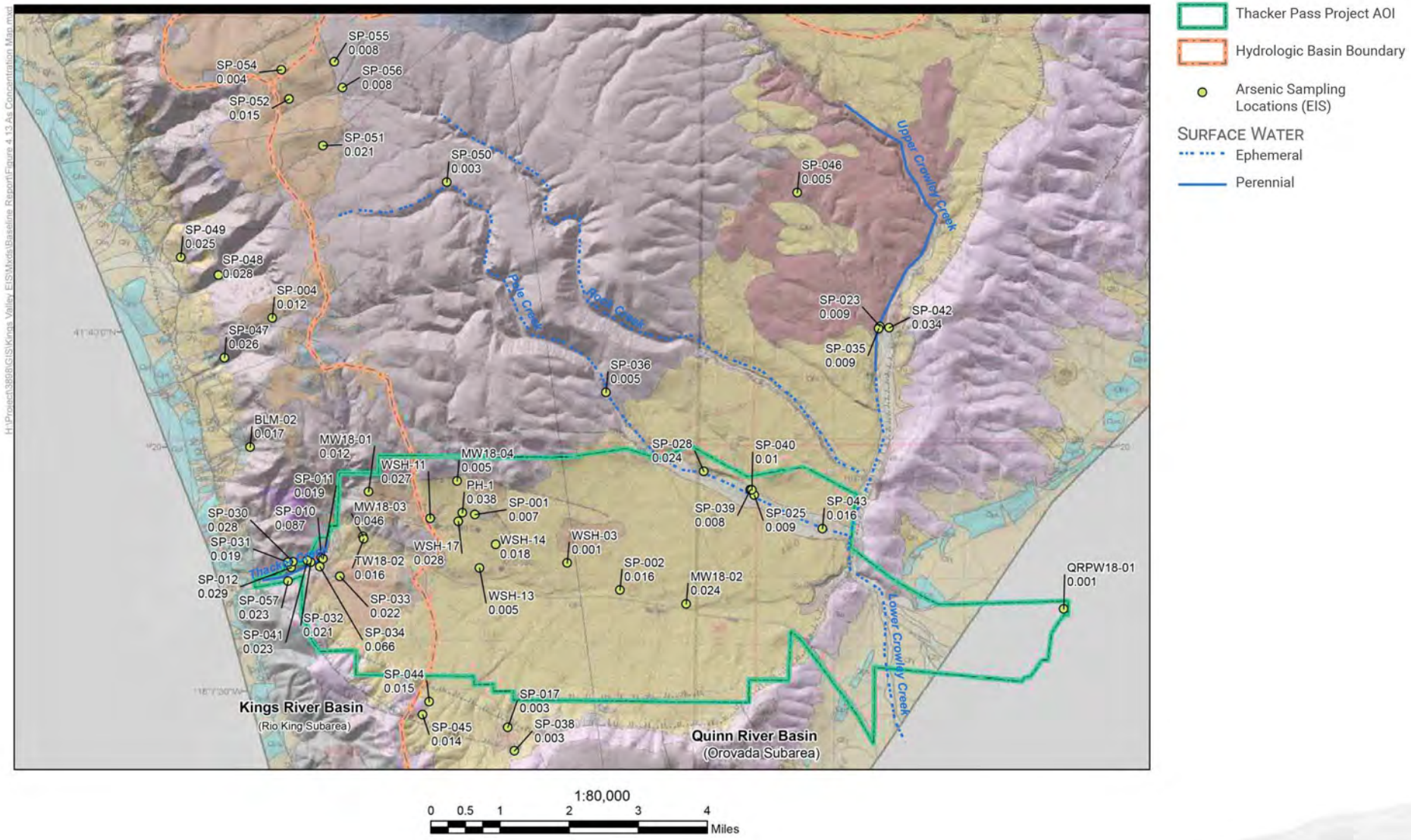
FIGURE 9: COMBINED THACKER PASS HYDROGRAPH



WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

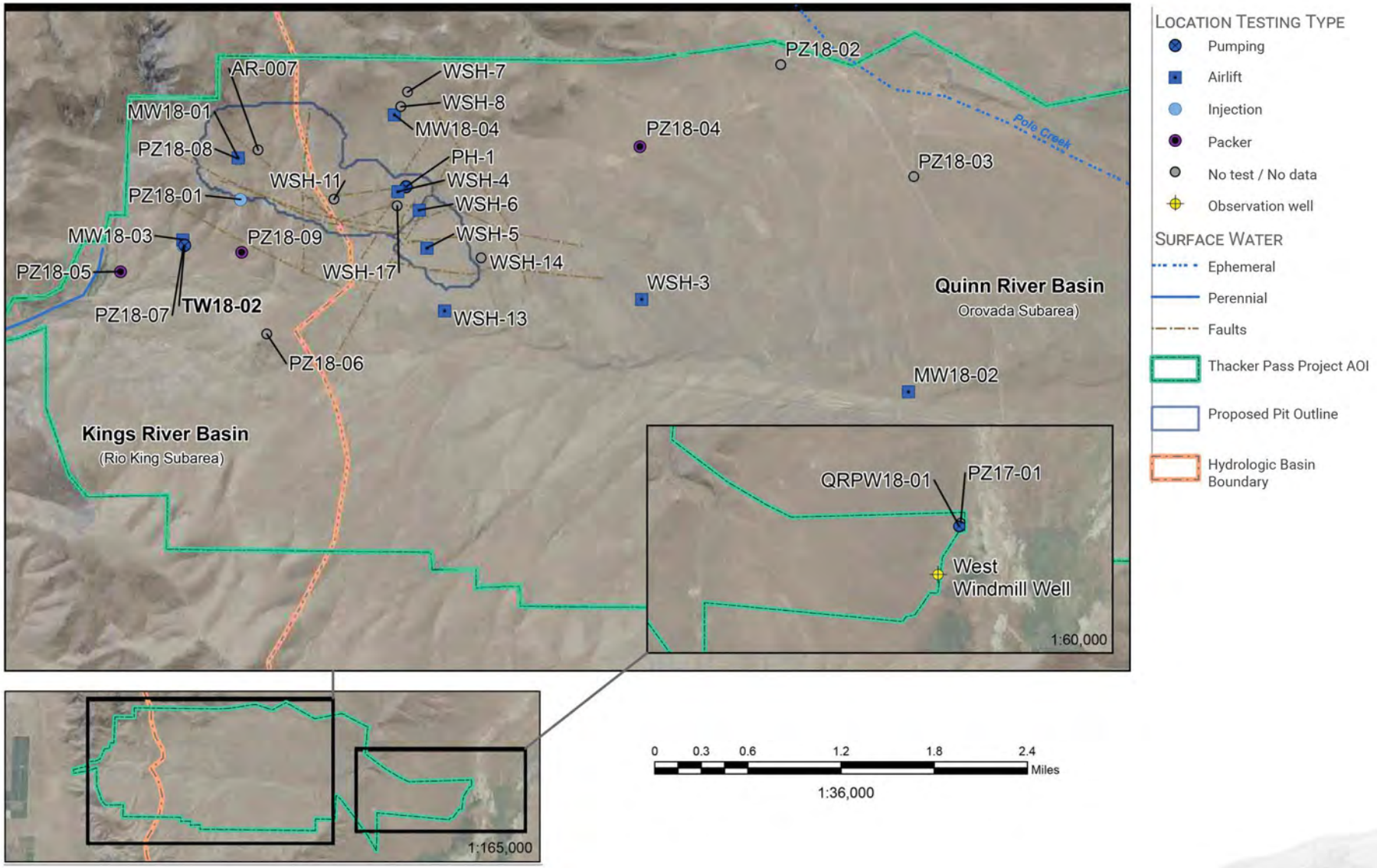
FIGURE 10: ARSENIC CONCENTRATION (MG/L) IN GROUNDWATER



WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

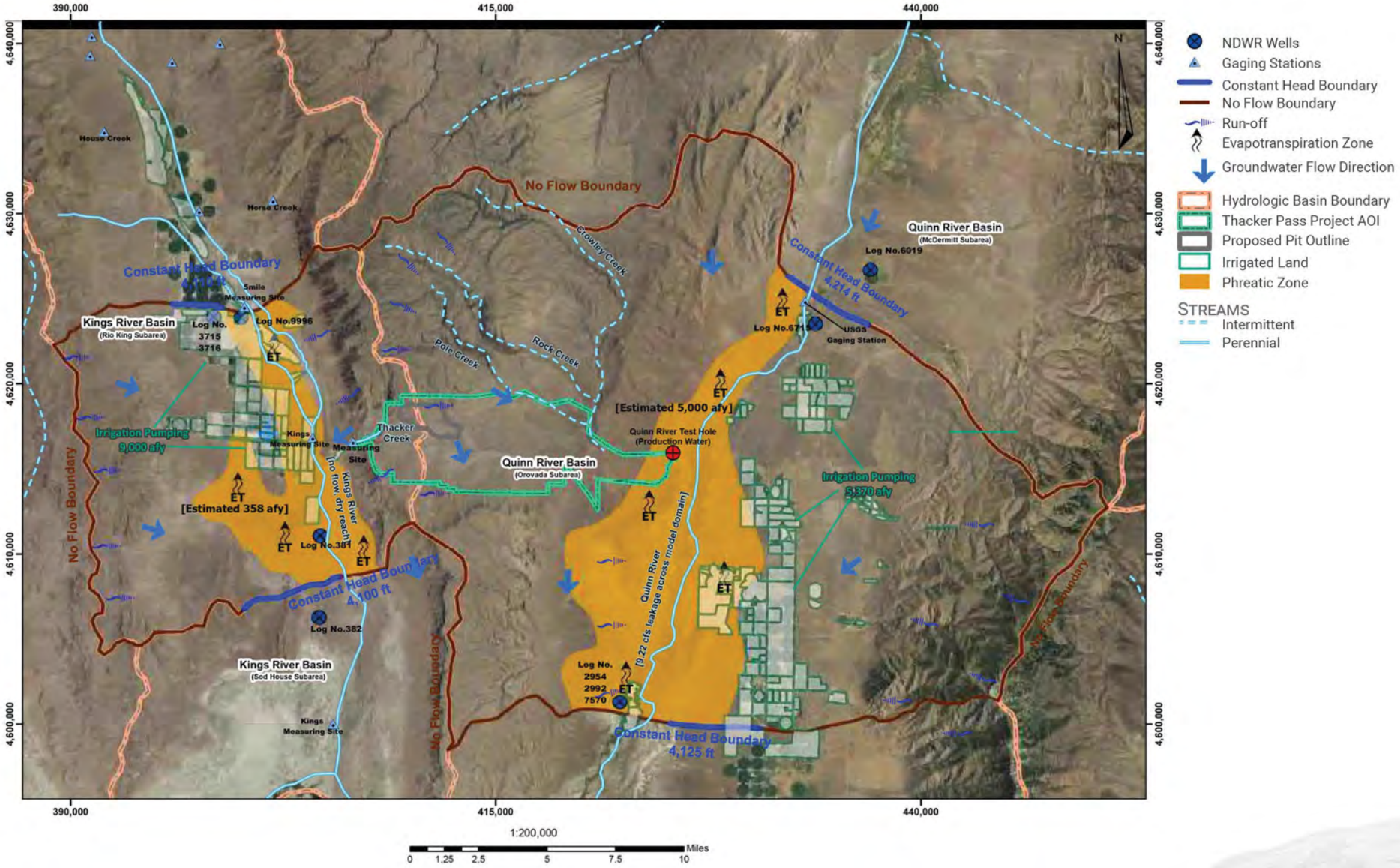
FIGURE 11: TESTING LOCATIONS AND TYPES



WATER RESOURCE SUMMARY: FIGURES

THACKER PASS - LITHIUM NEVADA

FIGURE 12: CONCEPTUAL MODEL DOMAIN AND BOUNDARY MAP



Wetlands Baseline Summary

THACKER PASS - LITHIUM NEVADA

Wetlands & Riparian Zones

This section identifies and describes wetland and riparian resources that may be affected by the Proposed Action (Lithium Nevada). Water resources, including surface water (streams), springs, groundwater, and geochemistry are discussed separately in the Water Resources Summary report.

Wetland Resources

- *In 2019, 2017 and 2012, the United States (U.S.) Army Corps of Engineers (USACE) issued an approved jurisdictional determination (AJD) for Lithium Nevada Corporation's (Lithium Nevada) Kings Valley Lithium Project and Thacker Pass Project*
- *All AJDs determined that all wetland resources within the project areas were isolated with no interstate commerce use and therefore non-jurisdictional*
  - *On a project-level scale, wetlands are isolated from the Kings and Quinn Rivers and have no direct surface connection to these rivers*
  - *On a regional watershed-level scale, the Quinn River watershed (HUC8-16040201 and HUC8-16040202) terminates at a large, closed basin playa lake bed is positioned at its lowest point in the Black Rock Desert (HUC6-160402)*

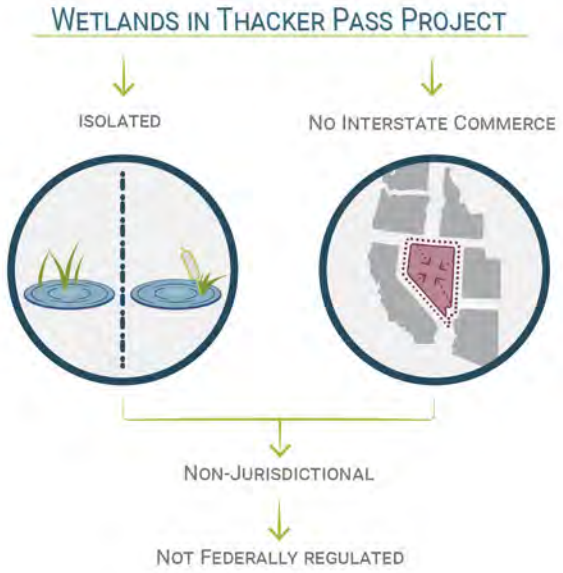


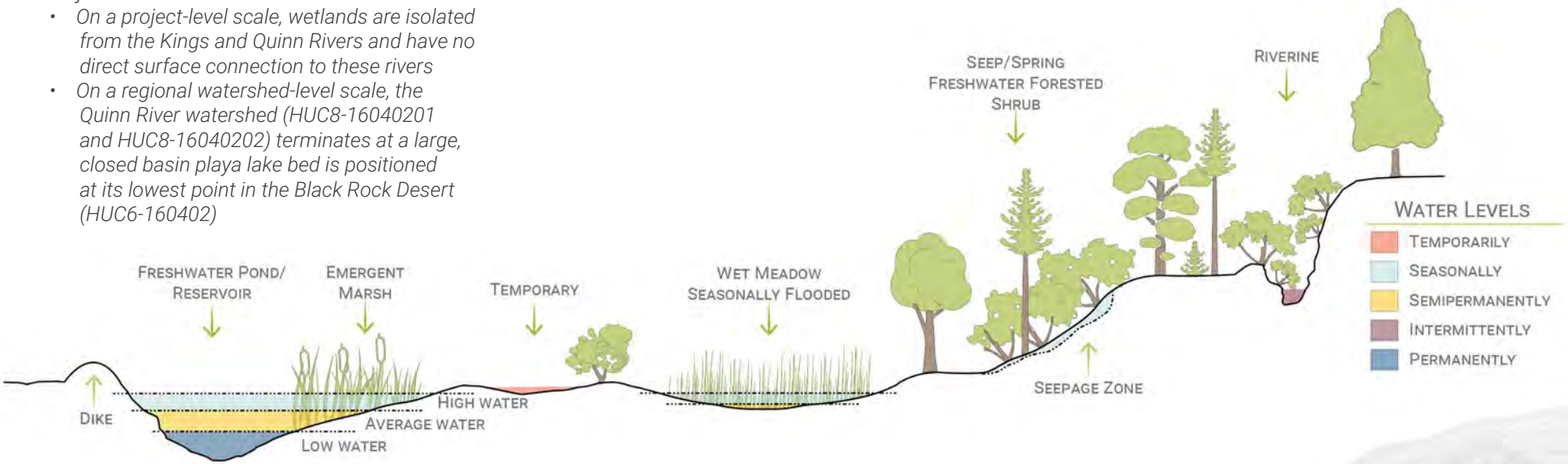
TABLE 1

Types & Acreages of Wetland Resources

Wetland Type	*Cowardin Code **	*Acres*
Emergent Marsh	PEM1F	9.120
Seep/Spring Freshwater Forested/ Shrub	PSS1C	8.103
Riverine	R4SB7	5.550
Freshwater Pond/ Reservoir	PUBHh	3.778
Wet Meadow Seasonally Flooded	PEM1C	1.261
Temporary	RU6	0.270
TOTAL		28.082

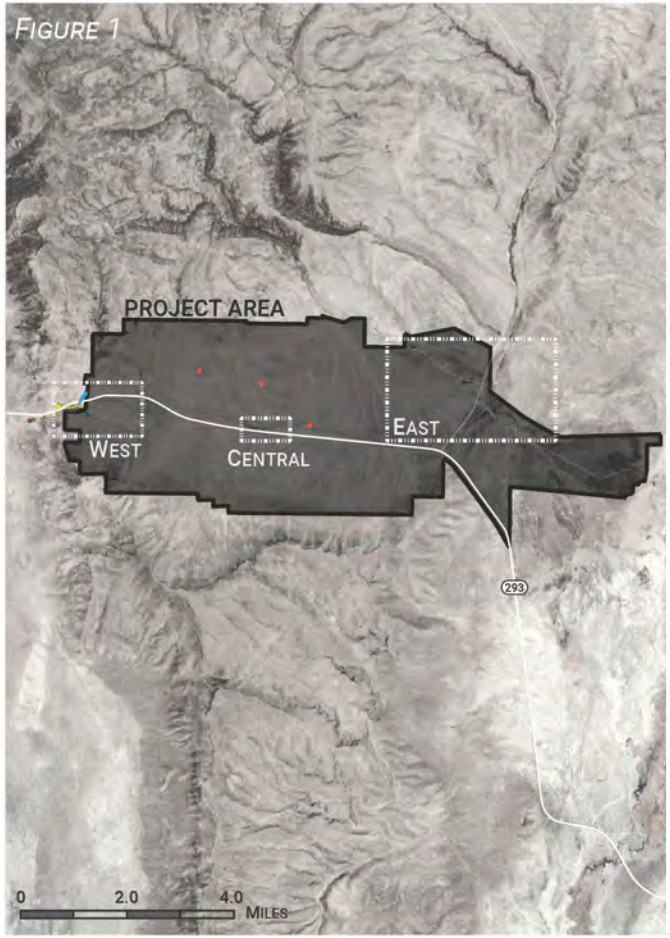
* Cowardin code is a classification of Wetlands and Deepwater Habitats of the United States.

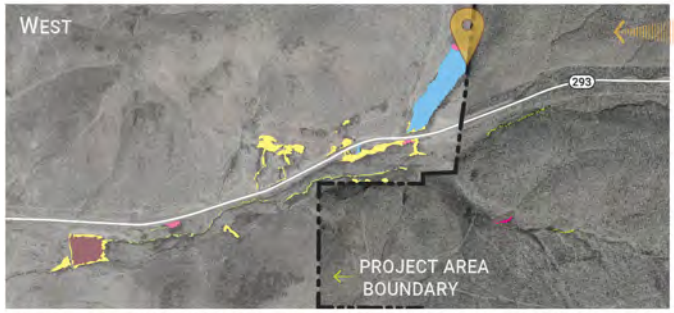
* Cowardin code is a classification of Wetlands and Deepwater Habitats of the United States.



WETLANDS BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA





Wetland and Riparian Zone Map

N

BIOLOGICAL STUDY AREA

WETLAND TYPE

- PEM1C - WET MEADOW SEASONALLY FLOODED
- PEM1F - EMERGENT MARSH
- PSS1C - SEEP/SPRING FRESHWATER FORESTED/SHRUB
- PUBHh - FRESHWATER POND/RESERVOIR
- R4SB7 - RIVERINE
- R6 - TEMPORARY
- LOCATION OF PHOTO

WILDERNESS AREAS SUMMARY

THACKER PASS - LITHIUM NEVADA

DISASTER PEAK WILDERNESS STUDY AREA
(OUTSIDE PROJECT AREA)

GENERAL DESCRIPTION

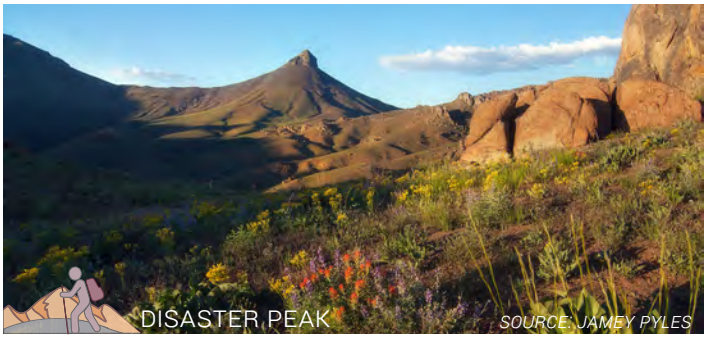
- *Approximately 17.0 miles Northwest of the Project Area (Disaster Peak to Lithium Nevada Boundary)*
- *32,040 acres of public lands (18,840 acres in Oregon and 13,200 acres in Nevada)*
- *1,097 acres of the Wilderness Study Area (WSA) in Nevada are recommended for nonwilderness*
- *Contains Disaster Peak (geologic landmark; large symmetrical butte visible throughout the region) and portions of the Granites, Trout Creek Mountains, and the McDermitt Caldera (collapsed volcanic dome)*
- *Topographically and ecologically diverse; exhibits a generally natural character*
- *Diverse vegetation communities; sagebrush/ grasslands, extensive mountain mahogany stands, limited stands of alder and willow*

ACCESS AND USE

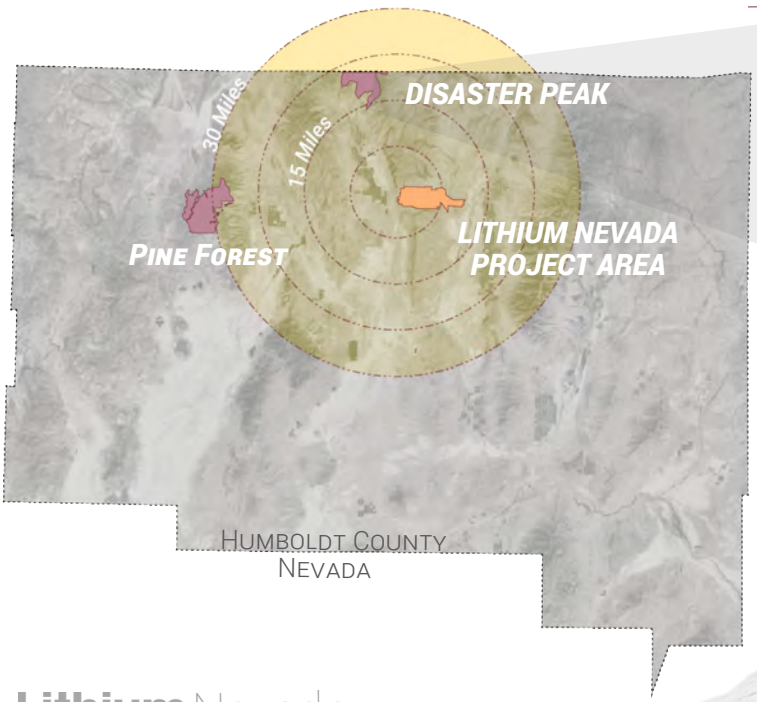
- *Roads are primarily used for hauling salt, supervising cattle, checking projects, and access for recreationists*
- *Water and campsites are abundant*
- *Opportunity for day hiking, backpacking, camping, hunting, fishing, sightseeing, photography, and winter sports*
- *Sage grouse habitat, trophy mule deer management area, and populations of Lahontan cutthroat trout and redside shiners*

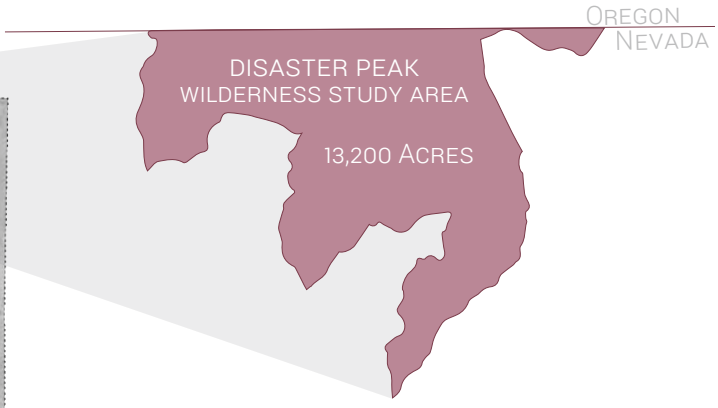
ENERGY AND MINERAL RESOURCE VALUES

- *Moderate potential for oil and gas; no deep drilling has occurred and no oil/gas mineral leases exist as of October 16, 1987*
- *Moderate potential for the occurrence of uranium/ thorium and beryllium and mercury*
- *High potential for the occurrence of gold in the eastern portion*
- *No potential for sand and gravel or geothermal energy resources*
- *35 mining claims located in the eastern and southern portions of the WSA; total of 705 acres as of October 16, 1987*
- *No economically minable resources have been discovered on the claims*
- *No present production of resources*



WILDERNESS AREAS WITHIN 30 MILES





Lithium Nevada

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT

WILDERNESS AREAS SUMMARY

THACKER PASS - LITHIUM NEVADA

PINE FOREST RANGE WILDERNESS AREA
(OUTSIDE PROJECT AREA)

GENERAL DESCRIPTION

- *Approximately 27 miles west of the Project Area*
- *24,015 acres of public lands in NV; managed by the BLM*
- *Diverse landscape of rolling slope rock formations*
- *Vegetation communities of sagebrush and dense aspen stands*
- *Elevations reaching over 9,000 feet*
- *Destination for hunters, anglers, and outdoor enthusiasts*
- *Contains the only alpine lakes in the region*
- *Habitat for rainbow trout, sage grouse, chukar, and big game wildlife including mule deer, pronghorn antelope and bighorn sheep*

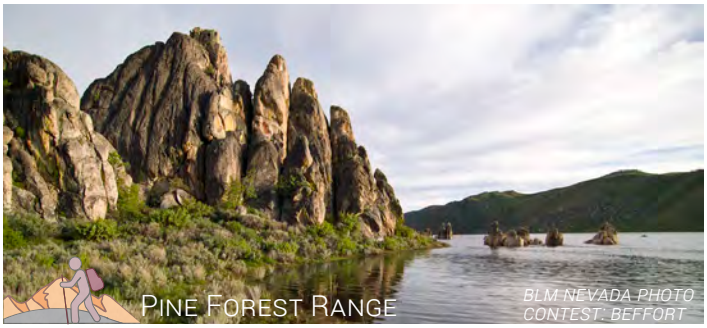
ACCESS AND USE

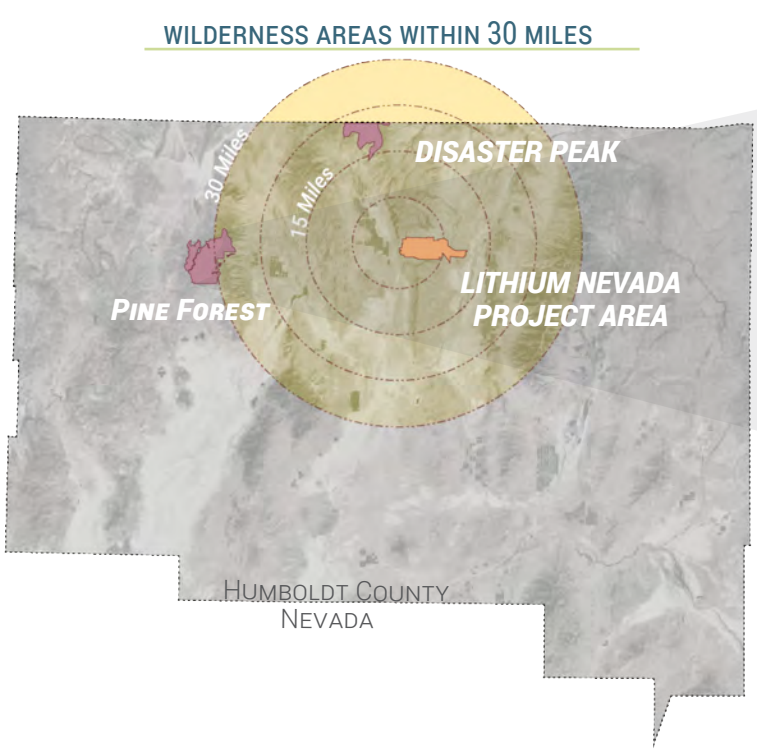
- *Some of Nevada's best scenic and recreational opportunities*
- *Opportunities for fishing, hunting, primitive camping, hiking, backpacking, mountain biking, horse packing, rock climbing, wildlife viewing, photography, nature study, and rock hounding*
- *Camping and picnic area located at Onion Reservoir just outside the WA boundary*
- *Access is limited by season and road conditions*

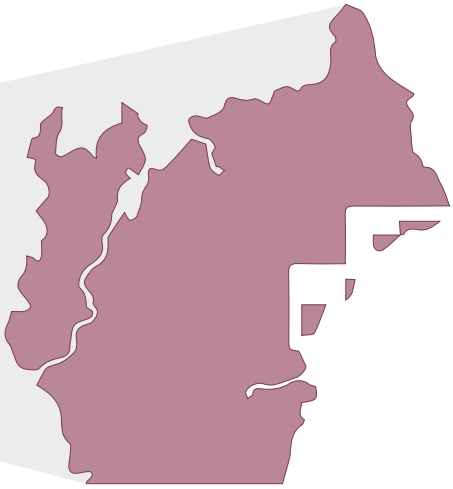
PUBLIC LANDS
(MANAGED BY BLM)

GENERAL DESCRIPTION

- *The majority of lands within and surrounding the Project Area are public lands managed by the BLM*
- *The surrounding area includes The Montana Mountains, The Double H Mountains, Sentinel Rock, and The Sentinel Hills*
- *Access and use by the general public is a potential occurrence*
- *Recreational uses may include hunting, fishing, wildlife viewing, camping, rock climbing, geocaching, and 4WD/ OHV travel*
- *Potential public resources include the collection of firewood, Christmas trees, pinyon pine nuts, posts, wildings (live transplants), woody biomass, and other seeds*







Lithium Nevada

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT

WILDLIFE BASELINE SUMMARY

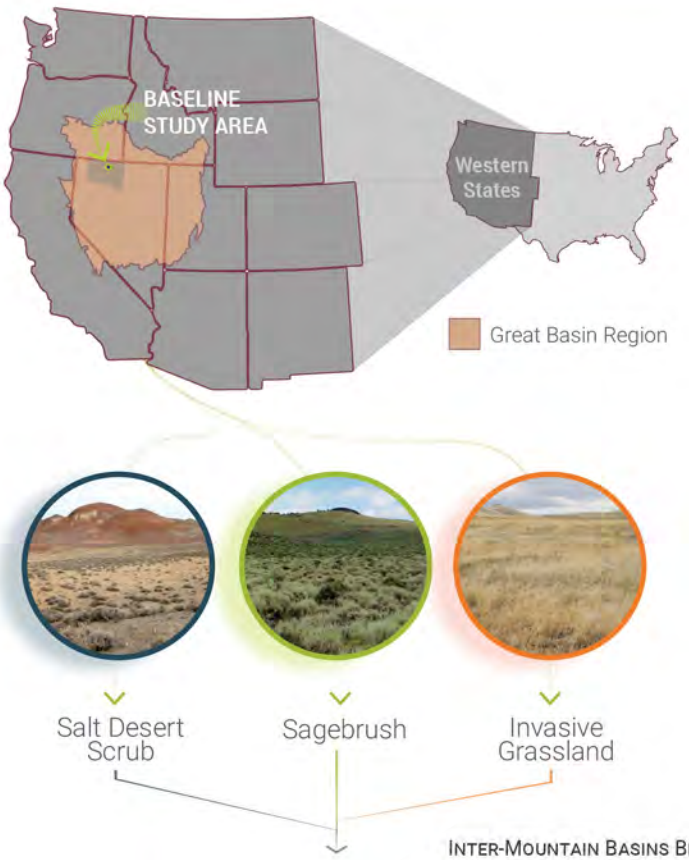
THACKER PASS - LITHIUM NEVADA

General Wildlife & Habitats

The study area contains habitat for a variety of wildlife typical of the Great Basin Region. Habitat is predominantly sagebrush, intermixed with salt desert scrub and invasive grasslands and forblands. Over 2,600 acres of land within the study area boundary were burned in a large fire in 2012. Key wildlife habitats in the study area also include cliff and canyon habitat, perennial, intermittent, and ephemeral streams, seasonal and perennial seeps and springs, and approximately 28.08 acres of aquatic resources, consisting of emergent marsh, seep/spring riparian wetlands, riverine wetlands, ponds/reservoirs, and temporary or seasonally flooded wetlands.

General wildlife species observed in the study area included cottontails (*Sylvilagus sp.*), jackrabbits (*Lepus sp.*), coyote (*Canis latrans*), ungulates (such as mule deer, *Odocoileus hemionus*), and a variety of snakes, lizards, and birds.

Great Basin Region & Predominant Habitat



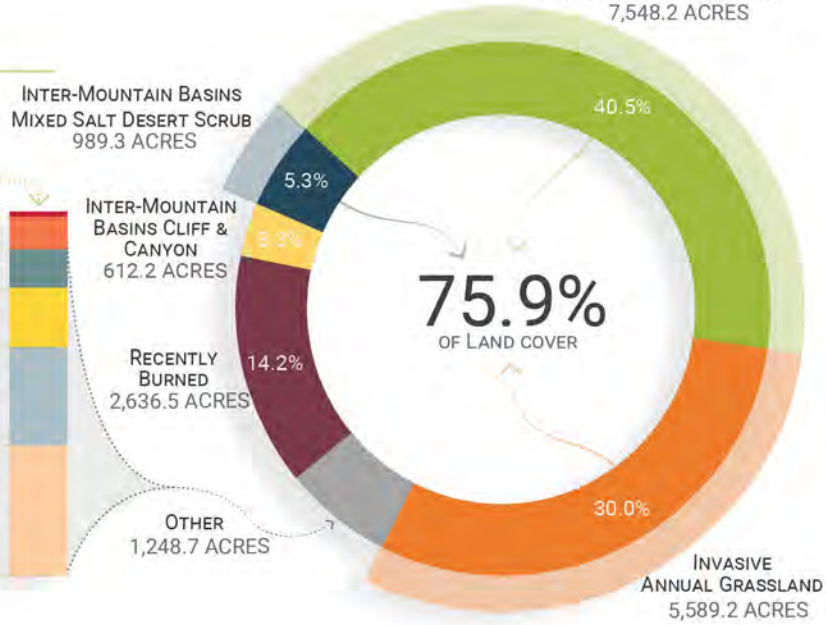
General Wildlife Species

Black Tailed Jackrabbit
(*Lepus californicus*)

Coyote
(*Canis latrans*)

SWReGAP* Land Cover In Project Area

Land Cover	Acres	%
Barren Lands, Non-Specific	3.1	0.02%
North American Arid West Emergent Marsh	20.5	0.1%
Inter-Mountain Basins Semi-Desert Shrub Steppe	24.3	0.1%
Inter-Mountain Basins Greasewood Flat	33.0	0.2%
Inter-Mountain Basins Semi-Desert Grassland	61.9	0.3%
Great Basin Xeric Mixed Sagebrush Shrubland	76.4	0.4%



* The Southwest Regional Gap Analysis Project (SWReGAP) is an update of the Gap Analysis Program's mapping and assessment of biodiversity for the five-state region encompassing Arizona, Colorado, Nevada, New Mexico, and Utah.

Photo Sources:
Jackrabbit - Jim Harper
Desert Horned Lizard -Nevada Department of Wildlife

WILDLIFE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

GAME SPECIES

Game species include big game, furbearers (an animal whose fur is valued commercially) and other game mammals, and game birds.

Big Game

Occupied pronghorn antelope (***Antilocapra Americana***), mule deer (***Odocoileus hemionus***), and California bighorn sheep (***Ovis canadensis californiana***) distributions occur in portions of the study area and 4-mile buffer area. Mountain goats (***Oreamnos americanus***) have also been reported by NDOW in the study area, though there are no known distributions of mountain goat in the study area. Year-round populations of mule deer and bighorn sheep are mapped in the study area and buffer. Limited use, winter, and summer pronghorn antelope distributions, and a pronghorn movement corridor, occur through portions of the study area and buffer. There are no big game water developments in the study area or vicinity.

In December 2015, indications of disease in the California bighorn sheep population in the Montana Mountains were revealed during routine capture and radiomarking efforts by NDOW (Nevada Department of Wildlife). The decision was made to depopulate the herd of bighorn sheep in the Montana Mountains due to an outbreak of pneumonia that caused die-off in the herd. Subsequently, there are no known bighorn sheep presently in the Montana Mountains, but bighorn sheep populations continue to occur in the Double H Mountains.

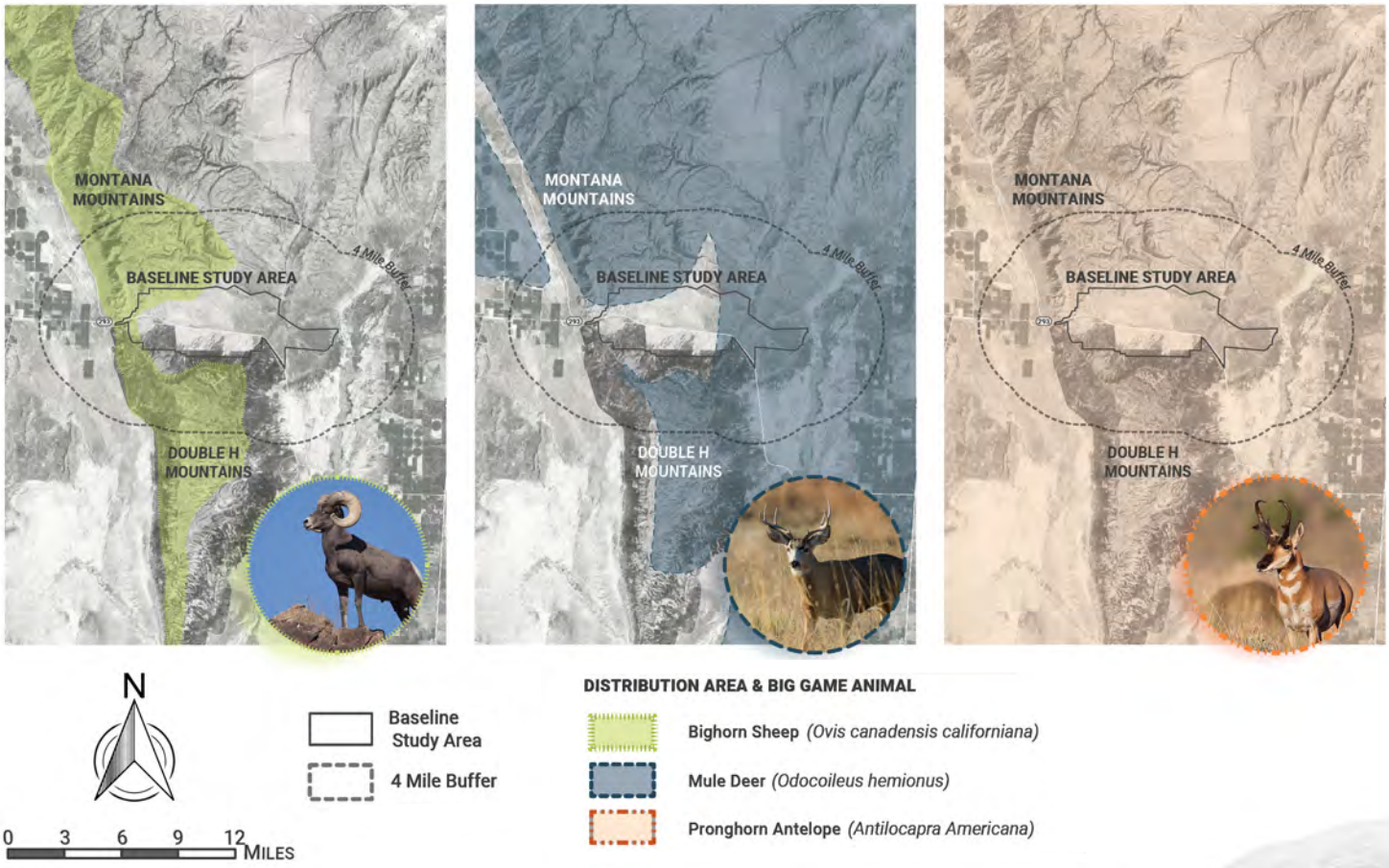
Furbearers & Other Game Mammals

Game mammals that could occur in the area include fox species, bobcat, badger, coyote, rabbits. Species surveys and NDOW records indicate the presence of cottontail rabbits in the study area. There are 16 small game water developments in the vicinity of the study area.

Game Birds

Game birds observed in the study area in 2018 included California quail (*Callipepla californica*), chukar (*Alectoris chukar*), Greater sage-grouse (*Centrocercus urophasianus*), mourning dove (*Zenaida macroura*), and American crow (*Corvus brachyrhynchos*). Greater sage-grouse is a special status species and as described in the next section.

Figure 1 **Big Game Distribution**



WILDLIFE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

Reptiles

Snakes and lizards are common in the region, in almost every habitat type. Reptile species observed in the study area and vicinity, as reported by NDOW, or incidentally observed in 2018, include Great Basin rattlesnake (***Crotalus oreganus lutosus***), western terrestrial gartersnake (***Thamnophis elegans***), western rattlesnake (*Crotalus oreganus*), Great Basin gopher snake (***Pituophis catenifer deserticola***), sagebrush lizard (***Sceloporus graciosus***), and desert horned lizard* (***Phrynosoma platyrhinos***). * BLM special status species.

Amphibians

The study area contains seeps, springs, wetlands, and streams, which provide potential habitat for amphibians. Frogs and toads can potentially use the associated riparian areas for forage, cover and breeding. During spring surveys for snails, an adult Pacific tree frog (***Pseudacris regilla***) was found in the cobble substrate at one spring. No other amphibian species were found during the survey.

Spring Snails

Many Great Basin populations of springsnails have become isolated with the drying conditions that followed the close of the Pleistocene. Some of these isolated populations have differentiated to form endemic species. Springs in the study area and surrounding survey area were surveyed for suitable habitat for springsnails. Springsnails were surveyed at 13 undeveloped springs in the survey area. During surveys for springsnails, the Kings River pyrg (*Pyrgulopsis imperialis*) was found at all springs collected. Other species detected at the springs included the turban pebble snail (*Fluminicola turbiniformis*) and Physa snails. None of these snails are identified as BLM special status species, though both species are NDOW species of conservation priority.

Special Status Species

Special status species are those that state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the Endangered Species Act (ESA), and those designated as sensitive and special status by the BLM (IM-NV-2018-003). In addition, there is a Nevada protected animal list (Nevada Administrative Code 501.100-503.104) that the BLM has incorporated, in part, into its sensitive species list.

Wildlife in Proximity to Thacker Pass

BLM Special Status Species

Desert Horned Lizard
(*Phrynosoma platyrhinosz*)

Pacific Tree Frog
(*Pseudacris regilla*)

Great Basin Rattlesnake
(*Crotalus oreganus lutosus*)

Sagebrush Lizard
(*Sceloporus graciosus*)

Physa Snail Species
(*Physa fontinalis*)

Desert Cottontail
(*Sylvilagus audubonii*)

Lahontan Cutthroat Trout

Lahontan cutthroat trout (***Oncorhynchus clarkia henshawi***; "LCT") is an inland subspecies of cutthroat trout (family Salmonidae) listed as threatened under the ESA. LCT is known to exist in the Crowley Creek-Quinn River watershed. Within the Quinn River Valley subwatershed, LCT occur in the upper reaches of Pole Creek, Riser Creek, Washburn Creek, and the upper reaches of Crowley Creek, where there is perennial flow. In addition, Rock Creek is listed as a recovery stream is it once supported LCT and may be suitable in the future to support LCT. However, it is not currently occupied by LCT and exhibits intermittent flow. No LCT occur in Thacker Creek or lower reaches of Pole Creek (NDOW, personal communication, January 8, 2018). The waters of the U.S. report for the Project indicates that the Crowley and Pole creek reaches in the study area are intermittent and ephemeral. Lahontan cutthroat trout would likely not find suitable habitat in the ephemeral or intermittent tributaries associated with the Project as LCT generally occur in streams with stable banks, perennial flow, rocky to gravelly substrate with riffle pool complexes, and riparian vegetation cover (USFWS 2012).

Photo Sources:
Physa Snail Species - René Weber
Desert Cottontail - Nevada Department of Wildlife
Sagebrush Lizard - 2019 Reptile Fact
Great Basin Rattlesnake - Evan Jenkins
Desert Horned Lizard - Danita Delimont / Getty Images
Pacific Tree Frog - Gary Nafis

WILDLIFE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

Bats

The study area and surrounding landscape provide foraging habitat and possibly resting/roosting habitat for bats. There are numerous outcrops, fissures, and other rock features which could potentially provide seasonal roosting, hibernation, or maternity colony habitat close to the study area.

Thirteen species of bats were detected in 2018 on acoustic monitoring equipment deployed in and around the study area. The monitors were established near likely foraging sites for bats, which included agricultural and open water habitats. Bat species detected during monitoring events included Fringed myotis (***Myotis thysanodes***), Long-eared myotis (***Myotis evotis***), Silver-haired bat (***Lasionycteris noctivagans***), Big brown bat (***Eptesicus fuscus***), Little brown myotis (***Myotis lucifugus***), Long-legged myotis (***Myotis volans***), Western small-footed myotis (***Myotis ciliolabrum***), Yuma myotis (***Myotis yumanensis***), California myotis (***Myotis californicus***), Hoary bat (***Aeorestes cinereus***), Mexican free-tailed bat (***Tadarida brasiliensis***), Canyon bat (***Parastrellus hesperus***), and Townsend's big eared bat (***Corynorhinus townsendii***). All of the species detected are BLM special status species.

Pygmy Rabbits

The pygmy rabbit (***Brachylagus idahoensis***) is a BLM special status species and found in sagebrush steppe areas within the Great Basin and Intermountain regions. Pygmy rabbit habitat includes areas of tall, dense big sagebrush stands of varying heights, with deep, loose soils capable of supporting burrow systems. There is potentially suitable habitat for pygmy rabbits in the study area, and the species was reported by NDOW to be in the study area vicinity. Inactive burrows and secondary signs, such as pellets, were observed in these suitable habitat areas. However, no pygmy rabbit sightings, active burrows or burrow complexes were found in the study area during summer and winter pygmy rabbit surveys.

Migratory Birds

Point-count and incidental observations in the study area in 2018 identified 52 species of migratory birds (not including the game birds or raptors). The most frequently detected birds were generalist species with large ranges that are resident grassland and shrubland species, including Horned lark (***Eremophila alpestris***), western meadowlark (***Sturnella neglecta)***, brewer's sparrow (***Spizella breweri***), mourning dove (***Zenaida macroura***), sage sparrow (***Artemisiospiza nevadensis***), lark sparrow (***Chondestes grammacus***), black-throated sparrow (***Amphispiza bilineata***), cliff swallow (***Petrochelidon pyrrhonota***), common raven (***Corvus corax***), and long-billed curlew (***Numenius americanus***). The migratory birds observed that are identified as BLM special status species include brewer's sparrow, loggerhead shrike (***Lanius ludovicianus***), and sage thrasher (***Oreoscoptes montanus***).

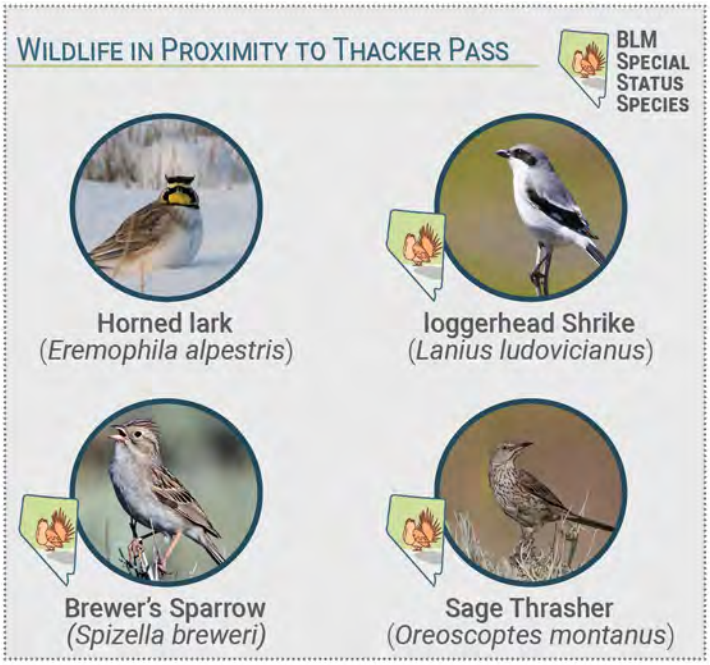


PHOTO SOURCES:
HORNED LARK - KATHY ZIMMERMAN
LOGGERHEAD SHRIKE - LANIUS LUDOVICIANUS
BREWER'S SPARROW - DAVID HOLLIE
SAGE THRASHER - RON DUDLEY
LONG-EARED MYOTIS - BATS AND CATS MINUS THE CATS
MEXICAN FREE-TAILED BAT - KARINE AIGNER
CANYON BAT - LV MOOSE
HOARY BAT - JOSE G. MARTINEZ-FONSECA

Lithium Nevada

U.S. Department of Interior
Bureau of Land Management

WILDLIFE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

Raptors

Occupied raptor nests occur within 10 miles of the study boundary. Aerial raptor surveys were conducted within the study area and within a 10-mile buffer of the study area in 2018. Active and inactive nests of ferruginous hawks (***Buteo regalis***), red-tailed hawks (***Buteo jamaicensis***), and other large and small raptors were observed during these surveys in pinyon-juniper woodlands, grassland and sagebrush habitats, and on rock outcrops and canyon walls.

In 2018, there were 23 active nests in the survey area, and 127 total nests. Nine active nests were occupied by golden eagles* (***Aquila chrysaetos)*** (a total of 13 golden eagle nests were occupied), 10 by red-tailed hawks, two by ferruginous hawks*, and two by common ravens (***Corvus corvax***). Other raptor species observed in the study area and surrounding 10-mile buffer area, as reported by NDOW, or during migratory bird surveys, included Swainson's hawk* (***Buteo swainsoni***), northern harrier (***Circus hudsonius***), Cooper's hawk (***Accipiter cooperii***), sharp-shinned hawk (***Accipiter striatus***), prairie falcon* (***Falco mexicanus***), northern goshawk* (***Accipiter gentilis***), northern saw-whet owl (***Aegolius acadicus***), osprey (***Pandion haliaetus***), rough-legged hawk (***Buteo lagopus***), merlin (***Falco columbarius***), turkey vulture (***Cathartes aura***), American kestrel (***Falco sparverius***), long-eared owl (***Asio otus***), short-eared owl* (***Asio flammeus***), flammulated owl* (***Psiloscops flammeolus***), western screech owl (Megascops kennicottii), and great horned owl (***Bubo virginianus***). * BLM special status species.

Golden Eagles

Thirteen nests were occupied by golden eagles* (Aquila chrysaetos) in 2018. Young or eggs were observed in nine of the nests, and the remaining four showed evidence of use or incubating postures. An estimated six golden eagle fledglings emerged from these nests. There are an estimated 18 golden eagle territories in the survey area. No golden eagle nests ere located within the study area. Five occupied territories occurred within two miles of the study area boundary.

TABLE 1

Raptor Nests

Nest Type	Total Number of Nests	Active in 2018
Golden Eagle	59	11 (9 golden eagles, 1 red-tailed hawk, 1 common raven)
Ferruginous Hawk	7	2
Large Raptor	41	10 (9 red-tailed hawk, 1 common raven)
Small Raptor	17	0
Common Raven	3	0
TOTALS	127	23

Wildlife in Proximity to Thacker Pass

BLM Special Status Species

Ferruginous Hawks
(*Buteo regalis*)

Swainson's hawk
(*Buteo swainsoni*)

Northern Goshawk
(*Accipiter gentilis*)

Northern Harrier
(*Circus hudsonius*)

Short-eared Owl
(*Asio flammeus*)

Flammulated Owl
(*Psiloscops flammeolus*)

Golden Eagle
(*Aquila chrysaetos*)

Prairie Falcon
(*Falco mexicanus*)

PHOTO SOURCES:
PRAIRIE FALCON - ALAN MURPHY
NORTHERN HARRIER - G. LASLEY/VIREO
GOLDEN EAGLE - GUNNAR PETTERSSON
NORTHERN GOSHAWK - PETS PLANET, HASSAN AYYAN
SWAINSON'S HAWK - GLENN BARTLEY/VIREO
FERRUGINOUS HAWKS - 2018 ABOUT ANIMALS
FLAMMULATED OWL - SARAH CHICKERING
SHORT-EARED OWL - ODNR DIVISION OF WILDLIFE

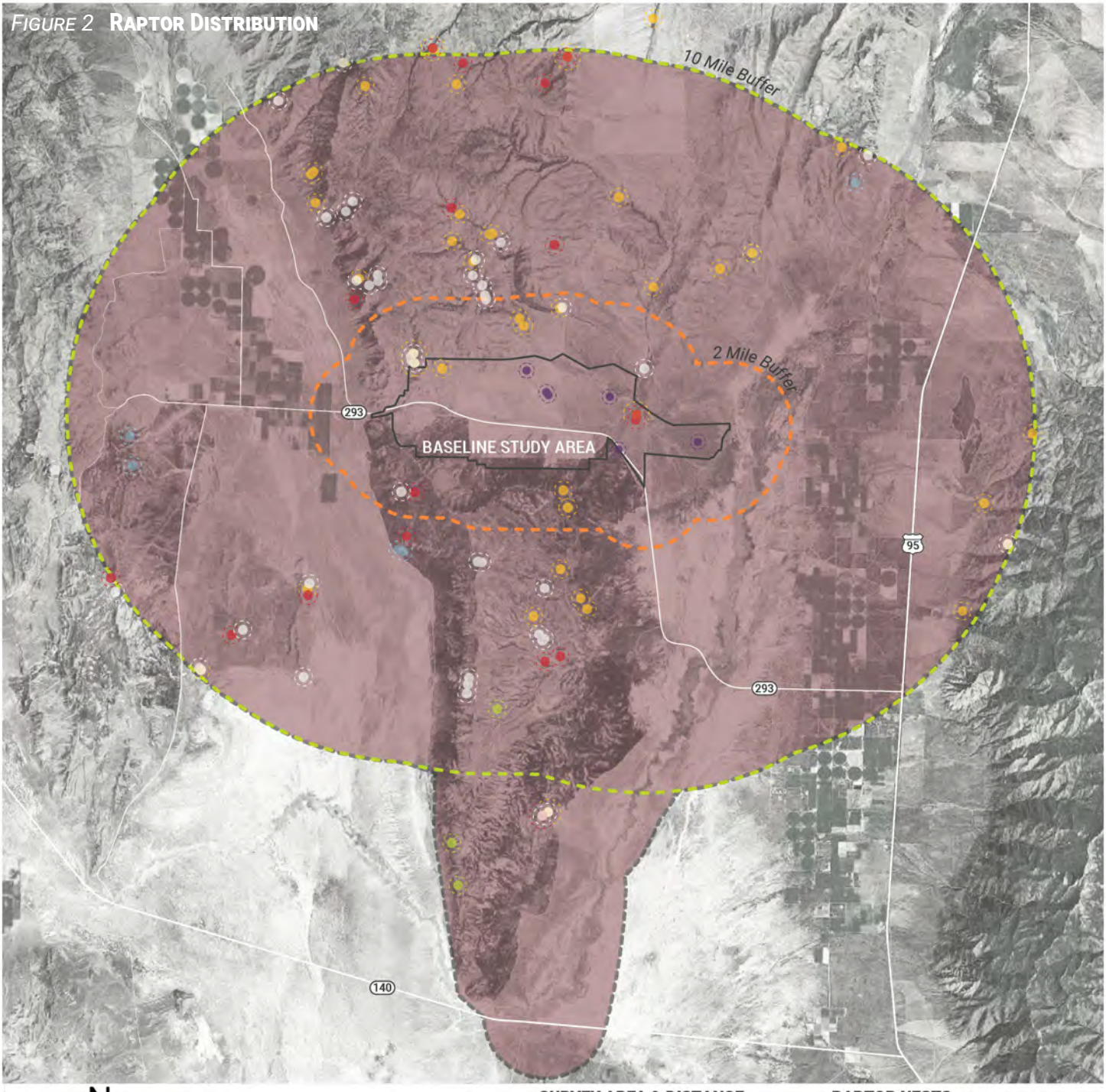
Lithium Nevada

U.S. Department of Interior
BUREAU OF LAND MANAGEMENT

WILDLIFE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

FIGURE 2 **RAPTOR DISTRIBUTION**



Lithium Nevada

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT

WILDLIFE BASELINE SUMMARY

THACKER PASS - LITHIUM NEVADA

Burrowing Owls

Burrowing owls (Athene Cunicularia) are a BLM special status species. In northern Nevada, the majority of the breeding population is seasonal, but observations of this species have been recorded in Nevada during all months of the year. Suitable habitat for breeding burrowing owls includes patches of sparse, low-growing sagebrush or grassland vegetation generally with canopy coverage of less than 30 percent (California Burrowing Owl Consortium [CBOC] 1993, BLM 2015).

Ground-based burrowing owl surveys were completed in 2018 throughout the study area. Thirty-four burrowing owls or their nests were detected at eight locations in the study area. The observations consisted primarily of individual adults (28). One juvenile was observed. Several of the adults were observed in the same area.

Greater sage-grouse

The Greater sage-grouse (Centrocercus urophasianus) is a BLM special status species. On September 22, 2015, the USFWS determined that the Greater sage-grouse does not warrant protection under the ESA. The finding prompted federal agencies, states, and counties to initiate a multitude of planning processes and new conservation measures to conserve Greater sage-grouse with the hope of averting the need to list the species. Subsequently, the Nevada and Northeastern California Greater sage-grouse Proposed Land Use Plan Amendment and FEIS (LUPA/FEIS) prepared by the BLM and USFS was signed in 2015, and amended in 2019. In the LUPA, Greater sage-grouse habitat on BLM-administered and National Forest System lands in the decision area consists of lands allocated as priority, general, or other habitat management areas (PHMA, GHMA, or OHMA respectively).

Greater sage-grouse habitat in the vicinity of the Project has primarily been classified as PHMA. GHMA also exist in the vicinity of the study area. There are 6 known active lek sites (a lek is a site at which group of male birds gathers seasonally to engage in competitive display) within 3.1 miles of the baseline study area boundary. Male grouse in lek mating systems tend to exhibit high fidelity to breeding leks. The habitat surrounding lek sites is important for greater sage-grouse because the birds disperse to areas surrounding the leks for nesting.

Figure 3 **Greater Sage-Grouse Distribution**