

REPORT OF WASTE DISCHARGE: TECHNICAL REPORT

VOLUME 3 OF 3

CALIFORNIA DEPARTMENT OF CORRECTIONS AND REHABILITATION

MULE CREEK STATE PRISON

IONE, CALIFORNIA

PREPARED FOR:

CALIFORNIA DEPARTMENT OF
CORRECTIONS AND REHABILITATION:
MULE CREEK STATE PRISON

AMADOR COUNTY

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**WATER BALANCE CALCULATIONS:
AVERAGE AND 100-YEAR**

SANITARY FLOW CHARACTERISTICS		INPUT DATA, CONSTANT			EXISTING STORAGE RESERVOIRS		CLIMATOLOGICAL FACTORS	
STARTING AVERAGE FLOW (MGD)	0.57	CATCHMENT AREA (AC)	27.0	CLIMATOLOGICAL DESIGN BASIS	1-in-100 YEAR			
		WATER SURFACE (AC)	21.6	DESIGN PRECIP/AVG PRECIP RATIO	1.81			
		BOTTOM SURFACE (AC)	9.6	OCT-APR EVAP/AVG EVAP RATIO	0.75			
IRRIGATION AREA CHARACTERISTICS		STORAGE AVAILABLE (MG)	155	MAY-SEP EVAP/AVG EVAP RATIO	1.00			
POST MCIC IRRIGATION AREA TOTAL (AC)	200	EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY)	0.000	IRRIGATION AREA SOIL RUNOFF COEFFICIENT	0.05			
POST MCIC IRRIGATION FIELDS 1-4 & 6 AREA (AC)	157			STORAGE CATCHMENT SOIL RUNOFF COEFF	1.00			
POST MCIC IRRIGATION FIELD 7 AREA (AC)	43							
POST MCIC NEW AREA (AC)	0							
POST MCIC NEW AREA W/ RESERVOIR (AC)	0							
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY	1.10							
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY	0.60							

MONTH	INPUT DATA, MONTHLY VARIABLE												
	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
AVG PRECIP, AVG OF IONE & PARDEE (IN)	22	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (Eto) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21	5.01
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00	1.00
CROP COEFFICIENT (Kc), TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.83	1.02	0.94	1.10	1.14	0.97	0.96	1.13	1.00	0.95	0.97	0.96
PRESTON YOUTH FACILITY II VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY II VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP FACILITY II VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL II VOLUME (MGD)		0.025	0.015	0.016	0.154	0.149	0.033	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.59	0.59	0.72	0.72	0.72	0.60	0.61	0.60	0.59	0.57	0.57	0.57

CALCULATIONS / MONTH	CALCULATIONS												
	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10	0.17
EFFECTIVE RAIN FOR PLANTS (IN)	37	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09	0.16
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (Eto) (Eto * Weighted Kc)	44	3.22	1.21	1.11	0.45	0.99	2.82	4.12	4.67	6.63	7.48	6.98	4.80
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (Etc * Seasonal Evaporation Ratio)	41	2.41	0.91	0.83	0.34	0.74	2.12	3.09	4.67	6.63	7.48	6.98	4.80
STORAGE RESERVOIR EVAPORATION (IN) (Eto * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21	5.01
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	208	17.7	17.1	17.7	17.7	16.0	17.7	17.1	17.7	17.1	17.7	17.7	17.1
II FLOW VOLUME (MG)	14	0.76	0.46	0.50	4.76	4.18	1.04	1.07	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	223	18.5	17.6	18.2	22.5	20.2	18.8	18.2	18.6	17.8	17.7	17.7	17.1

DESIGN DISCHARGE TO COWRP													
AVERAGE TYPICAL COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.61	0.63	0.61	0.61	0.63
MONTHLY DISCHARGE TO COWRP (MG)	114	0.0	0.0	0.0	0.0	0.0	0.0	19.0	19.0	19.0	19.0	19.0	19.0
HISTORICAL TYPICAL DISCHARGE TO COWRP (MG)	92	9.5	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9
CDC/ARSA AGREEMENT LIMITED COWRP DISCHARGE (MG)	114	0.0	0.0	0.0	0.0	0.0	0.0	19.0	19.0	19.0	19.0	19.0	19.0
CDCR MAXIMUM COWRP DISCHARGE (MG)	163	0.0	0.0	0.0	0.0	0.0	0.0	27.2	27.2	27.2	27.2	27.2	27.2
DESIGN DISCHARGE TO FIELD 7													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.10	4.20	4.20	4.20	4.20	4.20	2.66	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	25	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.98	7.76	7.57	5.09
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	30	2.41	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.00	3.48	9.07	8.84
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.5	28.8	48.4	74.2	98.9	123.5	126.0	128.4	124.3	103.8	72.9	42.7
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	30	2.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.48	9.07	8.84	5.95
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.29	0.29	0.20
EFFLUENT IRRIGATION RATE (IN/MONTH)	25	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.98	7.76	7.57	5.09
DESIGN DISCHARGE TO FIELDS 1-4 & 6													
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)		157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	16	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.76	3.22	4.24	4.13	2.78
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	69	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.22	13.73	18.05	17.61	11.85
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		16.09	28.83	48.39	74.22	98.95	123.47	126.02	128.36	120.81	94.73	64.06	36.76
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	69	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.22	13.73	18.05	17.61	11.85
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.58	0.57	0.39
EFFLUENT IRRIGATION RATE (IN/MONTH)	16	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.76	3.22	4.24	4.13	2.78
DESIGN LOSSES AND GAINS FROM STORAGE													
STORAGE AT BEGINNING OF MONTH (MG)		0.00	11.23	30.19	51.72	78.75	104.67	126.83	128.76	125.49	105.11	74.21	44.61
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		11.28	17.60	18.20	22.50	20.20	18.80	-0.80	-3.63	-18.41	-28.43	-27.76	-19.70
EFF. STORAGE RESERVOIR VOLUME (MG)		11.28	28.83	48.39	74.22	98.95	123.47	126.02	125.14	107.08	76.68	46.45	24.9
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.9	7.8	10.0	12.8	15.5	18.2	18.5	18.4	16.4	13.1	9.8	7.4
APPROXIMATE EFFECTIVE PRSTON PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
EVAPORATIVE LOSS FROM EFF. STORAGE RESERVOIR (MG)	15	0.46	0.19	0.24	0.11	0.27	1.07	1.62	2.06	2.95	2.79	1.91	1.01
PERCOLATION LOSS FROM EFF. STORAGE RESERVOIR (MG)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF TO EFF. STORAGE FROM RAIN CATCHMENT AREA (MG)	29	0.41	1.55	3.57	4.63	5.99	4.44	4.36	2.42	0.98	0.33	0.07	0.13
STORAGE AT END OF MONTH (MG)		11.23	30.19	51.72	78.75	104.67	126.83	128.76	125.49	105.11	74.21	44.61	24.03
													128.8
													155.0

SUMMARY			
ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)	OVERALL BALANCE (MUST NOT BE NEGATIVE)
WASTEWATER	208	EVAPORATION	TOTAL UNUSED DISPOSAL CAPACITY (MG)
INFLOW AND INFILTRATION	14	PERCOLATION	UNUSED LAA CAPACITY (MG)
PRECIPITATION INTO RESERVOIR	29	ON-SITE LAND DISPOSAL	UNUSED COWRP CAPACITY (MG)
		DISCHARGE TO COWRP	TOTAL UNUSED STORAGE CAPACITY (MG)
TOTAL INFLOW	251	TOTAL OUTFLOW	228

INPUT DATA, CONSTANT												
SANITARY FLOW CHARACTERISTICS			EXISTING STORAGE RESERVOIRS				CLIMATOLOGICAL FACTORS					
STARTING AVERAGE FLOW (MGD).....	0.57		CATCHMENT AREA (AC).....	27.0		CLIMATOLOGICAL DESIGN BASIS	Avg. Year Cond.					
			WATER SURFACE (AC).....	21.6		DESIGN PRECIP/AVG PRECIP RATIO.....	1.00					
			BOTTOM SURFACE (AC).....	9.6		OCT-APR EVAP/AVG EVAP RATIO.....	1.00					
			STORAGE AVAILABLE (MG).....	155		MAY-SEP EVAP/AVG EVAP RATIO.....	1.00					
POST MCIC IRRIGATION AREA TOTAL (AC).....	200		EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY).....	0.000		IRRIGATION AREA SOIL RUNOFF COEFFICIENT.....	0.05					
POST MCIC IRRIGATION FIELDS 1-4 & 6 AREA (AC).....	157					STORAGE CATCHMENT SOIL RUNOFF COEFF.....	1.00					
POST MCIC IRRIGATION FIELD 7 AREA (AC).....	43											
POST MCIC NEW AREA (AC).....	0											
POST MCIC NEW AREA W/ RESERVOIR (AC).....	0											
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY.....	1.10											
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY.....	0.60											

INPUT DATA, MONTHLY VARIABLE													
MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
AVG PRECIP, AVG OF IONE & PARDEE (IN)	22	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ETo) (IN)	56.5	3.86	1.50	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (Kc), EXISTING GRASSES		0.85	0.61	0.93	1.18	0.65	0.65	0.84	1.00	1.01	1.00	1.02	0.99
CROP COEFFICIENT (Kc), TREES (OAKS)		0.69	0.40	0.93	1.18	0.39	0.30	0.43	0.86	0.94	0.93	0.95	0.92
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.77	0.51	0.93	1.18	0.52	0.47	0.63	0.93	0.97	0.96	0.99	0.95
PRESTON YOUTH FACILITY II VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000	0.000
MCIC FACILITY II VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000	0.000
MCSP FACILITY II VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000	0.000
TOTAL II VOLUME (MGD)		0.025	0.015	0.016	0.154	0.149	0.033	0.036	0.028	0.020	0.000	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.59	0.59	0.59	0.72	0.72	0.60	0.61	0.60	0.59	0.57	0.57	0.57

CALCULATIONS													
CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
RAIN-RELATED CALCULATIONS													
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%	0.4%
ESTIMATED IONE RAIN, Avg. Year Cond. (IN)	22	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	21	0.29	1.11	2.56	3.32	4.29	3.18	3.12	1.73	0.70	0.23	0.05	0.09
EVAPORATION-RELATED CALCULATIONS													
EVAPOTRANSPIRATION POTENTIAL (IN) (ETc) (Eto * Weighted Kc)	48	2.97	0.76	1.06	0.86	1.23	1.96	3.69	7.07	7.79	8.07	7.01	5.55
Avg. Year Cond. DESIGN ET POTENTIAL (IN) (ETc * Seasonal Evaporation Ratio)	48	2.97	0.76	1.06	0.86	1.23	1.96	3.69	7.07	7.79	8.07	7.01	5.55
STORAGE RESERVOIR EVAPORATION (IN) (Eto * Water Surface Coefficient)	56	3.86	1.50	1.14	0.73	2.36	4.13	5.82	7.62	8.00	8.36	7.11	5.82
SANITARY-RELATED CALCULATIONS													
AVERAGE DRY WEATHER FLOW VOLUME (MG)	208	17.7	17.1	17.7	17.7	16.0	17.7	17.1	17.7	17.1	17.7	17.7	17.1
II FLOW VOLUME (MG)	14	0.76	0.46	0.50	4.76	4.18	1.04	1.07	0.87	0.60	0.00	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	223	18.5	17.6	18.2	22.5	20.2	18.8	18.2	18.6	17.8	17.7	17.7	17.1

DESIGN DISCHARGE TO COWRP														
AVERAGE TYPICAL COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.61	0.63	0.61	0.61	0.58	
MONTHLY DISCHARGE TO COWRP (MG)	113	0.0	0.0	0.0	0.0	0.0	0.0	19.0	19.0	19.0	19.0	19.0	17.5	
HISTORICAL TYPICAL DISCHARGE TO COWRP (MG)	92	9.5	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1	19.9	
CDCR/ARSA AGREEMENT LIMITED COWRP DISCHARGE (MG)	114	0.0	0.0	0.0	0.0	0.0	0.0	19.0	19.0	19.0	19.0	19.0	19.0	
CDCR MAXIMUM COWRP DISCHARGE (MG)	163	0.0	0.0	0.0	0.0	0.0	0.0	27.2	27.2	27.2	27.2	27.2	27.2	
DESIGN DISCHARGE TO FIELD 7														
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.35	1.85	4.20	4.20	4.20	3.63	0.00	0.00	0.00	0.00	
LAND AREA UNDER IRRIGATION (AC)	35	43	43	43	43	43	43	43	43	43	43	43	43	
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	35	2.94	0.00	0.00	0.00	0.00	0.00	0.00	1.88	7.80	8.62	7.65	6.00	
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	41	3.44	0.00	0.00	0.00	0.00	0.00	0.00	2.19	9.11	10.06	8.93	7.01	
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		18.5	25.5	44.2	68.4	90.9	112.1	111.8	110.4	91.6	61.1	28.0	0.0	
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	34	3.44	0.00	0.00	0.00	0.00	0.00	0.00	2.19	9.11	10.06	8.93	0.00	
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.30	0.32	0.29	0.00	
EFFLUENT IRRIGATION RATE (IN/MONTH)	29	2.94	0.00	0.00	0.00	0.00	0.00	0.00	1.88	7.80	8.62	7.65	0.00	
DESIGN DISCHARGE TO FIELDS 1-4 & 6														
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.00	
LAND AREA UNDER IRRIGATION (AC)	157	157	157	157	157	157	157	157	157	157	157	157	157	
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION RATE (IN/MONTH)	21	1.61	0.00	0.00	0.00	0.00	0.00	0.17	3.20	4.26	4.70	4.17	3.27	
POTENTIAL Avg. Year Cond. EFFLUENT APPLICATION VOLUME (MG)	91	6.84	0.00	0.00	0.00	0.00	0.00	0.74	13.65	18.14	20.03	17.78	13.95	
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		15.06	25.46	44.22	68.39	90.91	112.08	111.83	108.24	82.50	50.99	19.07	0.00	
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	77	6.84	0.00	0.00	0.00	0.00	0.00	0.74	13.65	18.14	20.03	17.78	0.00	
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.22	0.00	0.00	0.00	0.00	0.00	0.02	0.44	0.60	0.65	0.57	0.00	
EFFLUENT IRRIGATION RATE (IN/MONTH)	18	1.61	0.00	0.00	0.00	0.00	0.00	0.17	3.20	4.26	4.70	4.17	0.00	
DESIGN LOSSES AND GAINS FROM STORAGE														
STORAGE AT BEGINNING OF MONTH (MG)		0.00	7.86	26.02	45.89	70.71	93.28	112.64	110.84	92.82	62.36	29.31	0.40	
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		8.22	17.60	18.20	22.50	20.20	18.80	-1.54	-16.24	-28.45	-31.40	-28.02	-0.40	
UNADJUSTED STORAGE VOLUME (MG)		8.22	25.46	44.22	68.39	90.91	112.08	111.09	94.59	64.37	30.96	1.29	0.00	
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		5.6	7.5	9.5	12.2	14.6	17.0	16.8	15.0	11.7	8.1	4.8	0.0	
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	
EVAPORATIVE LOSS FROM STORAGE (MG)	15	0.58	0.30	0.29	0.24	0.94	1.90	2.66	3.11	2.55	1.83	0.93	0.00	
PERCOLATION LOSS FROM STORAGE (MG)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	16	0.23	0.86	1.97	2.56	3.31	2.45	2.41	1.33	0.54	0.18	0.04	0.07	
STORAGE AT END OF MONTH (MG)		7.86	26.02	45.89	70.71	93.28	112.64	110.84	92.82	62.36	29.31	0.40	0.07	
													112.6	
														155.0

SUMMARY												
ANNUAL INFLOW (MG)				ANNUAL OUTFLOW POTENTIAL (MG)				OVERALL BALANCE (MUST NOT BE NEGATIVE)				
WASTEWATER.....	208			EVAPORATION.....	15			TOTAL UNUSED DISPOSAL CAPACITY (MG).....	23			
INFLOW AND INFILTRATION.....	14			PERCOLATION.....	0			UNUSED LAA CAPACITY (MG).....	21			
PRECIPITATION INTO RESERVOIR.....	16			ON-SITE LAND DISPOSAL.....	132			UNUSED COWRP CAPACITY (MG).....	1			
TOTAL INFLOW	238			DISCHARGE TO COWRP.....	114			TOTAL UNUSED STORAGE CAPACITY (MG).....	42			
				TOTAL OUTFLOW	261							

SANITARY FLOW CHARACTERISTICS		INPUT DATA, CONSTANT				CLIMATOLOGICAL FACTORS	
STARTING AVERAGE FLOW (MGD).....	0.57	CATCHMENT AREA (AC).....		27.0	CLIMATOLOGICAL DESIGN BASIS		1-in-100 YEAR
IRRIGATION AREA CHARACTERISTICS		WATER SURFACE (AC).....		21.6	DESIGN PRECIP/AVG PRECIP RATIO.....		1.81
POST MCIC IRRIGATION AREA TOTAL (AC).....	200	BOTTOM SURFACE (AC).....		9.6	OCT-APR EVAP/AVG EVAP RATIO.....		0.75
POST MCIC IRRIGATION FIELDS 1-4 & 6 AREA (AC).....	157	STORAGE AVAILABLE (MG).....		155	MAY-SEP EVAP/AVG EVAP RATIO.....		1.00
POST MCIC IRRIGATION FIELD 7 AREA (AC).....	43	EFFECTIVE STORAGE PERCOLATION RATE (IN/DAY).....		0.000	IRRIGATION AREA SOIL RUNOFF COEFFICIENT.....		0.05
POST MCIC NEW AREA (AC).....	0						
POST MCIC NEW AREA W/ RESERVOIR (AC).....	0						
IRRIGATION FIELD 7 MAX APPLICATION EFFICIENCY.....	1.10						
IRRIGATION FIELDS 1-4 & 6 MAX APPLICATION EFFICIENCY.....	0.60						

INPUT DATA, MONTHLY VARIABLE												
MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	SEP
DAYS IN MONTH	365	31	30	31	31	28	31	30	31	30	31	30
AVERAGE DRY WEATHER FLOW (MGD)		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
AVG PRECIP, AVG OF IONE & PARDEE (IN)	22	0.31	1.17	2.69	3.49	4.52	3.35	3.29	1.82	0.74	0.25	0.06
ZONE 14 WET YEAR REFERENCE EVAPOTRANSPIRATION (ET _o) (IN)	45.6	3.86	1.19	1.17	0.41	0.87	2.90	4.30	4.13	6.63	7.87	7.21
WATER SURFACE EVAPORATION COEFFICIENT		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CROP COEFFICIENT (K _c) EXISTING GRASSES		0.92	1.11	0.95	1.15	1.17	1.10	1.03	1.13	1.02	1.00	1.00
CROP COEFFICIENT (K _c) TREES (OAKS)		0.75	0.92	0.94	1.05	1.10	0.85	0.89	1.13	0.98	0.90	0.94
WEIGHTED CROP COEFFICIENT FOR MCSP SITE		0.83	1.02	0.94	1.10	1.14	0.97	0.96	1.13	1.00	0.95	0.97
PRESTON YOUTH FACILITY III VOLUME (MGD)		0.011	0.014	0.016	0.067	0.097	0.029	0.023	0.001	0.000	0.000	0.000
MCIC FACILITY II VOLUME (MGD)		0.013	0.002	0.000	0.000	0.001	0.005	0.010	0.002	0.002	0.000	0.000
MCSP FACILITY II VOLUME (MGD)		0.000	0.000	0.000	0.087	0.051	0.000	0.003	0.025	0.018	0.000	0.000
TOTAL II VOLUME (MGD)		0.025	0.015	0.016	0.154	0.149	0.033	0.036	0.028	0.020	0.000	0.000
TOTAL INFLUENT FLOW RATE (MGD)		0.59	0.59	0.72	0.72	0.72	0.60	0.61	0.60	0.59	0.57	0.57

CALCULATIONS												
CALCULATIONS / MONTH	ANNUAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	SEP
RAIN-RELATED CALCULATIONS												
PERCENT ANNUAL RAINFALL/MONTH (%)		1.4%	5.4%	12.4%	16.0%	20.8%	15.4%	15.1%	8.4%	3.4%	1.1%	0.3%
ESTIMATED IONE RAIN, 1-in-100 YEAR (IN)	39	0.56	2.12	4.87	6.32	8.17	6.05	5.95	3.29	1.33	0.44	0.10
EFFECTIVE RAIN FOR PLANTS (IN)	37	0.53	2.01	4.63	6.00	7.76	5.75	5.65	3.13	1.26	0.42	0.09
EVAPORATION-RELATED CALCULATIONS												
EVAPOTRANSPIRATION POTENTIAL (IN) (ET _o) (ET _o * Weighted K _c)	44	3.22	1.21	1.11	0.45	0.99	2.82	4.12	4.67	6.63	7.48	6.98
1-in-100 YEAR DESIGN ET POTENTIAL (IN) (ET _o * Seasonal Evaporation Ratio)	41	2.41	0.91	0.83	0.34	0.74	2.12	3.09	4.67	6.63	7.48	6.98
STORAGE RESERVOIR EVAPORATION (IN) (ET _o * Water Surface Coefficient)	42	2.90	0.89	0.88	0.31	0.65	2.18	3.23	4.13	6.63	7.87	7.21
SANITARY-RELATED CALCULATIONS												
AVERAGE DRY WEATHER FLOW VOLUME (MG)	208	17.7	17.1	17.7	17.7	16.0	17.7	17.1	17.7	17.1	17.7	17.1
II FLOW VOLUME (MG)	14	0.76	0.46	0.50	4.76	4.18	1.04	1.07	0.87	0.60	0.00	0.00
TOTAL INFLUENT FLOW VOLUME (MG)	223	18.5	17.6	18.2	22.5	20.2	18.8	18.2	18.6	17.8	17.7	17.1

DESIGN DISCHARGE TO COWRP												
AVERAGE TYPICAL COWRP DISCHARGE (MGD)		0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.61	0.63	0.61	0.63
MONTHLY DISCHARGE TO COWRP (MG)	114	0.0	0.0	0.0	0.0	0.0	0.0	19.0	19.0	19.0	19.0	19.0
HISTORICAL TYPICAL DISCHARGE TO COWRP (MG)	92	9.5	3.9	0.3	0.5	1.7	0.0	0.0	4.0	10.2	15.0	27.1
CDCR/ARSA AGREEMENT LIMITED COWRP DISCHARGE (MG)	114	0.0	0.0	0.0	0.0	0.0	0.0	19.0	19.0	19.0	19.0	19.0
CDCR MAXIMUM COWRP DISCHARGE (MG)	163	0.0	0.0	0.0	0.0	0.0	0.0	27.2	27.2	27.2	27.2	27.2
DESIGN DISCHARGE TO FIELD 7												
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	1.10	4.20	4.20	4.20	4.20	4.20	2.66	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)	43	43	43	43	43	43	43	43	43	43	43	43
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	25	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.98	7.76	7.57
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	30	2.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.48	9.07	8.84
MAX EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		42.5	52.7	72.2	97.9	122.6	147.1	149.5	151.6	147.3	126.3	94.9
AVAILABLE EFFLUENT APPLIED TO LAND (MG)	30	2.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.48	9.07	8.84
AVERAGE EFFLUENT DISCHARGE RATE TO FIELD 7 (MGD)		0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.29	0.29
EFFLUENT IRRIGATION RATE (IN/MONTH)	25	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.98	7.76	7.57
DESIGN DISCHARGE TO FIELDS 1-4 & 6												
BEGINNING AVAILABLE RAIN WATER IN SOIL (IN)		0.00	0.00	0.28	0.28	0.28	0.28	0.28	0.28	0.00	0.00	0.00
LAND AREA UNDER IRRIGATION (AC)	157	157	157	157	157	157	157	157	157	157	157	157
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION RATE (IN/MONTH)	16	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.76	3.22	4.24	4.13
POTENTIAL 1-in-100 YEAR EFFLUENT APPLICATION VOLUME (MG)	69	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.22	13.73	18.05	17.61
REMAINING EFFLUENT VOLUME AVAILABLE FOR LAND (MG)		40.12	52.66	72.15	97.92	122.63	147.10	149.50	151.61	143.78	117.25	86.05
REMAINING AVAILABLE EFFLUENT APPLIED TO LAND (MG)	69	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.22	13.73	18.05	17.61
AVERAGE EFFLUENT DISCHARGE RATE (MGD)		0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.46	0.58	0.57
EFFLUENT IRRIGATION RATE (IN/MONTH)	16	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.76	3.22	4.24	4.13
DESIGN LOSSES AND GAINS FROM STORAGE												
STORAGE AT BEGINNING OF MONTH (MG)		24.03	35.06	53.95	75.42	102.43	128.30	150.31	152.02	148.46	127.62	96.20
EFFLUENT STORAGE VOLUME GAIN/LOSS (MG)		11.28	17.60	18.20	22.50	20.20	18.80	-8.00	-3.63	-18.41	-28.43	-27.76
UNADJUSTED STORAGE VOLUME (MG)		35.32	52.66	72.15	97.92	122.63	147.10	149.50	148.39	130.05	99.20	68.44
APPROXIMATE EFFECTIVE RESERVOIR EVAP AREA (AC)		8.5	10.4	12.6	15.4	18.1	20.8	21.0	20.9	18.9	15.5	12.2
APPROXIMATE EFFECTIVE RESERVOIR PERC AREA (AC)		9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6
EVAPORATIVE LOSS FROM STORAGE (MG)	18	0.67	0.25	0.30	0.13	0.32	1.23	1.84	2.35	3.41	3.32	2.38
PERCOLATION LOSS FROM STORAGE (MG)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RUNOFF TO STORAGE FROM RAIN CATCHMENT AREA (MG)	29	0.41	1.55	3.57	4.63	5.99	4.44	4.36	2.42	0.98	0.33	0.07
STORAGE AT END OF MONTH (MG)		35.06	53.95	75.42	102.43	128.30	150.31	152.02	148.46	127.62	96.20	66.13
MAXIMUM STORAGE REQUIRED (MG).....												
TOTAL AVAILABLE STORAGE (MG).....												
155.0												

SUMMARY					
ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE (MUST NOT BE NEGATIVE)	
WASTEWATER.....	208	EVAPORATION.....		TOTAL UNUSED DISPOSAL CAPACITY (MG).....	
INFLOW AND INFILTRATION.....	14	PERCOLATION.....		UNUSED LA A CAPACITY (MG).....	
PRECIPITATION INTO RESERVOIR.....	29	ON-SITE LAND DISPOSAL.....		UNUSED COWRP CAPACITY (MG).....	
		TO PRESTON RESERVOIR.....		TOTAL UNUSED STORAGE CAPACITY (MG).....	
TOTAL INFLOW	251	TOTAL OUTFLOW		231	

Appendix H

**LONG-DURATION DEPTH-DURATION-FREQUENCY TABLE
FOR IONE (DEPARTMENT OF WATER RESOURCES)**

Appendix F

**LONG-DURATION DEPTH-DURATION-
FREQUENCY TABLE FOR IONE
(DEPARTMENT OF WATER RESOURCES)**

Rainfall Depth Duration Frequency

Station	Statio No	County	Lat	Long.	Elev.	Source Ob	TinYrs Rec	Slope	Intercept	
Ione	B00 4283 00	Amadc	38.348	-120.938	284	DWR	89	0.381	2.07	0.9977

0.317

	Return Period for Rainfall For Indicated Number Of Concecutive Days												W-YR
	1	2	3	4	5	6	8	10	15	20	30	60	
RP 2	1.93	2.59	2.96	3.30	3.64	3.85	4.23	4.66	5.55	6.14	7.52	11.00	21.62
RP 5	2.60	3.56	4.15	4.59	5.00	5.32	5.80	6.37	7.52	8.41	10.20	14.91	27.64
RP 10	3.03	4.19	4.92	5.42	5.83	6.21	6.76	7.41	8.69	9.79	11.81	17.26	31.05
RP 25	3.56	4.96	5.86	6.41	6.82	7.27	7.90	8.65	10.04	11.43	13.70	20.02	34.90
RP 50	3.94	5.51	6.54	7.12	7.51	8.02	8.70	9.51	10.98	12.59	15.01	21.94	37.51
RP 100	4.32	6.06	7.20	7.81	8.17	8.73	9.47	10.34	11.86	13.69	16.26	23.76	39.93
RP 200	4.68	6.59	7.84	8.49	8.81	9.42	10.21	11.15	12.70	14.75	17.46	25.51	42.22
RP 500	5.15	7.27	8.69	9.36	9.64	10.30	11.15	12.17	13.76	16.12	18.99	27.74	45.07
RP 1000	5.51	7.79	9.32	10.00	10.24	10.95	11.85	12.93	14.54	17.12	20.11	29.37	47.14
RP 10000	6.67	9.47	11.38	12.11	12.18	13.04	14.09	15.36	16.99	20.35	23.69	34.59	53.55

Average	2.06	2.77	3.19	3.53	3.83	4.06	4.46	4.91	5.76	6.47	7.86	11.50	22.07
Stdev	0.76	0.97	1.11	1.20	1.29	1.35	1.52	1.63	1.93	2.31	2.90	4.21	7.28
Rec Max	4.65	6.79	7.38	7.53	8.38	8.53	8.53	8.53	10.82	15.51	18.06	24.30	43.59
Rec Min	0.69	1.03	1.09	1.12	1.12	1.12	1.24	1.26	1.26	1.26	2.18	3.32	8.73
Z	3.56	3.79	3.24	2.83	3.03	2.77	2.36	1.93	2.29	3.63	3.43	2.95	3.15
Yrs Rec	89	90	89	90	90	90	90	91	91	90	90	90	103
Calc CV	0.371	0.350	0.349	0.339	0.336	0.333	0.340	0.332	0.336	0.356	0.369	0.366	0.330
Reg CV	.354	.382	.406	.401	.391	.396	.388	.382	.383	.385	.378	.377	.309
Skew	1.3	1.1	0.8	0.5	0.5	0.4	0.3	0.1	0.1	0.6	0.7	0.7	0.8
Reg Skew	1.1	1.1	1.1	1.0	0.8	0.8	0.8	0.8	0.6	0.8	0.7	0.7	0.4
Kurtosis	2.2	2.6	1.5	0.8	1.1	0.7	0.0	-0.3	-0.2	1.5	0.8	0.4	0.4

Year	Maximum Rainfall For Indicated Number Of Concecutive Days												
	1	2	3	4	5	6	8	10	15	20	30	60	W-YR
1898	3.60	4.47	4.64	4.64	4.64	4.64	4.64	4.76	5.11	5.11	5.23	7.30	13.77
1899	1.93	2.56	3.20	3.54	4.04	4.04	4.94	7.17	7.80	7.93	9.00	9.22	20.03
1900	1.85	2.34	2.41	2.80	2.86	2.86	2.86	3.88	4.82	5.66	6.45	9.69	21.51
1901	2.05	2.79	3.61	4.03	4.03	4.72	5.54	5.52	5.54	7.35	7.69	11.29	25.48
1902	1.21	1.79	2.09	2.61	3.01	3.41	3.87	4.41	5.03	6.03	7.72	9.29	20.19
1903	1.85	2.92	3.58	4.10	5.01	5.03	5.03	5.53	5.53	7.54	9.71	10.34	22.39
1904	1.51	2.62	3.12	3.15	3.15	3.25	3.75	4.86	6.07	6.42	7.20	12.05	21.42
1905	2.90	2.90	2.90	3.20	4.20	4.20	4.55	4.85	5.55	5.55	5.50	9.65	25.95
1906	2.40	2.54	3.22	3.62	3.85	3.85	3.85	5.03	7.47	9.20	10.45	15.43	30.93
1907	4.37	6.79	7.38	7.53	8.38	8.53	8.53	8.53	8.53	10.60	12.20	18.04	33.82
1908	1.30	1.60	1.60	1.78	1.78	1.78	1.83	3.03	3.63	3.63	5.51	9.04	14.27
1909	1.45	2.60	3.80	4.42	4.54	5.07	5.99	6.39	7.99	9.21	12.66	19.24	26.01
1910	2.00	3.00	3.00	3.45	3.88	3.88	3.93	3.93	4.00	4.69	5.92	8.90	20.89
1911	2.17	3.57	5.27	6.12	6.45	7.30	7.80	8.42	10.82	15.51	18.06	24.30	30.46
1912	0.69	1.04	1.15	1.22	1.30	1.45	1.86	2.16	2.47	2.86	3.43	5.36	12.68

1913	1.20	1.84	2.22	2.72	2.95	3.36	3.36	3.55	4.01	4.01	4.01	4.86	14.26
1914	2.26	3.11	3.49	3.61	3.99	3.99	3.99	4.48	5.47	6.96	9.81	13.52	22.90
1915	1.50	1.95	2.15	2.30	2.83	3.03	3.88	4.20	5.88	6.20	7.77	10.87	22.80
1916													20.00
1917	1.30	2.30	2.60	2.90	3.25	3.55	4.10	4.35	4.55	4.55	5.35	7.25	17.70
1918	1.60	2.35	2.35	2.35	3.45	4.25	4.70	4.70	6.50	6.50	8.10	11.30	15.50
1919	2.25	3.55	3.90	4.00	4.05	4.40	4.60	4.70	5.00	6.45	8.15	10.35	18.75
1920	2.10	3.55	3.90	4.05	4.20	4.20	4.20	4.31	4.82	5.19	7.04	9.26	15.46
1921	3.85	3.95	4.50	4.72	4.72	4.72	4.72	5.72	6.62	7.02	7.72	13.51	26.57
1922	2.17	2.52	3.45	3.95	3.95	3.95	3.95	4.44	7.09	7.16	9.46	14.80	24.30
1923	2.20	3.00	4.30	5.30	5.30	5.30	5.50	6.10	6.70	6.70	9.30	14.15	26.07
1924	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	2.35	3.00	3.00	4.95	10.50
1925	1.95	3.05	3.27	3.27	3.52	3.74	4.27	5.79	5.94	7.79	8.41	11.84	28.60
1926	2.55	2.80	2.90	3.55	3.55	4.55	5.10	5.10	6.48	8.99	10.04	10.29	21.54
1927	1.50	3.00	3.00	4.25	4.25	4.51	5.46	5.96	6.26	6.91	7.41	10.51	24.11
1928	1.68	2.60	3.40	4.06	4.79	4.92	4.92	4.92	5.92	6.10	6.27	9.09	18.80
1929	1.91	2.98	3.49	3.49	3.49	3.49	3.49	3.57	4.07	4.07	4.07	6.57	15.52
1930	1.39	2.25	2.25	2.57	2.57	2.78	3.35	3.71	5.17	5.33	5.62	10.86	17.07
1931	1.65	1.65	1.65	2.53	2.53	2.53	2.65	2.65	2.65	2.65	3.92	6.39	12.62
1932	1.75	1.92	2.59	3.58	3.75	3.80	4.49	4.97	5.58	5.88	6.60	10.05	19.99
1933	1.20	1.72	1.72	1.72	2.32	3.12	3.12	3.82	3.82	3.82	5.07	7.87	12.77
1934	1.70	2.85	2.85	4.05	4.52	4.52	4.52	4.52	4.52	6.40	8.77	9.67	17.86
1935	2.50	2.72	2.72	2.72	3.25	4.30	4.52	4.52	5.22	5.65	6.35	9.47	23.94
1936	2.00	2.30	3.50	4.20	4.35	4.50	6.05	6.40	10.33	10.33	13.28	19.99	28.29
1937	4.40	4.65	5.85	6.15	6.60	6.95	7.70	8.15	8.70	9.50	10.10	19.90	34.99
1938	2.30	3.65	4.05	4.55	4.80	4.80	5.25	6.95	9.40	10.35	12.10	16.00	27.25
1939	1.72	2.40	2.55	2.80	2.80	2.80	2.80	2.80	2.80	3.17	3.42	5.93	14.01
1940	1.65	2.72	3.46	3.76	4.20	4.79	5.24	5.54	5.95	6.00	8.96	16.37	24.86
1941	1.85	2.40	2.46	3.46	5.46	5.46	4.17	4.52	7.17	8.59	11.13	14.00	25.17
1942	2.00	3.48	4.20	4.60	5.32	5.81	5.91	5.91	7.68	8.17	8.17	12.92	26.67
1943	2.05	2.78	3.58	3.81	4.43	4.77	5.38	5.42	7.10	8.03	10.13	15.90	27.61
1944	2.25	2.41	2.53	2.53	3.23	3.39	3.93	4.28	5.68	5.68	7.47	10.20	19.25
1945	2.68	3.88	4.78	4.78	4.98	5.27	5.27	5.27	5.66	5.66	5.66	9.58	23.66
1946	1.90	1.90	3.20	3.38	4.37	4.98	5.16	5.42	5.70	6.31	7.49	11.80	20.14
1947	2.16	3.12	3.20	3.20	3.91	3.91	3.91	4.13	4.13	4.13	4.82	7.33	14.54
1948	1.28	1.41	1.70	1.83	2.03	2.03	2.43	2.43	4.08	4.39	6.67	8.68	17.76
1949	1.76	2.71	3.14	3.14	3.14	3.14	3.72	3.86	4.87	5.45	6.93	10.49	17.23
1950	2.70	2.70	2.70	3.97	3.97	3.97	3.97	5.05	5.05	5.55	9.52	10.41	18.30
1951	4.65	5.30	5.30	5.30	5.55	5.70	6.24	6.25	6.25	8.87	10.85	14.60	28.76
1952	2.21	3.15	3.68	3.77	3.77	3.77	3.77	4.06	4.68	6.56	7.47	13.11	27.05
1953													15.10
1954													16.40
1955													18.28
1956													28.58
1957													18.93
1958													41.69
1959	1.65	2.09	2.09	2.55	2.88	3.22	3.68	4.01	4.01	4.75	6.13	10.54	13.45
1960	1.33	1.53	1.86	1.86	2.09	2.42	2.82	3.25	3.67	5.03	6.18	7.86	16.68
1961	1.38	1.68	2.16	2.16	2.16	2.26	2.40	2.77	2.93	3.23	4.81	6.51	13.82
1962	1.25	2.08	2.93	3.02	4.05	4.53	6.47	7.17	7.61	7.75	9.09	11.98	18.00
1963	2.88	3.52	4.20	4.65	4.65	4.65	4.65	4.65	6.07	6.38	6.38	10.35	24.44
1964	1.98	2.44	2.86	3.06	3.06	3.06	3.25	3.45	5.45	6.58	6.84	9.13	18.12
1965		3.43						7.18	8.10				25.01

Appendix I

LAA SOIL SAMPLING PLAN

LAND APPLICATION AREA SOIL SAMPLING PLAN

CALIFORNIA DEPARTMENT OF CORRECTIONS AND REHABILITATION

MULE CREEK STATE PRISON

IONE, CALIFORNIA

PREPARED FOR:

CALIFORNIA DEPARTMENT OF
CORRECTIONS AND REHABILITATION:
MULE CREEK STATE PRISON

AMADOR COUNTY

PREPARED BY:

KJELDSSEN, SINNOCK & NEUDECK, INC.
CIVIL ENGINEERS & LAND SURVEYORS

1550 HARBOUR BOULEVARD, SUITE 212
WEST SACRAMENTO, CALIFORNIA 95691
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October 15, 2018



Stephen K. Sinnock, P.E.
Christopher H. Neudeck, P.E.
Neal T. Colwell, P.E.
Barry O'Regan, P.E.

2291-0010
99-123

October 15, 2018

Via e-mail

Mr. Christofer Hudgens
Correctional Plant Manager II (A)
Mule Creek State Prison
California Department of Corrections and Rehabilitation
P.O. Box 409099
Ione, CA 95640

Re: LAA Soil Sampling Plan per Notice of Violation dated August 13, 2018

Dear Mr. Hudgens,

Please find enclosed the above-referenced Land Application Area (LAA) Soil Sampling Plan, which has been requested by the Central Valley Regional Water Quality Control Board (CVRWQCB). This LAA Soil Sampling Plan is intended to meet the requirements of Required Actions item 5 of the August 13, 2018 Notice of Violation issued by the CVRWQCB.

If this document is acceptable to CDCR, it should be submitted electronically to the Central Valley Regional Water Quality Control Board for review and approval. If you have any questions, please contact me at ncolwell@ksninc.com or (916) 403-5900.

Sincerely,
KJELDEN, SINNOCK & NEUDECK, INC.

Neal T. Colwell, RCE 59437

w/enclosures

cc: Gregor Larabee, CDCR Environmental & Regulatory Compliance, via e-mail
Eric Ppathakis, CDCR Office of Legal Affairs, via e-mail
Robert Sleppy, CDCR FPCM, via e-mail

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- Appendix A: Custom Soil Resource Report for Amador Area, California, NRCS, Generated May 9, 2014
- Appendix B: Geologic Map of California Sacramento Sheet, and Explanatory Data, Ca. Division of Mines and Geology, 1965
- Appendix C: Field Data Sheet
- Appendix D: Sample Chain of Custody Form

Engineer's Seals and Signatures

	<p>I hereby certify that this technical submission was prepared by me or under my direct supervision and that I am a duly registered engineer under the laws of the State of California. I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</p> <p>Neal T. Colwell 10/15/2018</p> <p>My license renewal date is 12/31/19</p>
---	---

Contributors to Land Application Area Soil Sampling Plan

Reviewed By:

James H. Witty

Stantec

Certified Professional Soil
Scientist

Background and Purpose

1.1 NOTICE OF VIOLATION DATED AUGUST 13, 2018

The Central Valley Regional Water Quality Control Board (CVRWQCB) issued a Notice of Violation dated August 13, 2018 (NOV) related claimed deficiencies in monitoring reports and the Technical Report submitted in response to a previous Notice of Violation dated December 5, 2016. The December 5, 2016 Notice of Violation required CDCR to address the following elements:

1. Evaluation of compliance under the Waste Discharge Requirements (WDRs) under reduced land application area (LAA);
2. Evaluate background groundwater conditions compared to downgradient wells, including a statistical analysis;
3. Evaluation of groundwater conditions across the site in relation to salinity management and nitrate loading; and
4. Preparation of a work plan to install three new deep wells.

A Technical Report dated April 2017 was prepared by SHN Engineers & Geologists to address items 1 through 3 above, and was submitted to the CVRWQCB on April 14, 2017. The work plan to install three new deep wells was submitted prior to the Technical Report.

Under item Required Actions Item 5 of the NOV, CDCR is required to prepare a LAA Soil Sampling Plan as follows:

“No later than 15 October, Discharger must submit a LAA Soil Sampling Plan to sample each LAA to assess impacts of effluent irrigation. The plan shall also evaluate background soil concentrations. Background samples must be collected from each soil type in areas where neither irrigation nor solids disposal has occurred.”

1.2 EXISTING LAAS AND UNDERLYING SOILS AND GEOLOGY

The MCSP LAAs consist of six functional units, grouped according to a combination of factors including:

1. Location;
2. Irrigation land application system; and

3. Area performance based on effectiveness of the LAA.

The designation and estimated effective area of the currently active LAAs is summarized in Table 1-1. The area of these LAAs was estimated based on evaluation of historical LAA maps, modifications to the LAAs as a result of improvements to the site (e.g., construction of the Mule Creek Infill Complex [MCIC]), and through examination of existing aerial imagery indicating the area effectively having treated effluent applied. The locations of these LAAs is presented schematically in Figure 1-1.

Table 1-1: LAA Designations and Approximate Area

LAA Number	Effective Area (acres)
1	28
2	28
3	31
4	39
6	31
7	43
Total	200

Prior to construction of the MCIC, LAA 5 was actively used and was located between LAA 4 and LAA 6.

1.2.2. EXISTING SOILS INFORMATION

Soil resource information available from the Natural Resource Conservation Service (NRCS) of the United States Department of Agriculture indicates that the MCSP LAAs are predominantly within eight (8) soil mapping units, with minor areas mapped within two additional soil mapping units. A custom soil report prepared for the MCSP vicinity of Amador County is contained in Appendix A, compiled May 9, 2014 from the NRCS¹, and is the source of the below information. The predominant mapped soil units within the LAAs are identified below with select characteristics per Appendix A. Minor (approximately 3% of LAA2) portions of the LAAs appear to be mapped within the Red Bluff-Mokelumne complex, 0 to 5 percent slopes (RbB) and less than 10% each of LAA 6 and 7 appear to be mapped with Pw (Placer Diggings and Riverwash), which have been considered insignificant for this study.

¹ NRCS Web Soil Survey, <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>, accessed May 9, 2014.

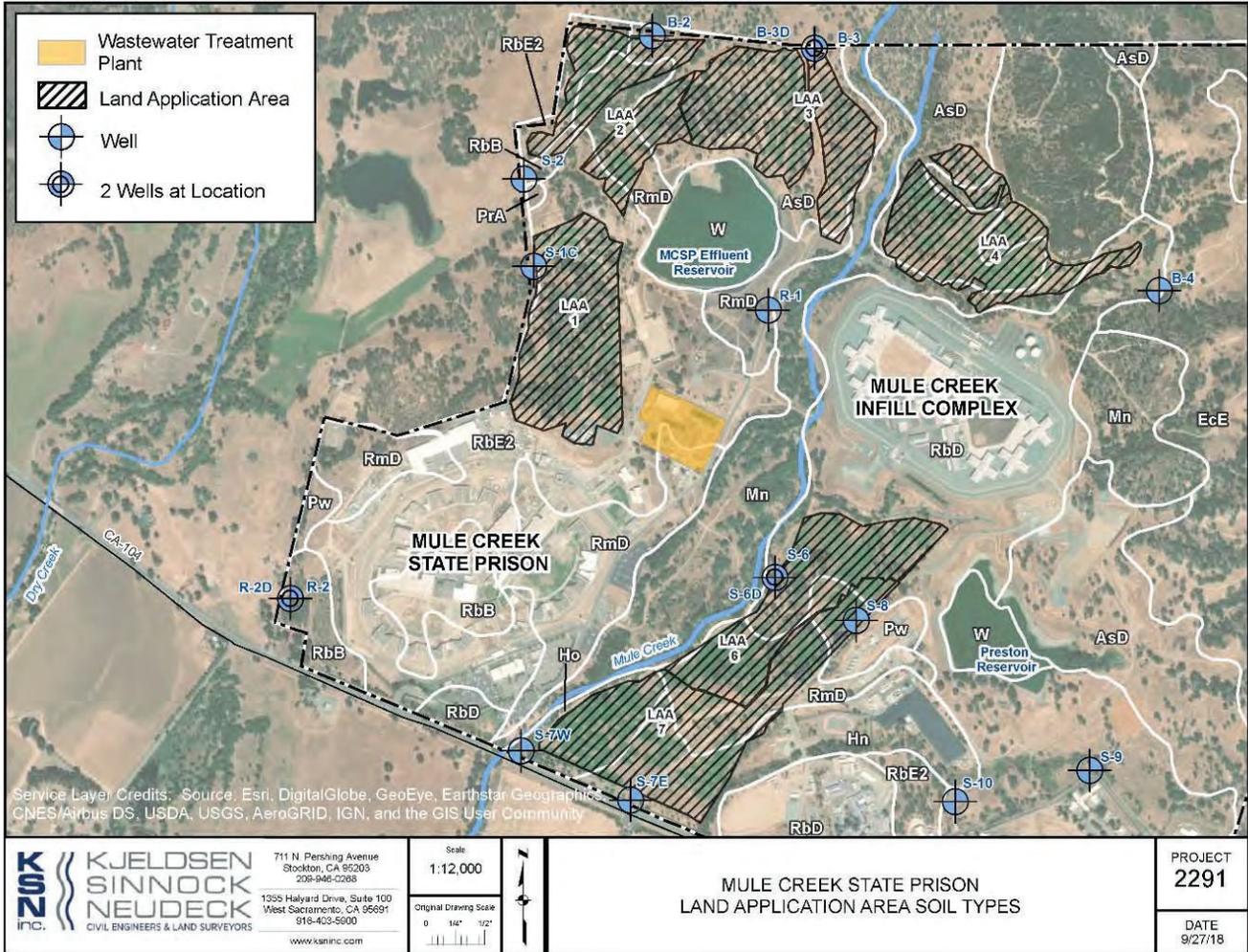


Figure 1-1: Soil Types Underlying MCSP LAAs

1.2.2.1. AsD - Auburn very rocky silt loam, 3 to 31 percent slopes

Map Unit Composition

Auburn and similar soils: 85 percent

Rock outcrop: 15 percent

Description of Auburn

Setting

Landform: Hills

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Side slope Down-slope shape: Concave

Across-slope shape: Convex

Parent material: Amphibolite schist

Typical profile

H1 - 0 to 9 inches: slightly acid, silt loam

H2 - 9 to 14 inches: slightly acid, silt loam

H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 31 percent

Depth to restrictive feature: 10 to 28 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: SHALLOW ROCKY LOAM FOOTHILLS (R018XD090CA)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

1.2.2.2. Hn - Honcut silt loam

Map Unit Composition

Honcut and similar soils: 99 percent

Minor components: 1 percent

Description of Honcut

Setting

Landform: Valley floors, flood plains, terraces

Landform position (two-dimensional): Toeslope, footslope *Landform position (three-dimensional):* Tread, tal, dip *Down-slope shape:* Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: slightly acid, silt loam

H2 - 11 to 27 inches: neutral, silt loam

H3 - 27 to 60 inches: neutral, loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated

Land capability classification (irrigated): 1 *Land capability classification (nonirrigated):* 3c *Hydrologic Soil Group:* C

Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Unnamed

Percent of map unit: 1 percent

Landform: Depressions

1.2.2.3. Ho - Honcut very fine sandy loam

Map Unit Composition

Honcut and similar soils: 96 percent

Minor components: 4 percent

Description of Honcut

Setting

Landform: Terraces, flood plains, valley floors

Landform position (two-dimensional): Footslope, toeslope *Landform position (three-dimensional):* Tread, dip, talf *Down-slope shape:* Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: slightly acid, very fine sandy loam

H2 - 11 to 27 inches: neutral, very fine sandy loam

H3 - 27 to 60 inches: neutral, fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated

Land capability classification (irrigated): 1 *Land capability classification (nonirrigated):* 3c *Hydrologic Soil Group:* C

Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

1.2.2.4. Mn - Mine tailings and Riverwash

Map Unit Composition

Mine tailings: 65 percent

Riverwash: 35 percent

Description of Mine Tailings

Properties and qualities

Slope: 0 to 5 percent

Natural drainage class: Excessively drained

Frequency of flooding: Rare

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Description of Riverwash

Setting

Landform: Drainageways

Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: gravelly coarse sand

H2 - 6 to 60 inches: stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities

Slope: 0 to 2 percent

Natural drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: Frequent

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8w

Hydrologic Soil Group: D

1.2.2.5.Pw - Placer diggings and Riverwash

Map Unit Composition

Placer diggings: 50 percent

Riverwash: 50 percent

Description of Placer Diggings

Properties and qualities

Slope: 0 to 15 percent

Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Frequency of flooding: Occasional

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 4s *Hydrologic Soil Group:* A

Ecological site: PLACER DIGGINGS AND RIVERWASH (R018XD097CA)

Description of Riverwash

Setting

Landform: Drainageways

Parent material: Alluvium

Typical profile

H1 - 0 to 6

H2 - 6 to 60 inches: stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities

Slope: 0 to 5 percent

Natural drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: Frequent

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8w

Hydrologic Soil Group: D

1.2.2.6. RbD - Red Bluff-Mokelumne complex, 5 to 16 percent slopes

Map Unit Composition

Red bluff and similar soils: 60 percent Mokelumne and similar soils: 25 percent Minor components: 15 percent

Description of Mokelumne

Setting

Landform: Swales on terraces

Landform position (two-dimensional): Foothlope, toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear, concave

Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam

H2 - 10 to 39 inches: very strongly acid, clay

H3 - 39 to 46 inches: weathered bedrock

Properties and qualities

Slope: 5 to 16 percent

Depth to restrictive feature: 39 to 60 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified *Land capability classification (nonirrigated):* 4e *Hydrologic Soil Group:* D

Ecological site: UPLAND TERRACES (R018XD092CA)

1.2.2.7.RbE2 - Red Bluff-Mokelumne complex, 16 to 36 percent slopes, eroded

Map Unit Composition

Red bluff and similar soils: 55 percent

Mokelumne and similar soils: 45 percent

Description of Mokelumne

Setting

Landform: Swales on terraces

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear, concave

Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam

H2 - 10 to 39 inches: very strongly acid, clay

H3 - 39 to 46 inches: weathered bedrock

Properties and qualities

Slope: 16 to 36 percent

Depth to restrictive feature: 39 to 60 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified *Land capability classification (nonirrigated):* 6e *Hydrologic Soil Group:* D

Ecological site: UPLAND TERRACES (R018XD092CA)

1.2.2.8. RmD - Red Bluff-Mokelumne-Mine pits complex, 2 to 16 percent slopes

Map Unit Composition

Red bluff and similar soils: 35 percent *Mokelumne and similar soils:* 35 percent *Mine pits:* 25 percent

Minor components: 5 percent

Description of Mokelumne

Setting

Landform: Swales on terraces

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear, concave

Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam

H2 - 10 to 39 inches: very strongly acid, clay

H3 - 39 to 46 inches: weathered bedrock

Properties and qualities

Slope: 2 to 16 percent

Depth to restrictive feature: 39 to 60 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified *Land capability classification (nonirrigated):* 4e *Hydrologic Soil Group:* D

Ecological site: UPLAND TERRACES (R018XD092CA)

Description of Mine Pits Typical profile

H1 - 0 to 60 inches: variable

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

1.3 UNDERLYING GEOLOGY

Available information (see Appendix B for the Sacramento Sheet of the Geologic Map of California and Explanatory Data) for the MCSP site indicates that it is underlain by primarily three bedrock types:

Eocene Nonmarine Sedimentary Rocks (Map Symbol Ec): The Ione formation of Eocene Nonmarine Sedimentary rock is described as massive, white quartzose sandstone, with lenses of white or light-colored anaerobic clay and white sandstone, gray or bluish gray shale and clay, lignite, and other carbonaceous beds.

Jurassic and/or Triassic Metavolcanic (Map Symbol JTRv): The Mother Lode Belt is described as containing mafic volcanic breccia and tuff, amphibolite schist, quartz porphyry “feeders” for dacite volcanics, and include Upper Jurassic basic sills and dikes.

Upper Jurassic Marine Sedimentary and Metasedimentary Rocks (Map Symbol Ju): The Cosumnes formation of the Amador group of Upper Jurassic Marine Sedimentary and Metasedimentary Rocks is described as dark gray clay slate, sheared greywacke, thin-bedded tuff, some basic lava, red and green chert, and a basal conglomerate.

Based on the mapping presented in Appendix B, Figure 1-2 presents the approximate aerial extent of mapped geology within the MCSP area and underlying the MCSP LAAs.

The parent material for the soils in the MCSP LAA vicinity is expected to be strongly based on the mineralogy of the underlying geologic formations. For the majority of the soils in the LAAs, (AsD, RbD, RmD, and RbE2) the depth to untethered bedrock is typically less than 40 inches and it is expected that the adjacent deeper loam soils and (Ho and Hu) and mine tailings or river wash soils (Mn) are predominantly formed from the adjacent upslope soils and related geology. This mineralogical composition is expected to be a dominant factor in composition of groundwater inorganic constituents. Because of this, this LAA Soil Sampling Plan considers both the soil mapped units and mapped underlying geology in developing the sampling plan and plan for data analysis.

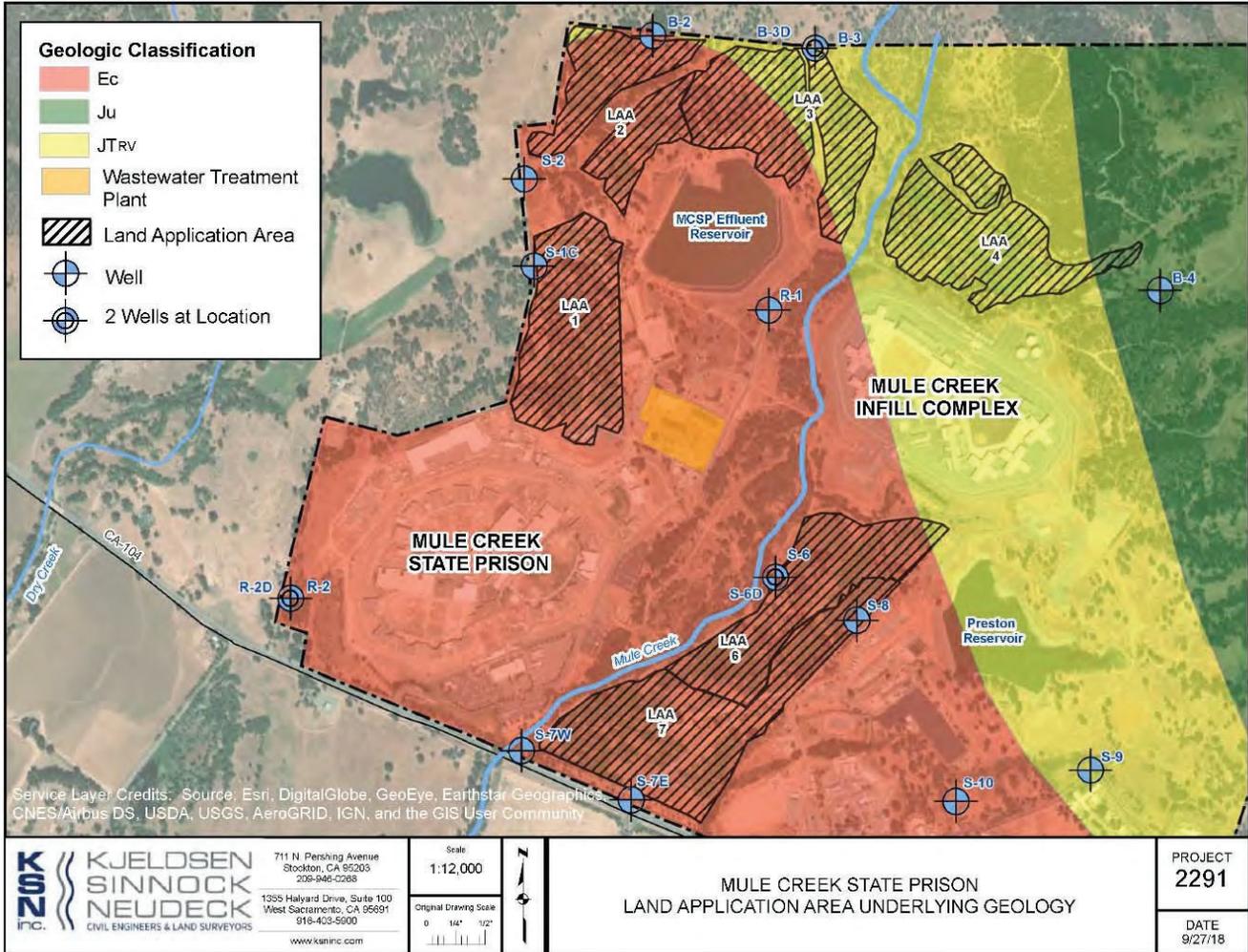


Figure 1-2: Geology Underlying MCSP LAAs

1.4 PURPOSE OF LAA SOIL SAMPLING

According to the NOV and the Technical Report, the purpose of the LAA soil sampling is to assess impacts of effluent irrigation and particularly the sources of salinity to shallow groundwater². The NOV also requests that soil samples be collected and evaluated for background soil concentrations. It is our understanding that the soil sampling and assessment of background soil concentrations is to provide information regarding the relative contribution of salinity (and specific salinity constituents of concern) to shallow groundwater. The NOV requires that background samples be collected from each soil type (which we have interpreted to mean each mapped soil unit per the NRCS data), therefore a total of eight (8) background soil samples will be collected per Table 1-2, however excluding RbB because of its very limited occurrence on the site.

² Technical Report page 23.

Table 1-2: Soil Types and Geology Underlying LAAs

LAA Number	Soil Types and Percentage									Underlying Geology and Percentage		
	AsD	Hn	Ho	Mn	Pw	RbB	RbD	RbE2	RmD	Ec	JTRv	Ju
1								100%		100%		
2	30%					3%		30%	37%	97%	3%	
3	~100%									48%	52 %	
4	64%			31%			5%				96%	4%
6					6%		62%		32%	98%	2%	
7		33%	26%		7%		3%		31%	100%		

In addition to meeting this requirement, the soil sampling and analysis is proposed to gather the following information to better inform an assessment of impacts (if any) to shallow groundwater, processes for soil organic content sequestration, nitrification/denitrification potential, mineralization/mobilization potential and to support development of the LAA Management Plan and Engineering Feasibility Study (both requirements of the NOV):

1. Soil total nitrogen; and
2. Soil total organic carbon.

This assessment is to be performed primarily based on comparison of characterization results between soils in the LAAs and similar source soils that have not historically had application of treated effluent or wastewater treatment process solids disposal (which has not been reported to have occurred on the site)

Soil Sampling Plan

The following soil sampling plan has been developed to collect and characterize soils at the MCSP site from the following locations;

- Within each LAA; and
- Soils not previously receiving application of treated effluent or wastewater solids disposal representative of each soil map unit identified within the LAAs.

This section outlines the proposed soil sampling locations, procedures for selecting the sample location and soil sample collection and field observations, and sample transportation. Soil sampling is intended to collect site observations regarding aggregate soil characteristics as well as result in obtaining laboratory analysis of soil salinity conditions, soil nitrogen, and organic carbon content. This soil sampling plan is a targeted plan intended to allow for an assessment of differing conditions between background and LAA soil characteristics.

2.1 SOIL SAMPLING LOCATIONS

Collection of a total of a total of fourteen (14) samples is proposed to characterize LAA soil conditions and background soil conditions. The below sub-sections describe the basis for the proposed LAA and background sample locations.

2.1.1. RATIONAL FOR LAA SOIL SAMPLE SITING

Six (6) composite samples (collected from up to 20 individual sample locations) are proposed to be collected from the six LAAs, one each from LAA 1 through 4 and one composite sample each from LAA 6 and LAA 7.

Figure 2-1: depicts the general locations of the soil samples to be collected, designated by the LAA. Each composite sample will be comprised from a series of individually collected samples collected within each LAA. Compositing of samples between LAAs or within multiple LAA samples is not proposed.

Within each LAA, a transect of the LAA will be developed an individual samples collected for compositing. The intent of the LAA sampling is to obtain a single composite representative sample of the soils which have historically been actively used in the LAA. Within each LAA, a single location will be identified for a test pit for observing soil characteristics. During sample collection, the site will be confirmed based on site observations including:

1. Existing sprinkler system location and evidence of past land application activities;
2. Review of general soil physical properties for consistency with soil map unit characteristics, as described in 1.2.2.

2.1.2. RATIONAL FOR BACKGROUND SOIL SAMPLE SITING

Up to seven (7) composite samples are proposed to be collected from up to twenty individual background soil samples within the seven major soil map units making up the majority of the LAAs, including AsD, Hn, Ho, Mn, RbD, RbE2, and RmD. Because of the limited extent of Pw and RbB in the LAAs and as representative background, samples from these mapped soil units are not proposed.

Figure 2-1: depicts the general locations of the proposed soil sample transects for collection of individual samples to make up the composite. Within each representative soil map unit, a single location will be identified for a test pit for observing soil characteristics. Because of some mapped soil units are of limited extent on the MCSP site background sampling may have to be adjusted and may be based on a limited set of individual samples.

Background soil sampling sites have been selected to represent each soil map unit, but also to be from areas known to historically not have received application of treated effluent (or wastewater solids disposal, which is not practiced at the site). The intent of the background sampling is to obtain a single composite sample representative sample of the soil map units. During sample collection, the site will be confirmed based on site observations including:

1. Absence of evidence of current or historical land application activities, e.g. sprinkler systems or other application improvements; and
2. Review of general soil morphological conditions and characteristics for consistency with soil map unit characteristics as described in 1.2.2.

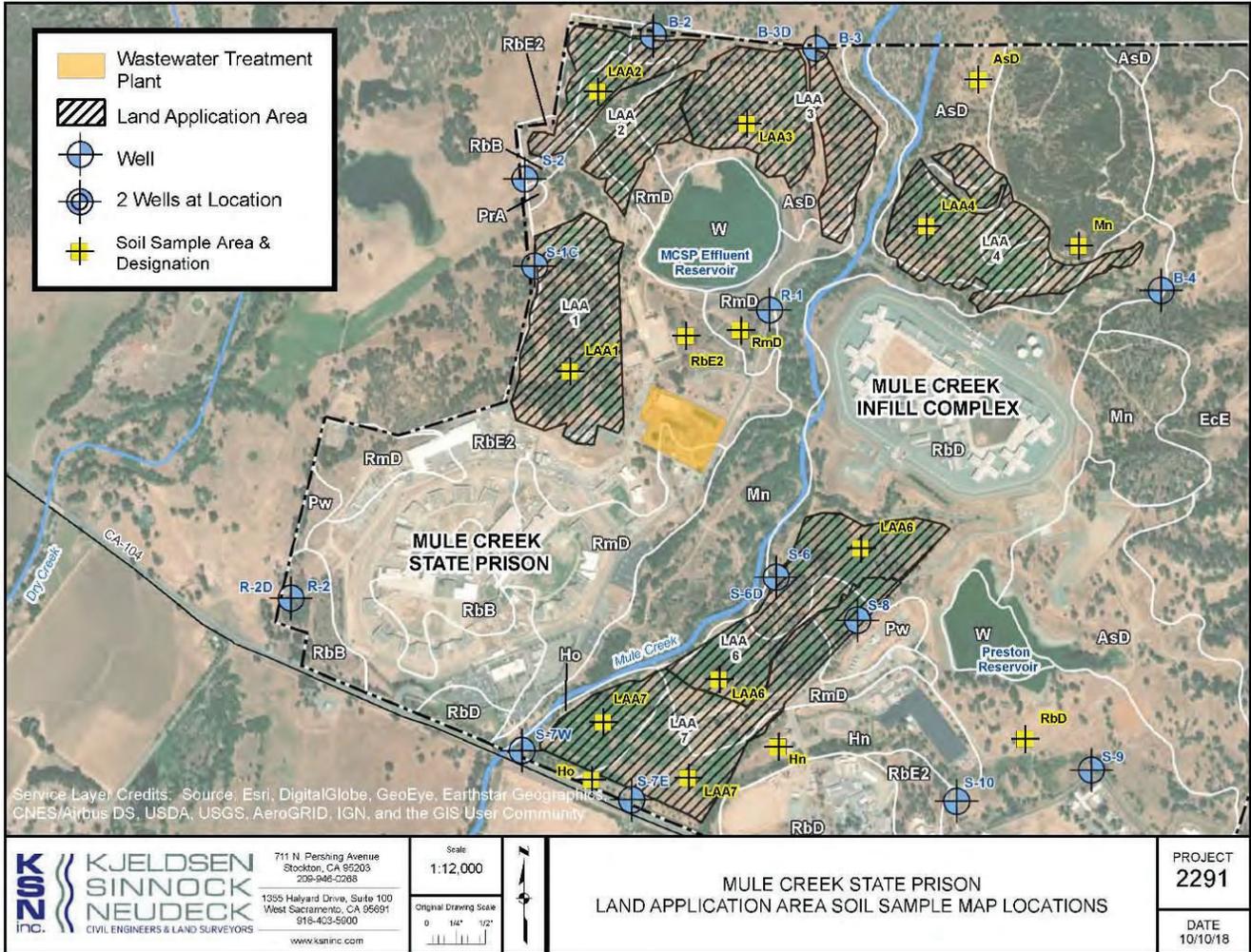


Figure 2-1: Soil Sampling Location Map

2.2 SOIL SAMPLING PROTOCOL

The following sub-sections outline the proposed soil sampling protocol for the LAA soil sampling and sampling of the background soils.

2.2.1. SAMPLE COLLECTION AND FIELD OBSERVATIONS AND NOTES

Prior to sampling, sampling personnel will wear appropriate personal protective equipment and will use nitrile gloves when handling samples. All sampling equipment will be cleaned with non-phosphate detergent before mobilizing to the field.

Samples will be collected with clean hand tools, consisting of spades and hand augers. Samples will be composited from up to 20 individual locations within each LAA and within background areas representative of the seven soil map units to be characteristics. Samples will be collected from the 6 to 12 inch depth interval or from 6 inches to bedrock surface if soils are shallower. At a representative location or each soil, a 20 to 36 inch depth sample will be collected for physical characterization. A

sufficient volume of site-specific soil sample will be collected to allow analysis of parameters as listed in Section 2.3, but not less than one (1) gallon. During sample collection the following information will be collected on a Field Data Sheet (to be collected on a field data sheet similar to Appendix C):

1. Sample Designation (e.g., LLA1, Hu);
2. GPS location of individual samples or representative pit location;
3. Date sample is collected;
4. Name of sampler;
5. Description of sample location (e.g., LAA1);
6. General condition of site, note vegetation and condition of vegetation, general moisture of surrounding soils, proximity to sprinklers or sprinkler laterals, evidence of soil disking, and other relevant site observations;
7. Soil description documented on Field Data Sheet, see Appendix C; and
8. Note sample container and final estimated volume of sample.

2.2.2. SAMPLE HANDLING, LABELING, AND TRANSPORTATION

Each sample will be individually and uniquely labeled. According to the sample site map shown in Figure 2-1:, the proposed sample labeling and designations are presented in Table 2-1. Each site-specific sample will be labeled with the Sample ID, date and time of sample collection, sampler name, and sample analysis to be performed.

During sample collection, a sample log (in the form of a chain of custody form) will be maintained. A laboratory provided chain of custody form will be used for each sample collected. A sample of the chain of custody form is provided in Appendix D. Prior to sampling, the client, address, contact information, project name, and sampler names should be completed on the chain of custody. Also the sample method and laboratory testing to be done on each sample completed. At the time of sample collection the date and time the sample is collected is to be noted on the chain of custody.

Samples are to be delivered upon completion of sampling to the laboratory for analysis under chain of custody documentation.

Table 2-1: Sample Labels and Designations

LAA Number or Soil Map Unit	Sample Label and Designation	
	Sample ID	Designation
1	LAA1	Land Application Area 1 composite sample
2	LAA2	Land Application Area 2 composite sample
3	LAA3	Land Application Area 3 composite sample
4	LAA4	Land Application Area 4 composite sample
6	LAA6	Land Application Area 6 composite sample
7	LAA7	Land Application Area 7 composite sample
AsD	AsD	Auburn very rocky silt loam background composite sample
Hn	Hn	Honcut silt loam background composite sample
Ho	Ho	Honcut very fine sandy loam background composite sample
Mn	Mn	Mine tailings and river wash background composite sample
RbD	RbD	Red Bluff-Mokelumne complex 5 to 16% background composite sample
RbE2	RbE2	Red Bluff-Mokelumne complex 16 to 36% background composite sample
RmD	RmD	Red Bluff-Mokelumne-Mine pits background composite sample

Since soil samples are not intended to be evaluated for volatile organic constituents, samples will be collected in polyethylene plastic sample bags, labeled as described above. Immediately after sample collection, samples will be placed in ice chests under ice and delivered to the laboratory immediately upon completion of the day's sampling.

2.3 LABORATORY ANALYSIS OF SOIL SAMPLES

Soil samples will be delivered to analytical laboratories for analysis of physical and aggregate characteristics, and soil extract water analysis.

2.3.1. PHYSICAL AND AGGREGATE CHARACTERIZATION

Laboratory analysis of each soil will include:

- Particle size;
- Total organic carbon and nitrogen, according to loss on ignition auto analyzer.;

2.3.2. SOIL EXTRACT WATER ANALYSIS

As a means to assess the potential for site soils to contribute to shallow groundwater quality, a soil extract water analysis is proposed. The saturated paste extract method as described by the Methods of Soil Analysis of the American Society of Agronomy/Soil Science Society of America (ASA/SSSA) is proposed for collecting samples for water quality analysis. This method employs deionized (DI) water

to saturate a soil sample and then vacuum extracts a sample of the water for analysis. Other methods, such as the Synthetic Precipitation Leaching Procedure (SPLP) as outlined in EPA Method 1312, which uses a low pH extraction fluid (pH of 5.0 for sites west of the Mississippi River), are intended to assess leaching of heavy metals, not soil salinity which is the focus of this study.

Samples collected according to this soil sampling plan will be delivered to a California ELAP certified laboratory for DI extraction and analyses of the extracted samples for the following (Table 2-2):

Table 2-2: Soil Extract Water Analysis

Analysis	Method⁽¹⁾
Total dissolved solids	SM 2540C
Electrical conductivity	SM 2510B
Calcium	EPA 200.7/EPA 200.8
Magnesium	EPA 200.7/EPA 200.8
Potassium	EPA 200.7/EPA 200.8
Sodium	EPA 200.7/EPA 200.8
Iron	EPA 200.7/EPA 200.8
Manganese	EPA 200.7/EPA 200.8
Total Alkalinity (and series)	SM 2320B
Sulfate	EPA 300.0
Chloride	EPA 300.0
Nitrate	EPA 300.0/SM4500
Nitrite	EPA 300.0/SM4500
Total Kjeldahl nitrogen	EPA 351.1
pH	SM 4500H-B out of hold time
Total organic carbon	SM5310C

(1) Or other appropriate EPA or Standard Method

For non EPA-method procedures and analysis, the laboratory will adhere to the Agricultural Laboratory Proficiency (ALP) standards and be ALP accredited.

2.3.3. ADDITIONAL SOIL CHEMICAL CHARACTERIZATION

Depending on observed and measured soil conditions, e.g., acidity or basicity, the composite samples may be analyzed for the following additional characteristics, according to standard agricultural laboratory procedures.

Table 2-3: **Additional Soil Chemical Characterization**

Characterization
Exchangeable iron, manganese, and aluminum
Exchangeable acidity
Base saturation
Cation exchange capacity
Total nitrogen and nitrogen speciation

2.3.4. LABORATORY QA/QC

Laboratory QA/QC shall be performed and QA/QC report provided with the results of all soil and water quality analysis pursuant to ELAP and/or ALP requirements.

2.4 DATA COMPILATION AND PRESENTATION

Data received from the laboratory analysis will be reviewed for meeting QA/QC criteria and any observed discrepancies noted. Results of the laboratory analysis will be prepared in summary comparison tables.

Soil Characterization and Evaluation Plan

3.1 LAA AND BACKGROUND SOIL CHARACTERIZATION

The results of field data and laboratory analysis of soil characteristics will be compiled and presented to characterize LAA and background soil conditions. The characterization will focus on salinity constituents, nitrogen constituents, and microbiological information.

3.1.1. LAA SOIL CHARACTERIZATION

Summary data tables will be prepared compiling and evaluating the characteristics of the LAA soils. Based on the single set of samples to be collected under this soil sampling plan, the following characteristics will be presented:

1. LAA range, average, and variability of overall extracted water TDS, EC, and salinity constituents;
2. LAA range, average, and form of nitrogen constituents from the extracted water; and
3. Total organic carbon and nitrogen.

3.1.2. BACKGROUND SOIL CHARACTERIZATION

As with the LAAs, summary data tables will be prepared compiling and evaluating the characteristics of each of the soil map units making up the LAAs. Based on the single set of samples to be collected under this soil sampling plan, the following characteristics will be presented:

1. Indicative soil map unit extracted water TDS, EC, and salinity constituents;
2. Indicative soil map unit form of nitrogen constituents from the extracted water; and
3. Total organic carbon and nitrogen.

3.2 EVALUATION OF IMPACT OF LAND APPLICATION ON LAA SOILS

Data and site information gathered under this soil sampling plan will contribute to an overall evaluation of the impact (if any) of the land application activities on underlying soils. The evaluation will be based on a comparison of characteristics measured within the LAAs as compared to the range and average of characteristics as indicated by the background soil map unit results.

Since the soil sampling methods do not represent in-situ conditions, evaluation and assessments must be at a relative or comparison basis.

3.3 PROPOSED LAA SOIL SAMPLING AND EVALUATION REPORT

The proposed LAA Soil Sampling and Evaluation Report to be prepared upon completion of this soil sampling plan and review and evaluation of data, is proposed to contain the following elements:

1. Report background and purpose;
2. Summary of field activities and sample information and notes;
3. Summary of laboratory results and characterization of LAA and background soil conditions for those parameters measured and observed;
4. Evaluation of data and assessment of the evidence to indicate an impact to LAA soils with respect to salinity, salinity constituents, and soil organic carbon and nitrogen and denitrification potential.
5. Appendices containing all field forms and data, laboratory reports and QC data, and calculations and references.

Appendix A

**CUSTOM SOIL RESOURCE REPORT FOR
AMADOR AREA, CALIFORNIA, NRCS,
GENERATED MAY 9, 2014**



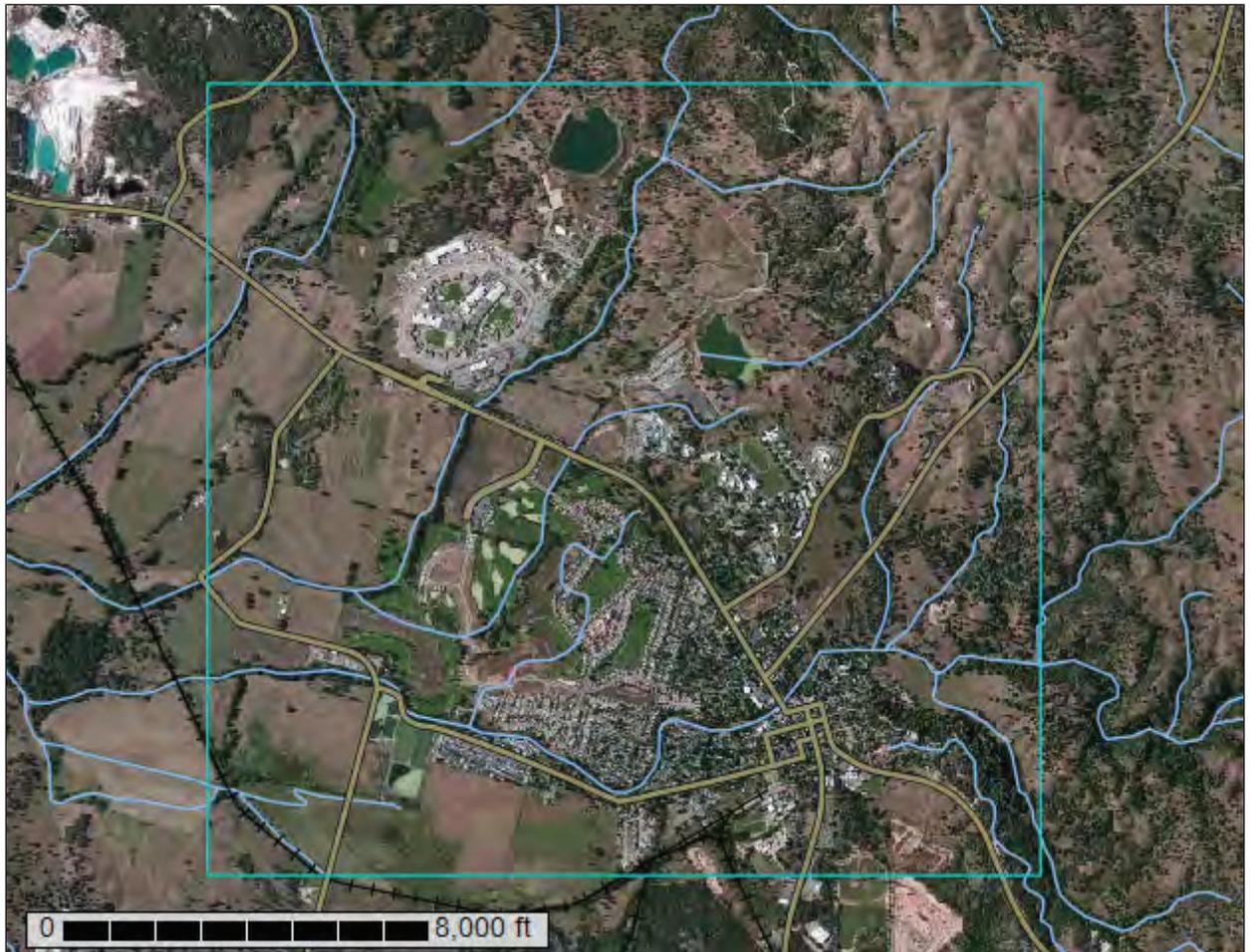
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Amador Area, California**



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

Custom Soil Resource Report

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Amador Area, California
 Survey Area Data: Version 7, Dec 4, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 12, 2010—Apr 29, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
 Special Point Features	 Special Line Features
 Blowout	Water Features
 Borrow Pit	 Streams and Canals
 Clay Spot	Transportation
 Closed Depression	 Rails
 Gravel Pit	 Interstate Highways
 Gravelly Spot	 US Routes
 Landfill	 Major Roads
 Lava Flow	 Local Roads
 Marsh or swamp	Background
 Mine or Quarry	 Aerial Photography
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

Map Unit Legend

Amador Area, California (CA628)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AnD	Argonaut gravelly loam, 3 to 31 percent slopes	7.5	0.2%
AsD	Auburn very rocky silt loam, 3 to 31 percent slopes	212.8	5.0%
EcD	Exchequer very rocky silt loam, 3 to 31 percent slopes	114.4	2.7%
EcE	Exchequer very rocky silt loam, 31 to 51 percent slopes	559.4	13.1%
Hm	Honcut clay loam, over clay	164.6	3.9%
Hn	Honcut silt loam	272.1	6.4%
Ho	Honcut very fine sandy loam	578.6	13.6%
Hs	Honcut very fine sandy loam, moderately well drained	10.2	0.2%
Hv	Honcut very fine sandy loam, channeled	3.2	0.1%
Mn	Mine tailings and Riverwash	306.7	7.2%
Mt	Mokelumne soils and alluvial land	52.1	1.2%
PrA	Perkins loam, 0 to 3 percent slopes	98.6	2.3%
PrC	Perkins loam, 3 to 16 percent slopes	16.3	0.4%
Pw	Placer diggings and Riverwash	182.1	4.3%
RbB	Red Bluff-Mokenlumne complex, 0 to 5 percent slopes	132.5	3.1%
RbD	Red Bluff-Mokelumne complex, 5 to 16 percent slopes	985.0	23.1%
RbE2	Red Bluff-Mokelumne complex, 16 to 36 percent slopes, eroded	292.7	6.9%
RmD	Red Bluff-Mokelumne-Mine pits complex, 2 to 16 percent slopes	126.9	3.0%
Ro	Rock land	5.3	0.1%
Sa	Sedimentary rock land	73.3	1.7%
W	Water	69.4	1.6%
Totals for Area of Interest		4,263.8	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly

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indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Amador Area, California

AnD—Argonaut gravelly loam, 3 to 31 percent slopes

Map Unit Setting

Elevation: 500 to 1,600 feet

Mean annual precipitation: 22 to 30 inches

Mean annual air temperature: 59 to 63 degrees F

Frost-free period: 225 to 300 days

Map Unit Composition

Argonaut and similar soils: 79 percent

Minor components: 21 percent

Description of Argonaut

Setting

Landform: Ridges

Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Interfluvium

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Residuum weathered from andesite and/or residuum weathered from metasedimentary rock

Typical profile

H1 - 0 to 2 inches: slightly acid, very gravelly loam

H2 - 2 to 6 inches: slightly acid, very gravelly loam

H3 - 6 to 10 inches: slightly acid, cobbly clay loam

H4 - 10 to 21 inches: slightly acid, gravelly clay

H5 - 21 to 27 inches: , weathered bedrock

Properties and qualities

Slope: 3 to 30 percent

Depth to restrictive feature: 18 to 30 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: SHALLOW ROCKY LOAM FOOTHILLS (R018XD090CA)

Minor Components

Auburn, silt loam

Percent of map unit: 10 percent

Eldorado, loam

Percent of map unit: 5 percent

Whiterock, loam

Percent of map unit: 5 percent

Unnamed, claypan soils

Percent of map unit: 1 percent

Landform: Fan remnants

AsD—Auburn very rocky silt loam, 3 to 31 percent slopes

Map Unit Setting

Elevation: 500 to 1,200 feet

Mean annual precipitation: 20 to 30 inches

Mean annual air temperature: 55 to 63 degrees F

Frost-free period: 225 to 300 days

Map Unit Composition

Auburn and similar soils: 85 percent

Rock outcrop: 15 percent

Description of Auburn

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Concave

Across-slope shape: Convex

Parent material: Amphibolite schist

Typical profile

H1 - 0 to 9 inches: slightly acid, silt loam

H2 - 9 to 14 inches: slightly acid, silt loam

H3 - 14 to 18 inches: , unweathered bedrock

Properties and qualities

Slope: 3 to 31 percent

Depth to restrictive feature: 10 to 28 inches to lithic bedrock

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 2.3 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4e

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Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: SHALLOW ROCKY LOAM FOOTHILLS (R018XD090CA)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

EcD—Exchequer very rocky silt loam, 3 to 31 percent slopes

Map Unit Setting

Elevation: 500 to 1,800 feet

Mean annual precipitation: 20 to 30 inches

Mean annual air temperature: 57 to 61 degrees F

Frost-free period: 225 to 300 days

Map Unit Composition

Exchequer and similar soils: 65 percent

Rock outcrop: 25 percent

Minor components: 10 percent

Description of Exchequer

Setting

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum and/or residuum weathered from metasedimentary rock

Typical profile

H1 - 0 to 6 inches: slightly acid, silt loam

H2 - 6 to 10 inches: , unweathered bedrock

Properties and qualities

Slope: 3 to 31 percent

Depth to restrictive feature: 4 to 20 inches to lithic bedrock

Natural drainage class: Somewhat excessively drained

*Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high
(0.01 to 0.57 in/hr)*

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 20 percent

Available water storage in profile: Very low (about 0.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

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Hydrologic Soil Group: D

Ecological site: VERY SHALLOW LAND (R018XD096CA)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Minor Components

Unnamed, moderately deep

Percent of map unit: 10 percent

EcE—Exchequer very rocky silt loam, 31 to 51 percent slopes

Map Unit Setting

Elevation: 500 to 1,800 feet

Mean annual precipitation: 20 to 30 inches

Mean annual air temperature: 57 to 61 degrees F

Frost-free period: 225 to 300 days

Map Unit Composition

Exchequer and similar soils: 70 percent

Rock outcrop: 25 percent

Minor components: 5 percent

Description of Exchequer

Setting

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Residuum weathered from metasedimentary rock and/or residuum

Typical profile

H1 - 0 to 6 inches: slightly acid, silt loam

H2 - 6 to 10 inches: , unweathered bedrock

Properties and qualities

Slope: 31 to 51 percent

Depth to restrictive feature: 4 to 20 inches to lithic bedrock

Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high
(0.01 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 20 percent

Available water storage in profile: Very low (about 0.9 inches)

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Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: VERY SHALLOW LAND (R018XD096CA)

Description of Rock Outcrop

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Unnamed, moderately deep

Percent of map unit: 5 percent

Hm—Honcut clay loam, over clay

Map Unit Setting

Elevation: 200 to 1,200 feet
Mean annual precipitation: 18 to 23 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Honcut and similar soils: 99 percent
Minor components: 1 percent

Description of Honcut

Setting

Landform: Valley floors, flood plains, terraces
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: neutral, clay loam
H2 - 10 to 40 inches: neutral, clay loam
H3 - 40 to 60 inches: neutral, clay

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained

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Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 36 to 60 inches

Frequency of flooding: Rare

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C

Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Unnamed

Percent of map unit: 1 percent

Landform: Depressions

Hn—Honcut silt loam

Map Unit Setting

Elevation: 200 to 1,200 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 250 to 300 days

Map Unit Composition

Honcut and similar soils: 99 percent

Minor components: 1 percent

Description of Honcut

Setting

Landform: Valley floors, flood plains, terraces

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Tread, tal, dip

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: slightly acid, silt loam

H2 - 11 to 27 inches: neutral, silt loam

H3 - 27 to 60 inches: neutral, loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

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Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Unnamed

Percent of map unit: 1 percent
Landform: Depressions

Ho—Honcut very fine sandy loam

Map Unit Setting

Elevation: 200 to 1,200 feet
Mean annual precipitation: 18 to 23 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Honcut and similar soils: 96 percent
Minor components: 4 percent

Description of Honcut

Setting

Landform: Terraces, flood plains, valley floors
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: slightly acid, very fine sandy loam
H2 - 11 to 27 inches: neutral, very fine sandy loam
H3 - 27 to 60 inches: neutral, fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

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Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: C
Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Perkins, loam

Percent of map unit: 3 percent

Unnamed

Percent of map unit: 1 percent
Landform: Depressions

Hs—Honcut very fine sandy loam, moderately well drained

Map Unit Setting

Elevation: 200 to 1,200 feet
Mean annual precipitation: 18 to 23 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Honcut and similar soils: 99 percent
Minor components: 1 percent

Description of Honcut

Setting

Landform: Terraces, flood plains, valley floors
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: slightly acid, very fine sandy loam
H2 - 11 to 27 inches: neutral, very fine sandy loam

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H3 - 27 to 60 inches: neutral, fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated

Land capability classification (irrigated): 1

Land capability classification (nonirrigated): 3c

Hydrologic Soil Group: C

Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Unnamed

Percent of map unit: 1 percent

Landform: Depressions

Hv—Honcut very fine sandy loam, channeled

Map Unit Setting

Elevation: 200 to 1,200 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 250 to 300 days

Map Unit Composition

Honcut and similar soils: 90 percent

Minor components: 10 percent

Description of Honcut

Setting

Landform: Valley floors, flood plains, terraces

Landform position (two-dimensional): Toeslope, footslope

Landform position (three-dimensional): Tread, talf, dip

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: slightly acid, very fine sandy loam

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H2 - 11 to 60 inches: neutral, fine sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high
(0.06 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 1

Land capability classification (nonirrigated): 3c

Hydrologic Soil Group: B

Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Unnamed, gullied

Percent of map unit: 10 percent

Landform: Drainageways

Mn—Mine tailings and Riverwash

Map Unit Setting

Elevation: 170 to 3,300 feet

Mean annual precipitation: 18 to 38 inches

Mean annual air temperature: 55 to 61 degrees F

Frost-free period: 175 to 275 days

Map Unit Composition

Mine tailings: 65 percent

Riverwash: 35 percent

Description of Mine Tailings

Properties and qualities

Slope: 0 to 5 percent

Natural drainage class: Excessively drained

Frequency of flooding: Rare

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Description of Riverwash

Setting

Landform: Drainageways
Parent material: Alluvium

Typical profile

H1 - 0 to 6 inches: , gravelly coarse sand
H2 - 6 to 60 inches: , stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities

Slope: 0 to 2 percent
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: D

Mt—Mokelumne soils and alluvial land

Map Unit Setting

Elevation: 200 to 400 feet
Mean annual precipitation: 20 to 22 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 250 to 300 days

Map Unit Composition

Alluvial land: 40 percent
Mokelumne and similar soils: 40 percent
Minor components: 20 percent

Description of Alluvial Land

Setting

Parent material: Alluvium

Typical profile

H1 - 0 to 10 inches: slightly alkaline, sandy loam
H2 - 10 to 30 inches: slightly alkaline, stratified sand to loam
H3 - 30 to 60 inches: slightly alkaline, stratified gravelly sand to gravelly loam

Properties and qualities

Slope: 0 to 2 percent
Natural drainage class: Well drained

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Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Frequency of flooding: Occasional
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Description of Mokelumne

Setting

Landform: Swales on terraces
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave, linear
Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 13 inches: strongly acid, gravelly sandy loam
H2 - 13 to 22 inches: very strongly acid, clay
H3 - 22 to 39 inches: very strongly acid, sandy clay loam
H4 - 39 to 52 inches: slightly alkaline, sandy clay loam
H5 - 52 to 56 inches: , weathered bedrock

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 50 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: UPLAND TERRACES (R018XD092CA)

Minor Components

Riverwash

Percent of map unit: 10 percent
Landform: Drainageways

Red bluff, gravelly loam

Percent of map unit: 5 percent

Pentz, sandy loam

Percent of map unit: 5 percent

PrA—Perkins loam, 0 to 3 percent slopes

Map Unit Setting

Elevation: 200 to 500 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 250 to 300 days

Map Unit Composition

Perkins and similar soils: 94 percent

Minor components: 6 percent

Description of Perkins

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Consolidated gravelly alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 8 inches: slightly acid, gravelly loam

H2 - 8 to 23 inches: slightly acid, gravelly loam

H3 - 23 to 40 inches: slightly acid, gravelly clay loam

H4 - 40 to 60 inches: neutral, stratified very gravelly sandy loam to very cobbly clay loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 1

Land capability classification (nonirrigated): 3c

Hydrologic Soil Group: C

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Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Mokelumne

Percent of map unit: 2 percent

Unnamed, very deep

Percent of map unit: 2 percent

Red bluff

Percent of map unit: 2 percent

PrC—Perkins loam, 3 to 16 percent slopes

Map Unit Setting

Elevation: 200 to 500 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 250 to 300 days

Map Unit Composition

Perkins, loam, and similar soils: 96 percent

Minor components: 4 percent

Description of Perkins, Loam

Setting

Landform: Hillslopes

Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Side slope

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Consolidated gravelly alluvium derived from igneous, metamorphic and sedimentary rock

Typical profile

H1 - 0 to 8 inches: slightly acid, gravelly loam

H2 - 8 to 23 inches: slightly acid, gravelly loam

H3 - 23 to 40 inches: slightly acid, gravelly clay loam

H4 - 40 to 60 inches: neutral, stratified very gravelly sandy loam to very cobbly clay loam

Properties and qualities

Slope: 3 to 16 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

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Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C

Ecological site: ROCKY LOAM FOOTHILLS (R018XD089CA)

Minor Components

Red bluff

Percent of map unit: 2 percent

Landform: Terraces

Mokelumne

Percent of map unit: 2 percent

Landform: Terraces

Pw—Placer diggings and Riverwash

Map Unit Setting

Elevation: 170 to 3,500 feet

Mean annual precipitation: 18 to 40 inches

Mean annual air temperature: 55 to 61 degrees F

Frost-free period: 200 to 300 days

Map Unit Composition

Placer diggings: 50 percent

Riverwash: 50 percent

Description of Placer Diggings

Properties and qualities

Slope: 0 to 15 percent

Natural drainage class: Somewhat excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Frequency of flooding: Occasional

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 4s

Hydrologic Soil Group: A

Ecological site: PLACER DIGGINGS AND RIVERWASH (R018XD097CA)

Description of Riverwash

Setting

Landform: Drainageways

Parent material: Alluvium

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Typical profile

H1 - 0 to 6 inches: , gravelly sand

H2 - 6 to 60 inches: , stratified extremely gravelly coarse sand to gravelly sand

Properties and qualities

Slope: 0 to 5 percent

Natural drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: About 0 inches

Frequency of flooding: Frequent

Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8w

Hydrologic Soil Group: D

RbB—Red Bluff-Mokenlumne complex, 0 to 5 percent slopes

Map Unit Setting

Elevation: 200 to 400 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 275 to 300 days

Map Unit Composition

Red bluff and similar soils: 55 percent

Mokelumne and similar soils: 40 percent

Minor components: 5 percent

Description of Red Bluff

Setting

Landform: Terraces

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

H1 - 0 to 7 inches: slightly acid, gravelly loam

H2 - 7 to 11 inches: strongly acid, loam

H3 - 11 to 40 inches: extremely acid, gravelly clay

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 11 to 50 inches to cemented horizon

Natural drainage class: Well drained

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Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

Description of Mokelumne

Setting

Landform: Swales on terraces

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear, concave

Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam

H2 - 10 to 39 inches: very strongly acid, clay

H3 - 39 to 46 inches: , weathered bedrock

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: 39 to 60 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

Minor Components

Unnamed

Percent of map unit: 3 percent

Landform: Drainageways

Unnamed, unnamed

Percent of map unit: 2 percent

Landform: Depressions

RbD—Red Bluff-Mokelumne complex, 5 to 16 percent slopes

Map Unit Setting

Elevation: 200 to 400 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 275 to 300 days

Map Unit Composition

Red bluff and similar soils: 60 percent

Mokelumne and similar soils: 25 percent

Minor components: 15 percent

Description of Red Bluff

Setting

Landform: Terraces

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

H1 - 0 to 7 inches: slightly acid, gravelly loam

H2 - 7 to 11 inches: strongly acid, loam

H3 - 11 to 40 inches: extremely acid, gravelly clay

Properties and qualities

Slope: 5 to 16 percent

Depth to restrictive feature: 11 to 60 inches to cemented horizon

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

Description of Mokelumne

Setting

Landform: Swales on terraces

Landform position (two-dimensional): Foothlope, toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear, concave

Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam

H2 - 10 to 39 inches: very strongly acid, clay

H3 - 39 to 46 inches: , weathered bedrock

Properties and qualities

Slope: 5 to 16 percent

Depth to restrictive feature: 39 to 60 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

Minor Components

Sedimentary rock land

Percent of map unit: 3 percent

Mokelumne

Percent of map unit: 3 percent

Perkins

Percent of map unit: 3 percent

Alluvial land

Percent of map unit: 3 percent

Pentz

Percent of map unit: 3 percent

RbE2—Red Bluff-Mokelumne complex, 16 to 36 percent slopes, eroded

Map Unit Setting

Elevation: 200 to 400 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 275 to 300 days

Map Unit Composition

Red bluff and similar soils: 55 percent

Mokelumne and similar soils: 45 percent

Description of Red Bluff

Setting

Landform: Terraces

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Riser

Down-slope shape: Concave

Across-slope shape: Convex

Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

H1 - 0 to 5 inches: slightly acid, gravelly loam

H2 - 5 to 11 inches: strongly acid, loam

H3 - 11 to 20 inches: extremely acid, gravelly clay

Properties and qualities

Slope: 16 to 36 percent

Depth to restrictive feature: 11 to 20 inches to cemented horizon

Natural drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum in profile: 25 percent

Available water storage in profile: Very low (about 1.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 6e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

Description of Mokelumne

Setting

Landform: Swales on terraces

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Tread

Down-slope shape: Concave

Across-slope shape: Linear, concave

Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam

H2 - 10 to 39 inches: very strongly acid, clay

H3 - 39 to 46 inches: , weathered bedrock

Properties and qualities

Slope: 16 to 36 percent

Depth to restrictive feature: 39 to 60 inches to paralithic bedrock

Natural drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

RmD—Red Bluff-Mokelumne-Mine pits complex, 2 to 16 percent slopes

Map Unit Setting

Elevation: 200 to 400 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 275 to 300 days

Map Unit Composition

Red bluff and similar soils: 35 percent

Mokelumne and similar soils: 35 percent

Mine pits: 25 percent

Minor components: 5 percent

Description of Red Bluff

Setting

Landform: Terraces
Landform position (two-dimensional): Foothlope
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium derived from metamorphic and sedimentary rock

Typical profile

H1 - 0 to 7 inches: slightly acid, gravelly loam
H2 - 7 to 11 inches: strongly acid, loam
H3 - 11 to 40 inches: extremely acid, gravelly clay

Properties and qualities

Slope: 2 to 16 percent
Depth to restrictive feature: 11 to 50 inches to cemented horizon
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: UPLAND TERRACES (R018XD092CA)

Description of Mokelumne

Setting

Landform: Swales on terraces
Landform position (two-dimensional): Foothlope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear, concave
Parent material: Weathered alluvium derived from sandstone and/or clayey marine alluvium

Typical profile

H1 - 0 to 10 inches: strongly acid, gravelly sandy loam
H2 - 10 to 39 inches: very strongly acid, clay
H3 - 39 to 46 inches: , weathered bedrock

Properties and qualities

Slope: 2 to 16 percent
Depth to restrictive feature: 39 to 60 inches to paralithic bedrock
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

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Frequency of ponding: None

Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: D

Ecological site: UPLAND TERRACES (R018XD092CA)

Description of Mine Pits

Typical profile

H1 - 0 to 60 inches: , variable

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Minor Components

Unnamed

Percent of map unit: 3 percent

Landform: Depressions

Unnamed

Percent of map unit: 2 percent

Landform: Drainageways

Ro—Rock land

Map Unit Setting

Elevation: 170 to 5,000 feet

Mean annual precipitation: 18 to 45 inches

Mean annual air temperature: 55 to 61 degrees F

Frost-free period: 110 to 180 days

Map Unit Composition

Rock land: 100 percent

Description of Rock Land

Typical profile

H1 - 0 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 30 to 70 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Natural drainage class: Excessively drained

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Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Hydrologic Soil Group: D

Sa—Sedimentary rock land

Map Unit Setting

Elevation: 170 to 500 feet

Mean annual precipitation: 18 to 23 inches

Mean annual air temperature: 61 degrees F

Frost-free period: 275 to 300 days

Map Unit Composition

Sedimentary rock land: 100 percent

Description of Sedimentary Rock Land

Setting

Landform: Terraces

Parent material: Sedimentary rock

Typical profile

H1 - 0 to 60 inches: , unweathered bedrock

Properties and qualities

Slope: 9 to 50 percent

Depth to restrictive feature: 0 inches to paralithic bedrock

Natural drainage class: Excessively drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Hydrologic Soil Group: D

W—Water

Map Unit Composition

Water: 100 percent

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Appendix B

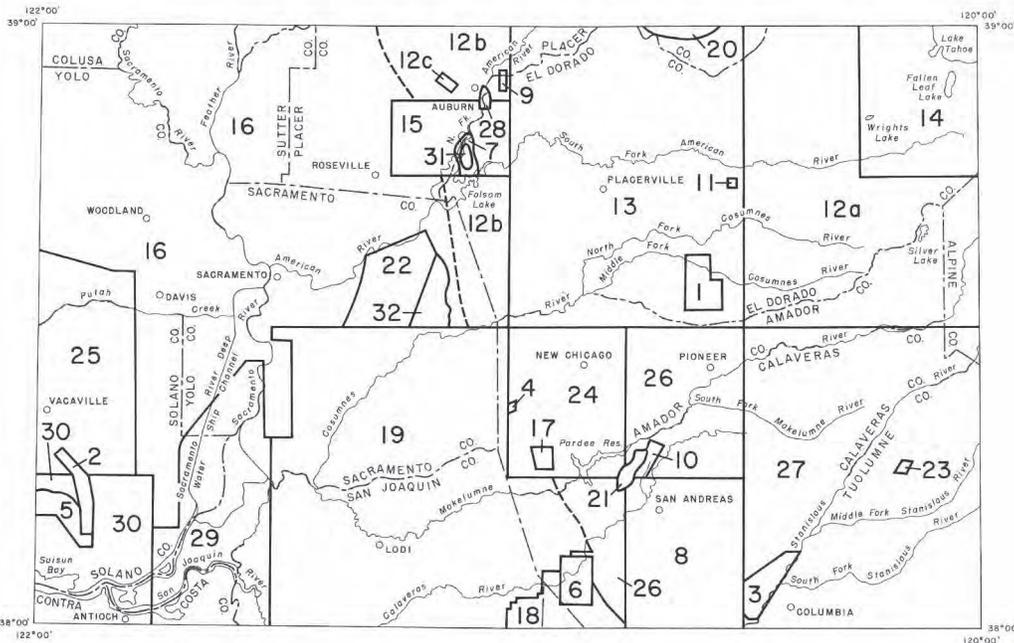
**GEOLOGIC MAP OF CALIFORNIA
SACRAMENTO SHEET, AND EXPLANATORY
DATA, CA. DIVISION OF MINES AND GEOLOGY,
1965**

EXPLANATORY DATA
SACRAMENTO SHEET
GEOLOGIC MAP OF CALIFORNIA

OLAF P. JENKINS EDITION

Compiled by Rudolph G. Strand and James B. Koenig, 1965

INDEX TO GEOLOGIC MAPPING
USED IN THE COMPILATION OF THE SACRAMENTO SHEET



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*Contains modifications which essentially reflect the structural interpretation and stratigraphic correlations in the Sierra Nevada foothill belt by Lorin Clark of the U. S. Geological Survey. See: i) Clark, Lorin D., 1964. Stratigraphy and structure of part of the western Sierra Nevada metamorphic belt, California: U. S. Geol. Survey Prof. Paper 410, 70 p., Pl. 1, scale 1:316,800; and ii) Clark, Lorin D., Report on the geology of the northwestern Sierra Nevada, California: U. S. Geol. Survey, in progress, 1965; map scale 1:250,000.

For a complete list of published geologic maps of this area see Division of Mines and Geology Special Reports 52 and 52-A.

STRATIGRAPHIC NOMENCLATURE

AGE	STATE MAP SYMBOL	STATE MAP UNIT <small>State Map Units listed here are not necessarily in stratigraphic sequence; the sequence used has been standardized for all sheets of the Geologic Map of California</small>	STRATIGRAPHIC UNITS AND CHARACTERISTIC LITHOLOGIES <small>(The formally named formations grouped within an individual State Map Unit are listed in stratigraphic sequence from youngest to oldest.)</small>	
QUATERNARY	Recent	Qs	RECENT DUNE SAND	Deposits of wind-blown sand east of Antioch.
		Qal	RECENT ALLUVIUM	Poorly sorted stream deposits of clay to boulder size, some colluvium and glacial outwash gravels.
		Qsc	RECENT RIVER AND MAJOR STREAM CHANNEL DEPOSITS IN THE GREAT VALLEY	Sediments along river channels and major streams including adjacent natural levees.
		Qf	RECENT ALLUVIAL FAN DEPOSITS IN THE GREAT VALLEY	Sediments deposited from streams emerging from high lands surrounding the Great Valley—Recent and Pleistocene alluvial fan deposits composed of heterogeneous sediments ranging in size from clay to gravel. Includes Victor Formation— <i>lenticular stream deposits of sand, silt, gravel, and clay.</i>
	Pleistocene	Qb	RECENT BASIN DEPOSITS IN THE GREAT VALLEY	Sediments deposited during flood stages of major streams in the areas between natural stream levees and fans.
		Ql	QUATERNARY LAKE DEPOSITS	Sand and fine gravel in terraces in the vicinity of Lake Tahoe.
		Qg	QUATERNARY GLACIAL DEPOSITS	Terminal, lateral, and ground moraines in the Pyramid Peak 30' quadrangle (mapping limited to thick deposits only); moraines in the Placerville 30' quadrangle (thin deposits).
		Qc	PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS	¹ Montezuma Formation— <i>obscurely stratified, slightly consolidated, clayey sand, cross-bedded pebbly sand, clay, and gravel, locally contains calcareous lenses (hardpan).</i> ² Red Bluff Formation and related terrace deposits— <i>poorly sorted gravel in reddish silty or sandy matrix.</i>
		Qpv ^b	PLEISTOCENE VOLCANIC ROCKS: BASALTIC	Black, fine-grained, partly scoriaceous basalt flows (in Robbs Peak quadrangle; may be Pliocene).
		QP	PLIOCENE-PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS	Arroyo Seco Gravel— <i>brick-red soil that encloses gravel composed of well-rounded clasts of quartz and quartzite</i> ; Laguna Formation— <i>compacted, noncaliche sediments of silt, clay, sand, and gravel size.</i> "Gravel deposits of uncertain age" of Piper and Gale including surficial deposits of well-rounded cobbles and boulders set in a matrix of deep red to reddish-brown soil (some may be Early Tertiary and others Quaternary). Old alluvium in the vicinity of Folsom Dam.
		Puc	UPPER PLIOCENE NONMARINE SEDIMENTARY ROCKS	Tehama Formation— <i>silty sand, fine- to medium-grained sand, interbedded conglomerate and sandstone, and silty to sandy clay that is massive.</i> (Early Pleistocene in part; locally contains undifferentiated Red Bluff (?) Formation and post-Rod Bluff stream terrace deposits). Pumice-pebble tuff of probable mud-flow origin interbedded with coarse to medium, greenish, chert pebble conglomerate, and tuff (south side of Potrero Hills; resembles the Orinda Formation). Chert, limestone conglomerate, and limestone breccia (north side of Potrero Hills).
		Pmlc	MIDDLE AND/OR LOWER PLIOCENE NONMARINE SEDIMENTARY ROCKS	Mehrten Formation— <i>coarse alluvial and mudflow deposits, chiefly of hornblende andesite fragments, includes gravel, sandstone, and tuffaceous beds</i> (generally considered upper Miocene in part; contains some locally derived rhyodacite clasts near Golden Gate Hill). Unnamed rhyolite tuff, rhyolitic and diatomaceous sand and silt (in the Indian Diggings area, Orma Ranch quadrangle; contains duttons considered to be "Pliocene, probably lower" according to G. D. Hanna, written communication from Q. Anne 3/28/64). North of 38° 30' N. Lat. along the eastern edge of the Great Valley, the Pmlc unit contains some Valley Springs Fm. which was not differentiated from the more abundant Mehrten Fm. Sandy clay shales containing cross-bedded, pebbly sandstone and conglomerate, and thin layers of tuff (southwest of Pittsburg; unit has been called Orinda Fm., "Low Modano Fm.", and "Wolfskill Fm.").
		Pv ^a	PLIOCENE VOLCANIC ROCKS: ANDESITIC	Light- to dark-gray, porphyritic latite (one flow has been called "Table Mountain Latite"; informally considered to be a part of the Mehrten Formation).
		Pv ^b	BASALTIC	Black basalt in northern Blue Mtn. quadrangle.
Pv ^c	PYROCLASTIC	³ Lawlor Tuff— <i>laghills tuff consisting of angular broken fragments of pumice set in a matrix of pumicite.</i> ⁴ Volcanic rocks of the Sierra Nevada commonly referred to the Mehrten Formation— <i>thick andesitic mudflows, breccia, tuff, gravel, and some massive andesitic lava in the Silver Lake quadrangle</i> (possibly includes strata not correlative with Mehrten Fm. in the Foothills area). Rhyolite tuff near Columbus believed to be younger than the Mehrten Fm., Q. Anne, written communication 6/10/64. Light-brown to pale-red, pumiceous, dacitic tuff beds of probable fluvialite origin, near base of the Tehama Fm. on west side of Great Valley.		
TERTIARY	Miocene	Mc	UNDIVIDED MIOCENE NONMARINE SEDIMENTARY ROCKS	Valley Springs Formation— <i>pumice-bearing sandstone, siltstone, and conglomerate, white and pink rhyolitic vitreous tuff beds, some of which contain conglomerate composed of clasts of pre-Cretaceous metamorphic rock and clasts of Tertiary rhyolite</i> (possibly Oligocene in part).
		Mu	UPPER MIOCENE MARINE SEDIMENTARY ROCKS	San Pablo Group: Neraby Formation— <i>bluish-gray, medium- to coarse-grained sandstone containing interbedded light-gray tuff, shale, and conglomerate</i> (unfossiliferous, possibly nonmarine; may be lower Pliocene). Clerbo Sandstone— <i>alternating layers of fine- and coarse-grained brownish-gray sandstone, and light-colored, concretionary, medium-grained sandstone</i> (may be lower Pliocene in part).
		Mvp	MIOCENE VOLCANIC ROCKS: PYROCLASTIC	Volcanic rocks of the Sierra Nevada commonly referred to the Valley Springs Formation— <i>white to buff-colored, massively bedded rhyolite tuff, some thin lenses of pebble conglomerate, sandstone, and rhyolite</i> (may not be entirely correlative with Valley Springs Fm. of the Foothills area).
	Eocene	Ec	EOCENE NONMARINE SEDIMENTARY ROCKS	Ione Formation— <i>massive, white quartzose sandstone, lenses of white or light-colored anaestitic clay and white sandstone, gray or bluish shale and clay, lignite, and other carbonaceous beds.</i> (In minor part marine. Includes some Valley Springs Fm. in the Buffalo Creek quadrangle).
		E	EOCENE MARINE SEDIMENTARY ROCKS	Markley Formation— <i>massively bedded, poorly sorted, richly micaceous, arkosic sandstone, and minor beds of clay shale and siltstone</i> (upper Eocene); Domingine Formation— <i>sandy siltstone, silty shale, argillaceous sandstone, medium- to fine-grained sandstone, and massive, medium- to coarse-grained sandstone and grit</i> (middle Eocene).
	Undivided	Ep	PALEOCENE MARINE SEDIMENTARY ROCKS	Martinez Formation— <i>silty to sandy, massive-bedded to slightly laminated clay shale, medium- to fine-grained calcareous sandstone, and ferruginous concretionary sandstone.</i> Undifferentiated Paleocene sedimentary rocks. Chocolate-colored shale in eastern part of Potrero Hills, considered to be Eocene by Thomas Bailey, written communication, 1965.
		Tc	TERTIARY NONMARINE SEDIMENTARY ROCKS	Volcanic sedimentary rocks near Vacaville— <i>massive pale-pink to white silty claystone, mudstone, or siltstone, lenses of cross-bedded coarse- to very coarse-grained, blue, friable sandstone, and lenses of andesitic pebbly and cobble conglomerate.</i> (May be marine in part, and part of the San Pablo Group). Auriferous (and nonauriferous) gravel deposits of uncertain age in the Sierra Nevada.
Ti [?]		TERTIARY INTRUSIVE (HYPABYSSAL) ROCKS: UNDIFFERENTIATED	Mafic intrusive rock of uncertain age (Orma Ranch quadrangle).	
Ti ^r		RHYOLITIC	Gray and brown porphyritic hornblende-biotite dacite, and gray, aphanitic, hornblende rhyodacite volcanic domes near Jackson (some intrusions were contemporaneous with the deposition of the Mehrten Fm.).	
Ti ^a	ANDESITIC	Volcanic neck of massive hornblende andesite (a presumed source vent of the surrounding Pliocene volcanic ejecta; located in northeastern part of Silver Lake quadrangle).		
Tv ^b	TERTIARY VOLCANIC ROCKS: BASALTIC	Punnam Peak Basalt— <i>iron-black, dense, augite basalt, locally containing pillow structure</i> (near Vacaville; probably Miocene, however, tentative ages range from Eocene to Pliocene).		

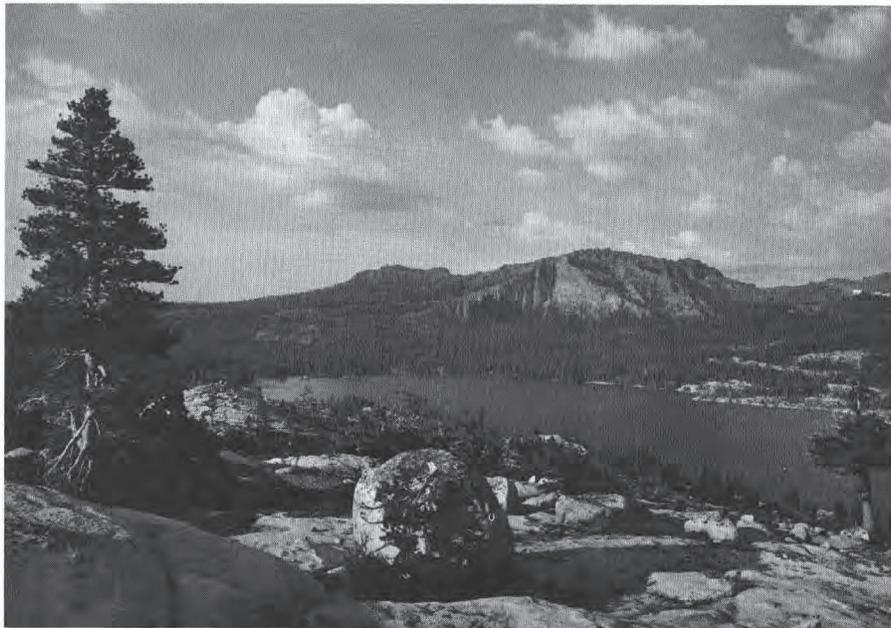
STRATIGRAPHIC NOMENCLATURE—Continued

AGE	STATE MAP SYMBOL	STATE MAP UNIT <small>State Map Units listed here are not necessarily in stratigraphic sequence; the sequence used has been standardized for all sheets of the Geologic Map of California</small>	STRATIGRAPHIC UNITS AND CHARACTERISTIC LITHOLOGIES <small>(The formally named formations grouped within an individual State Map Unit are listed in stratigraphic sequence from youngest to oldest.)</small>
CRETACEOUS MESOZOIC JURASSIC PALEOZOIC	Ku	UPPER CRETACEOUS MARINE SEDIMENTARY ROCKS	Chico Formation— <i>fine-grained sandstone, shale, siltstone, and conglomerate</i> (east side of Great Valley). Gray, silty clay shale, greenish-gray calcareous and ferruginous sandstone (near Vacaville).
	gr	MESOZOIC GRANITIC ROCKS: UNDIFFERENTIATED	Amphibole syenite in the northwest corner of the Blue Mountain quadrangle. Granodiorite, quartz monzonite, quartz diorite, granite, some hornblende gabbro and some fine-grained gneiss (not differentiated into separate cartographic units).
	gr ^a	GRANITE AND ADAMELLITE (QUARTZ MONZONITE)	Granite, quartz monzonite, mafic quartz monzonite, and alaskite.
	gr ^g	GRANODIORITE	Hornblende-biotite granodiorite; some "quartz porphyrite" in the Placerville 30' quadrangle.
	gr ^t	TONALITE (QUARTZ DIORITE) AND DIORITE	Mottled, gray, medium- to coarse-grained tonalite; dark-green, medium- to coarse-grained diorite; trondhjemite; and dioritic rocks in the San Andreas quadrangle.
	bi	MESOZOIC BASIC INTRUSIVE ROCKS	Medium- to coarse-grained hornblende gabbro, pyroxenite, noritic anorthositic and related rocks, some diorite, some mafic porphyritic hypabyssal intrusive rocks and megagabbro (may be Late Paleozoic in part).
	ub	MESOZOIC ULTRABASIC INTRUSIVE ROCKS	Serpentine (some silicified), peridotite, dunite, olivine pyroxenite, some ankerite and talc schist, ilmenite, and amphibolite derived from pyroxenite.
	Ju	UPPER JURASSIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS	¹ Mariposa Formation— <i>dark gray to black clay slate, tuff, graywacke, and conglomerate</i> . ² Salt Spring Slate— <i>dark-gray slate derived from siltstone, tuff, graywacke, and conglomerate</i> . ³ Consumes Formation of the Amador Group— <i>dark-gray clay slate, sheared graywacke, thin-bedded tuff, some basic lava, red and green chert, and a basal conglomerate</i> (may be Middle Jurassic in part).
	Jml	MIDDLE AND/OR LOWER JURASSIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS	Blue-black metamorphosed mudstone, wacke, siltstone, sandstone and siltsstone, pebble, cobble, and boulder conglomerate, quartzite, minor schist and highly altered tuff (perhaps correlative with the Sailor Canyon Fm. entirely or in part; older than adjacent "Juv" rocks in the Fallen Leaf Lake quadrangle).
	Jrv	JURASSIC AND/OR TRIASSIC METAVOLCANIC ROCKS	¹ Copper Hill Volcanics— <i>mafic, intermediate, and sparse felsic volcanic rocks, tuff, volcanic breccia, and amygdaloidal mafic lava</i> . ² Brewer Creek Volcanic Member of the Mariposa Fm.— <i>dark-green mafic volcanic breccia, some tuff, and rare pillow lava</i> . ³ Gopher Ridge Volcanics— <i>bedded mafic or intermediate tuff and volcanic breccia</i> . ⁴ Logcove Ridge Formation— <i>coarse mafic volcanic breccia, in part porphyritic, subordinate tuff, lapilli tuff, and minor pillow lava</i> . Volcanic rocks of uncertain stratigraphic position, chiefly mafic volcanic breccia and tuff. Amphibolite schist, quartz porphyry "feeders" for dacite volcanics; Upper Jurassic basic tills and dikes (Mother Lode belt). Early or Middle Jurassic recrystallized tuff-breccia, tuffaceous sandstone and tuff of andesitic and basaltic composition, andesite and basalt flows in the Fallen Leaf Lake quadrangle.
	m	PRE-CRETACEOUS METAMORPHIC ROCKS, UNDIFFERENTIATED	Paleozoic and Mesozoic mafic pyroclastic rocks, slate, phyllite, and metaconglomerate.
	ls	ls = LIMESTONE AND/OR DOLOMITE	Bluish-gray, dense, recrystallized limestone.
	ms	PRE-CRETACEOUS METASEDIMENTARY ROCKS	Dark-gray slate, some graywacke, conglomerate, and tuff. Phyllite and metavolcanic rocks in Columbia and San Andreas quadrangles.
	mv	PRE-CRETACEOUS METAVOLCANIC ROCKS	Green schist derived from basaltic and andesitic breccia and tuff (possibly in part equivalent to the metavolcanic rocks of the Calaveras Fm.). Porphyritic flow, flow breccia, and some amphibolite.
	gr-m	PRE-CENOZOIC GRANITIC AND METAMORPHIC ROCKS	Granitic dikes and metamorphic rocks undifferentiated (in the Omo Ranch quadrangle). Contiguous areas bordering the Pyramid Peak and Big Trees 30' quadrangles mapped as Calaveras Fm. and as granitic rocks respectively.
ip	PALEOZOIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS	Calaveras Formation— <i>late, phyllite, sheared sandstone, quartz-mica schist, gneiss, graphitic schist, crushed and elongated pebble conglomerate, quartzite, and rhythmically bedded slightly recrystallized to completely recrystallized radiolarian chert</i> . ("Calaveras" is applied as a general name for Sierra Nevada Paleozoic rocks.) Some areas shown as IP may be Mesozoic.	
ls	ls = LIMESTONE AND/OR DOLOMITE	White, blue-gray, and black recrystallized limestone, marble, dolomite, dolomitic limestone, and silicified marble.	
ipv	PALEOZOIC METAVOLCANIC ROCKS	Metavolcanic rocks of the Calaveras Formation— <i>mafic pyroclastic rocks, in part porphyritic, minor pillow lava, green schist, amphibolite schist, massive amphibolite, and minor black slate</i> .	

NOTES

¹ Not necessarily in stratigraphic sequence.

² Some structures indicated as faults in the foothills of the western Sierra Nevada are perhaps "zones of penetrative slip folding," A. Baird, Pomona College, Claremont, Calif., written communication March 11, 1961.



View northeastward across Silver Lake, Anador County. The mountains across the lake are composed of andesitic tuffs and breccias with subordinate lava flows. These Pliocene volcanic rocks rest upon Mesozoic granodiorite visible in the cleared areas on the far side of lake and also in the foreground. Photo by Robert C. Frampton, 1962.

Appendix C

FIELD DATA SHEET

Component Name:										Map Unit Symbol:					Date:
Observ. Method	Horizon	Depth (in)	Depth (cm)	Bnd	Matrix Color		Texture	Rock Frags		Structure		Consistence		Notes	
					Dry	Moist		Knd %	Rnd	Grade	Sz	Type	Dry		Mst
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															

Redoximorphic Features	Concentrations			Ped / V. Surface Features			Roots	Pores	pH, method	Effer (agent)	Clay %	Sand %	Notes													
	% Sz	Ch	Hd	Sp	Kd	Loc								Bd	Col	%	Dst	Cont	Kd	Loc	Col	Qty	Sz	Loc	Qty	Sz
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										

SAMPLE CHAIN OF CUSTODY FORM

LAND APPLICATION AREA SOIL EVALUATION REPORT

CALIFORNIA DEPARTMENT OF CORRECTIONS AND REHABILITATION

MULE CREEK STATE PRISON

IONE, CALIFORNIA

PREPARED FOR:

CALIFORNIA DEPARTMENT OF
CORRECTIONS AND REHABILITATION:
MULE CREEK STATE PRISON

AMADOR COUNTY

PREPARED BY:

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November 26, 2019



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2291-0010
99-402

November 26, 2019

Via e-mail

Mr. Christofer Hudgens
Correctional Plant Manager II (A)
Mule Creek State Prison
California Department of Corrections and Rehabilitation
P.O. Box 409099
Ione, CA 95640

Re: LAA Soil Evaluation Report per June 13, 2019 CVRWQCB Review of LAA Soil Sampling Plan

Dear Mr. Hudgens,

Please find enclosed the above-referenced Land Application Area (LAA) Soil Evaluation Report, which has been requested by the Central Valley Regional Water Quality Control Board (CVRWQCB). This LAA Soil Evaluation Report is intended to meet the requirements of Required Action Item 2 of the June 13, 2019 Review of Land Application Soil Sampling Plan issued by the CVRWQCB.

If this document and its attachments are acceptable to CDCR, they should be submitted electronically to the Central Valley Regional Water Quality Control Board for review and approval. If you have any questions, please contact me at ncolwell@ksninc.com or (916) 403-5900.

Sincerely,
KJELDEN, SINNOCK & NEUDECK, INC.

Neal T. Colwell, RCE 59437

w/enclosures

cc: Gregor Larabee, CDCR Environmental & Regulatory Compliance, via e-mail
Eric Papathakis, CDCR Office of Legal Affairs, via e-mail
Robert Sleppy, CDCR FPCM, via e-mail

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- Appendix A - Field Data Sheets
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- Appendix C - Laboratory Results

ENGINEER'S SEALS AND SIGNATURES

	<p>I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my knowledge and on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</p> <p>Neal T. Colwell 11/26/2019</p> <p>My license renewal date is 12/31/2019</p>
---	---

CONTRIBUTORS TO SOIL EVALUATION REPORT

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<u>James H. Witty</u>	<u>Stantec</u>	<u>Certified Professional Soil Scientist</u>
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Section 1

Background and Purpose

1.1 LAA SOIL SAMPLING PLAN APPROVAL

California Department of Corrections and Rehabilitation (CDCR) submitted a Land Application Area (LAA) Soil Sampling Plan to the Central Valley Regional Water Quality Control Board (CVRWQCB) on October 15, 2018 in response to a Notice of Violation dated August 13, 2018. CVRWQCB staff reviewed the LAA Soil Sampling Plan and approved the plan on June 13, 2019 under the following conditions of approval:

1. All Title 22 metals should be analyzed for in each soil sample.
2. The historical records for the disposal of WWTP sludge onsite must be compiled, evaluated, and submitted along with the final report for the soil sampling project. The location, volume, and analytical data for the sludge disposed of onsite should be incorporated into the analysis of the soil data.
3. An electronic version of all analytical data and the summary table, in .xls format, must be submitted with the final report.
4. The findings of the Soil Sampling and Evaluation Report should be compared to groundwater data and previous evaluations of that data to develop conclusions and recommendations regarding the land application of treated effluent on the site.

As an outcome of the CVRWQCB's review of the LAA Soil Sampling Plan, the following actions were required of CDCR:

1. Prior to initiating field work, please submit a statement of concurrence with these conditions via formal letter.
2. No later than 1 December 2019, the Discharger must submit the Soil Sampling and Evaluation Report.

In response to the CVRWQCB's review of the LAA Soil Sampling Plan, CDCR prepared a Letter of Concurrence to address Required Action 1 of the Board's review. In the CDCR Letter of Concurrence, the CVRWQCB's conditions of approval were agreed to be incorporated into the LAA Soil Sampling Plan as follows:

1. Title 22 metals, specifically metals referred to as the CAM-17 metals, listed below, were proposed for analysis.
 - As – Arsenic
 - Hg – Mercury
 - Sb – Antimony
 - Ba – Barium
 - Be – Beryllium
 - Cd – Cadmium
 - Cr – Chromium
 - Co – Cobalt
 - Cu – Copper
 - Pb – Lead
 - Mo – Molybdenum
 - Ni – Nickel
 - Se – Selenium
 - Ag – Gold
 - Tl – Thallium
 - V – Vanadium
 - Zn – Zinc
2. Available historical records will be reviewed regarding disposal of WWTP sludge on the site, and included in the evaluation and final report. Documentation and records, to the extent they exist, will be provided in the final report;
3. All analytical data and summary tables will be provided in electronic spreadsheet (Excel) format; and
4. Findings of the Soil Sampling and Evaluation Report will be compared to groundwater data and evaluations as requested.

This Soil Evaluation Report is intended to meet the requirements of the approved Soil Sampling Plan, and to address the above comments provided by the CVRWQCB's review.

1.2 MCSP HISTORICAL SOLIDS DISPOSAL TO LAAS

In the CVRWQCB's response to the LAA Soil Sampling Plan, Board Staff indicated that previous WDRs allowed for the onsite disposal of WWTP sludge within the LAAs. Board Staff also referenced historical monitoring reports from MCSP WWTP wherein sludge was shown to be land applied to several of the LAAs. Following the CVRWQCB's response, a review of all MCSP files made available by the CVRWQCB took place on November 7, 2019. Among the files reviewed, the following documents indicated the nature and volume of the WWTP biosolids applied to the LAAs:

- MCSP Sludge Disposal Plan, August 1, 1990. Prepared by Tom Garamendi, Environmental Health Scientist 4228.
- MCSP Notice of Intent (NOI) for the Discharge of Biosolids to Land, July 2, 2001. Submitted by Bob Karr of MCSP Operations Staff, which included an October 1, 2000 Solids Management Plan attachment.

The August 1, 1990 Sludge Disposal Plan was prepared under the guidance of the EPA Process Design Manual for "Land Application of Municipal Sludge". Land application of biosolids had been proposed for select portions of the LAAs that had adequate slopes and soil drainage, but was not proposed to include all of the LAA acreage. As described in the Sludge Disposal Plan, approximately 3 tons of biosolids per acre per year was proposed to be

spread over a 30-acre application area. The biosolids would be spread by means of manure spreader and then incorporated into the soil to a depth of six inches by means of a tractor - drawn disc.

The October 2000 Solids Management Plan describes application of 10.6 dry tons per hectare (approximately 4.4 tons per acre) of biosolids. Figure 1-1 is from the Solids Management Plan and shows the areas of biosolids disposal. From this figure it can be seen that as of October 2000 some application of biosolids occurred in every LAA, with limited coverage in LAAs 1, 3, and 4.



Figure 1-1. Historical Biosolids Disposal Areas

After review of the August 1, 1990 Sludge Disposal Plan, the CVRWQCB responded by requiring the MCSP Staff to develop and submit a further engineered design based on documented site data that would involve treatment of the biosolids to remove elevated levels of acetone, toluene and methylene chloride. Following submittal of the engineering documentation, the CVRWQCB approved the Sludge Disposal Plan on October 7, 1991.

Between October 7, 1991 and 2000, it is assumed that the application of biosolids adhered to the operations as proposed in the Sludge Disposal Plan, however available records do not include information regarding monitoring of such operations. In 2000 the CVRWQCB suspended MCSP approval for land application of biosolids and required the MCSP to dispose of the solid waste to the Amador Landfill instead. As a result, the MCSP submitted the July 2, 2001 Notice of Intent for the Discharge of Biosolids to Land (NOI), which proposed to land apply the WWTP biosolids to 130 acres of the MCSP LAAs under coverage of the Statewide General Order for Biosolids.

After review of the submitted Notice of Intent, it was rejected by CVRWQCB Staff due to lack of information and because the field soils contained pH values less than 5 std. units. Soils having pH values of less than 5.0 were classified as having "severe" limitations for land application and were excluded from eligibility under the General Order. Instead, the CVRWQCB requested that the MCSP Staff revise the Notice of Intent to include the following:

- Provide a report by a certified agronomist showing that the species identified in the Environmental Impact Report, Plant and Wildlife Survey, are not sensitive to metals or nutrient imbalances, and that bioaccumulation will not occur;
- Describe the types of vector control used to ensure the biosolids comply with Federal pathogen requirements for Class B biosolids;
- Provide a nitrogen balance showing the total nitrogen loading from each source of nitrogen applied to the disposal fields;
- Provide a Biosolids Storage Plan for the biosolids which will be stored on site during the wet season;
- Provide an Erosion Control Plan that specifies the application and management practices to be used to assure containment of the biosolids on the application site and to control soil erosion;
- Provide a map of samples collected and a description of the sample collection method and QA/QC procedures used to collect the soil samples whose results were submitted with the NOI; and
- Provide a chemical characterization of the soluble metals in the biosolids using the Title 22 WET test utilizing the citric acid extract procedure.

Due to the complexity of the information required of the MCSP Staff, the NOI was withdrawn on December 6, 2001. Since the withdrawal of the NOI, no records of disposal of WWTP biosolids via land application were found.

Although no monitoring and reporting data was available for the period of 1991 to 2000 when biosolids were being land applied, biosolids data from the sludge drying beds was available from three dates, 3/14/1990, 7/12/1990, and 3/29/2001. Table 1-1 provides a summary of these results for constituents monitored under this Soil Evaluation Report.

Table 1-1. Summary of Select Biosolids Data

Bed	Analyte	Sample Date	Units	Result (Dry Weight)	Method Detection Limit
Sludge Bed 3	Arsenic	3/14/1990	mg/kg	3.6	
Sludge Bed 3	Antimony	3/14/1990	mg/kg	<9.7	
Sludge Bed 3	Beryllium	3/14/1990	mg/kg	<0.03	
Sludge Bed 3	Cadmium	3/14/1990	mg/kg	2.96	
Sludge Bed 3	Copper	3/14/1990	mg/kg	241.33	
Sludge Bed 3	Chromium	3/14/1990	mg/kg	20.36	
Sludge Bed 3	Lead	3/14/1990	mg/kg	12.71	
Sludge Bed 3	Mercury	3/14/1990	mg/kg	0.69	
Sludge Bed 3	Nickel	3/14/1990	mg/kg	3.24	
Sludge Bed 3	Silver	3/14/1990	mg/kg	7.11	
Sludge Bed 3	Selenium	3/14/1990	mg/kg	5.91	
Sludge Bed 3	Thallium	3/14/1990	mg/kg	<4.8	
Sludge Bed 3	Zinc	3/14/1990	mg/kg	1204.22	
Sludge Bed 2	Nitrite Nitrogen	7/12/1990	mg/L	1.25	0.02
Sludge Bed 2	Nitrate Nitrogen	7/12/1990	mg/L	0.5	0.05
Sludge Bed 2	Phosphate, Total	7/12/1990	mg/L	2100	0.05
Sludge Bed 2	Ammonia Nitrogen	7/12/1990	mg/kg	15035	0.1
Sludge Bed 2	Total Kjeldahl Nitrogen	7/12/1990	mg/kg	43,673	0.1
Sludge Bed 5	Arsenic	3/29/2001	mg/kg	<0.5	0.5
Sludge Bed 5	Cadmium	3/29/2001	mg/kg	<0.5	0.5
Sludge Bed 5	Chromium	3/29/2001	mg/kg	15.45	1
Sludge Bed 5	Copper	3/29/2001	mg/kg	236.36	1
Sludge Bed 5	Mercury	3/29/2001	mg/kg	1.00	0.1
Sludge Bed 5	Molybdenum	3/29/2001	mg/kg	<1	1
Sludge Bed 5	Nickel	3/29/2001	mg/kg	13.64	1
Sludge Bed 5	Lead	3/29/2001	mg/kg	<2.5	2.5
Sludge Bed 5	Selenium	3/29/2001	mg/kg	2.73	0.25
Sludge Bed 5	Zinc	3/29/2001	mg/kg	618.18	1
Sludge Bed 5	Total Kjeldahl Nitrogen	3/29/2001	mg/kg	12,000	200

1.3 EXISTING LAAS AND UNDERLYING SOILS AND GEOLOGY

The MCSP LAAs consist of six functional units, grouped according to a combination of factors including:

1. Location;
2. Irrigation land application system; and
3. Area performance based on effectiveness of the LAA.

The designation and estimated effective area of the currently active LAAs is summarized in Table 1-2. The area of these LAAs was estimated based on evaluation of historical LAA maps, modifications to the LAAs as a result of improvements to the site (e.g., construction of the Mule Creek Infill Complex [MCIC]), and through examination of existing aerial imagery indicating the area effectively having treated effluent applied. The locations of these LAAs is presented schematically in Figure 1-2. Prior to construction of the MCIC, LAA 5 was actively used and was located between LAA 4 and LAA 6.

Table 1-2. LAA Designations and Approximate Area

LAA Number	Effective Area (acres)
1	28
2	28
3	31
4	39
6	31
7	43
Total	200

1.3.1 EXISTING SOILS INFORMATION

Soil survey information available from the Natural Resource Conservation Service (NRCS) of the United States Department of Agriculture indicates that the MCSP LAAs are predominantly within three soil series (the Auburn, Honcut, and Red Bluff-Mokelumne series) with identified historical mine tailings, consisting of nine (9) soil mapping units. These soil map units and their abbreviations are presented in Table 1-3.

Table 1-3. Soil Map Unit Abbreviations

Soil Map Unit Abbreviation	Soil Map Unit Name
AsD	Auburn Very Rocky Silt Loam
Hn	Honcut Silt Loam
Ho	Honcut Very Fine Sandy Loam
Mn	Mine Tailings and River Wash
Pw	Placer Diggings and Riverwash
RbB	Red Bluff-Mokelumne complex, 0 to 5 percent slopes
RbD	Red Bluff-Mokelumne, 5 to 16 percent slopes
RbE2	Red Bluff-Mokelumne, 16 to 36 percent slopes, eroded
RmD	Red Bluff-Mokelumne-Mine Pits, 2 to 16 percent slopes

The predominant mapped soil units within the LAAs are shown in Figure 1-2. Minor portions of LAA2 (approximately 3%) appear to be mapped within the Red Bluff-Mokelumne complex, 0 to 5 percent slopes (RbB) and less than 10% each of LAA 6 and 7 appear to be mapped with Pw (Placer Diggings and Riverwash), which have been considered insignificant for this study, however are expected to be similar to the other soil mapping units within the same soil series characterized at the site. The estimated percentages of each soil type present in the LAAs, as presented in the October 2018 Soil Sampling Plan, is shown in Table 1-4. For more information on the soil map units including description, slopes, setting, profiles, and qualities refer to the LAA Soil Sampling Plan dated October 2018.

Table 1-4. Soil Types Underlying LAAs

LAA Number	Soil Types and Percentage								
	AsD	Hn	Ho	Mn	Pw	RbB	RbD	RbE2	RmD
1								100%	
2	30%					3%		30%	37%
3	~100%								
4	64%			31%			5%		
6					6%		62%		32%
7		33%	26%		7%		3%		31%

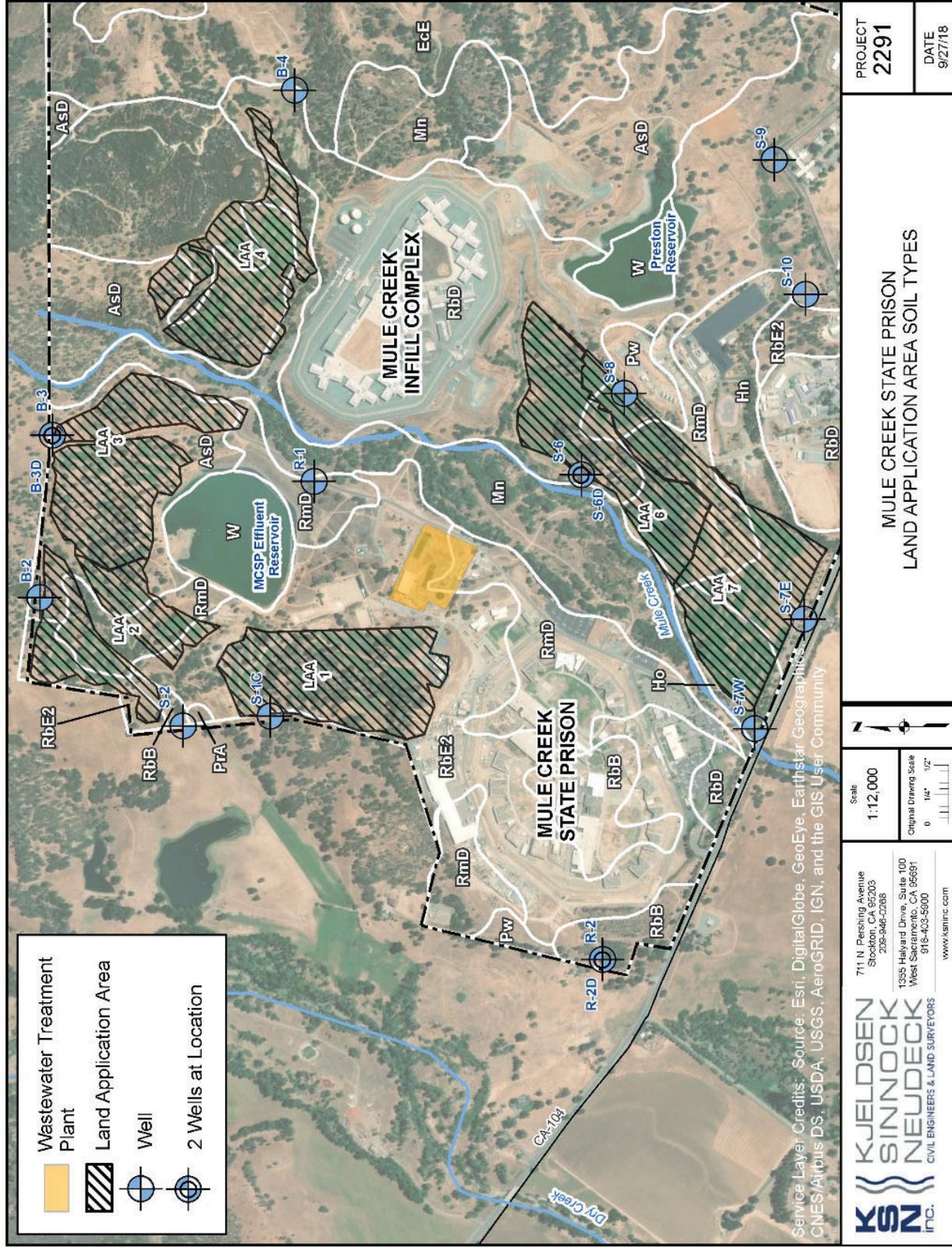


Figure 1-2. Soil Types Underlying MCSP LAAs

1.3.2 UNDERLYING GEOLOGY

Available information on underlying geology for the MCSP site was presented in the October 2018 Soil Sampling Plan. This information indicates that the site is underlain primarily by three bedrock types:

Eocene Nonmarine Sedimentary Rocks (Map Symbol Ec): The lone formation of Eocene Nonmarine Sedimentary rock is described as massive, white quartzose sandstone, with lenses of white or light-colored anaerobic clay and white sandstone, gray or bluish gray shale and clay, lignite, and other carbonaceous beds.

Jurassic and/or Triassic Metavolcanic (Map Symbol JTRv): The Mother Lode Belt is described as containing mafic volcanic breccia and tuff, amphibolite schist, quartz porphyry "feeders" for dacite volcanics, and include Upper Jurassic basic sills and dikes.

Upper Jurassic Marine Sedimentary and Metasedimentary Rocks (Map Symbol Ju): The Cosumnes formation of the Amador group of Upper Jurassic Marine Sedimentary and Metasedimentary Rocks is described as dark gray clay slate, sheared greywacke, thin-bedded tuff, some basic lava, red and green chert, and a basal conglomerate.

Figure 1-3 presents the approximate aerial extent of mapped geology within the MCSP area and underlying the MCSP LAAs.

The parent material for the soils in the MCSP LAA vicinity is expected to be strongly based on the mineralogy of the underlying geologic formations. For the majority of the soils in the LAAs, the depth to bedrock is typically less than 40 inches, and it is expected that the adjacent deeper soils and mine tailings or river wash map units are predominantly formed from the adjacent upslope soils and related geology. This mineralogical composition is expected to be a dominant factor in composition of groundwater inorganic constituents.

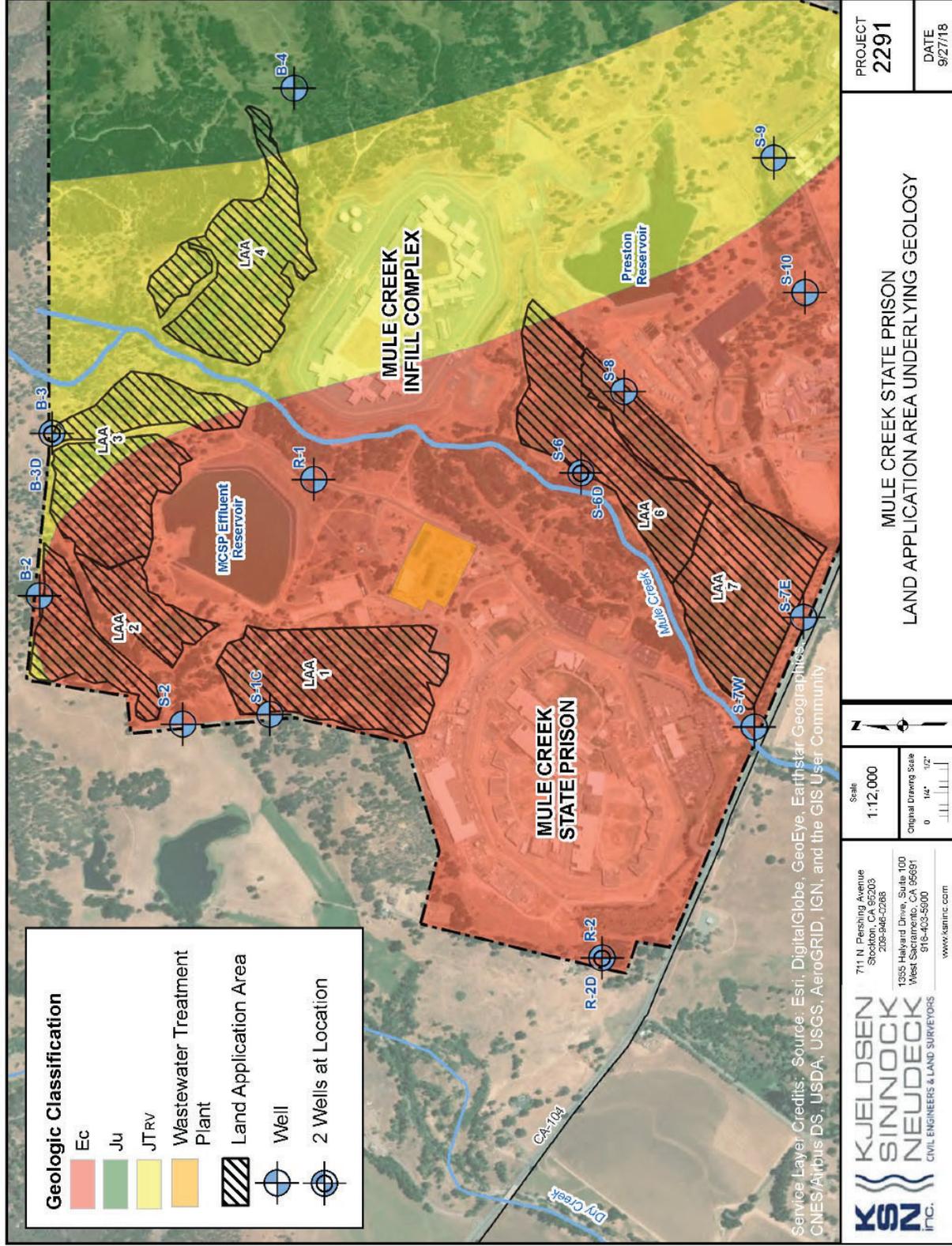


Figure 1-3. Geology Underlying MCSP LAAs

1.4 PURPOSE OF SOIL EVALUATION REPORT

The purpose of LAA soil sampling is to assess impacts of current and historical effluent irrigation to shallow groundwater. Pursuant to the CVRWQCB, this report also compiles and presents an assessment of soil characteristics and historical land application of biosolids. Soil samples were collected and evaluated for background soils as well as from LAAs. This report summarizes the characterization of soils in the LAAs and soils that have not historically had application of treated effluent or wastewater treatment process biosolids disposal. Further, the results from LAA soil sampling are evaluated in relation to underlying groundwater quality for currently and historically monitored constituents.

Section 2

Summary of Soil Sampling Activities

This section outlines the soil sampling locations, procedures for selecting the sample location, soil sample collection and field observations, and sample transportation and laboratory methods used to analyze the samples for various constituents. Site observations regarding aggregate soil characteristics were noted during sampling activities. Laboratory results used to assess soil characteristics in background soil sites as compared to LAAs are presented in Section 3.

2.1 SOIL SAMPLING LOCATIONS

A total of thirteen (13) samples were collected to characterize LAA and background soil conditions. The below sub-sections describe the basis for the sample locations that were selected.

2.1.1 RATIONALE FOR LAA SOIL SAMPLING SITES

Six (6) composite samples were collected for the six LAAs, one composite sample each from LAA 1 through 4 and one composite sample each from LAA 6 and LAA 7. The composite samples were composed of individual samples from at minimum 20 and at most 38 discreet locations, collected along multiple transects, within an LAA. Individual samples were collected using hand auger, as discussed further in Section Soil Sampling Protocol 2.2. Figure 2-1 through Figure 2-3 depict the discreet locations where individual soil samples were collected in each LAA for preparing the LAA composite sample. The intent of sampling along these transects was to collect representative samples of the soils used for land application of effluent and/or historical land application of biosolids. As noted in Section 1.2, biosolids are believed to have been historically applied to at least some portion of all of the LAAs, but have not been applied at the site since 2001. Within each LAA, soil profiles representative of the dominant landscape and vegetation features of the LAA were exposed to characterize soil physical properties. Attempts were made to locate at least one profile within each map unit and major soil series found in the LAAs. This strategy allows for comparison of soil chemical properties based on land use. The limits of each LAA during soil sampling were confirmed based on site observations including:

1. Existing sprinkler system location and evidence of past land application activities;
2. Review of general soil physical properties for consistency with soil map unit characteristics, as described in Section 1.3.1.

2.1.2 RATIONALE FOR BACKGROUND SOIL SAMPLING SITES

Seven (7) composite samples were collected for the seven major background soil map units. The composite samples were composed of individual samples from at minimum 20 discreet locations within the seven major soil map units. Because of the limited extent of Pw and RbB in the LAAs and as representative background, samples from these soil map units were not collected.

Individual soil samples were collected along transects within each representative soil map unit using a hand auger. Soil profiles representative of the dominant landscape and vegetation features of the map unit areas were exposed

to characterize soil physical properties. Attempts were made to locate at least one profile within each map unit and major soil series found at the site. This strategy allows for comparison of soil chemical properties based on land use. Because some mapped soil units were of limited extent on the MCSP site, the previously proposed background sampling areas required adjustment, and RmD and Hn soil map units are based on a limited set of discrete samples (11 and 18 samples respectively). Background soil sampling sites were selected to represent each soil map unit to the extent possible, and to represent areas known to historically not have received application of treated effluent or wastewater biosolids. During sample collection, the limits of the map units were confirmed based on site observations including:

1. Absence of evidence of current or historical land application activities, e.g. sprinkler systems or other application improvements;
2. Absence of evidence of major disturbances from recent anthropogenic activities, such as fill or excavation, where possible; and
3. Review of general soil morphological conditions and characteristics for consistency with soil map unit characteristics as described in Section 1.3.1.

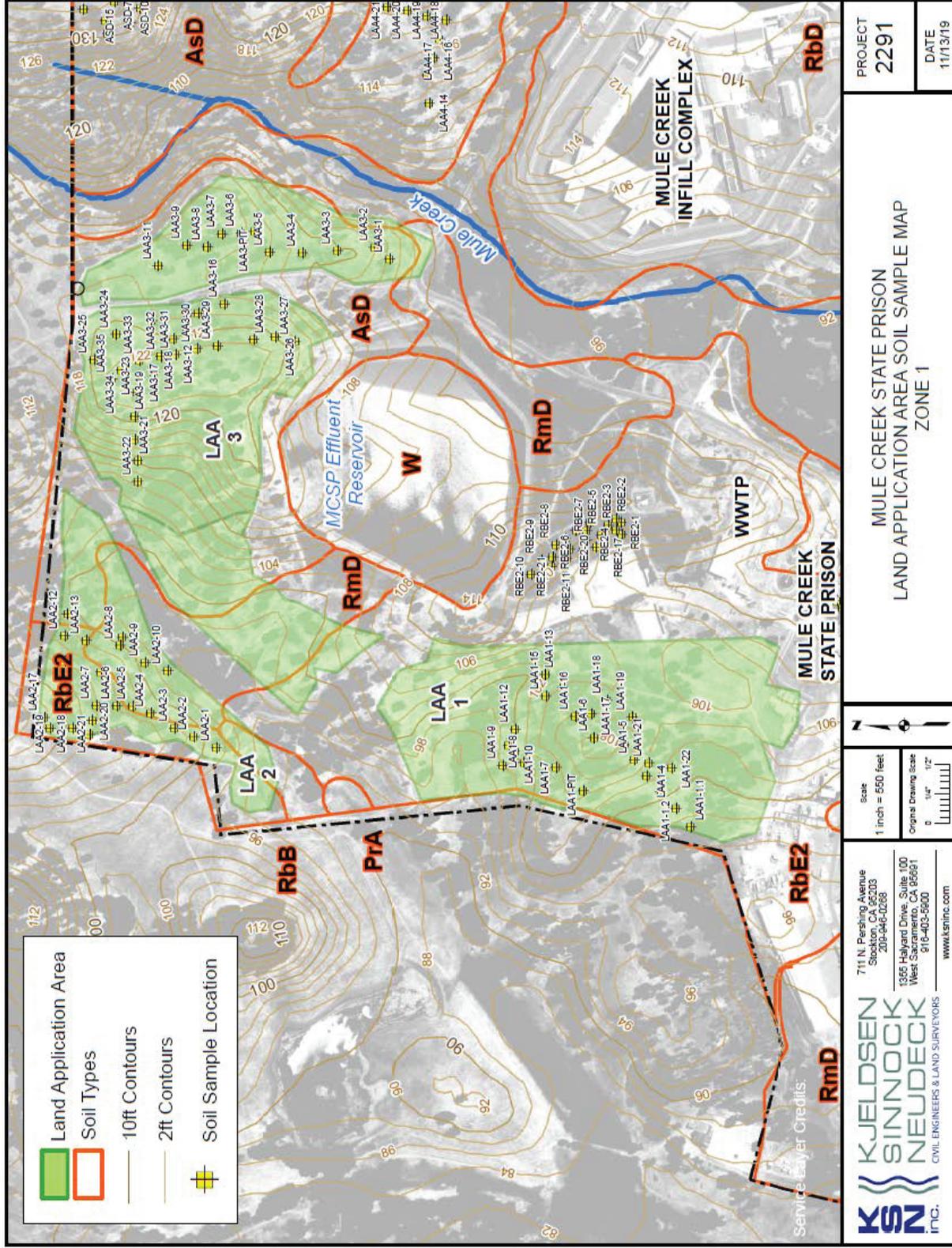


Figure 2-1. MCSP Soil Sampling Locations Near LAAs 1-3

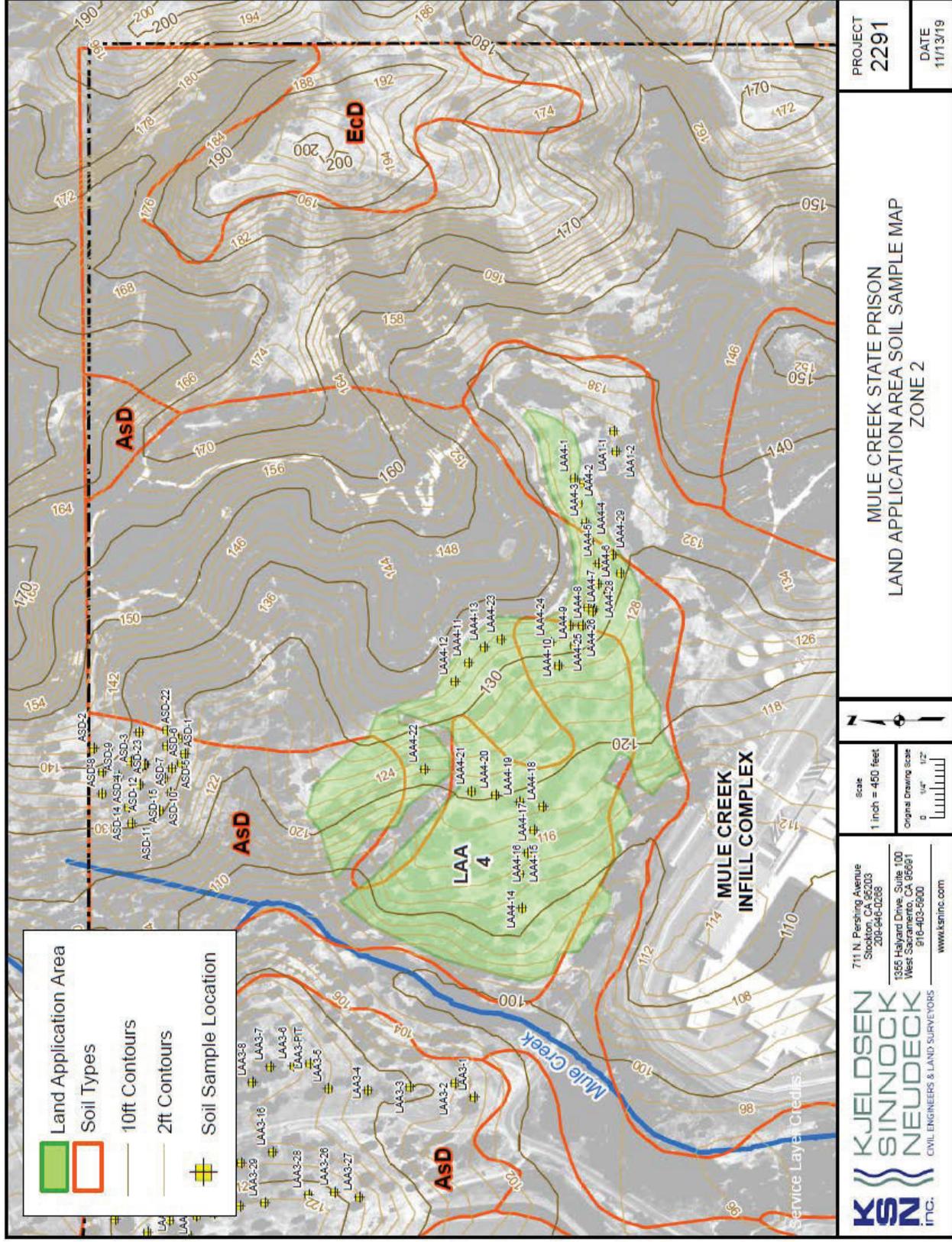
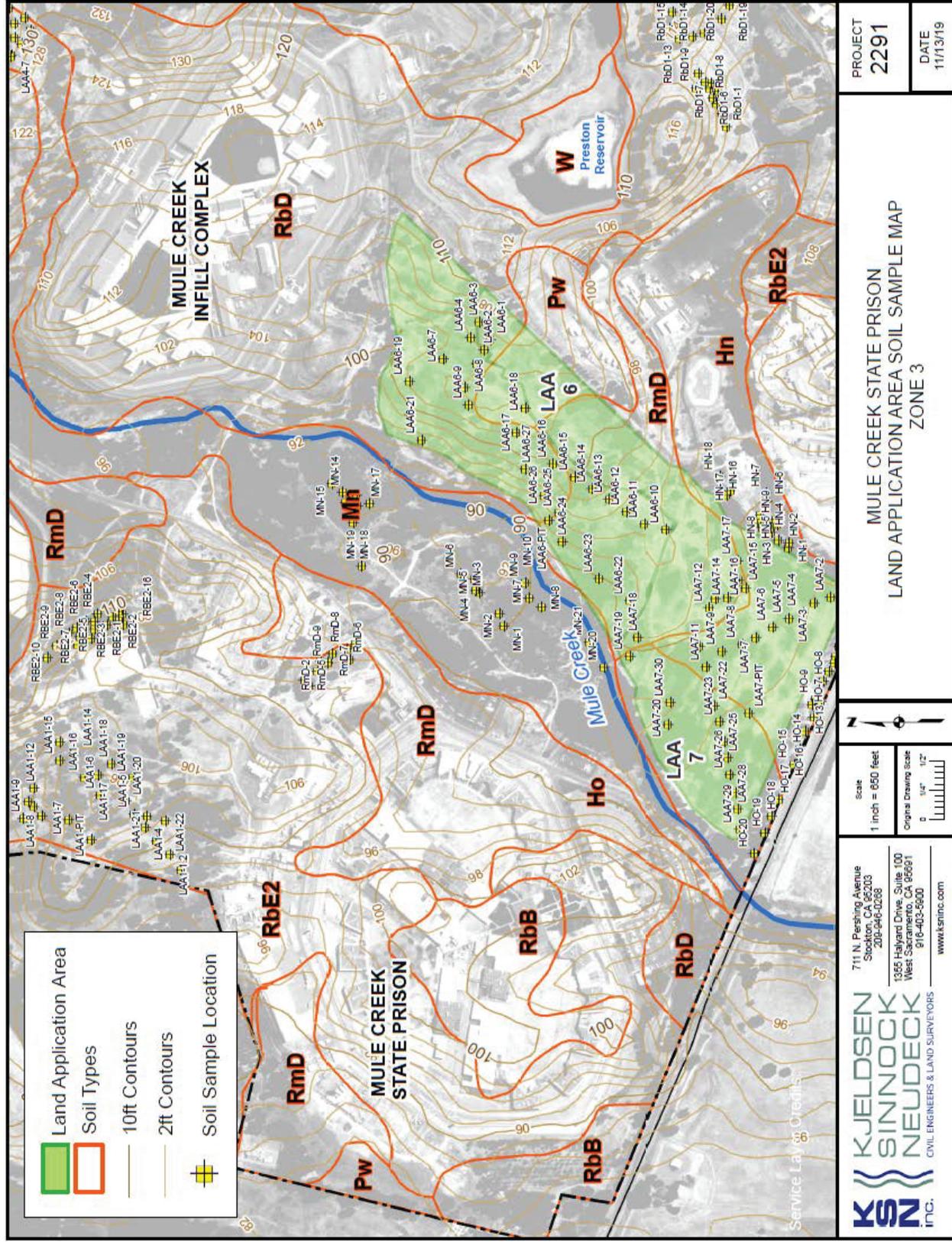


Figure 2-2. MCSP Soil Sampling Locations Near LAA4



<p>711 N. Pershing Avenue Stockton, CA 95210 209-946-0268</p> <p>1355 Hayland Drive, Suite 100 West Sacramento, CA 95691 916-403-5600</p> <p>www.ksninc.com</p>	<p>Scale 1 inch = 650 feet</p>	<p>PROJECT 2291</p>
	<p>Original Drawing Scale 0 1/4" 1/2"</p>	<p>DATE 11/13/19</p>
<p>MULE CREEK STATE PRISON LAND APPLICATION AREA SOIL SAMPLE MAP ZONE 3</p>		
<p>KSN KJELDSEN SINNOCK NEUDECK CIVIL ENGINEERS & LAND SURVEYORS</p>		

Figure 2-3. MCSP Soil Sampling Locations Near LAAs 6-7

2.2 SOIL SAMPLING PROTOCOL

The following sub-sections outline the soil sampling protocol used for sampling of LAA and background soils.

2.2.1 SAMPLE COLLECTION, HANDLING, LABELING AND FIELD OBSERVATIONS

Samples were collected Monday October 7th, 2019 through Wednesday October 9th, 2019. The samples were collected with clean hand tools, consisting of spades and hand augers. Samples were collected in clean polyethylene 5-gallon buckets from a minimum of 20 discreet locations within each LAA and background area. Samples were collected from the 6 to 12-inch depth interval, or from 6 inches to bedrock surface if soils were shallower. Individual samples were composited by splitting the volume collected between two buckets, mixing using hand tools, and then pouring together into a third bucket incrementally until the entire volume was well mixed. After the composited sample was completely mixed, pre-labeled laboratory supplied sample containers were filled with the appropriate volume of sample for each of the analyses. The sample labeling and designations used are presented in Table 2-1. Each site-specific sample was labeled with the Sample ID, date and time of sample collection, sampler name, and laboratory analysis to be performed.

At a representative location for each soil, a 20 to 36-inch depth test pit was dug to allow for physical characterization of the soils. For each test pit, the general location and landscape position of the site, the vegetation and condition of vegetation, general moisture content of surrounding soils mapped soil phase, sample ID, parent material, soil description, and other relevant site observations were documented on a Field Data Sheet (see Appendix A).

Each of the individual samples' and the pits' GPS locations were recorded using a Trimble TSC3 device. The Trimble also recorded the sample site or pit designation. The recorded GPS locations have an accuracy of +/- 3m to 5m. The recorded GPS points were used to generate Figure 2-1 through Figure 2-3.

During sample collection, a sample log (in the form of a Chain of Custody (COC) form) was maintained. A laboratory provided COC form was used. Prior to sampling, the client, address, contact information, project name, and sampler names were completed on the chain of custody. Also, the sample method and laboratory testing to be performed on each sample was completed. At the time of sample collection, the date and time the sample was collected were noted. The COC forms were used to record the following information (completed COC forms are included in Appendix B):

1. Sample Designation (e.g., LAA1, Ho);
2. Date sample was collected;
3. Name of staff collecting the sample;
4. Note of sample container and final estimated volume of sample.

Labeled and sealed samples were placed in covered boxes and retrieved by the laboratory for analysis under chain of custody documentation upon completion of the day's sampling.

Table 2-1. Sample Labels and Designations

LAA Number or Soil Map Unit	Sample Label and Designation	
	Sample ID	Designation
1	LAA1	Land Application Area 1 composite sample
2	LAA2	Land Application Area 2 composite sample
3	LAA3	Land Application Area 3 composite sample
4	LAA4	Land Application Area 4 composite sample
6	LAA6	Land Application Area 6 composite sample
7	LAA7	Land Application Area 7 composite sample
AsD	AsD	Auburn very rocky silt loam background composite sample
Hn	Hn	Honcut silt loam background composite sample
Ho	Ho	Honcut very fine sandy loam background composite sample
Mn	Mn	Mine tailings and river wash background composite sample
RbD	RbD	Red Bluff-Mokelumne complex 5 to 16% background composite sample
RbE2	RbE2	Red Bluff-Mokelumne complex 16 to 36% background composite sample
RmD	RmD	Red Bluff-Mokelumne-Mine pits background composite sample

2.3 LABORATORY ANALYSIS OF SOIL SAMPLES

Fruit Growers Laboratory, Inc. (FGL) performed analysis of physical and chemical characteristics, and soil extract water analysis. This section describes the laboratory methods utilized to characterize the soils.

2.3.1 SOIL CHEMICAL AND PHYSICAL CONSTITUENTS AND METALS ANALYZED

Soil physical, chemical, and metals characteristics of the soils were analyzed. CAM17 metals were assessed for their total concentration based on an extracted sample prepared per EPA Method 3050B with sample analysis conducted per the associated EPA method identified in Table 2-2. Where the metals results obtained under the Method 3050B extraction exceed 10 times the Soluble Threshold Limit Concentration (STLC), a second extraction using the California Waste Extraction Test, citric acid method was performed for comparison with STLCs. Samples collected were delivered to a California ELAP certified laboratory for extraction and analysis. For non-EPA procedures and analyses, the laboratory adhered to the Agricultural Laboratory Proficiency (ALP) standards, and was ALP accredited, as listed in Table 2-2.

Table 2-2. Composite Sample Analyses

Analysis	Analysis Method
Physical Characteristics	CSSS 47.3
Moisture	SA1: 7-2
Saturation	SA1: 7-2
pH	SA2: 12.2
Soil Salinity (E.C.)	SW 51.20
SAR	Ag 6010
Limestone	USDAH23A
Total dissolved solids	SM 2540C
Electrical conductivity	SM 2510B
Calcium	Ag 6010 / SM 6010B
Magnesium	Ag 6010
Sodium	Ag 6010
Potassium	Ag 6010
Chloride	SW 51.40
Sulfate	Ag 6010
Phosphorus	USC: 12.0
Boron	Ag 6010
Zinc	Ag 6010 / 6010B
Manganese	Ag 6010
Iron	Ag 6010
Copper	Ag 6010 / 6010B
Cation Exchange Capacity	SA2: 12.2
Ammonia Nitrogen	4500NH3G
Nitrate Nitrogen	4500NO3F
Total Nitrogen	993.13
Gypsum Requirement	Ag 6010
Organic Matter	993.13
Antimony	6010B
Arsenic	6010B
Barium	6010B
Beryllium	6010B
Cadmium	6010B
Chromium	6010B
Cobalt	6010B
Lead	6010B
Mercury	7471A
Molybdenum	6010B
Nickel	6010B
Selenium	6010B
Silver	6010B
Thallium	6010B
Vanadium	6010B

2.4 LABORATORY QA/QC

Data received from the laboratory analysis was reviewed for meeting ELAP and/or ALP Quality Control (QC) requirements.

2.5 DATA COMPILATION AND PRESENTATION

Data from the October 7th through 9th soil sampling was compiled and is presented in Table 2-3. Copies of the laboratory results and QA/QC sheets are provided in Appendix C.

Table 2.3. Summary of MCSP Composite Sample Results

Sample Date	Soil Sample Result	Units	LAA1	LAA2	LAA3	LAA4	LAA6	LAA7	RBEZ	ASD	RmD	Hh	Ho	Mh	RbD	
			10/8/2019	10/8/2019	10/8/2019	10/7/2019	10/9/2019	10/9/2019	10/8/2019	10/7/2019	10/11/2019	10/9/2019	10/9/2019	10/9/2019	10/9/2019	10/18/2019
Agricultural Soil Analyses																
Analysis Date			10/17/2019	10/17/2019	10/17/2019	10/17/2019	10/17/2019	10/17/2019	10/17/2019	10/17/2019	10/11/2019	10/9/2019	10/17/2019	10/17/2019	10/17/2019	10/18/2019
Sand (Physical Char.)		%	55.8	22.1	29.8	35.7	39.5	48.2	54.5	33.2	43.2	42.2	43.2	53.2	40.7	10/17/2019
Silt (Physical Char.)		%	18	39.2	36.6	25.6	32.9	29.2	20.6	34.3	24.3	32.8	31.7	24.2	26.7	10/18/2019
Clay (Physical Char.)		%	26.2	38.7	33.6	8.7	27.6	22.6	24.9	32.5	32.5	25	22.6	22.6	32.6	10/18/2019
Moisture		%	5.1	10.5	7.9	5.8	6.5	5.8	5.5	5.7	4.4	35	5.6	7.8	4.6	10/18/2019
Saturation		%	31.1	48.2	44	45	38.3	38.3	41.6	37.4	39	35	37.8	40.8	41.8	10/18/2019
pH		units	5.22	5.75	6.7	6.87	6.03	6.6	5.77	6.34	6.49	6.7	6.4	6.32	6.12	10/18/2019
Soil Salinity (E.C.)		dS/m	0.65	0.49	1.12	0.66	0.99	1.15	0.48	0.27	0.55	0.53	0.51	0.9	0.44	10/18/2019
SAR		-	4.1	2.6	3.3	2.5	3.3	2.5	0.3	0.2	0.2	0.3	0.2	0.9	0.2	10/18/2019
Limestone		%	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10/18/2019
Calcium, Soluble		meq/L	1.39	1.4	4.36	2.33	3.04	5.14	2.83	1.6	4.34	3.05	3.73	5.79	2.63	10/18/2019
Magnesium, Soluble		meq/L	0.617	0.788	3.13	2.07	1.83	2.6	1.06	1.05	1.94	1.95	1.95	5.43	1.94	10/18/2019
Sodium, Soluble		meq/L	4.07	2.73	5.05	3.19	4.85	4.85	0.394	0.23	0.379	1.27	0.475	2.13	0.331	10/18/2019
Potassium, Soluble		meq/L	0.236	0.117	0.283	0.156	0.242	0.332	0.614	0.163	0.163	0.0463	0.22	0.124	0.233	10/18/2019
Chloride		meq/L	2.84	1.34	2.06	1.34	3.65	2.94	0.72	0.11	0.28	0.36	0.29	2.61	0.39	10/18/2019
Sulfate		meq/L	1.24	0.974	0.926	0.566	1.73	1.55	0.735	0.306	0.795	1.45	0.873	4.44	0.727	10/18/2019
Nitrate Nitrogen		ppm	3.6	5.6	8.2	4.1	2.9	2.5	8.1	3.6	5.5	1.5	3.3	<0.9	5.6	10/18/2019
Phosphorus		ppm	10	15	13	3	11	21	9	<2	<2	2	8	3	<2	10/18/2019
Boron		ppm	0.45	0.27	0.12	0.1	0.2	0.14	0.61	0.08	0.25	0.12	0.18	0.18	0.1	10/18/2019
Zinc		ppm	1.3	2.8	2.7	0.6	1.7	2.7	1	0.7	1.1	1.6	3.4	0.8	0.8	10/18/2019
Manganese		ppm	13.1	23.4	33.8	15.1	26	21.6	26	38.7	19.4	15.1	22.7	15.1	17.7	10/18/2019
Iron		ppm	52.4	71.9	46.9	27.6	94.6	82.6	24.7	23.7	43.1	49.5	74.4	91.9	61.1	10/18/2019
Copper		ppm	1.4	3	4.6	2.3	2.6	3.5	1.6	3.8	1.9	4	5.4	3.9	3.2	10/18/2019
CEC		meq/100g	8.1	16.4	21.1	15.1	11.2	9.75	12	10.8	12	12.9	10.5	13.5	16.7	10/18/2019
Exchangeable Calcium		meq/100g	2.9	8.7	13.5	7.1	7	7	4.2	10.8	9.2	8.8	7.6	8.3	10.4	10/18/2019
Exchangeable Magnesium		meq/100g	0.88	3.76	6.7	11	3.32	2.18	0.78	5.38	2.61	3.81	2.62	4.94	5.77	10/18/2019
Exchangeable Potassium		meq/100g	0.138	0.252	0.466	0.425	0.364	0.314	0.166	0.471	0.2	0.13	0.281	0.162	0.471	10/18/2019
Exchangeable Sodium		meq/100g	0.183	0.339	0.464	0.64	0.454	0.253	<0.087	<0.087	<0.087	0.16	<0.087	0.147	0.09	10/18/2019
Exchangeable Hydrogen		meq/100g	4	3.3	<0.01	<0.01	<0.01	<0.01	3.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10/18/2019
Ammonia-Nitrogen		ppm	6	6	3	7	4	4	2	4	4	3	4	3	5	10/18/2019
Gypsum Requirement (C)		Tons/AF	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	10/18/2019
Organic Matter		%	1.39	1.99	1.94	1.35	1.9	2.12	2.25	1.5	2.2	1.44	1.73	1.68	1.57	10/18/2019
Total Nitrogen		%	<0.05	0.07	0.08	<0.05	0.08	0.1	0.09	0.06	0.08	0.08	0.09	0.06	0.06	10/18/2019
Inorganic Metals, Total																
Analysis Date			10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019	10/18/2019
Antimony		mg/kg	<3.7	<3.9	<3.9	<4	<3.9	<3.9	<3.8	<3.9	<3.9	<3.9	<3.8	<3.9	<3.9	10/18/2019
Arsenic		mg/kg	6.42	16.7	23.5	5.94	13.5	13.6	24.3	4.86	13.4	12.9	22.0	9.5	7.29	10/18/2019
Barium		mg/kg	55.4	64.8	97.3	86.7	99.4	127	103	104	69.6	135	128	98.1	109	10/18/2019
Beryllium		mg/kg	<0.55	<0.59	<2.9	<0.59	<0.59	<0.59	<0.56	<0.58	<0.58	<0.58	<0.57	<0.58	<0.59	10/18/2019
Cadmium		mg/kg	<0.55	<0.59	<0.56	<0.59	<0.59	<0.59	<0.56	<0.56	<0.56	<0.56	<0.57	<0.56	<0.59	10/18/2019
Chromium		mg/kg	41.1	7.16	13.8	11.6	54.7	49.7	33	10.2	29.6	23.8	46.1	49.1	9.99	10/18/2019
Chromium STL		mg/L	-	-	-	-	0.15	-	-	-	-	-	-	-	-	10/18/2019
Cobalt		mg/kg	<4.6	9.96	20.9	41.4	2.28	10.3	1.28	22.5	4.44	10.5	8.37	6.88	18.2	10/18/2019
Copper		mg/kg	18.9	44.5	101	91.8	34.4	46.3	31.4	115	35	51.1	56.3	54.5	59	10/18/2019
Lead		mg/kg	8.72	5.81	3.89	3.46	16.7	15.8	0.97	4.78	7.08	13.1	31.1	7.72	5.76	10/18/2019
Mercury		mg/kg	0.085	<0.050	<0.050	0.085	0.3	0.15	0.087	0.12	0.08	0.1	0.24	0.3	<0.060	10/18/2019
Molybdenum		mg/kg	<0.92	<0.98	<0.98	<0.98	<0.98	<0.98	<0.94	<0.96	<0.96	<0.97	<0.96	<0.96	<0.96	10/18/2019
Nickel		mg/kg	11	8.17	23.2	24.8	20.9	47	8.57	25	16.6	25.3	41.5	45	17.4	10/18/2019
Selenium		mg/kg	<9.2	<9.8	<9.7	<9.9	<9.8	<9.8	<9.4	<9.6	<9.7	<9.7	<9.5	<9.6	<9.8	10/18/2019
Silver		mg/kg	<4.6	<4.9	<9.7	<4.9	<4.9	<4.9	<9.4	<9.4	<4.8	<9.7	<4.8	<9.6	<4.9	10/18/2019
Thallium		mg/kg	<9.2	<9.8	<19	<9.8	<20	<20	<19	<9.8	<4.8	<9.7	<9.5	<9.6	<4.9	10/18/2019
Vanadium		mg/kg	82.7	104	182	126	98.8	70.9	142	181	105	91.3	70.8	82.2	135	10/18/2019
Zinc		mg/kg	19.2	55.1	68	53.9	53.9	75.8	30.1	65.7	40.6	69.1	79.9	61.5	54.8	10/18/2019

Section 3

Characterization of LAAs and Background Soils

The LAA's are underlain by 7 soil map units, that comprise 4 soil series (Auburn, Honcut, Mokelumne, and Red Bluff) and 2 miscellaneous areas (Mine Pits, and Mine Tailings and Riverwash). Neither of these miscellaneous areas were observed as significant portions of the actively applied (and sampled) area of the LAAs, and the heterogeneity of soil properties in these miscellaneous areas prevents establishing a representative soil for comparison within an individual map unit, let alone between other map units. The Auburn and Honcut map units generally form end members for the site with very different physical properties. The Red Bluff and Mokelumne complex map units represent areas where these two series are intermixed spatially and separation of the series' into distinct map units is impractical at the level of the Soil Survey of the Amador Area (NRCS, 1965). The soils identified in the field generally corresponded with mapped soils.

3.1 METALS ASSESSMENT

Because historic application of biosolids at the site possibly containing elevated concentrations of certain heavy metals typical of municipal wastewater sludges occurred, the total metals concentration of site soils were assessed and compared with the Total Threshold Limit Concentration (TTLC) for metals identified in Title 22 of the California Code of Regulations (CCR), commonly known as CAM-17 Metals. Further analysis under the Soluble Threshold Limit Concentration (STLC) were conducted in cases where the results collected under the TTLC comparison were ten times or more than the STLC. The STLC is used to simulate conditions where water may carry soluble material to groundwater.

Review of the analytical data did not indicate a significant difference between the metal concentrations in the LAA samples and those from similar soils at the site. Summary statistics for the soil metal data are presented in Table 3-1. Chromium TTLC comparison indicated a result slightly above 10 times the STLC threshold in LAA 6, and therefore an STLC analysis and comparison was performed. The LAA6 chromium result determined under STLC procedures was 0.15 mg/L, well below the STLC limit for chromium of 5 mg/L. Both LAA 6 and LAA 7 had slightly higher concentrations of chromium than the highest background concentrations of the Honcut soils and the adjacent Mine Tailings and Riverwash (Mn) map unit, likely related to similar parent materials from the alluvium in this area. Cobalt was elevated at LAA 4 compared to all other samples, however it was within typical soil concentrations and less than 0.5 percent of the TTLC limit of 8,000 mg/kg. All metals were well below their TTLC limits as can be seen in Table 3-1. Data from individual LAAs and background soil map units is presented in Table 2-3.

Table 3-1. Comparison of Metals in LAAs and Background Soils

Metal	STLC	TTL	All Background (Total Unless indicated as STLC)				All LAA (Total Unless indicated as STLC)				Biosolids Maximum mg/kg (Dry wt)		
			Maximum	Minimum	Average	Std. Dev.	Maximum	Minimum	Average	Std. Dev.			
Antimony	15	500	<3.9	<3.9	<4	<3.9	<3.9	<3.9	<3.9	<3.8	<3.9	<3.9	<9.7
Arsenic	5	500	24.3	4.9	13.5	6.7	23.5	13.3	6.0	5.9	13.3	6.0	3.6
Barium	100	10,000	135	70	107	20	127	88	24	55	88	24	NA
Beryllium	0.75	75	<0.59	<2.9	<0.59	<0.59	<0.59	<0.58	<0.58	<0.56	<0.58	<0.58	<0.03
Cadmium	1	100	<0.59	<0.58	<0.59	<0.59	<0.59	<0.58	<0.58	<0.56	<0.58	<0.58	2.96
Chromium	5	500	49	10	29	14	55	30	19	7	30	19	20.36
Chromium STLC ⁽¹⁾	5		--	--	--	--	0.15	-	-	-	-	-	--
Cobalt	80	8,000	22.5	1.3	10.3	7.0	41.4	17.0	13.6	2.3	17.0	13.6	NA
Copper	25	2,500	115.0	31.4	57.3	25.5	101.0	56.2	29.9	18.9	56.2	29.9	241.33
Lead	5	1,000	31.1	4.8	12.6	8.8	16.7	9.0	5.4	3.5	9.0	5.4	12.71
Mercury	0.2	20	0.3	0.1	0.2	0.1	0.3	0.2	0.1	0.1	0.2	0.1	1
Molybdenum	350	3,500	<0.98	<0.97	<0.99	<0.98	<0.98	<0.96	<0.97	<0.94	<0.96	<0.97	0
Nickel	20	2,000	45.0	8.6	25.6	12.4	47.0	22.5	12.6	8.2	22.5	12.6	13.64
Selenium	1	100	<9.8	<9.7	<9.9	<9.8	<9.8	<9.6	<9.7	<9.4	<9.6	<9.7	5.91
Silver	5	500	<4.9	<9.7	<4.9	<4.9	<9.8	<9.6	<4.8	<9.4	<9.6	<4.8	7.11
Thallium	7	700	<9.8	<19	<9.9	<9.8	<20	<19	<9.7	<19	<19	<9.7	0
Vanadium	24	2,400	181.0	70.8	115.3	36.2	182.0	110.7	36.2	70.9	110.7	36.2	NA
Zinc	250	5,000	79.9	30.1	57.4	15.9	75.8	54.3	17.7	19.2	54.3	17.7	1204.22

NA = Not Analyzed

(1) STLC analysis conducted on LAA6 for chromium only.

3.2 SOIL FERTILITY AND NUTRIENT ASSESSMENT

Typical groundwater quality concerns with effluent application to land include salinity, nitrogen, and soluble manganese and iron. Although pH may be affected, generally the buffer capacity of soils does not result in any significant modification of background soil pH as a result of effluent application. The soils at the site naturally have moderately acidic to acidic pH values, and based on soil chemistry the effluent, and agronomic biosolids application, would have little effect on soil pH. A site-specific evaluation of these typical concerns are discussed below and associated data is presented in Table 3-2.

Table 3-2. Comparison of Agricultural Constituents in LAAs and Background Soils

Constituent	All Background				All LAA				Average Effluent Concentration		Average Groundwater Concentration	
	Maximum	Minimum	Average	Std. Dev.	Maximum	Minimum	Average	Std. Dev.	Background	Compliance	Background	Compliance
pH (Std. Units)	6.7	5.8	6.3	0.3	6.9	5.2	6.2	0.6	NA	NA	NA	NA
ECe (µmhos/cm)	1.2	0.3	0.6	0.3	1.2	0.5	0.8	0.3	NA	NA	1.03	0.67
SAR	0.9	0.2	0.4	0.3	4.1	2.2	2.9	0.6	NA	NA	NA	NA
Sodium, Soluble (mg/kg)	49	5	17	15	119	63	96	22	52.87	41.35	41.35	53.65
Chloride (mg/kg)	93	4	24	29	129	27	80	35	45.93	141.24	141.24	48.99
Sulfate (mg/kg)	213	15	64	63	83	27	56	19	NA	93.31	93.31	54.36
Ammonia-Nitrogen (mg/kg)	5.0	2.0	3.6	0.9	7.0	3.0	5.0	1.4	NA	0.19	0.19	0.12
Nitrate Nitrogen (mg/kg)	8.1	1.5	4.6	2.1	8.2	2.5	4.5	1.9	16.97	6.76	6.76	3.24
Phosphorus (mg/kg)	9.0	2.0	5.5	3.0	21	3.0	12.2	5.4	NA	0.73	0.73	0.22
Boron (mg/kg)	0.6	0.1	0.2	0.2	0.5	0.1	0.2	0.1	0.04	0.35	0.35	0.23
Manganese (mg/kg)	39	15	22	8	34	13	22	7	2.75	59.21	59.21	31.88
Iron (mg/kg)	92	24	53	23	95	28	63	23	0.31	6.54	6.54	0.99

NA = Not Analyzed

3.2.1 SALINITY

The soil salinity parameters Electrical Conductivity (EC), sodium, chloride, and boron are slightly elevated in the LAA's. When the Mn map unit is excluded from the background soil samples, sulfate is also slightly elevated. With the exception of LAA 3, LAA 6, and LAA 7, the land application areas have an E_{Ce} of less than 700 $\mu\text{mhos/cm}$ which is protective of the most sensitive of crops. LAA 3, LAA 6, and LAA 7 have an E_{Ce} of less than 1,150 $\mu\text{mhos/cm}$ which is very protective of any forage crops that may be grown in the area. The Mn map unit had an E_{Ce} of 1,170 $\mu\text{mhos/cm}$, suggesting increased moisture and vegetation growth in these fine soils that generally increases soil salinity, especially prior to the wet season. LAA-3 is also adjacent to a drainage that feeds into Mule Creek. Excluding Mn, the background E_{Ce} averages 460 $\mu\text{mhos/cm}$.

Soil sodium adsorption ratios (SAR) reflect potential impacts to infiltration, hydraulic conductivity, and drainage. The SAR of the LAA soils range from 2 to 4 and average effluent SAR is 3.8, indicating there would be no impacts to soil permeability. The background soils had SAR values less than 1, reflecting low sodium content associated with rainfed irrigation. The average concentration of soluble sodium is 96 mg/L for the LAA soils and 53 mg/L for the effluent. There would be no foliar damage from sodium when irrigating with the effluent, and the soil sodium is below thresholds for yield reductions of crops (e.g. range and pasture grasses) reasonably grown at the site. Similarly, average chloride concentrations of 80 mg/L were higher in the LAA soils than in background soils having a concentration of 24 mg/L chloride. The chloride does not pose a hazard to sensitive crop production.

3.2.2 NUTRIENTS

The nitrogen content, particularly nitrate, in soils is a major player in both vegetation production and groundwater quality. In soils, it is desirable to have significant amounts organic matter where nitrogen is recalcitrant with typical mineralization rates of 3 percent per year. The available nitrogen has potential to reduce mineralization rates, especially when building up soil organic matter. However, depending on amount and timing of organic content in the soils, there is a potential for groundwater degradation. The LAA soils had 1.8 percent organic matter (OM), 1,630 lbs organic nitrogen per acre furrow slice (afs: 1 acre 6 inches deep), and a carbon:nitrogen ratio (C:N) of 21. Similarly, the background soils had 1.8 percent OM, 1,470 lbs organic nitrogen per afs, and a C:N of 23. Based on the maximum effluent application rate since construction of the MCIC, 0.7MG/ac-yr (LAA 7, 2017), a total of 126 lbs N/ac was applied. Adding an approximately 50 lbs N/ac from OM mineralization, the mineral N of 176 lbs/ac could be sustainably removed by the irrigated range/pasture grasses without threat to groundwater quality.

Additional factors affect the LAA soils' capability to protect the groundwater from excess nitrate. There are benefits to using effluent for nitrogen supply, particularly, multiple applications at a low rate improve the nutrient use efficiency, which reduces the amount of nitrogen potentially leaching below the rooting zone. The presence of oak trees and woody shrubs allows for capture of nitrogen leaching below the root zone of the grasses. Also, the organic nature of effluent provides a balance of ammonia and nitrate, with the ammonia cation having potential to be retained in the soil. The LAA capacity to remove the applied N is observed in that there is no significant buildup of mineral nitrogen. The average nitrate and ammonia were similar between the LAA and background soils at 9.5 and 8.2 mg N/kg (19.0 and 16.4 lbs/afs), respectively, with the LAA's having an average of 5 mg ammonia N/kg.

The phosphorus content of the LAAs is higher than that of the background soils, 12.2 and 5.5 mg P/kg respectively, consistent with the application of organic matter and effluent. However, the phosphorus in the LAAs is substantially below pasture grass demand. Additionally, the nutrients boron and sulfate are similar between the

LAA and background soils. The soluble and exchangeable iron and manganese pools are typically low in crop land and rangeland soils, but the addition of large quantities of organic carbon can create anaerobic conditions increasing the concentration of these pools. There is no significant difference in the concentrations of these metals in LAA soils and background soils.

3.3 CONCLUSION

The soils of the LAA's are suitable for effluent irrigation of rangeland pasture grasses. There is no evidence of increased metal concentrations associated with the land application of biosolids. Nitrogen application rates are below plant demand, as well as protective of groundwater quality. Groundwater nitrate concentrations in compliance wells averages 3.2 mg/L. The salinity is affected by the effluent land application; however, the soils' increased values are below water quality goals for crops that could reasonably be grown in the area. It should be noted that there are significant background sources of high groundwater salinity with average background values (EC = 1027 $\mu\text{mhos/cm}$) significantly higher than in compliance wells (EC = 666 $\mu\text{mhos/cm}$), with the exception of sodium with 41 mg/L in background and 54 mg/L in compliance wells. Groundwater compliance wells do not exceed nitrogen nor salinity water quality goals for agriculture or potable use.

Section 4

Recommended Practices and Monitoring

It is recommended that MCSP continues to monitor for nitrogen and salinity in both the effluent applied to the LAAs and the groundwater as described in the LAA Management Plan (submitted under separate cover). Under current and historical effluent concentrations and loading rates, the groundwater has not been shown to be impacted by nitrogen but the monitoring is recommended because of the concentration in the effluent and the potential for degradation or impact to occur under certain conditions. Soil salinity has been shown to increase slightly in the LAAs, which is expected with land application of treated effluent. Monitoring of the salinity is recommended to continue to evaluate the degree of increase in salinity and to monitor for long-term increasing trends. Additionally, distributing effluent application to the largest area practicable will reduce the overall increase in salinity to site soils and underlying groundwater on an aerial basis.

APPENDICES

Appendix A

FIELD DATA SHEETS

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase RbE2, Red Bluff-Mokelumne complex, eroded General Location SW of effluent Reservoir, NE of gun range Sample ID RbE2
 Legal Description _____ Lat/Long _____ Slope % 15
 Veg/Crop annual grasses recently burned Landscape Position Backslope Parent Material Alluvium
 Drainage Class WD Ksat (limiting) MH WRD (in) L+ (3+) Eff Depth VD Aspect SW Run Off M

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text gr	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	3	cw	7.5YR	3/2	8	18 gr	FSL	1 f sbk / gr	dry	SH	OS/OP	cf	
Bt1	16	gw	5YR	3/4	10	8 gr	FSL	0 Massive	dry	Soft	SS/SP	ff	few faint clay films
Bt2	22+		5YR	4/6	15	10 gr	FSL	0 Massive	dry	MH	SS/SP		common distinct clay films

Comments: _____
 Epipedon: Ochric
 Endo Pedon: Argillic
 Hydrologic Soil Group: C+
 Generally consistent with Red Bluff series.

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase RbD, Red Bluff-Mokelumne Complex General Location East of Preston Reservoir Sample ID RbD
 Legal Description _____ Lat/Long _____ Slope % 10
 Veg/Crop Annual Grass Landscape Position Backslope Parent Material Alluvium/Resi-
 Drainage Class MWD Ksat (limiting) VL WRD VL Eff Depth MS Aspect WSW Run Off VH

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	5	cw	5YR	3/3	35	3 gr	CL	2 m gr/ 1 f sbk	dry	Soft	0S/P	mf & vf	
Bt	15	ai	5YR	4/4	41	3 gr	CL	1 m abk	dry	MH	MS/P	ff	common clay films
2 Cr	20+	Weathered schist, red iron coating of exposed faces											

Comments: _____
 Epipedon: Ochric
 Endo Pedon: Argillic
 Hydrologic Soil Group: D
 Consistent with Mokelumne, eroded

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase Ho, Honcut very fine sandy loam General Location East of LAA7 Sample ID Hn
 Legal Description _____ Lat/Long _____ Slope % <5
 Veg/Crop Bunch grass, blackberry, oak, and willows Landscape Position Stream Terrace Parent Material Alluvium
 Drainage Class WD Ksat (limiting) ML WRD (in) L+ (3.6+) Eff Depth VD Aspect S Run Off M

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	8	cw	7.5YR	3/2	10	0	VFSL	3 f gr / 1 f sbk	dry	Soft	MS/MP	mf, mvf	7.5YR 6/3 (4/4 wet) root channels
Ap2	18+		5YR	3/3	12	<2	VFSL	1 m sbk	dry	MH	MS/MP	ff	

Comments: _____
 Epipedon: Mollic
 Endo Pedon: Argillic?
 Hydrologic Soil Group: C
 Mapped as having silt loam surface texture. Soil is consistent with Honcut series.

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase AsD, Auburn very rocky silt loam General Location N of LAA 4 Sample ID AsD
 Legal Description _____ Lat/Long _____ Slope % 25
 Veg/Crop Annual grass Landscape Position _____ Backslope _____ Parent Material Residium
 Drainage Class WD Ksat (limiting) L WRD (in) VL (2.5) Eff Depth MS Aspect SW Run Off VH

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap1	5	cw	5YR	3/3	8	15 gr	SiL	2 m gr	dry	SH	SS/SP	mf, mvf	
Ap2	15	ai	5YR	3/4	10	20 gr	gr SiL	1 m sbk	dry	VH	SS/SP	ff	
R	Slightly weathered and fractured schist												

Comments:

Epipedon: Ochric

Endo Pedon: none

Hydrologic Soil Group: D

Soil is consistent with Auburn series

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase RbE2, Red Bluff-Mokelumne complex, eroded General Location middle of LAA 1 Sample ID LAA1
 Legal Description _____ Lat/Long _____ Slope % 10
 Veg/Crop annual grasses Landscape Position _____ Backslope _____ Parent Material Alluvium
 Drainage Class WD Ksat (limiting) MH WRD (in) L+ (3+) Eff Depth VD Aspect SW Run Off M

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	5	cw	5YR	3/4	12	10 gr	SiL	2 m gr	dry	Soft	OS/SP	c vf	
Ap2	13	cw	5YR	4/4	10	25 gr	gr L excb	0 Massive	dry	Soft	OS/SP	ff	
Bt	27+		2.5YR	4/4	28	60 cb	CL	0 Massive	dry	MH	SS/IMP		few clay films

Comments: _____
 Epipedon: Ochric
 Endo Pedon: Argillic
 Hydrologic Soil Group: C
 Generally consistent with Red Bluff series

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase RmD, Red Bluff-Mokelumne-Mine Pits General Location Center of LAA 2 Sample ID LAA 2
 Legal Description _____ Lat/Long _____ Slope % 10
 Veg/Crop Oak Grassland Landscape Position _____ Backslope/footslope _____ Parent Material Alluvium
 Drainage Class WD Ksat (limiting) VL WRD _____ Eff Depth VD Aspect ESE Run Off VH

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	3	aw	5YR	4/3	42	14 gr	C	1 m gr/ 1 f sbk	dry	MH	S/MP	cf cvf	
ABt	12	cw	5YR	4/4	45	8 gr, 30 cb	C	1 m sbk	moist	VF	MS/P	fm	common clay films
Bt	24+		5YR	4/6	50	<5	C	1 m pr	moist	EF	MS/MP		many clay films

Comments: _____
 Epipedon: Ochric _____
 Endo Pedon: Argillic _____
 Hydrologic Soil Group: C _____
 Consistent with Mokelumne eroded _____

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase AsD, Auburn very rocky silt loam General Location Eastern knoll of LAA 3 Sample ID LAA 3
 Legal Description _____ Lat/Long _____ Slope % 8
 Veg/Crop Annual grass Landscape Position Shoulder Parent Material Residium
 Drainage Class WD Ksat (limiting) L WRD (in) VL (2.75) Eff Depth MS Aspect W SW Run Off VH

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	3	cw	5YR	3/3	12	8 gr	SiL	1 m gr/ 1 f sbk	dry	Soft	SS/SP	cf, cvf	
Bt	15	ai	5YR	3/4	15	9 gr	SiL	0 massive	dry	Soft	MS/MP	ff	few faint clay films
R	Slightly weathered schist with some weathered rock/soil between plates												

Comments: _____
 Epipedon: Ochric
 Endo Pedon: Argillic
 Hydrologic Soil Group: D
 Soil is consistent with Auburn series

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase AsD, Auburn very rocky silt loam General Location LAA 4 Sample ID LAA 4
 Legal Description _____ Lat/Long _____ Slope % 16
 Veg/Crop Annual grass/Oak / Gray Pine Landscape Position _____ Backslope _____ Parent Material Residium
 Drainage Class WD Ksat (limiting) L WRD (in) VL (2) Eff Depth MS Aspect _____ WSW _____ Run Off VH

Horizon	Depth (in)	Boundary	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap1	4	cw	7.5 YR	4/4	10	30 cb+gr	Sil cb	2 m gr	dry	VH	SS/MP	mf, mvf	
AB	13	aw	7.5 YR	4/4	15	20 gr	gr SiL	1 m sbk	dry	EH	MS/MP	ff	
Cr/R	24+	Moderately weathered and fractured schist, with soft rock fingering between plates											

Comments:

Epipedon: Ochric

Endo Pedon: none

Hydrologic Soil Group: D

Soil is consistent with Auburn series

Mule Creek State Prison Pedon Descriptions

October 7-9, 2019

Soil Phase Ho, Honcut very fine sandy loam General Location Southern portion of W 1/2 LAA7 Sample ID LAA7
 Legal Description Lat/Long Slope % <5
 Veg/Crop Bermuda grass and annual grasses and broadleaves Landscape Position Stream Terrace Parent Material Alluvium
 Drainage Class WD Ksat (limiting) ML WRD (in) L+ (3+) Eff Depth VD Aspect S Run Off M

Horizon	Depth (in)	Moist Hue	V/C	% C	% RF	Text	Structure	Wetness	Consistence	Stickyness / Plasticity	Roots	Comments
Ap	4	7.5YR	3/2	12	5 cb, 15 gr	grSiL	1 f sbk /1 c gr	dry	MH	MS/MP	mf, mvf	
Ap2	13	5YR	3/3	15	25 gr	grL	0 Massive	dry	MH	MS/P	ff	
Bt	24+	5YR	4/4	22	40 cb/gr	grL	0 Massive	dry/moist	Soft	MS/SP		few faint clay films

Comments:
 Epipedon: Ochric
 Endo Pedon: Argillic
 Hydrologic Soil Group: C
 Gravelly variant of Honcut series



36461:10/14/2019

TEST DESCRIPTION - See Reverse side for Container, Preservative and Sampling information

Client: **KSN, Inc.**
Address: **Attn: Neal Colwell**
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Phone: (916)403-5900 Fax: (916)403-5901

Contact Person: **Neal Colwell**

Project Name: **MCSP - Soil Analyses**

Purchase Order Number:

Quote Number: **ST 20190515-01**

Sampler(s): **EAP/SEW/JW**

Sampling Fee: Pickup Fee:

Compositor Setup Date: **10/7/19** Time: **12:35**

Lab Number: **STK 1965009** 3-17441

Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite(C) Grab(G)	Type of Sample	Bacti Reason: Routine(ROUT) Repeat(RPT) Replace(RPL) Other(O) Special(SPL)	Soil-% Moisture,Saturation,NO3-N,PO4-P,K,PH,Salinity,Limestone, Lime Reg.,Ca,Mg,Na,SAR,Al,B,Cl,Zn,Mn,Fe,Cu,CeC,Exc. Mg,Exc. K,Exc. Na,Exc. H,NH3-N,% Org. Mat.,Total N GypRegCalc,SO4	Physical Char.-%Sand,Silt,Clay	Wet Chemistry-NO2	Wet Chemistry-TKN	General Mineral	Metals, Total-TTLC-CAM 17	Run Exchangeable and Soluble Aluminum***
1	LAA1			C	S			1	X	X	X	1,1	X
2	LAA2			C	S			1	X	X	X	1,1	X
3	LAA3			C	S			1	X	X	X	1,1	X
4	LAA4	10/7/19	1235	C	S			1	X	X	X	1,1	X
5	LAA6			C	S			1	X	X	X	1,1	X
6	LAA7			C	S			1	X	X	X	1,1	X
7	AsD	10/7/19	1355	C	S			1	X	X	X	1,1	X
8	Hn			C	S			1	X	X	X	1,1	X
9	No			C	S			1	X	X	X	1,1	X
10	Mn			C	S			1	X	X	X	1,1	X

Relinquished Date: 10/19/19 Time: 1300 Received By: *[Signature]*

Relinquished Date: 10/19/19 Time: 1400 Received By: *[Signature]*

Relinquished Date: 10/19/19 Time: 1700 Received By: *[Signature]*

Relinquished Date: 10/19/19 Time: 1700 Received By: *[Signature]*

Remarks: **Multiple Chains**

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Phone: (559) 734-9473
Fax: (559) 734-8435

Inter-Laboratory Condition Upon Receipt (Attach to COC) 1955009

Sample Receipt at: STK CC CH VI

1. Number of ice chests/packages received: 1 Shipping tracking # _____

2. Were samples received in a chilled condition? Temps: 4.0 / _____ / _____ / _____
Surface water SWTR bact samples: A sample that has a temperature upon receipt of >10° C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.

- 3. Do the number of bottles received agree with the COC? Yes No N/A
- 4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
- 5. VOAs checked for Headspace? Yes No N/A
- 6. Were sample custody seals intact? Yes No N/A
- 7. If required, was sample split for pH analysis? Yes No N/A
- 8. Were all analyses within holding times at time of receipt? Yes No
- 9. Verify sample date, time and sampler name Yes No

Sign and date the COC, place in a ziplock and put in the same ice chest as the samples.

Sample Receipt Review completed by (initials): [Signature]

Sample Receipt at SP:

1. Were samples received in a chilled condition? Temps: 6.2 / _____ / _____ / _____
Acceptable is above freezing to 60 C. If many packages are received at one time check for tests/H.T.'s/rushes/

2. Shipping tracking numbers:
546496107 / 18818

- 3. Do the number of bottles received agree with the COC? Yes No N/A
- 4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
- 5. Were sample custody seals intact? Yes No N/A

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

- 1. Were all requested analyses understood and acceptable? Yes No
- 2. Did bottle labels correspond with the client's ID's? Yes No
- 3. Were all bottles requiring sample preservation properly preserved? Yes No N/A FGL
[Exception: Oil & Grease, VOA and CrVI verified in lab]
- 4. VOAs checked for Headspace? Yes No N/A
- 5. Have rush or project due dates been checked and accepted? Yes No N/A
- 6. Were all analyses within holding times at time of receipt? Yes No

Attach labels to the containers and include a copy of the COC for lab delivery.

Sample Receipt, Login and Verification completed by (initials): [Signature]

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: _____ Phone Number: _____
Initiated By: _____ Date: _____
Problem: _____
Resolution: _____

2. Person Contacted: _____
Initiated By: _____
Problem: _____
Resolution: _____

(3-17441)
KSN, Inc.

STK1955009

SRP-10/08/2019-16:46:15



Client: KSN, Inc. Address: Attn: Neal Colwell 1550 Harbor Blvd, Suite 212 West Sacramento, CA. 95691 Phone: (916)403-5900 Fax: (916)403-5901 Contact Person: Neal Colwell Project Name: MCSP - Soil Analyses Purchase Order Number: Quote Number: ST 20190515-01		Method of Sampling: Composite(C) Grab(G) Type of Sample: **SEE REVERSE SIDE** Potable(P) Non-Potable(NP) Ag Water(AgW) Bacti Type: Other(O) System(SYS) Source(SR) Waste(W) Bacti Reason: Routine(ROUT) Repeat(RPT) Replace(RPL) Other(O) Special(SPL)		36461:10/14/2019 TEST DESCRIPTION - See Reverse side for Container, Preservative and Sampling information	
Sampler(s) Elisabeth Sampling Fee: _____ Pickup Fee: _____ Time: _____ Compositor Setup Date: 10/14/19 _____ Time: _____ Lab Number: STK 1955146 3-17441		Soil-% Moisture, Saturation, NO3-N, PO4-P, K, pH, Salinity, Limestone, Lime, Reg., Ca, Mg, Na, SAR, Al, B, Cl, Zn, Mn, Fe, Cu, CEC, Exc. Ca, Exc. Mg, Exc. K, Exc. Na, Exc. H, NH3-N, % Org. Mat., Total N, GypRegCalc, SO4 **Provide extract to Wet Chem for Nitrite Analysis** 250ml(BPa)		Physical Char.-%Sand:Silt:Clay 250ml(BPa)	
Wet Chemistry-NO2 ***Run on Extraction from Ag Dept.*** Wet Chemistry-TKN ***Analyze from DI Extraction***		General Mineral ***Analyze from DI Extraction*** Wet Chemistry-TKN ***Analyze from DI Extraction*** TOC ***Analyze from DI Extraction***		Metals, Total-TTLC-CAM 17 Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn ***Run Wet STLC on any metals that Exceed Limits*** 8oz(G), 8oz(G) Laboratory Directive: ***If pH is 4.5 or Less Run Exchangeable and Soluble Aluminum***	
Relinquished Date: 10/19/19 Time: 5:30 PM Received By: Elisabeth Colwell		Relinquished Date: 10/19/19 Time: 1:35 PM Received By: JAC		Relinquished Date: 10/19/19 Time: 17:00 Received By: JAC	
Relinquished Date: 10/19/19 Time: 05:00 PM Received By: JAC		Relinquished Date: 10/19/19 Time: 03:35 PM Received By: JAC		Relinquished Date: 10/19/19 Time: 17:00 Received By: JAC	

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 Fax: (530) 734-9473

Inter-Laboratory Condition Upon Receipt (Attach to COC) 1955148

Sample Receipt at: STK CC

CH VI

1. Number of ice chests/packages received: _____ Shipping tracking # _____

2. Were samples received in a chilled condition? Temps: 5.1 / _____ / _____ / _____ / _____
Surface water SWTR bact samples: A sample that has a temperature upon receipt of >10° C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.

- 3. Do the number of bottles received agree with the COC? Yes No N/A
- 4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
- 5. VOAs checked for Headspace? Yes No N/A
- 6. Were sample custody seals intact? Yes No N/A
- 7. If required, was sample split for pH analysis? Yes No N/A
- 8. Were all analyses within holding times at time of receipt? Yes No
- 9. Verify sample date, time and sampler name Yes No

Sign and date the COC, place in a ziplock and put in the same ice chest as the samples.

Sample Receipt Review completed by (initials): AE

Sample Receipt at SP:

1. Were samples received in a chilled condition? Temps: 3, 4, 3, 3, _____
Acceptable is above freezing to 6°C. If many packages are received at one time check for tests/H.T.'s/rushes/

2. Shipping tracking numbers: 546510046 / 13766 / 15762 / 14458

- 3. Do the number of bottles received agree with the COC? Yes No N/A
- 4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
- 5. Were sample custody seals intact? Yes No N/A

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

- 1. Were all requested analyses understood and acceptable? Yes No
- 2. Did bottle labels correspond with the client's ID's? Yes No
- 3. Were all bottles requiring sample preservation properly preserved? Yes No N/A FGL
[Exception: Oil & Grease, VOA and CrVI verified in lab]
- 4. VOAs checked for Headspace? Yes No N/A
- 5. Have rush or project due dates been checked and accepted? Yes No N/A
- 6. Were all analyses within holding times at time of receipt? Yes No

Attach labels to the containers and include a copy of the COC for lab delivery.

Sample Receipt, Login and Verification completed by (initials): [Signature]

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: _____ Phone Number: _____
Initiated By: _____ Date: _____
Problem: _____
Resolution: _____

2. Person Contacted: _____
Initiated By: _____
Problem: _____
Resolution: _____

(3-17441)

KSN, Inc.

STK1955148

(Please use the back of this sheet for additional contacts)

CTC-10/09/2019-16:00:45

umber here



36461:10/14/2019

TEST DESCRIPTION - See Reverse side for Container, Preservative and Sampling information

Client: KSN, Inc.
Address: Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691
Phone: (916)403-5900 Fax: (916)403-5901
Contact Person: Neal Colwell
Project Name: **MCSP - Soil Analyses**
Purchase Order Number:
Quote Number: **ST 20190515-01**

Sampler(s): **C7B/SEW**
Sampling Fee: Pickup Fee: Time:
Compositor Setup Date: / / Time:
Lab Number: **STK 1955243** 3-17441

Sample Num	Location Description	Date Sampled	Time Sampled	Method of Sampling: Composite(C) Grab(G)	Type of Sample	**SEE REVERSE SIDE**	Bact Type: Other(O) System(SYS) Source(SR) Waste(W)	Bact Reason: Routine(ROUT) Repeat(RPT) Replace(RPL) Other(O) Special(SPL)	Soil-% Moisture, Saturation, NO3-N, PO4-P, K, pH, Salinity, Limestone, Lime, Reg., Ca, Mg, Na, SAR, Al, B, Cl, Zn, Mn, Fe, Cu, CEC, Exc. Ca, Exc. Mg, Exc. K, Exc. Na, Exc. H, NH3-N, % Org. Mat., Total N, Gyp, Reg, Calc, SO4	250ml(BPa) **Provide extract to Wet Chem for Nitrite Analysis**	Physical Char.-% Sand; Silt; Clay	250ml(BPa)	Wet Chemistry-NO2	Wet Chemistry-TKN	General Mineral	***Analyze from DI Extraction***	Wet Chemistry-TKN	***Analyze from DI Extraction***	TOC	***Analyze from DI Extraction***	Metals, Total-TTL-C-CAM 17 Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Tl, V, Zn	8oz(G), 8oz(G)	Laboratory Directive: ***Run Wet STLC on any metals that Exceed Limits*** ***If pH is 4.5 or Less Run Exchangeable and Soluble Aluminum***
1	LAA1			C	S									X	X	X	X	X	X	X	X	1,1	X
2	LAA2			C	S									X	X	X	X	X	X	X	X	1,1	X
3	LAA3			C	S									X	X	X	X	X	X	X	X	1,1	X
4	LAA4			C	S									X	X	X	X	X	X	X	X	1,1	X
5	LAA6	10/9/18	3:10	C	S									X	X	X	X	X	X	X	X	1,1	X
6	LAA7	10/9/18	12:55	C	S									X	X	X	X	X	X	X	X	1,1	X
7	AsD			C	S									X	X	X	X	X	X	X	X	1,1	X
8	Hn	10/9/18	10:08	C	S									X	X	X	X	X	X	X	X	1,1	X
9		10/9/18	4:50	C	S									X	X	X	X	X	X	X	X	1,1	X
10	Mn	10/9/18	6:10	C	S									X	X	X	X	X	X	X	X	1,1	X

Relinquished Date: 10/16/18 Time: 7:30 AM Received By: J. Yabari Date: 10/19/18 Time: 1335
 Relinquished Date: 10/10/19 Time: 1335 Received By: J. Yabari Date: 10/10/19 Time: 1700

Remarks: Multiple Chains
1041

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Fax: (530) 343-3807

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9415 W. Goshen Avenue
Visalia, CA 93291
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Fax: (559) 34-8438



Client: KSN, Inc. Address: Attn: Neal Colwell 1550 Harbor Blvd, Suite 212 West Sacramento, CA. 95691 Phone: (916)403-5900 Fax: (916)403-5901 Contact Person: Neal Colwell Project Name: MCSP - Soil Analyses Purchase Order Number: Quote Number: ST 20190515-01 Sampler(s) ZAB/SEW Sampling Fee: _____ Pickup Fee: _____ Time: _____ Compositor Setup Date: _____ Time: _____ Lab Number: STK 1955243 3-17441		36461:10/14/2019 TEST DESCRIPTION - See Reverse side for Container, Preservative and Sampling information	
Method of Sampling: Composite(C) Grab(G) Type of Sample: **SEE REVERSE SIDE** Soil-% Moisture,Saturation,NO3-N,PO4-P,K,pH,Salinity,Limestone,Time, Reg.,Ca,Mg,Na,SAR,Al,B,Ci,Zn,Mn,Fe,Cu,CeC,Exc. Ca,Exc. Mg,Exc. K,Exc. Na,Exc. H,NH3-N,% Org, Mat.,Total N, GypReqCalc,SO4 **Provide extract to Wet Chem for Nitrite Analysis** 250ml(BPa) Physical Char.-%Sand:Silt:Clay 250ml(BPa) Wet Chemistry-NO2 ***Run on Extraction from Ag Dept.*** Laboratory Directive: ***Hold this soil for DI Extraction upon Client Request *** ***To Run Analyses on DI Extraction for Gen Min, TKN, TOC*** 8oz(G) General Mineral ***Analyze from DI Extraction*** Wet Chemistry-TKN ***Analyze from DI Extraction*** TOC ***Analyze from DI Extraction*** Metals, Total-TTLC-CAM 17 Sb,As,Ba,Be,Cd,Cr,Co,Cu,Pb,Hg,Mo,NI,Se,Ag,Tl,V,Zn 8oz(G), 8oz(G) Laboratory Directive: ***Run Wet STLC on any metals that Exceed Limits*** ***If pH is 4.5 or Less Run Exchangeable and Soluble Aluminum***	Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature] Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature]		
Method of Sampling: Composite(C) Grab(G) Type of Sample: **SEE REVERSE SIDE** Soil-% Moisture,Saturation,NO3-N,PO4-P,K,pH,Salinity,Limestone,Time, Reg.,Ca,Mg,Na,SAR,Al,B,Ci,Zn,Mn,Fe,Cu,CeC,Exc. Ca,Exc. Mg,Exc. K,Exc. Na,Exc. H,NH3-N,% Org, Mat.,Total N, GypReqCalc,SO4 **Provide extract to Wet Chem for Nitrite Analysis** 250ml(BPa) Physical Char.-%Sand:Silt:Clay 250ml(BPa) Wet Chemistry-NO2 ***Run on Extraction from Ag Dept.*** Laboratory Directive: ***Hold this soil for DI Extraction upon Client Request *** ***To Run Analyses on DI Extraction for Gen Min, TKN, TOC*** 8oz(G) General Mineral ***Analyze from DI Extraction*** Wet Chemistry-TKN ***Analyze from DI Extraction*** TOC ***Analyze from DI Extraction*** Metals, Total-TTLC-CAM 17 Sb,As,Ba,Be,Cd,Cr,Co,Cu,Pb,Hg,Mo,NI,Se,Ag,Tl,V,Zn 8oz(G), 8oz(G) Laboratory Directive: ***Run Wet STLC on any metals that Exceed Limits*** ***If pH is 4.5 or Less Run Exchangeable and Soluble Aluminum***	Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature] Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature]		
Method of Sampling: Composite(C) Grab(G) Type of Sample: **SEE REVERSE SIDE** Soil-% Moisture,Saturation,NO3-N,PO4-P,K,pH,Salinity,Limestone,Time, Reg.,Ca,Mg,Na,SAR,Al,B,Ci,Zn,Mn,Fe,Cu,CeC,Exc. Ca,Exc. Mg,Exc. K,Exc. Na,Exc. H,NH3-N,% Org, Mat.,Total N, GypReqCalc,SO4 **Provide extract to Wet Chem for Nitrite Analysis** 250ml(BPa) Physical Char.-%Sand:Silt:Clay 250ml(BPa) Wet Chemistry-NO2 ***Run on Extraction from Ag Dept.*** Laboratory Directive: ***Hold this soil for DI Extraction upon Client Request *** ***To Run Analyses on DI Extraction for Gen Min, TKN, TOC*** 8oz(G) General Mineral ***Analyze from DI Extraction*** Wet Chemistry-TKN ***Analyze from DI Extraction*** TOC ***Analyze from DI Extraction*** Metals, Total-TTLC-CAM 17 Sb,As,Ba,Be,Cd,Cr,Co,Cu,Pb,Hg,Mo,NI,Se,Ag,Tl,V,Zn 8oz(G), 8oz(G) Laboratory Directive: ***Run Wet STLC on any metals that Exceed Limits*** ***If pH is 4.5 or Less Run Exchangeable and Soluble Aluminum***	Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature] Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature]		
Method of Sampling: Composite(C) Grab(G) Type of Sample: **SEE REVERSE SIDE** Soil-% Moisture,Saturation,NO3-N,PO4-P,K,pH,Salinity,Limestone,Time, Reg.,Ca,Mg,Na,SAR,Al,B,Ci,Zn,Mn,Fe,Cu,CeC,Exc. Ca,Exc. Mg,Exc. K,Exc. Na,Exc. H,NH3-N,% Org, Mat.,Total N, GypReqCalc,SO4 **Provide extract to Wet Chem for Nitrite Analysis** 250ml(BPa) Physical Char.-%Sand:Silt:Clay 250ml(BPa) Wet Chemistry-NO2 ***Run on Extraction from Ag Dept.*** Laboratory Directive: ***Hold this soil for DI Extraction upon Client Request *** ***To Run Analyses on DI Extraction for Gen Min, TKN, TOC*** 8oz(G) General Mineral ***Analyze from DI Extraction*** Wet Chemistry-TKN ***Analyze from DI Extraction*** TOC ***Analyze from DI Extraction*** Metals, Total-TTLC-CAM 17 Sb,As,Ba,Be,Cd,Cr,Co,Cu,Pb,Hg,Mo,NI,Se,Ag,Tl,V,Zn 8oz(G), 8oz(G) Laboratory Directive: ***Run Wet STLC on any metals that Exceed Limits*** ***If pH is 4.5 or Less Run Exchangeable and Soluble Aluminum***	Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature] Relinquished Date: 10/19/19 Time: 1335 Received By: [Signature]		

Remarks: Multiple Chains
2002

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 Fax: (209) 942-0423

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 Fax: (530) 343-3807

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 Visalia, CA 93291
 Phone: (559) 734-9473
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Inter-Laboratory Condition Upon Receipt (Attach to COC) 1955243

Sample Receipt at: STK CC CH VI

1. Number of ice chests/packages received: 1 Shipping tracking # _____

2. Were samples received in a chilled condition? Temps: 5.2 / _____ / _____ / _____ / _____
Surface water SWTR bact samples: A sample that has a temperature upon receipt of >10° C, whether iced or not, should be flagged unless the time since sample collection has been less than two hours.

- 3. Do the number of bottles received agree with the COC? Yes No N/A
- 4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
- 5. VOAs checked for Headspace? Yes No N/A
- 6. Were sample custody seals intact? Yes No N/A
- 7. If required, was sample split for pH analysis? Yes No N/A
- 8. Were all analyses within holding times at time of receipt? Yes No
- 9. Verify sample date, time and sampler name Yes No

Sign and date the COC, place in a ziplock and put in the same ice chest as the samples.

Sample Receipt Review completed by (initials): [Signature]

Sample Receipt at SP:

1. Were samples received in a chilled condition? Temps: 2, 2, 5 / _____ / _____
Acceptable is above freezing to 6°C. If many packages are received at one time check for tests/H.T.'s/rushes/

2. Shipping tracking numbers:
54655 1138 11501 1118

- 3. Do the number of bottles received agree with the COC? Yes No N/A
- 4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
- 5. Were sample custody seals intact? Yes No N/A

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

- 1. Were all requested analyses understood and acceptable? Yes No
- 2. Did bottle labels correspond with the client's ID's? Yes No
- 3. Were all bottles requiring sample preservation properly preserved? Yes No N/A FGL
[Exception: Oil & Grease, VOA and CrVI verified in lab]
- 4. VOAs checked for Headspace? Yes No N/A
- 5. Have rush or project due dates been checked and accepted? Yes No N/A
- 6. Were all analyses within holding times at time of receipt? Yes No

Attach labels to the containers and include a copy of the COC for lab delivery.

Sample Receipt, Login and Verification completed by (initials): [Signature]

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted: _____ Phone Number: _____
Initiated By: _____ Date: _____
Problem: _____
Resolution: _____

2. Person Contacted: _____
Initiated By: _____
Problem: _____
Resolution: _____

(3-17441)
KSN, Inc.
STK1955243
IV-10/10/2019-16:11:10

(Please use the back of this sheet for additional contacts)

Number here

Appendix C

LABORATORY RESULTS

November 7, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955009-004

Customer ID : 3-17441

Sampled On : October 7, 2019-12:35

Sampled By : EAB/SEW/JW

Received On : October 8, 2019-14:00

Matrix : Soil

Description : LAA4

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Soil								
Moisture	5.8	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	45.0	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.87	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.66	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	2.2	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	2.33	0.1	meq/l	30.1%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	2.07	0.16	meq/l	26.7%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	3.19	0.087	meq/l	41.2%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.156	0.026	meq/L	2.0%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	0.76	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	0.556	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	4.1	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	3	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.1	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	0.6	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	15.1	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	27.6	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	2.3	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	27.2	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	15.1	0.1	meq/100g	55.5%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	11.0	0.16	meq/100g	40.4%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.425	0.026	meq/100g	1.6%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	0.640	0.087	meq/100g	2.4%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	7	1	ppm		4500NH3F	11/03/19:211555	4500NH3G	11/04/19:217272
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.35	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	ND	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-11-07



November 7, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955009-007

Customer ID : 3-17441

Sampled On : October 7, 2019-13:55

Sampled By : EAB/SEW/JW

Received On : October 8, 2019-14:00

Matrix : Soil

Description : AsD

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Soil								
Moisture	5.7	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	37.4	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.34	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.27	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	0.2	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	1.60	0.1	meq/l	52.8%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	1.05	0.16	meq/l	34.6%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	0.230	0.087	meq/l	7.6%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.153	0.026	meq/L	5.0%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	0.11	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	0.306	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	3.6	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	ND	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.08	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	0.7	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	38.7	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	23.7	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	3.8	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	16.7	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	10.8	0.1	meq/100g	64.7%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	5.38	0.16	meq/100g	32.2%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.471	0.026	meq/100g	2.8%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	ND	0.087	meq/100g	0.0%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	4	1	ppm		4500NH3F	11/03/19:211555	4500NH3G	11/04/19:217272
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.50	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.06	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-11-07



November 7, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955009-013

Customer ID : 3-17441

Sampled On : October 7, 2019-15:20

Sampled By : EAB/SEW/JW

Received On : October 8, 2019-14:00

Matrix : Soil

Description : RmD

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Soil								
Moisture	4.4	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	39.0	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.49	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.55	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	0.2	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	4.34	0.1	meq/l	63.7%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	1.94	0.16	meq/l	28.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	0.379	0.087	meq/l	5.6%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.153	0.026	meq/L	2.2%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	0.28	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	0.795	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	5.5	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	ND	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.25	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	1.1	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	19.4	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	43.1	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	1.9	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	12.0	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	9.2	0.1	meq/100g	76.7%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	2.61	0.16	meq/100g	21.8%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.200	0.026	meq/100g	1.7%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	ND	0.087	meq/100g	0.0%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	4	1	ppm		4500NH3F	11/03/19:211555	4500NH3G	11/04/19:217272
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	2.20	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.08	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-11-07



October 29, 2019

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Subject: Subcontract Analysis for FGL Lab No. STK1955009

Enclosed please find results for the following sample(s) which were received by FGL.

- Sub Contracted-Mercury

Please note that this analysis was performed by Babcock Laboratories, Inc. (ELAP Certified Laboratory)

Thank you for using FGL Environmental.

Sincerely,

Cindy Aguirre  Digitally signed by Cindy Aguirre
Title: Customer Service Rep
Date: 2019-10-29

Enclosure



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 1 of 7
Project Name: No Project
Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
Received on Ice (Y/N): Yes Temp: 3 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

<u>Lab Sample #</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Sampled</u>	<u>By</u>	<u>Date Submitted</u>	<u>By</u>
B9J2882-01	LAA4	Solid	10/7/19 12:35	EAB/SEW/JW	10/15/19 08:25	GSO
B9J2882-02	AsD	Solid	10/7/19 13:55	EAB/SEW/JW	10/15/19 08:25	GSO
B9J2882-03	RmD	Solid	10/7/19 15:20	EAB/SEW/JW	10/15/19 08:25	GSO



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 2 of 7
Project Name: No Project
Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2882-01

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
LAA4	Solid	10/07/19 12:35	10/15/19 8:25

<u>Analyte(s)</u>	<u>Result</u>	<u>RDL</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date</u>	<u>Analyst</u>	<u>Flag</u>
Metals and Metalloids; EPA SW846 Series							
Mercury	0.085	0.050	mg/kg	EPA 7471A	10/24/19 15:05	KSL	

mailing
P.O Box 432
Riverside, CA 92502-0432

location
6100 Quail Valley Court
Riverside, CA 92507-0704

P 951 653 3351
F 951 653 1662
www.babcocklabs.com

CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 3 of 7
Project Name: No Project
Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2882-02

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
AsD	Solid	10/07/19 13:55	10/15/19 8:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846 Series							
Mercury	0.12	0.050	mg/kg	EPA 7471A	10/24/19 15:07	KSL	

mailing
P.O Box 432
Riverside, CA 92502-0432

location
6100 Quail Valley Court
Riverside, CA 92507-0704

P 951 653 3351
F 951 653 1662
www.babcocklabs.com

CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 4 of 7
Project Name: No Project
Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2882-03

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
RmD	Solid	10/07/19 15:20	10/15/19 8:25

<u>Analyte(s)</u>	<u>Result</u>	<u>RDL</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date</u>	<u>Analyst</u>	<u>Flag</u>
Metals and Metalloids; EPA SW846 Series							
Mercury	0.080	0.050	mg/kg	EPA 7471A	10/24/19 15:09	KSL	

mailing
P.O Box 432
Riverside, CA 92502-0432

location
6100 Quail Valley Court
Riverside, CA 92507-0704

P 951 653 3351
F 951 653 1662
www.babcocklabs.com

CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
 Contact: Cindy Aguirre
 Address: 853 Corporation Street
 Santa Paula, CA 93060

Analytical Report: Page 5 of 7
 Project Name: No Project
 Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
 Received on Ice (Y/N): Yes Temp: 3 °C

Metals and Metalloids; EPA SW846 Series - Batch Quality Control

Analyte(s)	Result	RDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch 9J23117 - EPA 7471A										
Blank (9J23117-BLK1)				Prepared & Analyzed: 10/24/19						
Mercury	ND	0.050	mg/kg							
LCS (9J23117-BS1)				Prepared & Analyzed: 10/24/19						
Mercury	0.204	0.050	mg/kg	0.200		102	77-115			
Matrix Spike (9J23117-MS1)				Source: B9J2882-01		Prepared & Analyzed: 10/24/19				
Mercury	0.297	0.050	mg/kg	0.200	0.0849	106	22-150			
Matrix Spike Dup (9J23117-MSD1)				Source: B9J2882-01		Prepared & Analyzed: 10/24/19				
Mercury	0.304	0.050	mg/kg	0.200	0.0849	110	22-150	2.56	25	



BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 6 of 7
Project Name: No Project
Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
Received on Ice (Y/N): Yes Temp: 3 °C

Notes and Definitions

- ND: Analyte NOT DETECTED at or above the Method Detection Limit (**if MDL is reported**), otherwise at or above the Reportable Detection Limit (RDL)
- NR: Not Reported
- RDL: Reportable Detection Limit
- MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

Alexis Nicole Harold For Cindy A. Waddell

cc:

e-Standard_No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.

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CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
 Contact: Cindy Aguirre
 Address: 853 Corporation Street
 Santa Paula, CA 93060

Analytical Report: Page 7 of 7
 Project Name: No Project
 Project Number: STK1955009 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2882
 Received on Ice (Y/N): Yes Temp: 3 °C

**Subcontract to
 Babcock Laboratories, Inc.**

3 °C T60

On Ice YES NO

Samples Intact YES NO

Map Ref

Client: Fruit Growers Laboratory, Inc. Address: FGL Environmental, Inc. 853 Corporation St. Santa Paula, CA 93060-3005 Phone: Fax: Contact Person: Project Name: STK1955009 - (3-17441) Purchase Order Number: Sampler(s) EAB/SEW/JW Compositor Setup Date: ___/___/___ Time: ___/___/___ Lab Number:				Method of Sampling: Composite(C) Grab(G) Type of Sample: **SEE REVERSE SIDE** Potable(P) Non-Potable(NP) Ag Water(AgW) Bacti Type: Other(O) System(SYS) Source(SR) Waste(W) Bacti Reason: Routine(ROUT) Repeat(RPT) Replate(RPL) Other(O) Special(SPL) Sub Contracted-Mercury ***Run Wet STLC on any metals that Exceed Limits*** Run as is. Dry weight reporting is not needed 8oz(P)																	
Samp Num	Location Description	Date Sampled	Time Sampled	Method of Sampling	Type of Sample	Potable	Non-Potable	Ag Water	Bacti Type	Bacti Reason	Other	Special	Sub Contracted-Mercury								
4	LAA4	10/07/19	12:35	C	S								1								
7	AsD	10/07/19	13:55	C	S								1								
13	RmD	10/07/19	15:20	C	S								1								
														B9J2882 Rc'd: 10/15/2019 08:25 EVS Temp Gun Id :60							
Remarks: Debby Hagen spoke with Elizabeth B. @ KSN 10/10/19. Elizabeth B. said to run as is. No Dry Weight Reporting. srp 10/10/19																					
Relinquished				Date:	Time:	Relinquished				Date:	Time:	Relinquished				Date:	Time:				
Received By: <i>GSO</i>				Date: <i>10/14/19</i>	Time: <i>17:30</i>	Received By: <i>GSO</i>				Date: <i>10/15/19</i>	Time: <i>8:25</i>	Received By:				Date:	Time:				

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CA ELAP No. 2698
 EPA No. CA00102
 NELAP No. OR4035
 LACSD No. 10119

October 25, 2019

KSN, Inc.
 Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955009
 Customer : 3-17441

Laboratory Report

Introduction: This report package contains total of 9 pages divided into 3 sections:

Case Narrative (2 pages) : An overview of the work performed at FGL.
 Sample Results (3 pages) : Results for each sample submitted.
 Quality Control (4 pages) : Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
LAA4	10/07/2019	10/08/2019	STK1955009-004	S
AsD	10/07/2019	10/08/2019	STK1955009-007	S
RmD	10/07/2019	10/08/2019	STK1955009-013	S

Sampling and Receipt Information: All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples arrived on ice. All samples were prepared and analyzed within the method specified hold time. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Inorganic - Metals QC

3050	10/16/2019:211947 All preparation quality controls are within established criteria, except: The following note applies to Copper, Antimony, Barium, Nickel, Vanadium: 435 Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery. The following note applies to Arsenic: 430 Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.
6010B	10/18/2019:216428 All analysis quality controls are within established criteria. 10/21/2019:216460 All analysis quality controls are within established criteria.

October 25, 2019
KSN, Inc.

Lab ID : STK1955009
Customer : 3-17441

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:DMB

Approved By **Kelly A. Dunnahoo, B.S.**



Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2019-10-25



October 25, 2019

Lab ID : STK1955009-004
Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 7, 2019-12:35
Sampled By : EAB/SEW/JW
Received On : October 8, 2019-14:00
Matrix : Soil

Description : LAA4
Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	4*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	5.94	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	86.7	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	11.6	0.99*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	41.4	0.99*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	91.8	0.99*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	3.46	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.99*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	24.8	0.99*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	126	0.99*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	53.9	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955009-007

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 7, 2019-13:55

Sampled By : EAB/SEW/JW

Received On : October 8, 2019-14:00

Matrix : Soil

Description : AsD

Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	4.86	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	104	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	10.2	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	22.5	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	115	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	4.78	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	25.0	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.6*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	9.6*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	19*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	181	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	65.7	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955009-013

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 7, 2019-15:20

Sampled By : EAB/SEW/JW

Received On : October 8, 2019-14:00

Matrix : Soil

Description : RmD

Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	13.4	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	69.6	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	29.6	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	4.44	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	35.0	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	7.08	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	16.6	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	105	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	40.6	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

October 25, 2019
KSN, Inc.

Lab ID : STK1955009
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals Antimony	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<2	
			LCS	mg/kg	24.00	91.5 %	85-115	
			MS	mg/kg	22.01	27.8 %	75-125	435
			MSD	mg/kg	20.95	22.7 %	75-125	435
			MSRPD	mg/kg	34.92	1.4	≤2	
PDS	mg/kg	22.86	85.7 %	75-125				
Arsenic	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	95.4 %	85-115	
			MS	mg/kg	36.68	111 %	75-125	
			MSD	mg/kg	34.92	114 %	75-125	
			MSRPD	mg/kg	34.92	2.5 %	≤20	
PDS	mg/kg	38.11	136 %	75-125	430			
Barium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	94.9 %	85-115	
			MS	mg/kg	36.68	123 %	75-125	
			MSD	mg/kg	34.92	135 %	75-125	435
			MSRPD	mg/kg	34.92	1.9 %	≤20	
PDS	mg/kg	38.11	103 %	75-125				
Beryllium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	93.2 %	85-115	
			MS	mg/kg	36.68	113 %	75-125	
			MSD	mg/kg	34.92	115 %	75-125	
			MSRPD	mg/kg	34.92	2.9 %	≤20	
PDS	mg/kg	38.11	112 %	75-125				
Cadmium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	95.3 %	85-115	
			MS	mg/kg	36.68	108 %	75-125	
			MSD	mg/kg	34.92	110 %	75-125	
			MSRPD	mg/kg	34.92	3.0 %	≤20	
PDS	mg/kg	38.11	111 %	75-125				
Chromium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.0 %	85-115	
			MS	mg/kg	36.68	100 %	75-125	
			MSD	mg/kg	34.92	117 %	75-125	
			MSRPD	mg/kg	34.92	5.1 %	≤20	
PDS	mg/kg	38.11	89.0 %	75-125				
Cobalt	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.5 %	85-115	
			MS	mg/kg	36.68	97.5 %	75-125	
			MSD	mg/kg	34.92	100 %	75-125	
			MSRPD	mg/kg	34.92	2.3 %	≤20	
PDS	mg/kg	38.11	100 %	75-125				
Copper	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.6 %	85-115	
			MS	mg/kg	36.68	127 %	75-125	435
			MSD	mg/kg	34.92	133 %	75-125	435
			MSRPD	mg/kg	34.92	0.5 %	≤20	
PDS	mg/kg	38.11	122 %	75-125				
Lead	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	94.9 %	85-115	
			MS	mg/kg	36.68	106 %	75-125	
			MSD	mg/kg	34.92	112 %	75-125	
			MSRPD	mg/kg	34.92	0.4 %	≤20	
PDS	mg/kg	38.11	108 %	75-125				
Molybdenum	3050	10/16/19:211947JZA	Blank	mg/kg		ND	<0.5	

October 25, 2019
KSN, Inc.

Lab ID : STK1955009
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Molybdenum	3050	10/16/19:211947JZA (STK1955148-001)	LCS	mg/kg	24.00	92.9 %	85-115	
			MS	mg/kg	22.01	83.6 %	75-125	
			MSD	mg/kg	20.95	84.8 %	75-125	
			MSRPD	mg/kg	34.92	3.4%	≤20	
			PDS	mg/kg	22.86	91.6 %	75-125	
Nickel	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.2 %	85-115	435
			MS	mg/kg	36.68	112 %	75-125	
			MSD	mg/kg	34.92	126 %	75-125	
			MSRPD	mg/kg	34.92	5.7%	≤20	
PDS	mg/kg	38.11	111 %	75-125				
Selenium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	93.5 %	85-115	
			MS	mg/kg	36.68	86.3 %	75-125	
			MSD	mg/kg	34.92	80.3 %	75-125	
			MSRPD	mg/kg	34.92	16.1%	≤20	
PDS	mg/kg	38.11	112 %	75-125				
Silver	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.9 %	85-115	
			MS	mg/kg	36.68	110 %	75-125	
			MSD	mg/kg	34.92	111 %	75-125	
			MSRPD	mg/kg	34.92	3.7%	≤20	
PDS	mg/kg	38.11	109 %	75-125				
Thallium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<10	
			LCS	mg/kg	40.00	93.1 %	85-115	
			MS	mg/kg	36.68	112 %	75-125	
			MSD	mg/kg	34.92	115 %	75-125	
			MSRPD	mg/kg	34.92	2.3%	≤20	
PDS	mg/kg	38.11	116 %	75-125				
Vanadium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.7 %	85-115	435
			MS	mg/kg	36.68	119 %	75-125	
			MSD	mg/kg	34.92	144 %	75-125	
			MSRPD	mg/kg	34.92	5.1%	≤20	
PDS	mg/kg	38.11	94.7 %	75-125				
Zinc	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	93.8 %	85-115	
			MS	mg/kg	36.68	111 %	75-125	
			MSD	mg/kg	34.92	125 %	75-125	
			MSRPD	mg/kg	34.92	4.7%	≤20	
PDS	mg/kg	38.11	114 %	75-125				
Antimony	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		0.0037	0.01	
			CCV	ppm	1.000	103 %	90-110	
			CCB	ppm		0.001	0.01	
Arsenic	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		-0.0192	0.02	
			CCV	ppm	1.000	99.3 %	90-110	
			CCB	ppm		0.0010	0.02	
Barium	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		0.00133	0.005	
			CCV	ppm	1.000	102 %	90-110	
			CCB	ppm		0.00093	0.005	
Beryllium	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	

October 25, 2019
KSN, Inc.

Lab ID : STK1955009
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note	
Metals									
Beryllium	6010B	10/18/19:216428AC	CCB	ppm	1.000	0.0001	0.005		
			CCV	ppm		103 %			90-110
			CCB	ppm		0.00019			0.005
Cadmium	6010B	10/18/19:216428AC	CCV	ppm	1.000	102 %	90-110		
			CCB	ppm	1.000	-0.00024	0.005		
			CCV	ppm		106 %	90-110		
			CCB	ppm	-0.00057	0.005			
Chromium	6010B	10/18/19:216428AC	CCV	ppm	1.000	100 %	90-110		
			CCB	ppm	1.000	-0.0003	0.01		
			CCV	ppm		103 %	90-110		
			CCB	ppm	-0.00007	0.01			
Cobalt	6010B	10/18/19:216428AC	CCV	ppm	1.000	98.9 %	90-110		
			CCB	ppm	1.000	-0.0035	0.01		
			CCV	ppm		101 %	90-110		
			CCB	ppm	0.0011	0.01			
Copper	6010B	10/18/19:216428AC	CCV	ppm	1.000	98.6 %	90-110		
			CCB	ppm	1.000	0.00001	0.01		
			CCV	ppm		99.3 %	90-110		
			CCB	ppm	0.0005	0.01			
Lead	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110		
			CCB	ppm	1.000	-0.0012	0.01		
			CCV	ppm		105 %	90-110		
			CCB	ppm	-0.0023	0.01			
Molybdenum	6010B	10/18/19:216428AC	CCV	ppm	1.000	97.4 %	90-110		
			CCB	ppm	1.000	-0.00001	0.01		
			CCV	ppm		99.4 %	90-110		
			CCB	ppm	-0.0003	0.01			
Nickel	6010B	10/18/19:216428AC	CCV	ppm	1.000	100 %	90-110		
			CCB	ppm	1.000	0.00004	0.01		
			CCV	ppm		104 %	90-110		
			CCB	ppm	-0.0006	0.01			
Selenium	6010B	10/21/19:216460AC	CCV	ppm	1.000	103 %	90-110		
			CCB	ppm	1.000	0.0077	0.02		
			CCV	ppm		98.5 %	90-110		
			CCB	ppm	0.0089	0.02			
			CCV	ppm	1.000	101 %	90-110		
CCB	ppm	0.0189	0.02						
Silver	6010B	10/21/19:216460AC	CCV	ppm	1.000	103 %	90-110		
			CCB	ppm	1.000	0.0001	0.01		
			CCV	ppm		104 %	90-110		
			CCB	ppm	-0.00004	0.01			
			CCV	ppm	1.000	103 %	90-110		
CCB	ppm	-0.00005	0.01						
Thallium	6010B	10/21/19:216460AC	CCV	ppm	1.000	97.4 %	90-110		
			CCB	ppm	1.000	0.0024	0.01		
			CCV	ppm		99.3 %	90-110		
			CCB	ppm	-0.00001	0.01			
			CCV	ppm	1.000	97.5 %	90-110		
			CCB	ppm	0.0007	0.01			
Vanadium	6010B	10/18/19:216428AC	CCV	ppm	1.000	99.2 %	90-110		
			CCB	ppm	1.000	-0.0001	0.01		
			CCV	ppm		101 %	90-110		
			CCB	ppm	-0.0002	0.01			
Zinc	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110		

October 25, 2019
 KSN, Inc.

Lab ID : STK1955009
 Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Zinc	6010B	10/18/19:216428AC	CCB CCV CCB	ppm ppm ppm	1.000	-0.0003 106 % -.000004	0.02 90-110 0.02	
Definition								
PDS	: PDS failed, matrix - Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.							
CCV	: Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.							
CCB	: Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.							
Blank	: Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.							
LCS	: Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.							
MS	: Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.							
MSD	: Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.							
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.							
ND	: Non-detect - Result was below the DQO listed for the analyte.							
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.							
Explanation								
430	: Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.							
435	: Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.							

October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955148-001

Customer ID : 3-17441

Sampled On : October 8, 2019-09:20

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : LAA1

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	55.8	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	18.0	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	26.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	5.1	0.1	%		SA1:7-2	10/14/19:211767	SA1:7-2	10/15/19:216137
Saturation	31.1	0.1	%		ASA10.2	10/11/19:211769	SA1:7-2	10/11/19:215952
pH	5.22	--	units		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Soil Salinity (ec)	0.65	0.01	dS/m		ASA10.2	10/11/19:211769	WS 51.20	10/14/19:216026
SAR	4.1	0.1	--		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Limestone	< 0.1	0.1	%		USDAH23A	10/11/19:211768	USDAH23A	10/15/19:216157
Calcium, Soluble	1.39	0.1	meq/l	22.0%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Magnesium, Soluble	0.617	0.16	meq/l	9.8%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Sodium, Soluble	4.07	0.087	meq/l	64.5%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Potassium, Soluble	0.236	0.026	meq/L	3.7%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Chloride	2.84	0.01	meq/l		ASA10.2	10/11/19:211769	WS 51.40	10/14/19:216044
Sulfate	1.25	0.1	meq/l		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Nitrate Nitrogen	3.6	0.9	ppm		SA2:9-3	10/11/19:211771	4500NO3F	10/14/19:216069
Phosphorus	10	1	ppm		USC:12.1	10/16/19:211996	6010-Ag	10/17/19:216311
Boron	0.45	0.02	ppm		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Zinc	1.3	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Manganese	13.1	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Iron	52.4	0.2	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Copper	1.4	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
CEC	8.10	0.01	meq/100g		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Exchangeable Calcium	2.9	0.1	meq/100g	35.8%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Magnesium	0.88	0.16	meq/100g	10.9%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Potassium	0.138	0.026	meq/100g	1.7%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Sodium	0.183	0.087	meq/100g	2.3%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Hydrogen	4.00	0.01	meq/100g	49.4%	ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Ammonia-Nitrogen	6	1	ppm		4500NH3F	10/10/19:211685	4500NH3G	10/14/19:216085
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
% Organic Matter	1.39	0.01	%		993.13	10/14/19:211858	993.13	10/15/19:216230
Total Nitrogen	ND	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955148-002

Customer ID : 3-17441

Sampled On : October 8, 2019-11:20

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : LAA2

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	22.1	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	39.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	38.7	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	10.5	0.1	%		SA1:7-2	10/14/19:211767	SA1:7-2	10/15/19:216137
Saturation	48.2	0.1	%		ASA10.2	10/11/19:211769	SA1:7-2	10/11/19:215952
pH	5.75	--	units		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Soil Salinity (ec)	0.49	0.01	dS/m		ASA10.2	10/11/19:211769	WS 51.20	10/14/19:216026
SAR	2.6	0.1	--		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Limestone	< 0.1	0.1	%		USDAH23A	10/11/19:211768	USDAH23A	10/15/19:216157
Calcium, Soluble	1.40	0.1	meq/l	27.8%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Magnesium, Soluble	0.788	0.16	meq/l	15.7%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Sodium, Soluble	2.73	0.087	meq/l	54.2%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Potassium, Soluble	0.117	0.026	meq/L	2.3%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Chloride	1.34	0.01	meq/l		ASA10.2	10/11/19:211769	WS 51.40	10/14/19:216044
Sulfate	0.974	0.1	meq/l		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Nitrate Nitrogen	5.6	0.9	ppm		SA2:9-3	10/11/19:211771	4500NO3F	10/14/19:216069
Phosphorus	15	1	ppm		USC:12.1	10/16/19:211996	6010-Ag	10/17/19:216311
Boron	0.27	0.02	ppm		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Zinc	2.8	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Manganese	23.4	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Iron	71.9	0.2	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Copper	3.0	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
CEC	16.4	0.01	meq/100g		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Exchangeable Calcium	8.7	0.1	meq/100g	53.0%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Magnesium	3.76	0.16	meq/100g	22.9%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Potassium	0.252	0.026	meq/100g	1.5%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Sodium	0.339	0.087	meq/100g	2.1%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Hydrogen	3.30	0.01	meq/100g	20.1%	ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Ammonia-Nitrogen	6	1	ppm		4500NH3F	10/10/19:211685	4500NH3G	10/14/19:216085
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
% Organic Matter	1.99	0.01	%		993.13	10/14/19:211858	993.13	10/15/19:216230
Total Nitrogen	0.07	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955148-003

Customer ID : 3-17441

Sampled On : October 8, 2019-14:40

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : LAA3

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	29.8	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	36.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	33.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	7.9	0.1	%		SA1:7-2	10/14/19:211767	SA1:7-2	10/15/19:216137
Saturation	44.0	0.1	%		ASA10.2	10/11/19:211769	SA1:7-2	10/11/19:215952
pH	6.70	--	units		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Soil Salinity (ec)	1.12	0.01	dS/m		ASA10.2	10/11/19:211769	WS 51.20	10/14/19:216026
SAR	2.6	0.1	--		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Limestone	< 0.1	0.1	%		USDAH23A	10/11/19:211768	USDAH23A	10/15/19:216157
Calcium, Soluble	4.36	0.1	meq/l	34.0%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Magnesium, Soluble	3.13	0.16	meq/l	24.4%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Sodium, Soluble	5.05	0.087	meq/l	39.4%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Potassium, Soluble	0.283	0.026	meq/L	2.2%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Chloride	2.06	0.01	meq/l		ASA10.2	10/11/19:211769	WS 51.40	10/14/19:216044
Sulfate	0.926	0.1	meq/l		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Nitrate Nitrogen	8.2	0.9	ppm		SA2:9-3	10/11/19:211771	4500NO3F	10/14/19:216069
Phosphorus	13	2	ppm		USC:12.0	10/11/19:211770		10/11/19:215985
Boron	0.12	0.02	ppm		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Zinc	2.7	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Manganese	33.8	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Iron	46.9	0.2	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Copper	4.6	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
CEC	21.1	0.01	meq/100g		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Exchangeable Calcium	13.5	0.1	meq/100g	64.0%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Magnesium	6.70	0.16	meq/100g	31.8%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Potassium	0.466	0.026	meq/100g	2.2%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Sodium	0.477	0.087	meq/100g	2.3%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Ammonia-Nitrogen	3	1	ppm		4500NH3F	10/10/19:211685	4500NH3G	10/14/19:216085
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
% Organic Matter	1.94	0.01	%		993.13	10/14/19:211858	993.13	10/15/19:216230
Total Nitrogen	0.08	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955148-012

Customer ID : 3-17441

Sampled On : October 8, 2019-15:45

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : RbE2

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	54.5	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	20.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	24.9	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	5.5	0.1	%		SA1:7-2	10/14/19:211767	SA1:7-2	10/15/19:216137
Saturation	41.6	0.1	%		ASA10.2	10/11/19:211769	SA1:7-2	10/11/19:215952
pH	5.77	--	units		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Soil Salinity (ec)	0.48	0.01	dS/m		ASA10.2	10/11/19:211769	WS 51.20	10/14/19:216026
SAR	0.3	0.1	--		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Limestone	< 0.1	0.1	%		USDAH23A	10/11/19:211768	USDAH23A	10/15/19:216157
Calcium, Soluble	2.83	0.1	meq/l	57.8%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Magnesium, Soluble	1.06	0.16	meq/l	21.6%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Sodium, Soluble	0.394	0.087	meq/l	8.0%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Potassium, Soluble	0.614	0.026	meq/L	12.5%	ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Chloride	0.72	0.01	meq/l		ASA10.2	10/11/19:211769	WS 51.40	10/14/19:216044
Sulfate	0.735	0.1	meq/l		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Nitrate Nitrogen	8.1	0.9	ppm		SA2:9-3	10/11/19:211771	4500NO3F	10/14/19:216069
Phosphorus	9	1	ppm		USC:12.1	10/16/19:211996	6010-Ag	10/17/19:216311
Boron	0.61	0.02	ppm		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
Zinc	1.0	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Manganese	26.0	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Iron	24.7	0.2	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
Copper	1.6	0.1	ppm		SA2:19-3	10/11/19:211772	6010-Ag	10/14/19:216053
CEC	8.65	0.01	meq/100g		ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Exchangeable Calcium	4.2	0.1	meq/100g	48.6%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Magnesium	0.78	0.16	meq/100g	9.0%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Potassium	0.166	0.026	meq/100g	1.9%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Sodium	ND	0.087	meq/100g	0.0%	SA2:9-3	10/11/19:211771	6010-Ag	10/11/19:216023
Exchangeable Hydrogen	3.50	0.01	meq/100g	40.5%	ASA10.2	10/11/19:211769	SA2:12.2	10/11/19:215977
Ammonia-Nitrogen	2	1	ppm		4500NH3F	10/10/19:211685	4500NH3G	10/14/19:216085
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/11/19:211769	6010-Ag	10/15/19:216127
% Organic Matter	2.25	0.01	%		993.13	10/14/19:211858	993.13	10/15/19:216230
Total Nitrogen	0.09	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 29, 2019

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Subject: Subcontract Analysis for FGL Lab No. STK1955148

Enclosed please find results for the following sample(s) which were received by FGL.

- Sub Contracted-Mercury

Please note that this analysis was performed by Babcock Laboratories, Inc. (ELAP Certified Laboratory)

Thank you for using FGL Environmental.

Sincerely,

Cindy Aguirre  Digitally signed by Cindy Aguirre
Title: Customer Service Rep
Date: 2019-10-29

Enclosure



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 1 of 8
Project Name: No Project
Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
Received on Ice (Y/N): Yes Temp: 3 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

apml le rdet ifd- pifot

<u>Lab Sample #</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Sampled</u>	<u>By</u>	<u>Date Submitted</u>	<u>By</u>
B9J7884D1	LAA1	Solid	10/8/19 9:70	Elisabeth	10/15/19 08:75	GS-
B9J7884D7	LAA7	Solid	10/8/19 11:70	Elisabeth	10/15/19 08:75	GS-
B9J7884D3	LAA3	Solid	10/8/19 1K:K0	Elisabeth	10/15/19 08:75	GS-
B9J7884DK	RbE7	Solid	10/8/19 15:K5	Elisabeth	10/15/19 08:75	GS-



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 7 of 8
Project Name: No Project
Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J288S01R

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
LAA1	Solid	10/08/19 09:70	10/15/19 8:75

<u>yt pl(ie)AD</u>	<u>seAuli</u>	<u>s LF</u>	<u>3 t fiA h eiUod</u>	<u>yt pl(AfALpie</u>	<u>yt pl(Ai</u>	<u>gIpV</u>
Metals and Metalloids/EPA S; 8K6 Series						
Mercury	0.085	0.050	mg/kg EPA 4K41A	10/7K/19 16:11	TSL	



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 3 of 8
Project Name: No Project
Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J288S012

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
LAA7	Solid	10/08/19 11:70	10/15/19 8:75

<u>yt pl(ie)AD</u>	<u>seAuli</u>	<u>sLF</u>	<u>3t fiA h eiUod</u>	<u>yt pl(A)AL pie</u>	<u>yt pl(Ai</u>	<u>glpM</u>
Metals and Metalloids/EPA S; 8K6 Series						
Mercury	ND	0.050	mg/kg EPA 4K41A	10/7K/19 16:13	TSL	

mailing
P.O Box 432
Riverside, CA 92502-0432

location
6100 Quail Valley Court
Riverside, CA 92507-0704

P 951 653 3351
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www.babcocklabs.com

CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page K of 8
Project Name: No Project
Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J288S01;

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
LAA3	Solid	10/08/19 1K:K0	10/15/19 8:75

<u>yt pl(ie)AD</u>	<u>seAuli</u>	<u>sLF</u>	<u>3t fiA h eiUod</u>	<u>yt pl(A)AL pie</u>	<u>yt pl(Ai</u>	<u>glpM</u>
Metals and Metalloids/EPA S; 8K6 Series Mercury	ND	0.050	mg/kg EPA 4K41A	10/7K/19 16:15	TSL	



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 5 of 8
Project Name: No Project
Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J288S01E

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
RbE7	Solid	10/08/19 15:K5	10/15/19 8:75

<u>yt pl(ie)AD</u>	<u>seAuli</u>	<u>sLF</u>	<u>3t fiA h eiUod</u>	<u>yt pl(A)ALpie</u>	<u>yt pl(Ai</u>	<u>glpM</u>
Metals and Metalloids/EPA S; 8K6 Series						
Mercury	0.094	0.050	mg/kg EPA 4K41A	10/7K/19 16:14	TSL	



BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
 Contact: Cindy Aguirre
 Address: 853 Corporation Street
 Santa Paula, CA 93060

Analytical Report: Page 6 of 8
 Project Name: No Project
 Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
 Received on Ice (Y/N): Yes Temp: 3 °C

h eiplApt d h eipllofdAP46y aW8EQaerfeA0Bpi- U Cuplfi(7 ot irol

Analyte(s)	Result	RDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Bpi- U9J2; RR8 046y SESRy										
Blpt k)9J2; RR80BFKRD										
Prepared & Analyzed: 10/7K/19										
Mercury	ND	0.050	mg/kg							
F7 a)9J2; RR80BaRD										
Prepared & Analyzed: 10/7K/19										
Mercury	0.199	0.050	mg/kg	0.700		99.K	44215			
h pirfx al fke)9J2; RR80h aRD										
a our- e: B9J288S01R Prepared & Analyzed: 10/7K/19										
Mercury	0.749	0.050	mg/kg	0.700	0.08K8	94.7	772150			
h pirfx al fke Lul)9J2; RR80h aLRD										
a our- e: B9J288S01R Prepared & Analyzed: 10/7K/19										
Mercury	0.315	0.050	mg/kg	0.700	0.08K8	115	772150	17.1	75	



BABCOCK Laboratories, Inc.
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Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 4 of 8
Project Name: No Project
Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ctZ019

Work Order Number: B9J288S
Received on Ice (Y/N): Yes Temp: 3 °C

NoieApt d Ledt fifot A

- ND: Analyte N- ODECOED at or above the Method Detection Limit (MDL) or above the Reportable Detection Limit (RDL) otherwise at or above the Reportable Detection Limit (RDL)
- NR: Not Reported
- RDL: Reportable Detection Limit
- MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

yl l rovp l

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

ylexfANf- ole Hprold gor 7 ft d(y . Wpddell

cc:

e2Standard_No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.

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EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.
The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
 Contact: Cindy Aguirre
 Address: 853 Corporation Street
 Santa Paula, CA 93060

Analytical Report: Page 8 of 8
 Project Name: No Project
 Project Number: SOT19551K8 2(3214KK1)

Report Date: 792 ct27019

Work Order Number: B9J288S
 Received on Ice (Y/N): Yes Temp: 3 °C

**Subcontract to
 Babcock Laboratories, Inc.**

3 °C T60

On Ice YES NO

Samples Intact YES NO Map Ref.

Client: Fruit Growers Laboratory, Inc. Address: FGL Environmental, Inc. 853 Corporation St. Santa Paula, CA 93060-3005 Phone: _____ Fax: _____ Contact Person: Project Name: STK1955148 - (3-17441) Purchase Order Number: _____ Sampler(s) Elisabeth Compositor Setup Date: ___/___/___ Time: ___/___/___ Lab Number: _____				Method of Sampling: Composite(C) Grab(G) Type of Sample **SEE REVERSE SIDE** Potable(P) Non-Potable(NP) Ag Water(AgW) Bacti Type: Other(O) System(SYS) Source(SR) Waste(W) Bacti Reason: Routine(ROUT) Repeat(RPT) Replace(RPL) Other(O) Special(SPL) Sub Contracted-Mercury ***Run Wet STLC on any metals that Exceed Limits*** Run as is. Dry weight reporting is not needed 8oz(P)														
Samp Num	Location Description	Date Sampled	Time Sampled															
1	LAA1	10/08/19	09:20	C	S													
2	LAA2	10/08/19	11:20	C	S													
3	LAA3	10/08/19	14:40	C	S													
12	RbE2	10/08/19	15:45	C	S													
Remarks:				Relinquished: Date: 10/14/19 Time: 10:30 Received By: GSO Date: _____ Time: _____		Relinquished: GSO Date: 10/15/19 Time: 8:25 Received By: WCCP Legum Date: 10/15/19 Time: 8:25		Relinquished: _____ Date: _____ Time: _____ Received By: _____ Date: _____ Time: _____										

B9J2887
 Rc'd: 10/15/2019 08:25
 EVS Temp Gun Id :60

October 25, 2019

KSN, Inc.
 Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955148
 Customer : 3-17441

Laboratory Report

Introduction: This report package contains total of 11 pages divided into 3 sections:

Case Narrative (2 pages) : An overview of the work performed at FGL.
 Sample Results (4 pages) : Results for each sample submitted.
 Quality Control (5 pages) : Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
LAA1	10/08/2019	10/09/2019	STK1955148-001	S
LAA2	10/08/2019	10/09/2019	STK1955148-002	S
LAA3	10/08/2019	10/09/2019	STK1955148-003	S
RbE2	10/08/2019	10/09/2019	STK1955148-012	S

Sampling and Receipt Information: All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples arrived on ice. All samples were prepared and analyzed within the method specified hold time. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Inorganic - Metals QC

3050	10/16/2019:211947 All preparation quality controls are within established criteria, except: The following note applies to Copper, Antimony, Barium, Nickel, Vanadium: 435 Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery. The following note applies to Arsenic: 430 Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.
6010B	10/18/2019:216428 All analysis quality controls are within established criteria.
	10/21/2019:216460 All analysis quality controls are within established criteria.

October 25, 2019
KSN, Inc.

Lab ID : STK1955148
Customer : 3-17441

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:DMB

Approved By **Kelly A. Dunnahoo, B.S.**



Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2019-10-25



October 25, 2019

Lab ID : STK1955148-001

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell

1550 Harbor Blvd, Suite 212

West Sacramento, CA. 95691

Sampled On : October 8, 2019-09:20

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : LAA1

Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.7*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	6.42	1.8*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	55.4	0.55*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.55*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.55*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	41.1	0.92*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	ND	4.6*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Copper	18.9	0.92*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	8.72	1.8*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.92*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	11.0	0.92*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.2*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.6*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.2*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	82.7	0.92*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	19.2	1.8*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

October 25, 2019

Lab ID : STK1955148-002
Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 8, 2019-11:20
Sampled By : Elisabeth
Received On : October 9, 2019-13:30
Matrix : Soil

Description : LAA2
Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	16.7	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	64.8	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	7.16	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	9.96	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	44.5	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	5.81	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	8.17	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	104	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	55.1	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955148-003

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 8, 2019-14:40

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : LAA3

Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	23.5	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	97.3	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	2.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Cadmium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	13.8	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	20.9	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	101	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	3.69	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	23.2	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	19*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	182	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	68.0	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955148-012

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 8, 2019-15:45

Sampled By : Elisabeth

Received On : October 9, 2019-13:30

Matrix : Soil

Description : RbE2

Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.8*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	24.3	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	103	0.56*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.56*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.56*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	33.0	0.94*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	1.28	0.94*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	31.4	0.94*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	18.6	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.94*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	8.57	0.94*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.4*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	9.4*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	19*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	142	0.94*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	30.1	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

October 25, 2019
KSN, Inc.

Lab ID : STK1955148
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Antimony	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<2	
			LCS	mg/kg	24.00	91.5 %	85-115	
			MS	mg/kg	22.01	27.8 %	75-125	435
			MSD	mg/kg	20.95	22.7 %	75-125	435
			MSRPD	mg/kg	34.92	1.4	≤2	
PDS	mg/kg	22.86	85.7 %	75-125				
Arsenic	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	95.4 %	85-115	
			MS	mg/kg	36.68	111 %	75-125	
			MSD	mg/kg	34.92	114 %	75-125	
			MSRPD	mg/kg	34.92	2.5%	≤20	
PDS	mg/kg	38.11	136 %	75-125	430			
Barium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	94.9 %	85-115	
			MS	mg/kg	36.68	123 %	75-125	
			MSD	mg/kg	34.92	135 %	75-125	435
			MSRPD	mg/kg	34.92	1.9%	≤20	
PDS	mg/kg	38.11	103 %	75-125				
Beryllium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	93.2 %	85-115	
			MS	mg/kg	36.68	113 %	75-125	
			MSD	mg/kg	34.92	115 %	75-125	
			MSRPD	mg/kg	34.92	2.9%	≤20	
PDS	mg/kg	38.11	112 %	75-125				
Cadmium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	95.3 %	85-115	
			MS	mg/kg	36.68	108 %	75-125	
			MSD	mg/kg	34.92	110 %	75-125	
			MSRPD	mg/kg	34.92	3.0%	≤20	
PDS	mg/kg	38.11	111 %	75-125				
Chromium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.0 %	85-115	
			MS	mg/kg	36.68	100 %	75-125	
			MSD	mg/kg	34.92	117 %	75-125	
			MSRPD	mg/kg	34.92	5.1%	≤20	
PDS	mg/kg	38.11	89.0 %	75-125				
Cobalt	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.5 %	85-115	
			MS	mg/kg	36.68	97.5 %	75-125	
			MSD	mg/kg	34.92	100 %	75-125	
			MSRPD	mg/kg	34.92	2.3%	≤20	
PDS	mg/kg	38.11	100 %	75-125				
Copper	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.6 %	85-115	
			MS	mg/kg	36.68	127 %	75-125	435
			MSD	mg/kg	34.92	133 %	75-125	435
			MSRPD	mg/kg	34.92	0.5%	≤20	
PDS	mg/kg	38.11	122 %	75-125				
Lead	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	94.9 %	85-115	
			MS	mg/kg	36.68	106 %	75-125	
			MSD	mg/kg	34.92	112 %	75-125	
			MSRPD	mg/kg	34.92	0.4%	≤20	
PDS	mg/kg	38.11	108 %	75-125				
Molybdenum	3050	10/16/19:211947JZA	Blank	mg/kg		ND	<0.5	

October 25, 2019
KSN, Inc.

Lab ID : STK1955148
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Molybdenum	3050	10/16/19:211947JZA (STK1955148-001)	LCS	mg/kg	24.00	92.9 %	85-115	
			MS	mg/kg	22.01	83.6 %	75-125	
			MSD	mg/kg	20.95	84.8 %	75-125	
			MSRPD	mg/kg	34.92	3.4%	≤20	
			PDS	mg/kg	22.86	91.6 %	75-125	
Nickel	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.2 %	85-115	435
			MS	mg/kg	36.68	112 %	75-125	
			MSD	mg/kg	34.92	126 %	75-125	
			MSRPD	mg/kg	34.92	5.7%	≤20	
PDS	mg/kg	38.11	111 %	75-125				
Selenium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	93.5 %	85-115	
			MS	mg/kg	36.68	86.3 %	75-125	
			MSD	mg/kg	34.92	80.3 %	75-125	
			MSRPD	mg/kg	34.92	16.1%	≤20	
PDS	mg/kg	38.11	112 %	75-125				
Silver	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.9 %	85-115	
			MS	mg/kg	36.68	110 %	75-125	
			MSD	mg/kg	34.92	111 %	75-125	
			MSRPD	mg/kg	34.92	3.7%	≤20	
PDS	mg/kg	38.11	109 %	75-125				
Thallium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<10	
			LCS	mg/kg	40.00	93.1 %	85-115	
			MS	mg/kg	36.68	112 %	75-125	
			MSD	mg/kg	34.92	115 %	75-125	
			MSRPD	mg/kg	34.92	2.3%	≤20	
PDS	mg/kg	38.11	116 %	75-125				
Vanadium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.7 %	85-115	435
			MS	mg/kg	36.68	119 %	75-125	
			MSD	mg/kg	34.92	144 %	75-125	
			MSRPD	mg/kg	34.92	5.1%	≤20	
PDS	mg/kg	38.11	94.7 %	75-125				
Zinc	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	93.8 %	85-115	
			MS	mg/kg	36.68	111 %	75-125	
			MSD	mg/kg	34.92	125 %	75-125	
			MSRPD	mg/kg	34.92	4.7%	≤20	
PDS	mg/kg	38.11	114 %	75-125				
Antimony	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		0.0037	0.01	
			CCV	ppm	1.000	103 %	90-110	
			CCB	ppm		0.001	0.01	
			CCV	ppm	1.000	102 %	90-110	
CCB	ppm		0.0003	0.01				
Arsenic	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		-0.0192	0.02	
			CCV	ppm	1.000	99.3 %	90-110	
			CCB	ppm		0.0010	0.02	
			CCV	ppm	1.000	100 %	90-110	
CCB	ppm		0.0040	0.02				
Barium	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	

October 25, 2019
KSN, Inc.

Lab ID : STK1955148
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note	
Metals Barium	6010B	10/18/19:216428AC	CCB	ppm	1.000	0.00133	0.005		
			CCV	ppm		102 %	90-110		
			CCB	ppm		0.00093	0.005		
			CCV	ppm		99.2 %	90-110		
			CCB	ppm		-0.00113	0.005		
Beryllium	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110		
			CCB	ppm	0.0001	0.005			
			CCV	ppm	1.000	103 %	90-110		
			CCB	ppm	0.00019	0.005			
			CCV	ppm	1.000	106 %	90-110		
	6010B	10/21/19:216460AC		CCB	ppm	1.000	0.00005	0.005	
				CCV	ppm	1.000	105 %	90-110	
				CCB	ppm	-0.00022	0.005		
				CCV	ppm	1.000	103 %	90-110	
				CCB	ppm	0.00015	0.005		
Cadmium	6010B	10/18/19:216428AC	CCV	ppm	1.000	102 %	90-110		
			CCB	ppm	-0.00024	0.005			
			CCV	ppm	1.000	106 %	90-110		
			CCB	ppm	-0.00057	0.005			
			CCV	ppm	1.000	102 %	90-110		
Chromium	6010B	10/18/19:216428AC	CCB	ppm	1.000	-0.0003	0.01		
			CCV	ppm	1.000	103 %	90-110		
			CCB	ppm	-0.00007	0.01			
			CCV	ppm	1.000	102 %	90-110		
			CCB	ppm	-0.0003	0.01			
Cobalt	6010B	10/18/19:216428AC	CCV	ppm	1.000	98.9 %	90-110		
			CCB	ppm	-0.0035	0.01			
			CCV	ppm	1.000	101 %	90-110		
			CCB	ppm	0.0011	0.01			
			CCV	ppm	1.000	103 %	90-110		
	6010B	10/21/19:216460AC		CCB	ppm	1.000	0.0003	0.01	
				CCV	ppm	1.000	103 %	90-110	
				CCB	ppm	0.00001	0.01		
				CCV	ppm	1.000	101 %	90-110	
				CCB	ppm	-0.0006	0.01		
Copper	6010B	10/18/19:216428AC	CCV	ppm	1.000	98.6 %	90-110		
			CCB	ppm	0.00001	0.01			
			CCV	ppm	1.000	99.3 %	90-110		
			CCB	ppm	0.0005	0.01			
			CCV	ppm	1.000	98.0 %	90-110		
Lead	6010B	10/18/19:216428AC	CCB	ppm	1.000	0.0003	0.01		
			CCV	ppm	1.000	101 %	90-110		
			CCB	ppm	-0.0012	0.01			
			CCV	ppm	1.000	105 %	90-110		
			CCB	ppm	-0.0023	0.01			
Molybdenum	6010B	10/18/19:216428AC	CCV	ppm	1.000	103 %	90-110		
			CCB	ppm	1.000	-0.0038	0.01		
			CCV	ppm	1.000	97.4 %	90-110		
			CCB	ppm	-0.00001	0.01			
			CCV	ppm	1.000	99.4 %	90-110		
Molybdenum	6010B	10/18/19:216428AC	CCB	ppm	1.000	-0.0003	0.01		
			CCV	ppm	1.000	102 %	90-110		
			CCB	ppm	1.000	102 %	90-110		

October 25, 2019
KSN, Inc.

Lab ID : STK1955148
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Molybdenum	6010B	10/18/19:216428AC	CCB	ppm		0.0003	0.01	
Nickel	6010B	10/18/19:216428AC	CCV	ppm	1.000	100 %	90-110	
			CCB	ppm		0.00004	0.01	
			CCV	ppm	1.000	104 %	90-110	
			CCB	ppm		-0.0006	0.01	
			CCV	ppm	1.000	104 %	90-110	
			CCB	ppm		-0.0004	0.01	
Selenium	6010B	10/21/19:216460AC	CCV	ppm	1.000	103 %	90-110	
			CCB	ppm		0.0077	0.02	
			CCV	ppm	1.000	98.5 %	90-110	
			CCB	ppm		0.0089	0.02	
			CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		0.0189	0.02	
Silver	6010B	10/21/19:216460AC	CCV	ppm	1.000	103 %	90-110	
			CCB	ppm		0.0001	0.01	
			CCV	ppm	1.000	104 %	90-110	
			CCB	ppm		-0.00004	0.01	
			CCV	ppm	1.000	103 %	90-110	
			CCB	ppm		-0.00005	0.01	
Thallium	6010B	10/21/19:216460AC	CCV	ppm	1.000	97.4 %	90-110	
			CCB	ppm		0.0024	0.01	
			CCV	ppm	1.000	99.3 %	90-110	
			CCB	ppm		-0.00001	0.01	
			CCV	ppm	1.000	97.5 %	90-110	
			CCB	ppm		0.0007	0.01	
Vanadium	6010B	10/18/19:216428AC	CCV	ppm	1.000	99.2 %	90-110	
			CCB	ppm		-0.0001	0.01	
			CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		-0.0002	0.01	
			CCV	ppm	1.000	105 %	90-110	
			CCB	ppm		-0.0007	0.01	
Zinc	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm		-0.0003	0.02	
			CCV	ppm	1.000	106 %	90-110	
			CCB	ppm		-0.00004	0.02	
			CCV	ppm	1.000	107 %	90-110	
			CCB	ppm		-0.0004	0.02	
Definition	<p>PDS : PDS failed, matrix - Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.</p> <p>CCV : Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.</p> <p>CCB : Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.</p> <p>Blank : Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.</p> <p>LCS : Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.</p> <p>MS : Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.</p> <p>MSD : Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.</p> <p>MSRPD : MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.</p> <p>ND : Non-detect - Result was below the DQO listed for the analyte.</p> <p>DQO : Data Quality Objective - This is the criteria against which the quality control data is compared.</p>							
Explanation	<p>430 : Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.</p>							

October 25, 2019
KSN, Inc.

Lab ID : STK1955148
Customer : 3-17441

Quality Control - Inorganic

Explanation

435 : Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.
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October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243-005

Customer ID : 3-17441

Sampled On : October 9, 2019-15:10

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : LAA6

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	39.5	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	32.9	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	27.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	6.5	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	38.3	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.03	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.99	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	3.3	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	3.04	0.1	meq/l	29.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	1.83	0.16	meq/l	17.8%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	5.19	0.087	meq/l	50.4%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.242	0.026	meq/L	2.3%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	3.65	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	1.73	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	2.9	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	11	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.20	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	1.7	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	26.0	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	94.6	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	2.6	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	11.2	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	7.1	0.1	meq/100g	63.4%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	3.32	0.16	meq/100g	29.6%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.364	0.026	meq/100g	3.3%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	0.454	0.087	meq/100g	4.1%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	4	1	ppm		4500NH3F	10/21/19:211773	4500NH3G	10/21/19:216503
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.90	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.08	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243-006

Customer ID : 3-17441

Sampled On : October 9, 2019-12:55

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : LAA7

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	48.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	29.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	22.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	5.8	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	38.3	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.60	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	1.15	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	2.5	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	5.14	0.1	meq/l	39.8%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	2.60	0.16	meq/l	20.1%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	4.85	0.087	meq/l	37.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.332	0.026	meq/L	2.6%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	2.94	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	1.55	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	2.5	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	21	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.14	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	2.7	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	21.6	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	82.6	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	3.5	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	9.75	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	7.0	0.1	meq/100g	71.8%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	2.18	0.16	meq/100g	22.4%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.314	0.026	meq/100g	3.2%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	0.253	0.087	meq/100g	2.6%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	4	1	ppm		4500NH3F	10/21/19:211773	4500NH3G	10/21/19:216503
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	2.12	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.1	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243-008

Customer ID : 3-17441

Sampled On : October 9, 2019-10:08

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : Hn

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	42.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	32.8	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	25.0	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	5.7	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	35.0	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.70	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.53	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	0.8	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	3.05	0.1	meq/l	48.3%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	1.95	0.16	meq/l	30.9%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	1.27	0.087	meq/l	20.1%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.0463	0.026	meq/L	0.7%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	0.36	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	1.45	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	1.5	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	2	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.12	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	1.6	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	15.1	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	49.5	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	4.0	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	12.9	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	8.8	0.1	meq/100g	68.2%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	3.81	0.16	meq/100g	29.5%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.130	0.026	meq/100g	1.0%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	0.160	0.087	meq/100g	1.2%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	3	1	ppm		4500NH3F	10/21/19:211773	4500NH3G	10/21/19:216503
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.44	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.08	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243-009

Customer ID : 3-17441

Sampled On : October 9, 2019-16:30

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : Ho

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	43.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	31.7	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	25.1	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	5.6	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	37.8	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.40	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.51	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	0.3	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	3.73	0.1	meq/l	58.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	1.95	0.16	meq/l	30.6%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	0.475	0.087	meq/l	7.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.220	0.026	meq/L	3.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	0.29	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	0.873	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	3.3	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	8	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.18	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	3.4	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	22.7	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	74.4	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	5.4	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	10.5	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	7.6	0.1	meq/100g	72.4%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	2.62	0.16	meq/100g	25.0%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.281	0.026	meq/100g	2.7%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	ND	0.087	meq/100g	0.0%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	4	1	ppm		4500NH3F	10/21/19:211773	4500NH3G	10/21/19:216503
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.73	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.09	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243-010

Customer ID : 3-17441

Sampled On : October 9, 2019-18:10

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : Mn

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	53.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	24.2	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	22.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	7.8	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	40.8	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.32	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	1.17	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	0.9	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	5.79	0.1	meq/l	43.0%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	5.43	0.16	meq/l	40.3%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	2.13	0.087	meq/l	15.8%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.124	0.026	meq/L	0.9%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	2.61	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	4.44	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	ND	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	3	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.18	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	0.8	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	15.1	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	91.9	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	3.9	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	13.5	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	8.3	0.1	meq/100g	61.5%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	4.94	0.16	meq/100g	36.6%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.162	0.026	meq/100g	1.2%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	0.147	0.087	meq/100g	1.1%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	3	1	ppm		4500NH3F	10/21/19:211773	4500NH3G	10/21/19:216503
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.68	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.06	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24



October 24, 2019

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243-011

Customer ID : 3-17441

Sampled On : October 9, 2019-20:45

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : RbD

Project : Mule Creek State Prison - Soil Analyses

Sample Results - Ag

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Physical Char.								
% Sand	40.7	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Silt	26.7	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
% Clay	32.6	0.5	%		CSSS47.3	10/16/19:211782	CSSS47.3	10/17/19:216303
Soil								
Moisture	4.6	0.1	%		SA1:7-2	10/17/19:211943	SA1:7-2	10/18/19:216378
Saturation	41.8	0.1	%		ASA10.2	10/16/19:211945	SA1:7-2	10/16/19:216220
pH	6.12	--	units		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Soil Salinity (ec)	0.44	0.01	dS/m		ASA10.2	10/16/19:211945	WS 51.20	10/17/19:216307
SAR	0.2	0.1	--		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Limestone	< 0.1	0.1	%		USDAH23A	10/16/19:211944	USDAH23A	10/17/19:216343
Calcium, Soluble	2.63	0.1	meq/l	51.2%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Magnesium, Soluble	1.94	0.16	meq/l	37.8%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Sodium, Soluble	0.331	0.087	meq/l	6.4%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Potassium, Soluble	0.233	0.026	meq/L	4.5%	ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Chloride	0.39	0.01	meq/l		ASA10.2	10/16/19:211945	WS 51.40	10/17/19:216177
Sulfate	0.727	0.1	meq/l		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Nitrate Nitrogen	5.6	0.9	ppm		SA2:9-3	10/16/19:211948	4500NO3F	10/17/19:216322
Phosphorus	ND	2	ppm		USC:12.0	10/16/19:211946		10/17/19:216379
Boron	0.10	0.02	ppm		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
Zinc	0.8	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Manganese	17.7	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Iron	61.1	0.2	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
Copper	3.2	0.1	ppm		SA2:19-3	10/16/19:211950	6010-Ag	10/17/19:216339
CEC	16.7	0.01	meq/100g		ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Exchangeable Calcium	10.4	0.1	meq/100g	62.3%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Magnesium	5.77	0.16	meq/100g	34.6%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Potassium	0.471	0.026	meq/100g	2.8%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Sodium	0.090	0.087	meq/100g	0.5%	SA2:9-3	10/16/19:211948	6010-Ag	10/17/19:216304
Exchangeable Hydrogen	ND	0.01	meq/100g	0.0%	ASA10.2	10/16/19:211945	SA2:12.2	10/17/19:216338
Ammonia-Nitrogen	5	1	ppm		4500NH3F	10/21/19:211773	4500NH3G	10/21/19:216503
Gypsum Requirement(C)	ND	0.5	Tons/AF		ASA10.2	10/16/19:211945	6010-Ag	10/17/19:216333
% Organic Matter	1.57	0.01	%		993.13	10/11/19:211794	993.13	10/17/19:216341
Total Nitrogen	0.06	0.05	%		993.13	10/11/19:211794	993.13	10/17/19:216341

ND=Non-Detected. PQL=Practical Quantitation Limit.

Reviewed and
Approved By

Scott Bucy



Digitally signed by Scott Bucy
 Title: Director of Agricultural Servi
 Date: 2019-10-24





October 29, 2019

KSN, Inc.
Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Subject: Subcontract Analysis for FGL Lab No. STK1955243

Enclosed please find results for the following sample(s) which were received by FGL.

- Sub Contracted-Mercury

Please note that this analysis was performed by Babcock Laboratories, Inc. (ELAP Certified Laboratory)

Thank you for using FGL Environmental.

Sincerely,

Cindy Aguirre  Digitally signed by Cindy Aguirre
Title: Customer Service Rep
Date: 2019-10-29

Enclosure



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 1 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

<u>Lab Sample #</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Date Sampled</u>	<u>By</u>	<u>Date Submitted</u>	<u>By</u>
B9J2886-01	LAA6	Solid	10/9/19 15:10	EAB/SEW	10/15/19 08:25	GSO
B9J2886-02	LAA7	Solid	10/9/19 12:55	EAB/SEW	10/15/19 08:25	GSO
B9J2886-03	Hn	Solid	10/9/19 10:08	EAB/SEW	10/15/19 08:25	GSO
B9J2886-04	Ho	Solid	10/9/19 16:30	EAB/SEW	10/15/19 08:25	GSO
B9J2886-05	Mn	Solid	10/9/19 18:10	EAB/SEW	10/15/19 08:25	GSO
B9J2886-06	RbD	Solid	10/9/19 20:45	EAB/SEW	10/15/19 08:25	GSO



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 2 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2886-01

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
LAA6	Solid	10/09/19 15:10	10/15/19 8:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846 Series							
Mercury	0.30	0.050	mg/kg	EPA 7471A	10/24/19 15:37	KSL	

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location
6100 Quail Valley Court
Riverside, CA 92507-0704

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CA ELAP No. 2698
EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 3 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2886-02

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
LAA7	Solid	10/09/19 12:55	10/15/19 8:25

<u>Analyte(s)</u>	<u>Result</u>	<u>RDL</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date</u>	<u>Analyst</u>	<u>Flag</u>
Metals and Metalloids; EPA SW846 Series							
Mercury	0.15	0.050	mg/kg	EPA 7471A	10/24/19 15:44	KSL	

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EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.

The Standard of Excellence for Over 100 Years

Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 4 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2886-03

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Hn	Solid	10/09/19 10:08	10/15/19 8:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846 Series							
Mercury	0.10	0.050	mg/kg	EPA 7471A	10/24/19 15:46	KSL	

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NELAP No. OR4035
LACSD No. 10119



BABCOCK Laboratories, Inc.

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Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 5 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2886-04

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Ho	Solid	10/09/19 16:30	10/15/19 8:25

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846 Series Mercury	0.24	0.050	mg/kg	EPA 7471A	10/24/19 15:48	KSL	



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Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 6 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2886-05

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
Mn	Solid	10/09/19 18:10	10/15/19 8:25

<u>Analyte(s)</u>	<u>Result</u>	<u>RDL</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date</u>	<u>Analyst</u>	<u>Flag</u>
Metals and Metalloids; EPA SW846 Series							
Mercury	0.30	0.050	mg/kg	EPA 7471A	10/24/19 15:50	KSL	

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NELAP No. OR4035
LACSD No. 10119



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Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 7 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Laboratory Reference Number

B9J2886-06

<u>Sample Description</u>	<u>Matrix</u>	<u>Sampled Date/Time</u>	<u>Received Date/Time</u>
RbD	Solid	10/09/19 20:45	10/15/19 8:25

<u>Analyte(s)</u>	<u>Result</u>	<u>RDL</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date</u>	<u>Analyst</u>	<u>Flag</u>
Metals and Metalloids; EPA SW846 Series Mercury	ND	0.050	mg/kg	EPA 7471A	10/24/19 15:53	KSL	

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BABCOCK Laboratories, Inc.
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Client Name: FGL Environmental, Inc.
 Contact: Cindy Aguirre
 Address: 853 Corporation Street
 Santa Paula, CA 93060

Analytical Report: Page 8 of 10
 Project Name: No Project
 Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
 Received on Ice (Y/N): Yes Temp: 3 °C

Metals and Metalloids; EPA SW846 Series - Batch Quality Control

Analyte(s)	Result	RDL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Flag
Batch 9J23117 - EPA 7471A										
Blank (9J23117-BLK1)				Prepared & Analyzed: 10/24/19						
Mercury	ND	0.050	mg/kg							
LCS (9J23117-BS1)				Prepared & Analyzed: 10/24/19						
Mercury	0.204	0.050	mg/kg	0.200		102	77-115			
Matrix Spike (9J23117-MS1)				Source: B9J2882-01		Prepared & Analyzed: 10/24/19				
Mercury	0.297	0.050	mg/kg	0.200	0.0849	106	22-150			
Matrix Spike Dup (9J23117-MSD1)				Source: B9J2882-01		Prepared & Analyzed: 10/24/19				
Mercury	0.304	0.050	mg/kg	0.200	0.0849	110	22-150	2.56	25	



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Client Name: FGL Environmental, Inc.
Contact: Cindy Aguirre
Address: 853 Corporation Street
Santa Paula, CA 93060

Analytical Report: Page 9 of 10
Project Name: No Project
Project Number: STK1955243 - (3-17441)

Report Date: 29-Oct-2019

Work Order Number: B9J2886
Received on Ice (Y/N): Yes Temp: 3 °C

Notes and Definitions

- ND: Analyte NOT DETECTED at or above the Method Detection Limit (**if MDL is reported**), otherwise at or above the Reportable Detection Limit (RDL)
- NR: Not Reported
- RDL: Reportable Detection Limit
- MDL: Method Detection Limit

* / (Non-NELAP): NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

Alexis Nicole Harold For Cindy A. Waddell

cc:

e-Standard_No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.

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EPA No. CA00102
NELAP No. OR4035
LACSD No. 10119

October 25, 2019

KSN, Inc.
 Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Lab ID : STK1955243
 Customer : 3-17441

Laboratory Report

Introduction: This report package contains total of 12 pages divided into 3 sections:

Case Narrative (2 pages) : An overview of the work performed at FGL.
 Sample Results (6 pages) : Results for each sample submitted.
 Quality Control (4 pages) : Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
LAA6	10/09/2019	10/10/2019	STK1955243-005	S
LAA7	10/09/2019	10/10/2019	STK1955243-006	S
Hn	10/09/2019	10/10/2019	STK1955243-008	S
Ho	10/09/2019	10/10/2019	STK1955243-009	S
Mn	10/09/2019	10/10/2019	STK1955243-010	S
RbD	10/09/2019	10/10/2019	STK1955243-011	S

Sampling and Receipt Information: All samples were received in acceptable condition and within temperature requirements, unless noted on the Condition Upon Receipt (CUR) form. All samples arrived on ice. All samples were prepared and analyzed within the method specified hold time. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

Quality Control: All samples were prepared and analyzed according to the following tables:

Inorganic - Metals QC

3050	10/16/2019:211947 All preparation quality controls are within established criteria, except: The following note applies to Copper, Antimony, Barium, Nickel, Vanadium: 435 Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery. The following note applies to Arsenic: 430 Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.
6010B	10/18/2019:216428 All analysis quality controls are within established criteria. 10/21/2019:216460 All analysis quality controls are within established criteria.

October 25, 2019
KSN, Inc.

Lab ID : STK1955243
Customer : 3-17441

Inorganic - Metals QC

6010B	10/25/2019:216766 All analysis quality controls are within established criteria.
CA STLC	10/25/2019:212360 All preparation quality controls are within established criteria.

Certification:: I certify that this data package is in compliance with ELAP standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:DMB

Approved By **Kelly A. Dunnahoo, B.S.**



Digitally signed by Kelly A. Dunnahoo, B.S.
Title: Laboratory Director
Date: 2019-10-25



October 25, 2019

Lab ID : STK1955243-005

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 9, 2019-15:10
Sampled By : EAB/SEW
Received On : October 10, 2019-13:35
Matrix : Soil

Description : LAA6
Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, STLC								
Chromium	0.15	0.05*	mg/L		CA STLC	10/25/19:212360	6010B	10/25/19:216766
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	13.5	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	99.4	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	54.7	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	2.28	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	34.4	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	16.7	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	20.9	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	98.8	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	53.9	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955243-006
Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 9, 2019-12:55
Sampled By : EAB/SEW
Received On : October 10, 2019-13:35
Matrix : Soil

Description : LAA7
Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	13.6	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	127	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	49.7	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	10.3	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	46.3	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	15.8	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	47.0	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	20*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	70.9	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	75.8	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955243-008

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 9, 2019-10:08
Sampled By : EAB/SEW
Received On : October 10, 2019-13:35
Matrix : Soil

Description : Hn
Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	12.9	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	135	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	23.8	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	10.5	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	51.1	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	13.1	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	25.3	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.7*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	91.3	0.97*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	69.1	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

October 25, 2019

Lab ID : STK1955243-009
 Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
 1550 Harbor Blvd, Suite 212
 West Sacramento, CA. 95691

Sampled On : October 9, 2019-16:30
 Sampled By : EAB/SEW
 Received On : October 10, 2019-13:35
 Matrix : Soil

Description : Ho
 Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.8*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	22.0	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	128	0.57*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.57*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.57*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	46.1	0.95*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	8.37	0.95*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	56.3	0.95*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	31.1	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.95*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	41.5	0.95*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.5*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.5*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	70.8	0.95*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	79.9	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955243-010
Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell
1550 Harbor Blvd, Suite 212
West Sacramento, CA. 95691

Sampled On : October 9, 2019-18:10
Sampled By : EAB/SEW
Received On : October 10, 2019-13:35
Matrix : Soil

Description : Mn
Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	9.50	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	98.1	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.58*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	49.1	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	6.88	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	54.5	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	7.72	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	45.0	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.6*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.6*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	82.2	0.96*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	61.5	1.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.



October 25, 2019

Lab ID : STK1955243-011

Customer ID : 3-17441

KSN, Inc.

Attn: Neal Colwell

1550 Harbor Blvd, Suite 212

West Sacramento, CA. 95691

Sampled On : October 9, 2019-20:45

Sampled By : EAB/SEW

Received On : October 10, 2019-13:35

Matrix : Soil

Description : RbD

Project : Mule Creek State Prison - Soil Analyses

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Metals, Total								
Antimony	ND	3.9*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Arsenic	7.29	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Barium	109	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Beryllium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cadmium	ND	0.59*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Chromium	9.99	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Cobalt	18.2	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Copper	58.0	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Lead	5.76	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Molybdenum	ND	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Nickel	17.4	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Selenium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Silver	ND	4.9*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Thallium	ND	9.8*	mg/kg		3050	10/16/19:211947	6010B	10/21/19:216460
Vanadium	135	0.98*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428
Zinc	54.8	2*	mg/kg		3050	10/16/19:211947	6010B	10/18/19:216428

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

October 25, 2019
KSN, Inc.

Lab ID : STK1955243
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Antimony	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<2	
			LCS	mg/kg	24.00	91.5 %	85-115	
			MS	mg/kg	22.01	27.8 %	75-125	435
			MSD	mg/kg	20.95	22.7 %	75-125	435
			MSRPD	mg/kg	34.92	1.4	≤2	
PDS	mg/kg	22.86	85.7 %	75-125				
Arsenic	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	95.4 %	85-115	
			MS	mg/kg	36.68	111 %	75-125	
			MSD	mg/kg	34.92	114 %	75-125	
			MSRPD	mg/kg	34.92	2.5 %	≤20	
PDS	mg/kg	38.11	136 %	75-125	430			
Barium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	94.9 %	85-115	
			MS	mg/kg	36.68	123 %	75-125	
			MSD	mg/kg	34.92	135 %	75-125	435
			MSRPD	mg/kg	34.92	1.9 %	≤20	
PDS	mg/kg	38.11	103 %	75-125				
Beryllium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	93.2 %	85-115	
			MS	mg/kg	36.68	113 %	75-125	
			MSD	mg/kg	34.92	115 %	75-125	
			MSRPD	mg/kg	34.92	2.9 %	≤20	
PDS	mg/kg	38.11	112 %	75-125				
Cadmium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.3	
			LCS	mg/kg	40.00	95.3 %	85-115	
			MS	mg/kg	36.68	108 %	75-125	
			MSD	mg/kg	34.92	110 %	75-125	
			MSRPD	mg/kg	34.92	3.0 %	≤20	
PDS	mg/kg	38.11	111 %	75-125				
Chromium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.0 %	85-115	
			MS	mg/kg	36.68	100 %	75-125	
			MSD	mg/kg	34.92	117 %	75-125	
			MSRPD	mg/kg	34.92	5.1 %	≤20	
PDS	mg/kg	38.11	89.0 %	75-125				
Cobalt	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.5 %	85-115	
			MS	mg/kg	36.68	97.5 %	75-125	
			MSD	mg/kg	34.92	100 %	75-125	
			MSRPD	mg/kg	34.92	2.3 %	≤20	
PDS	mg/kg	38.11	100 %	75-125				
Copper	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.6 %	85-115	
			MS	mg/kg	36.68	127 %	75-125	435
			MSD	mg/kg	34.92	133 %	75-125	435
			MSRPD	mg/kg	34.92	0.5 %	≤20	
PDS	mg/kg	38.11	122 %	75-125				
Lead	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	94.9 %	85-115	
			MS	mg/kg	36.68	106 %	75-125	
			MSD	mg/kg	34.92	112 %	75-125	
			MSRPD	mg/kg	34.92	0.4 %	≤20	
PDS	mg/kg	38.11	108 %	75-125				
Molybdenum	3050	10/16/19:211947JZA	Blank	mg/kg		ND	<0.5	

October 25, 2019
KSN, Inc.

Lab ID : STK1955243
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Molybdenum	3050	10/16/19:211947JZA (STK1955148-001)	LCS	mg/kg	24.00	92.9 %	85-115	
			MS	mg/kg	22.01	83.6 %	75-125	
			MSD	mg/kg	20.95	84.8 %	75-125	
			MSRPD	mg/kg	34.92	3.4%	≤20	
			PDS	mg/kg	22.86	91.6 %	75-125	
Nickel	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	96.2 %	85-115	435
			MS	mg/kg	36.68	112 %	75-125	
			MSD	mg/kg	34.92	126 %	75-125	
			MSRPD	mg/kg	34.92	5.7%	≤20	
PDS	mg/kg	38.11	111 %	75-125				
Selenium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	93.5 %	85-115	
			MS	mg/kg	36.68	86.3 %	75-125	
			MSD	mg/kg	34.92	80.3 %	75-125	
			MSRPD	mg/kg	34.92	16.1%	≤20	
PDS	mg/kg	38.11	112 %	75-125				
Silver	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.9 %	85-115	
			MS	mg/kg	36.68	110 %	75-125	
			MSD	mg/kg	34.92	111 %	75-125	
			MSRPD	mg/kg	34.92	3.7%	≤20	
PDS	mg/kg	38.11	109 %	75-125				
Thallium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<10	
			LCS	mg/kg	40.00	93.1 %	85-115	
			MS	mg/kg	36.68	112 %	75-125	
			MSD	mg/kg	34.92	115 %	75-125	
			MSRPD	mg/kg	34.92	2.3%	≤20	
PDS	mg/kg	38.11	116 %	75-125				
Vanadium	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<0.5	
			LCS	mg/kg	40.00	92.7 %	85-115	435
			MS	mg/kg	36.68	119 %	75-125	
			MSD	mg/kg	34.92	144 %	75-125	
			MSRPD	mg/kg	34.92	5.1%	≤20	
PDS	mg/kg	38.11	94.7 %	75-125				
Zinc	3050	10/16/19:211947JZA (STK1955148-001)	Blank	mg/kg		ND	<1	
			LCS	mg/kg	40.00	93.8 %	85-115	
			MS	mg/kg	36.68	111 %	75-125	
			MSD	mg/kg	34.92	125 %	75-125	
			MSRPD	mg/kg	34.92	4.7%	≤20	
PDS	mg/kg	38.11	114 %	75-125				
Antimony	6010B	10/18/19:216428AC	CCV	ppm	1.000	103 %	90-110	
			CCB	ppm		0.001	0.01	
			CCV	ppm	1.000	102 %	90-110	
			CCB	ppm		0.0003	0.01	
Arsenic	6010B	10/18/19:216428AC	CCV	ppm	1.000	99.3 %	90-110	
			CCB	ppm		0.0010	0.02	
			CCV	ppm	1.000	100 %	90-110	
			CCB	ppm		0.0040	0.02	
Barium	6010B	10/18/19:216428AC	CCV	ppm	1.000	102 %	90-110	
			CCB	ppm		0.00093	0.005	
			CCV	ppm	1.000	99.2 %	90-110	
			CCB	ppm		-0.00113	0.005	
Beryllium	6010B	10/18/19:216428AC	CCV	ppm	1.000	103 %	90-110	

October 25, 2019
KSN, Inc.

Lab ID : STK1955243
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals Beryllium	6010B	10/18/19:216428AC	CCB	ppm	1.000	0.00019	0.005	
			CCV	ppm		106 %	90-110	
			CCB	ppm		0.00005	0.005	
Cadmium	6010B	10/18/19:216428AC	CCV	ppm	1.000	106 %	90-110	
			CCB	ppm	1.000	-0.00057	0.005	
			CCV	ppm	1.000	102 %	90-110	
			CCB	ppm	1.000	-0.00013	0.005	
Chromium	6010B	10/18/19:216428AC	CCV	ppm	1.000	103 %	90-110	
			CCB	ppm	1.000	-0.00007	0.01	
			CCV	ppm	1.000	102 %	90-110	
			CCB	ppm	1.000	-0.0003	0.01	
	6010B	10/25/19:216766AC	CCV	ppm	1.000	102 %	90-110	
			CCB	ppm	1.000	-0.0004	0.01	
			CCV	ppm	1.000	104 %	90-110	
			CCB	ppm	1.000	-0.00002	0.01	
Cobalt	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm	1.000	0.0011	0.01	
			CCV	ppm	1.000	103 %	90-110	
			CCB	ppm	1.000	0.0003	0.01	
Copper	6010B	10/18/19:216428AC	CCV	ppm	1.000	99.3 %	90-110	
			CCB	ppm	1.000	0.0005	0.01	
			CCV	ppm	1.000	98.0 %	90-110	
			CCB	ppm	1.000	0.0003	0.01	
Lead	6010B	10/18/19:216428AC	CCV	ppm	1.000	105 %	90-110	
			CCB	ppm	1.000	-0.0023	0.01	
			CCV	ppm	1.000	103 %	90-110	
			CCB	ppm	1.000	-0.0038	0.01	
Molybdenum	6010B	10/18/19:216428AC	CCV	ppm	1.000	99.4 %	90-110	
			CCB	ppm	1.000	-0.0003	0.01	
			CCV	ppm	1.000	102 %	90-110	
			CCB	ppm	1.000	0.0003	0.01	
Nickel	6010B	10/18/19:216428AC	CCV	ppm	1.000	104 %	90-110	
			CCB	ppm	1.000	-0.0006	0.01	
			CCV	ppm	1.000	104 %	90-110	
			CCB	ppm	1.000	-0.0004	0.01	
Selenium	6010B	10/21/19:216460AC	CCV	ppm	1.000	98.5 %	90-110	
			CCB	ppm	1.000	0.0089	0.02	
			CCV	ppm	1.000	101 %	90-110	
			CCB	ppm	1.000	0.0189	0.02	
Silver	6010B	10/21/19:216460AC	CCV	ppm	1.000	104 %	90-110	
			CCB	ppm	1.000	-0.00004	0.01	
			CCV	ppm	1.000	103 %	90-110	
			CCB	ppm	1.000	-0.00005	0.01	
Thallium	6010B	10/21/19:216460AC	CCV	ppm	1.000	99.3 %	90-110	
			CCB	ppm	1.000	-0.00001	0.01	
			CCV	ppm	1.000	97.5 %	90-110	
			CCB	ppm	1.000	0.0007	0.01	
Vanadium	6010B	10/18/19:216428AC	CCV	ppm	1.000	101 %	90-110	
			CCB	ppm	1.000	-0.0002	0.01	
			CCV	ppm	1.000	105 %	90-110	
			CCB	ppm	1.000	-0.0007	0.01	
Zinc	6010B	10/18/19:216428AC	CCV	ppm	1.000	106 %	90-110	
			CCB	ppm	1.000	-0.00004	0.02	
			CCV	ppm	1.000	107 %	90-110	

October 25, 2019
KSN, Inc.

Lab ID : STK1955243
Customer : 3-17441

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Zinc	6010B	10/18/19:216428AC	CCB	ppm		-0.0004	0.02	
Chromium	CA STLC	10/25/19:212360AC	ExBlk PDS	mg/L mg/L	4.000	-0.00001 229 %	0.01 N/A	
Definition								
PDS	: PDS failed, matrix - Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.							
CCV	: Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.							
CCB	: Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.							
Blank	: Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.							
ExBlk	: TCLP/STLC Extraction Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.							
LCS	: Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.							
MS	: Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.							
MSD	: Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.							
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.							
ND	: Non-detect - Result was below the DQO listed for the analyte.							
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.							
Explanation								
430	: Post Digestion Spike (PDS) not within Acceptance Range (AR) because of matrix interferences affecting this analyte. Data was accepted based on the LCS recovery.							
435	: Sample matrix may be affecting this analyte. Data was accepted based on the LCS or CCV recovery.							

MCSP GROUNDWATER EVALUATION REPORT



**Mule Creek State Prison
Groundwater Evaluation Report**

October 12, 2018

Prepared for:

KSN Inc.

Prepared by:

Stantec Consulting Services Inc.

OCTOBER 12, 2018

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1.0 SELECTION OF BACKGROUND/AMBIENT MONITORING WELLS

In order to assess potential impacts to groundwater related to the land application of treated effluent, it is necessary to first provide an assessment of background or ambient water quality in the area prior to the discharge and compare these data to the monitoring results where impacts would be expected. This is complicated by the fact that shallow groundwater quality is often spatially variable. Therefore, generally the best approach is to obtain baseline water chemistry data at each “compliance” monitoring location, prior to the application of treated effluent, and use these data as each well’s own baseline or “background”, enabling statistical assessment via an intra-well approach comparing pre to post discharge data. This approach enables a more accurate assessment of the changes in groundwater quality at a particular location that are specifically related to the change in land use and with a high degree of confidence. The range of background data at a facility or sub-regionally is also important as these data can be used as a threshold as to whether an identified exceedance of background, using intra-well statistics, is truly significant across the entire facility or the region. Unfortunately, in many cases, baseline water quality data have not been collected prior to discharge and it is therefore necessary to determine or estimate what the range of background/ambient conditions likely are or were at the site. Several methods are typically employed to accomplish this task, including an assessment of groundwater flow direction and water chemistry.

The first and the most commonly utilized method of determining whether individual wells are representative of non-effluent impacted groundwater is the location of the well relative to the point of discharge and the calculated groundwater flow direction. That is, based on the groundwater flow direction/hydraulic gradient, is groundwater at a particular location likely to be impacted by effluent application operations. These types of assessments are the most common due to their simplicity, relying principally on the measured hydraulic head and the construction of groundwater contour maps. A determination is then made as to whether the well is up-, down-, or cross- gradient of the discharge. Background locations are then generally selected as up to cross gradient of effluent storage and land application operations, while compliance wells are selected within or directly down gradient of these operations. One limitation to this approach is that it only considers the *potential* for groundwater movement, not whether effluent land application has actually moved to and/or impacted water chemistry at a particular location as this must also require a conduit (permeable zone).

Another common method for determining whether a well is representative of background/ambient conditions is water chemistry. These types of assessments rely on evaluating groundwater and effluent hydro-chemical types, typically through graphical means such as in the form of Piper, Durov, or Stiff diagrams. If the water chemistry at a particular location is unique or cannot be reasonably explained as a mixture of effluent and some other source, a determination may be made that it represents background/ambient conditions, regardless of location.

Another water chemistry method independent of solute chemistry is the use of the stable isotopes of water. The stable isotopes of water can be particularly telling as the isotopes represent the water



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molecule itself and can indicate its source. For instance, groundwater or surface water derived from high elevations in the Sierra have water isotopes ($\delta^2\text{H}$ and $\delta^{18}\text{O}$) values that are substantively lighter (more negative) than water occurring and recharging groundwater locally in the foothills. The best approach is not to limit an assessment of background to only one method, but instead to use as many of tools as possible providing a clearer picture of baseline conditions providing a high level of confidence in the results. Accordingly, several methods were considered to determine whether a given well may be considered representative of background/ambient conditions or more likely to be influenced by the land application of treated effluent (compliance well).

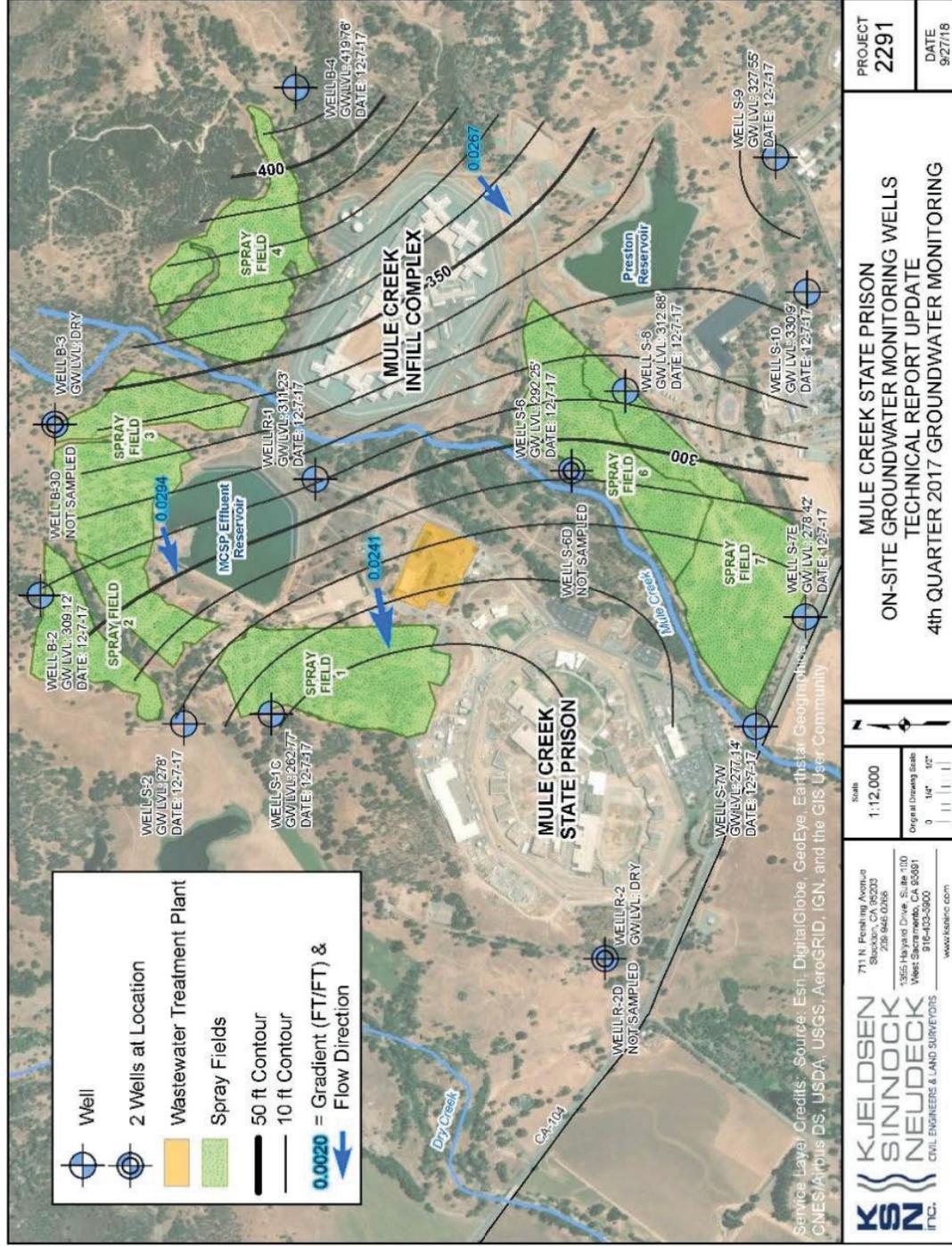
1.1 HYDRAULIC GRADIENT

Groundwater contour maps were constructed by KSN Inc. for the past four quarters and provided as Figures 1 through 4 for reference. These maps illustrate the horizontal groundwater flow direction and gradient and were used to provide an assessment of the hydraulic potential of whether a well was likely to be significantly impacted by effluent. As can be seen from these figures, groundwater contour data indicate that wells B-2, B-3, B-3D, B-4, and S-10 are at locations that can best be described as hydraulically up-gradient of the effluent land application and storage areas. S-9 is located in an area where the groundwater elevation contours suggest a groundwater divide and thus this well may or may not be down-gradient of the Preston Reservoir, which has been reported to contain a mixture of effluent and surface water. The remaining wells are located in areas that are hydraulically down gradient of effluent storage and/or land application operations and thus are more likely to be influenced by such operations.



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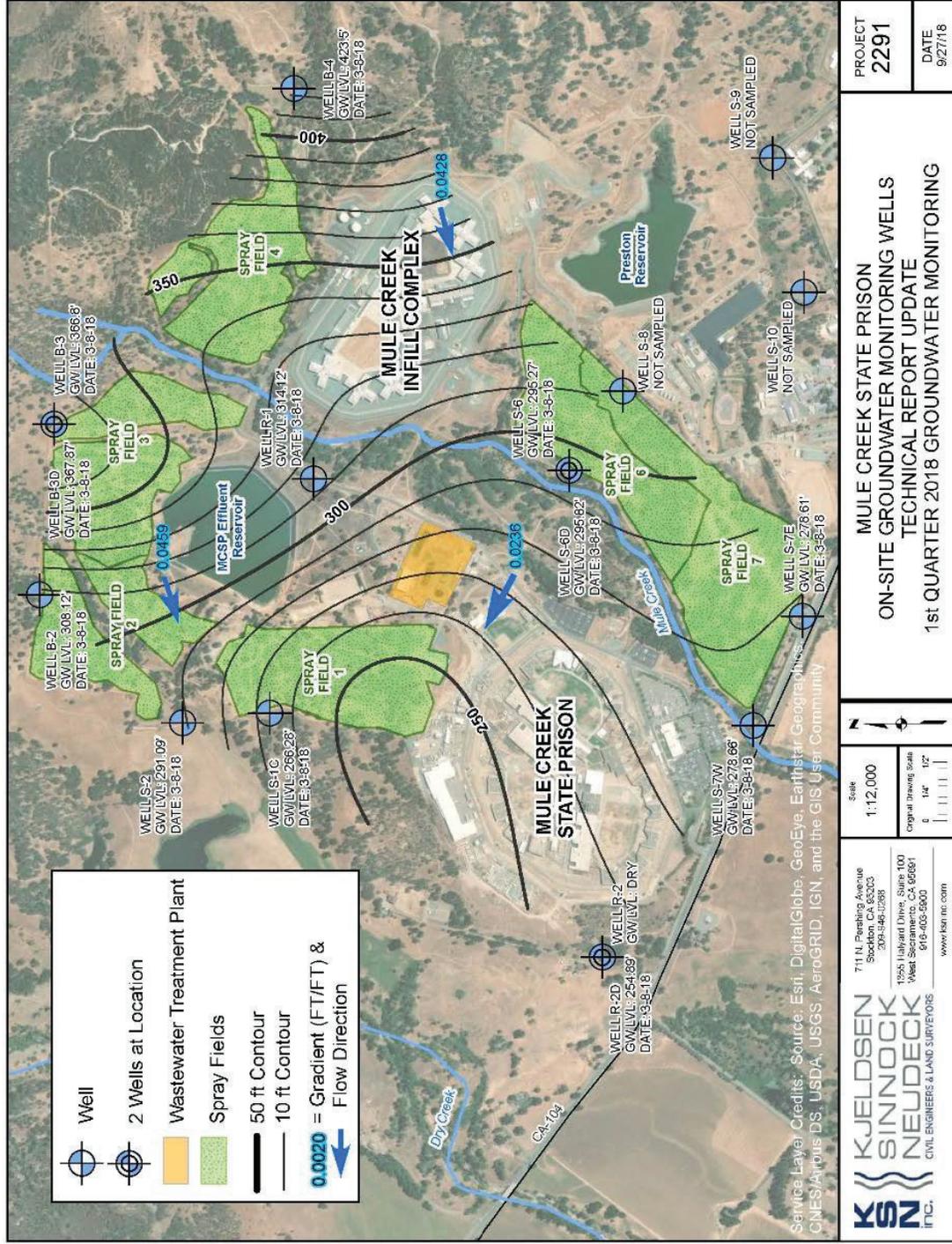


Figure 2: First Quarter 2018 Groundwater Contour Map



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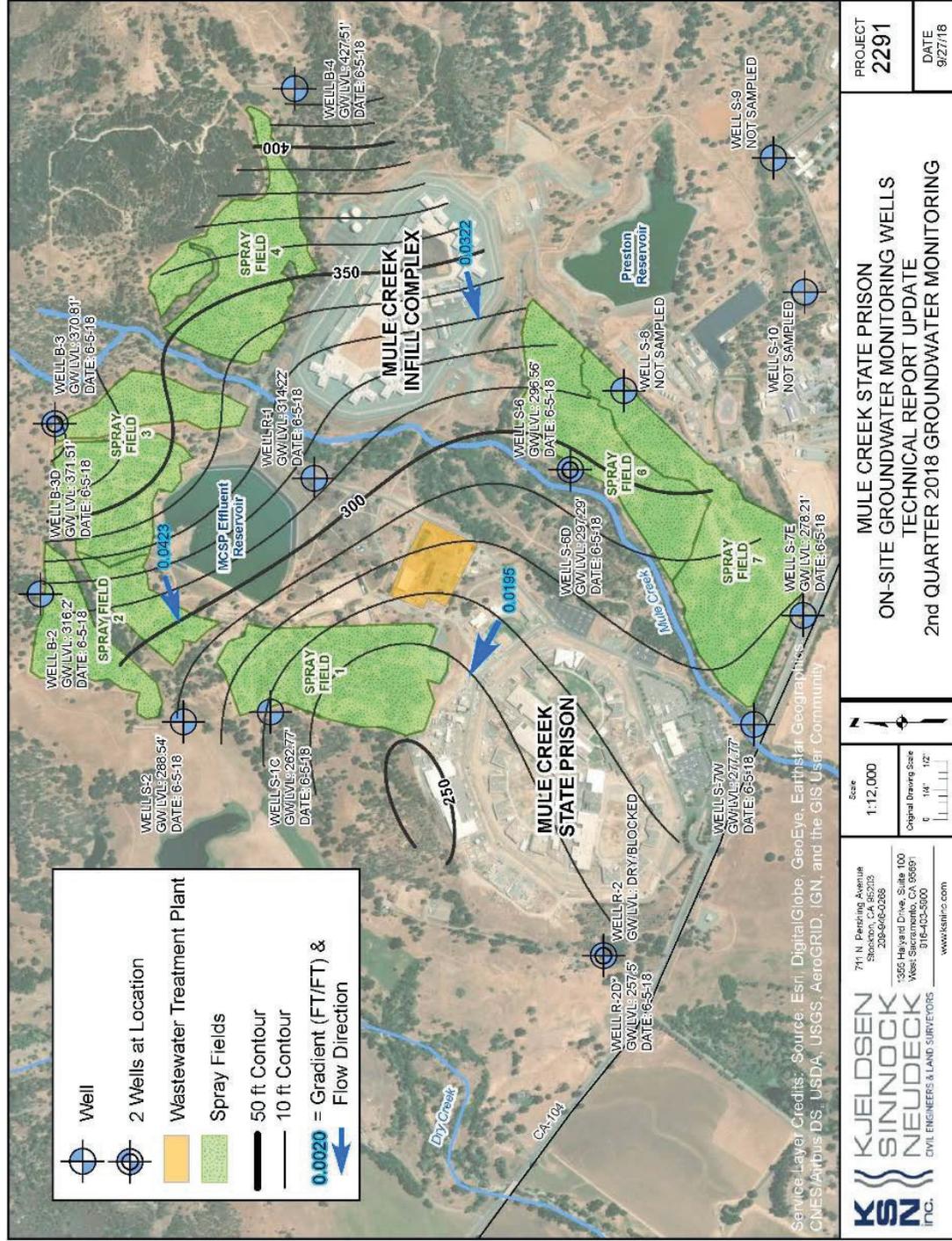


Figure 3: Second Quarter 2018 Groundwater Contour Map



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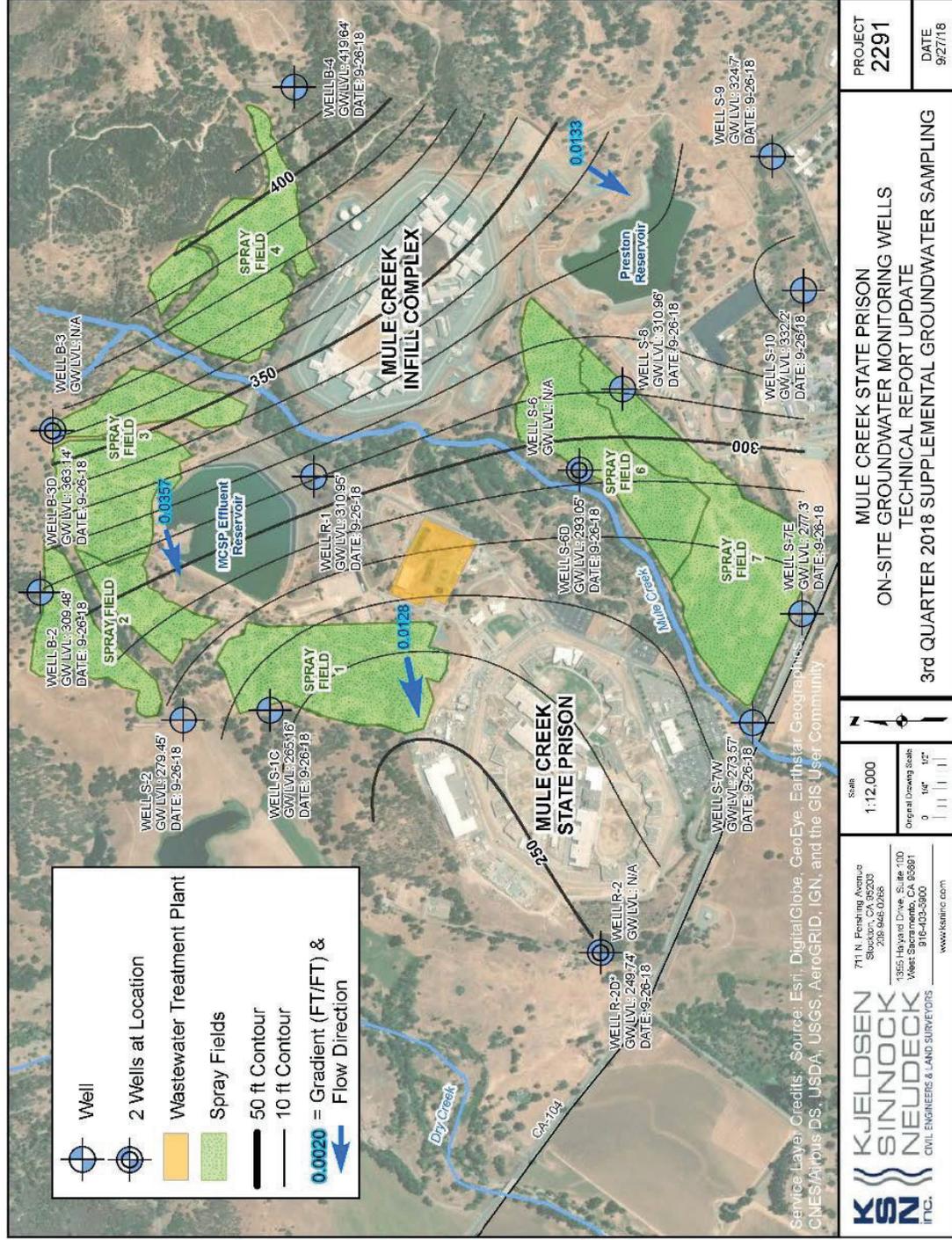


Figure 4: Third Quarter 2018 Groundwater Contour Map



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1.2 HYDROCHEMISTRY

1.2.1 Piper Diagrams

Water chemistry can also be used to evaluate the source of water and whether it is influenced by effluent or reflective of ambient conditions. Average concentrations of major cations (calcium, magnesium, sodium, and potassium) and anions (sulfate, bicarbonate, and chloride) were used to construct a Piper diagram, as illustrated in Figure 5. Piper diagrams are used to provide a geochemical assessment of water chemistry, graphically illustrating the dominant ions present at each of the respective sample locations. The Piper Diagram in Figure 5 was constructed by plotting the average concentration of major cations and anions (Ca, Mg, K, Na, Alkalinity, Cl, and SO_4) from each sample location in the respective lower triangles and projecting the intersection of these points to the upper diamond. These plots are then used to determine unique chemical end-members, determine potential mixing relationships, and to evaluate whether chemical trends in water chemistry exist (e.g., cation-exchange, mineral precipitation/dissolution, etc).

For comparison the sample locations in Figure 5 were color coded with regards to groundwater flow direction with wells upgradient (background/ambient) of land application areas noted as solid squares (B-2, B-3, B-3E, B-4, S-10). These data provide an idea of the variability of water chemistry at facility monitoring wells up gradient of the land application area. Similarly, open squares in Figure 5 represent locations that are down to down/cross gradient of land application however have a chemical signature that does not indicate the presence of effluent or mixture thereof. For instance, despite the hydraulic gradient, which suggests that S-1C (open gray square) is located down gradient of LAA-1, the water chemistry suggests indicates that it is representative of ambient/background conditions, being one of the most unlike effluent of the sample locations assessed. Similarly, monitoring wells S-2, S-9, R-1, and R-2 (also open squares), based on chemistry alone, are not likely influenced by effluent storage or land application operations, despite being down to cross gradient of the land application of effluent. For reference, the black dashed double headed arrows in Figure 5 illustrate apparent mixing relationships between known background chemistry types and the range of chemical compositions that result from their mixtures.

Conversely, monitoring wells S-6, S-7E, S-7W, and S-8 (open diamonds) appear to follow a mixing trend with background/ambient sources and effluent (red dashed line). Interesting, unlike the replacement well S-1C, the previous well S-1 also falls on the mixing trend with effluent land application operations. Based on the chemical signature, hydraulic, gradient, and our understanding of the historical effluent land application operations, where the primary land application areas have been LAA-6 and LAA-7, it is reasonable to conclude that monitoring wells S-6, S-7E, S-7W, and S-8 are more likely to be influenced by effluent land application operations, supporting the chemical signature presented in the Piper Diagram and should thus be considered compliance monitoring wells.



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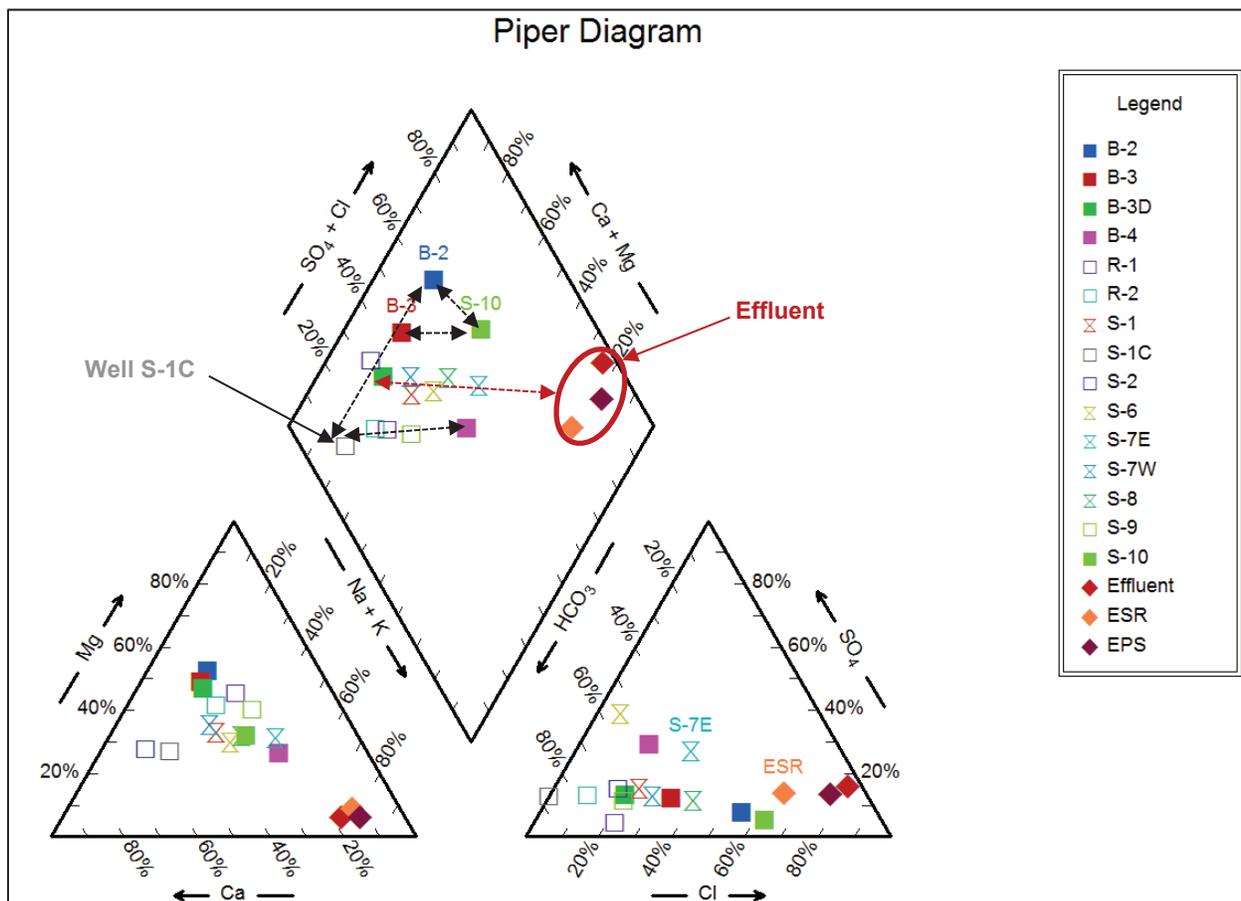


Figure 5: Piper Diagram

1.2.2 Durov Diagrams

Similar to the Piper Diagram, Durov Diagrams represent a plot of major cations and ions however also account for pH and salinity in the form of TDS. Figure 6 illustrates the Durov diagram for reference, including inferred mixtures of background/ambient sources (black dashed arrows) and effluent and background/ambient sources (red dashed arrows). This figure illustrates the variability of ambient salinity and chemistry in the region with the lowest concentrations represented by S-1C and B-4 and the highest ambient salinity represented by B-2 and S-10. In comparison, effluent is generally much more dilute than most background groundwater sources and is likely reducing the concentration of salts in irrigated areas as represented by the red dashed mixing arrows.



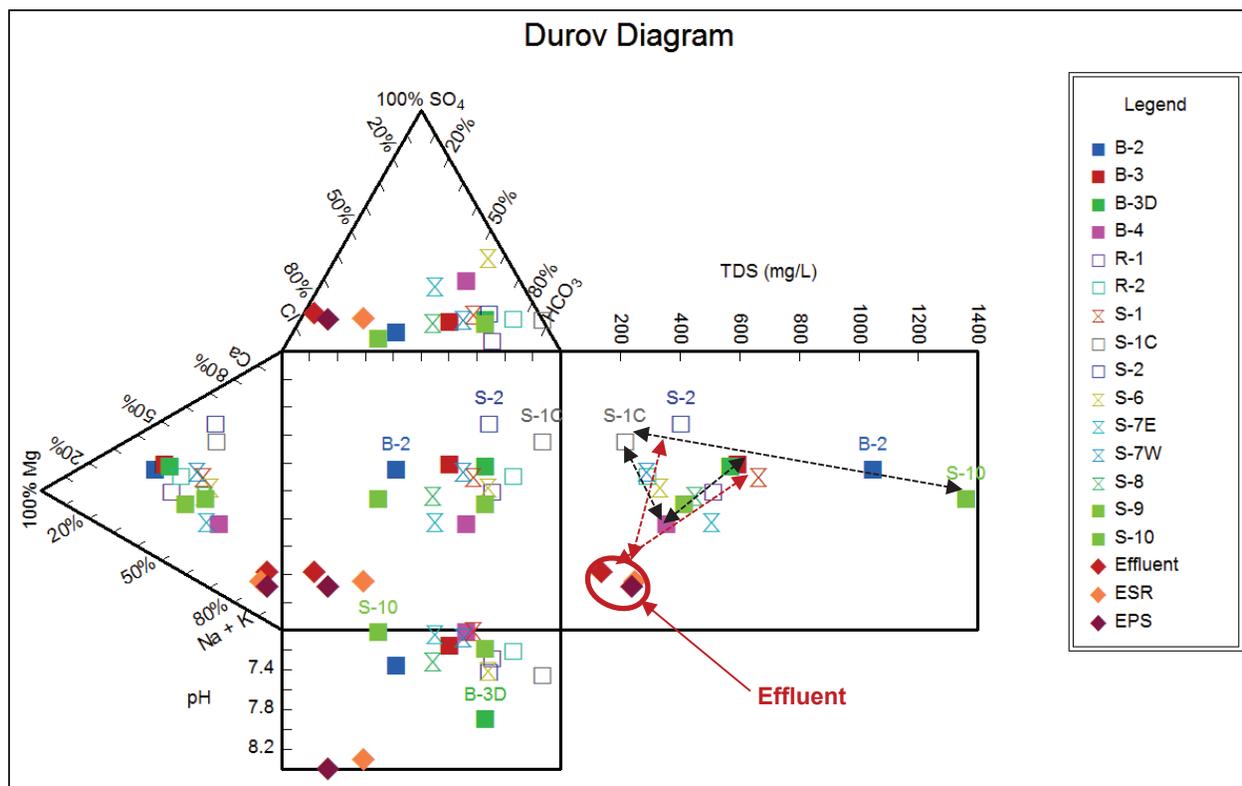


Figure 6: Durov Diagram

1.2.3 Stiff Diagrams

Stiff diagrams are another tool used to graphically illustrate water composition and spatial variations in chemistry. Creation of Stiff diagrams provides a simplified model in which the spatial variability of major water chemistry in the vicinity of the effluent storage and land application facilities can be observed. Additionally, the magnitude of the Stiff vertices is indicative of the concentration of the respective ions in water, providing a graphical indicator of dissolved salt concentration. Figure 7 represents the results of supplemental sampling collected the third quarter 2018, with groundwater contour map, with each well’s constructed Stiff Diagram overlying or near its well marker.

As can be seen from Figure 7, the shapes of the stiff diagrams vary at locations both up and down gradient of the effluent land application operations suggesting complex shallow groundwater chemistry. Shallow groundwater is often variable in chemical composition as it can locally be influenced by both natural (geology/rock type, soil composition, vegetation, permeability, recharge source, proximity to surface water, etc) and anthropogenic conditions (effluent land application, land use, agriculture, etc.) on a relatively short time scale. This is in general contrast with deep groundwater which is a composite of shallower recharged sources with a longer residence time that tends to “average” out significant differences at a given depth.



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Larger Stiff Diagrams equate to higher concentrations of dissolved solutes. As can be seen in Figure 7, groundwater locations up or cross gradient of effluent land application are generally larger (having higher concentrations of major ions) than those at compliance locations. This again indicates that the percolation of effluent is impacting shallow groundwater quality in such a manner that reduces the overall concentration of solutes. This appears to be the case as groundwater monitoring locations within or directly downgradient of effluent land application, which are generally more dilute (smaller Stiff Diagrams) compared to background.



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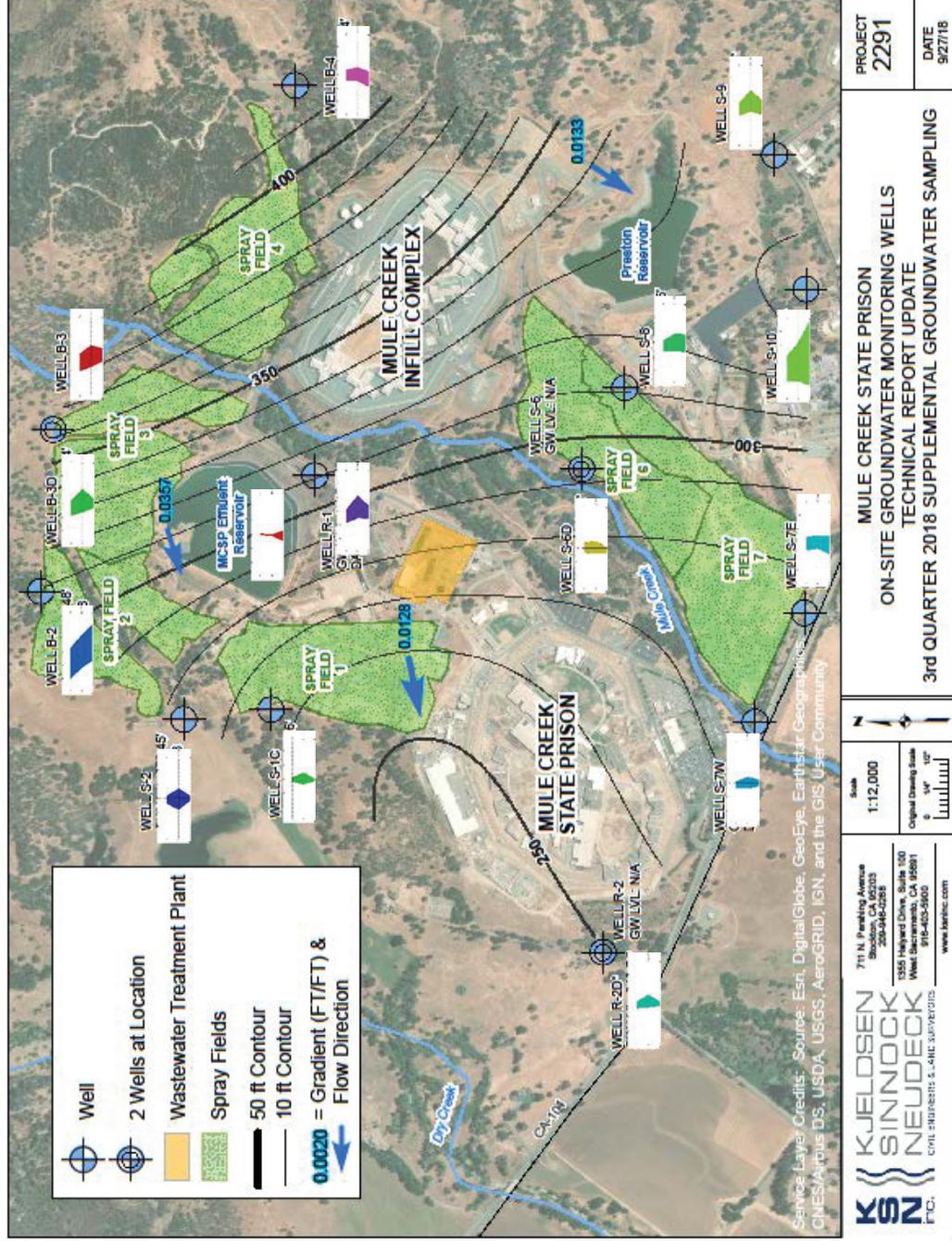


Figure 7: Stiff Diagrams



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1.3 STABLE ISOTOPES OF WATER

The stable isotope of water can be used as an indicator of various sources of water and solutes in hydrologic investigations. This is most commonly accomplished by evaluating the stable isotope ratios $^{18}\text{O}/^{16}\text{O}$ and $^2\text{H}/^1\text{H}$ and comparing those ratios to recognized reference standard Surface Mean Ocean Water (VSMOW), simultaneously assessed during analysis. The absolute isotopic ratios of both the sample and the reference standard are measured and compared pursuant to Equation (1), with the results being reported in the conventional delta notation and with the units of permil (‰), or parts per thousand deviation from the reference standard. Evaluation of stable isotopes using this convention allows for very precise assessment and comparison of samples worldwide.

$$(1) \quad \delta R (\text{‰, Standard}) = \left(\frac{(R)\text{Sample}}{(R)\text{Standard}} - 1 \right) \times 1000$$

R = Absolute isotopic ratio (e.g., $^{18}\text{O}/^{16}\text{O}$ or $^2\text{H}/^1\text{H}$)

KSN recently sampled the groundwater monitoring wells as well as the Effluent Storage Reservoir (ESR) and Effluent Pump Station (EPS) for general mineral chemistry and the stable isotopes of water during September of 2018. Figure 8 represents a plot of the $\delta^2\text{H}$ of water and the total dissolved solids (TDS) concentration for each of the sample locations assessed, providing a snap shot of potential sources of water at each location. These two variables are independent of one another, one being a dissolved solute and the other being the water molecule itself. Together these data can provide valuable insight into the source of water and processes affecting water quality in a region.

What can be deduced from Figure 8 is that groundwater quality monitored at the facility wells is dominated by processes where the recharge source is not subject to significant amounts evaporation, which affects both solute concentration (increase) and the isotopic composition (makes residual water less negative). Instead the range in salinity indicated by the black dashed arrow is due to processes that do not change the isotopic composition and may include mixing with higher salinity local water, mineral dissolution, and transpiration from plants. For reference, Figure 8 also has an evaporation model for water chemistry from the ESR, where water is derived for spray irrigation, illustrating how this water source would evolve if only subjected to evaporation. Note the dilute and isotopically light ($\delta^2\text{H} = -93$ permil) signature for effluent sampled from the EPS, reflective of the Sierran derived water supply source water.

Additionally, one of the groundwater monitoring wells, R-1, sticks out isotopically compared to all other monitoring wells suggesting a source of recharge that is different than other wells. Given the groundwater flow direction at the site, Mule Creek is the most plausible source. Although not sampled during the September 2018 event (lack of water), water in Mule Creek would be derived from drainage that is a mixture of local water, with a $\delta^2\text{H}$ of approximately -53 permil (\pm), and higher elevation precipitation resulting in an isotopic signature that is intermediate. If additional information is required regarding the source of water at R-1, stable isotopes should be collected periodically from Mule Creek, when water is present. Also, as previously stated, the isotope samples were collected during only one event. The collection of multiple samples during different seasons would provide additional insight into how groundwater and surface water (ESR) are influenced/interact and on a seasonal basis.



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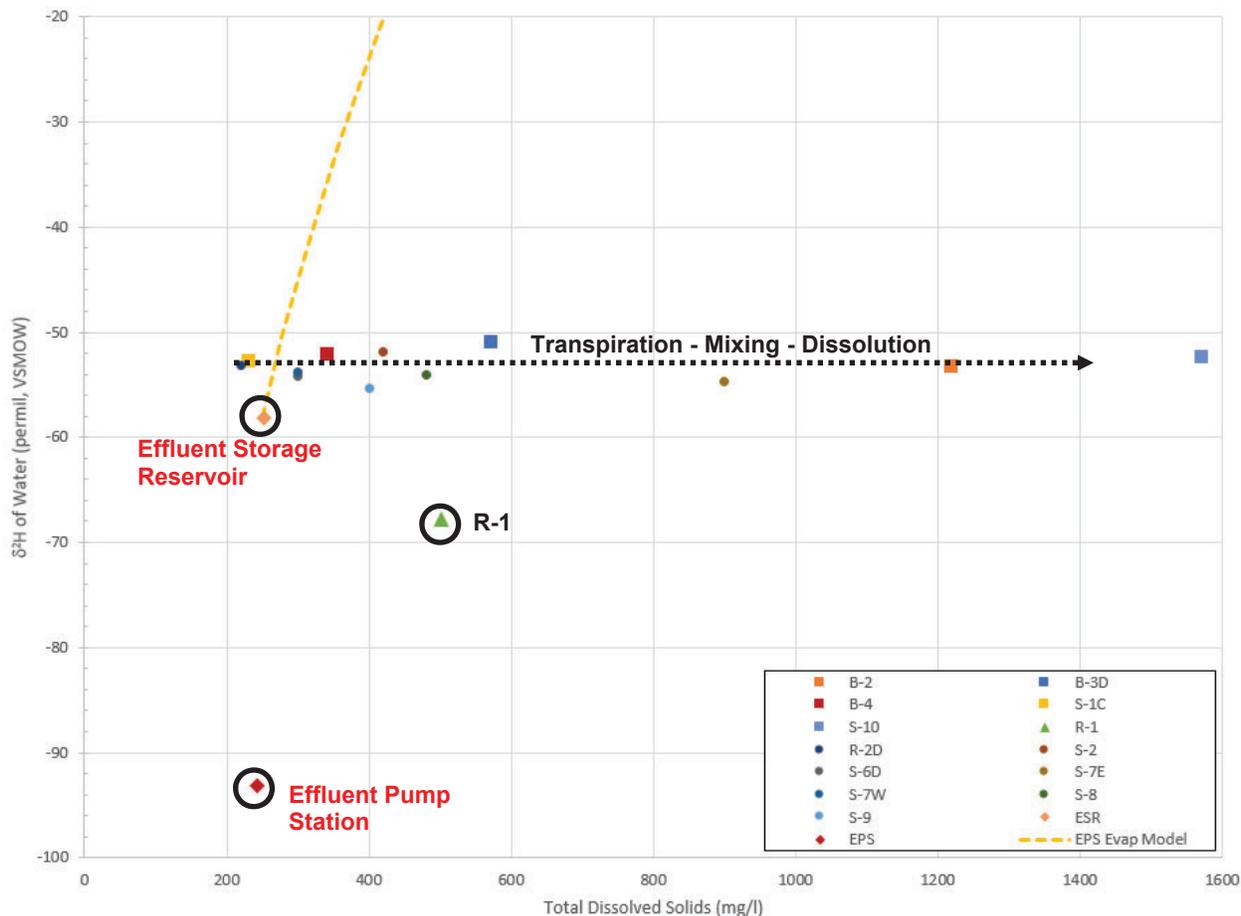


Figure 8: δ²H of Water versus TDS Concentration

1.4 CONCLUSION

A determination of which wells represent background/ambient conditions and those more likely to be influenced by effluent storage and land application of (e.g., compliance monitoring wells) was made utilizing several tools that includes, groundwater flow direction/hydraulic gradient, historical effluent storage and land application operations, and geochemical markers developed from major cations and anions, as well as the stable isotopes of the water. Based on review of these data monitoring wells B-2, B-3, B-3D, B-4, S-1C, and S-10 provided the highest likelihood of being representative of the variability of background/ambient groundwater quality influencing the facility. Water quality from R-1, R-2, S-6D, S-2, and S-9 also mostly likely represent background/ambient conditions, however the evidence is less significant. Conversely, the available data suggests that monitoring wells S-6, S-7E, S-7W, and S-8 are more likely to be impacted by land application operations, although ambient sources cannot be ruled out entirely. Given the water chemistry at these locations, hydraulic gradient, and historically higher hydraulic loading of effluent at LAA-6 and LAA-7, these wells should be considered compliance locations, for the purpose of evaluating potential historical land application impacts at the facility. However,



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moving forward and given the lack of pre- land application groundwater quality at these locations, intra-well trends may be considered for compliance, in leu of inter-well assessments. A summary of the evidence used in this determination of the potential influence of effluent at a given groundwater monitoring location is provided as Table 1.

Table 1: Groundwater Source Assessment Summary

Well	Groundwater flow Direction/Gradient	Major Ion Chemistry	Stable Isotopes of Water	Overall Conclusion
B-2	Up-Gradient	Background/Ambient		Background/Ambient
B-3	Up-Gradient	Background/Ambient		Background/Ambient
B-3D	Up-Gradient	Background/Ambient		Background/Ambient
B-4	Up-Gradient	Background/Ambient or Potential Effluent mixture		Background/Ambient
R-1	Down-Gradient	Background/Ambient		Most Likely Background
R-2	Down-Gradient	Background/Ambient		Most Likely Background
R-2D	Down-Gradient			
S-1	Down/Cross-Gradient	Potential Effluent mixture		More Likely Effluent Mixture
S-1C	Down/Cross-Gradient	Background/Ambient		Background/Ambient
S-2	Down/Cross-Gradient	Background/Ambient		Background/Ambient
S-6	Down-Gradient	Potential Effluent mixture		More Likely Effluent Mixture
S-6D	Down-Gradient			Most Likely Background
S-7E	Down/Cross-Gradient	Potential Effluent mixture		More Likely Effluent Mixture
S-7W	Down/Cross-Gradient	Potential Effluent mixture		More Likely Effluent Mixture
S-8	Down-Gradient (Preston)	Potential Effluent mixture		More Likely Effluent Mixture
S-9	Down/Cross-Gradient (Preston)	Background/Ambient or Potential Effluent mixture		Most Likely Background
S-10	Up-Gradient	Background/Ambient		Background/Ambient



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2.0 STATISTICAL ASSESSMENT

A summary of the range of concentrations at locations determined to be representative of background/ambient conditions (B-2, B-3, B-3D, B-4, S-1C, S-2, and S-10) is presented in Table 2. The range represented by all of the remaining wells is also presented for comparison along with relevant water quality goals for potable or agricultural use. One interesting finding is the elevated concentrations of nitrate at B-3/B-3D and S-10, exceeding the primary MCL of 10 mg/l. The source of nitrogen at S-10 is not precisely known. The source of nitrogen at B-3/B-3D is unknown and may be related to farming/grazing practices up gradient of the well.

Table 2: Summary of Raw Groundwater Quality Data

Constituent	Background/Ambient Wells	All Other Wells	Water Quality Goal
pH	6.2 – 9.0	6.2 – 8.6	6.5 – 8.4 (ag)
TDS (mg/l)	51 – 1700	168 – 1100	450 (ag)
Nitrate as N (mg/l)	ND – 38.3	ND – 7.97	10 (pMCL)
TKN (mg/l)	ND – 3.6	ND – 24	--
Total Coliform (MPN/100ml)	ND – 540	ND – 2400	2.2 (BP)
Arsenic (mg/l)	ND – 0.11	ND – 0.0039	0.01 (pMCL)
Boron (mg/l)	ND – 1	ND – 1	0.7 (ag)
Calcium (mg/l)	37 – 160	18 – 110	--
Chloride (mg/l)	13.8 – 490	6 – 155	106 (ag)
Iron (mg/l)	ND – 39.4	ND – 21.4	0.3 (sMCL)
Magnesium (mg/l)	11.7 – 153	13 – 88	--
Manganese (mg/l)	ND – 2.05	ND – 3.43	0.05 (sMCL)
Potassium (mg/l)	0.54 – 24	ND – 14	--
Sodium (mg/l)	3.12 – 210	1.99 – 337	69 (ag)
Sulfate (mg/l)	17.2 – 148	11 – 261	250 (sMCL)
Total Alkalinity (mg/l)	152 – 502	30 – 466	--
Hardness (mg/l)	92 – 1170	101 – 540	--

Ag – agricultural water quality goal, BP – Basin Plan objective, pMCL – Primary maximum contaminant level, sMCL – Secondary maximum contaminant level.

2.1 OUTLIER ANALYSIS

The first step performed on water quality data was to evaluate potential statistical outliers in the background dataset. The background/ambient monitoring data were subsequently pooled and a distribution test performed for the Monitoring and Reporting Program (MRP) parameters that contain water quality objectives including pH, TDS, nitrate, arsenic, boron, chloride, iron, manganese, sodium, and sulfate in order to determine whether parametric or non-parametric statistical tests apply. This was done utilizing Rosner's Outlier Test, where the number of observations was greater than 25, or Dixon's Outlier Test, where the number of observations was between 3 and 25. The outlier tests were conducted at 99% level of significance and using the program CHEMSTAT™. Identified outliers were further reviewed in order to determine if they were "reasonable" based on historical observations and/or any known anthropogenic cause of the anomaly. Note that total coliform was not statistically assessed due to the fact that this constituent is common in the surface soil and water, however given its



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large size relative to typical sediment pore space, is not typically present in groundwater. When detected in groundwater, the density of coliform is often governed by poor well design, a failure of a well seal, preferential conduit such as fractures or bedding planes, very shallow well screen, sediment generation during sampling, and/or, in general, sampling procedures. The following provides a summary of the outlier analysis:

- Nitrate-N:** Statistical outliers were identified for eight observations and at monitoring locations S-10 (all observations) and B-3 (4/3/07, 8/6/07, and 11/13/07). These concentrations were reviewed and found to be reasonable given this historical data set and were subsequently retained for further analysis.
- Boron:** Statistical outliers were identified at B-2 (3/18/15 and 6/29/15). Given the magnitude of the outliers (~1000 x other historical observation), these values likely represent a reporting error (e.g. ug/l vs. mg/l). Accordingly, they were removed from further analysis.
- Iron:** Statistical outliers were identified at B-2 (12/8/15, 3/17/16, 6/16/16, and 9/15/16), B-3 (3/17/16), and S-2 (6/16/16 and 9/15/16). Given the magnitude of the outliers (~1000 x other historical observation), these values likely represent a reporting error (e.g. ug/l vs. mg/l). Accordingly, they were removed from further analysis.
- Manganese:** A statistical outlier was identified at S-2 (3/17/16). Given the magnitude of this outlier (~1000 x other historical observation), it likely represents a reporting error (e.g. ug/l vs. mg/l). Accordingly, this outlier was removed from further analysis.
- Sodium:** Statistical outliers were identified at B-4 (12/8/15), S-10 (10/22/15), and B-2 (6/28/12). The outliers at B-4 and B-2 were inconsistent with historical observations and subsequently removed from further analysis. The outlier at S-10 was the only observation for this monitoring location on record. This sample was subsequently retained for further analysis.
- Sulfate:** A statistical outlier was identified at B-4 (4/4/07). This outlier was further reviewed and found to be inconsistent with historical operations. Accordingly, this outlier was removed from further analysis.

2.2 NORMALITY TEST

Following the outlier analysis, a normality test was performed using Shapiro-Francia Test at the 99% level of confidence and on the modified (removal of outliers noted above) pooled historical background dataset and using the program CHEMSTAT™. The results of this analysis indicated that most of the parameters assessed (TDS, nitrate, arsenic, boron, chloride, iron, manganese, and sodium) were non-parametrically distributed, except pH and sulfate. For the nonparametric parameters, nonparametric statistical tests apply. Nonparametric tests for statistical significance are also very powerful when there are many historical observations, where parametric tests tend to be better for parameters with few



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observations. Given the significant number of observations following adjustments for the noted outliers above for the parametrically distributed parameters pH (163) and sulfate (136) nonparametric statistical tests were also utilized for these parameters in order to establish comparative background statistics.

2.3 INTER-WELL NON-PARAMETRIC BACKGROUND STATISTICS

Table 3 provides a summary of the non-parametric background statistics for each of the MRP inorganic parameters which also contain a water quality objective for agricultural or potable use. These background statistics represent the upper threshold for each parameter from wells surrounding the land application areas, but not likely influenced, by effluent storage or land application operations. When background exceeds a water quality goal, it is assumed that there is no assimilative capacity in the underlying aquifer and thus background becomes the site-specific groundwater limitation (SSGL). This was the case for all parameters except sulfate. Accordingly, these values should not be exceeded in groundwater at compliance monitoring locations. Conversely, where the background statistic is less than the water quality objective, assimilative capacity exists, and the water quality goal becomes the SSGL, provided best practical treatment and control measures are being implemented on the discharge. However, in many cases, the land application of effluent, which is generally more dilute than background groundwater quality may have improved local groundwater conditions underling the land application area. In order to evaluate future impacts at a compliance location, intra-well statistics may be more appropriate.

Table 3: Non-Parametric Background Statistics

Constituent	Upper Threshold Background Statistic	Water Quality Goal	SSGL
pH	6.2 – 9.0	6.5 – 8.4 (ag)	6.2 – 9.0
TDS (mg/l)	1700	450 (ag)	1700
Nitrate as N (mg/l)	38	10 (pMCL)	38
Arsenic (mg/l)	0.11	0.01 (pMCL)	0.11
Boron (mg/l)	1	0.7 (ag)	1
Chloride (mg/l)	490	106 (ag)	490
Iron (mg/l)	3.7	0.3 (sMCL)	3.7
Manganese (mg/l)	2.05	0.05 (sMCL)	2.05
Sodium (mg/l)	210	69 (ag)	210
Sulfate (mg/l)	116	250 (sMCL)	250

Ag – agricultural water quality goal, BP – Basin Plan objective, pMCL – Primary maximum contaminant level, sMCL – Secondary maximum contaminant level.



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2.4 COMPLIANCE ASSESSMENT

For parameters where nonparametric background statistics are the SSGL a single reported concentration over the SSGL (also under the lower value for pH) indicates a statically significant exceedance of the SSGL, provided the data were not biased and representative of an outlier not related to facility effluent storage or land application operations. This compliance assessment was conducted for parameters with background based SSGLs (all constituents except sulfate) and for the most recent eight historical observations. If a statistically significant outlier was identified that cannot be readily explained, resampling or comparison to the next regularly scheduled monitoring event is generally recommended, in order to confirm the exceedance. The maximum concentration for the most recent observations are summarized in Table 4 for all non-background/ambient monitoring wells. Note, that some of the parameters are not routinely monitored and the past eight observations extend back several years. Bold data in Table 4 indicates a potential exceedance of a SSGL.

For parameters that are based on a water quality goal for agricultural or potable use based on long term averages, an alternative statistic applies, as was the case for sulfate. For this parameter, the lower confidence level (LCL) about the mean is computed over the past eight quarters of observation. If the LCL exceeds the SSGL, a determination is made that a statistically significant impact has occurred. The program CHEMSTAT™ was subsequently used to perform the LCL test on the facility's compliance monitoring wells and at the 99% confidence interval.

For reference, the formula used to compute the LCL is provided as the following equation:

$$\text{LCL} = \text{mean} - t(1-\alpha, n-1) \times \text{SD}/\sqrt{n}$$

mean = average of last eight quarterly measurements

SD = standard deviation of last eight quarterly measurements

n = number of observations (typically past 8)

1- α = level of confidence = 99%



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Table 4: Compliance Assessment

Constituent	SSGL	R-1	R-2	S-1	S-6	S-7E	S-7W	S-8	S-9
pH	6.2 – 9.0	6.6-7.3	6.2-7.9	6.9-7.1	7.0-7.8	6.3-7.4	6.5-7.6	7.0-7.7	6.7-7.7
TDS (mg/l)	1700	488	353	679	343	416	280	455	460
Nitrate as N (mg/l)	38	<0.02	1.2	4.1	<0.02	8.96	0.83	7.97	1.47
Arsenic (mg/l)	0.11	<0.002	<0.002	0.01	<0.002	<0.002	<0.002	<0.002	<0.002
Boron (mg/l)	1	0.136	0.158	0.66	0.77	0.14	0.066	0.17	0.2
Chloride (mg/l)	490	82	18	155	13.6	91	40	120	70
Iron (mg/l)	3.7	<0.1	2.72	<0.02	1.15	2.71	6.93 ^a / 0.0369	<0.1	<0.1
Manganese (mg/l)	2.05	0.222	3.43	0.06	0.22	0.075	0.29	0.033	<0.02
Sodium (mg/l)	210	69	32	120	46	143	23	70	70
Sulfate (mg/l)	250	22	44	73	100	204	35	46 ^b	49 ^b

a. Represents a statistically significant outlier not reflective of historical observations.

b. Insufficient data for LCL test. Maximum reported value reported.

As can be seen in Table 4, only two wells contained a constituent that exceeded background at a statistically significant level, the parameters iron at S-7W and manganese at R-2. A summary of these exceedances is provided as follow:

S-7W: Over the past eight observations, iron was reported at concentrations that exceeded the SSGL of 3.7 mg/l during two monitoring events and at concentrations of 4.98 (6/16/16) and 6.93 mg/l (9/15/16). These observations were further reviewed and found to be statistically significant outliers at the 99% level of confidence. Furthermore, on review of the historical database back to 2007 most reported observations were non-detect and not one other exceeded 1 mg/l. Accordingly, these reported observations are highly suspect. Once these anomalous readings were removed, the next highest reported concentration was reported at 0.0369 mg/l, below the SSGL.

R-2: Over the past eight observations, manganese was reported at concentrations that exceeded the SSGL of 2.05 mg/l during five monitoring events and at a maximum concentration of 3.43 mg/l (6/10/13). These observations were further reviewed and there was no statistically significant evidence that they represent outliers at the 99% level of confidence. Instead these observations appear to reflect groundwater chemistry at this location. It is important to recall that review of major ionic chemistry suggests that this monitoring location is most likely representative of ambient (non-effluent) water quality.

Iron and Manganese Occurrence Overview: Both iron and manganese are naturally occurring elements that are present in soil and rock. At near neutral pH and under oxidizing conditions both of these elements are present as a solid and in often in the form of oxides. Under acidic conditions these oxides can be solubilized and present in the dissolved form. Furthermore, in the presence of organic rich sediment or under high loading, reducing conditions can cause oxides to become soluble. One or both of these processes may explain higher concentrations of iron or manganese, including that at R-2. Furthermore, sample technique is important. As both iron and manganese are commonly present in the subsurface, any sediment generated during sampling for metals can bias the results as they are typically field or laboratory acidified using nitric acid, which solubilizes these constituents, prior to analysis. Field



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filtration through a minimum 0.45-micron filter prior to acid preservation is recommended to help limit potential sampling bias when it comes to these and other **metals/metalloids**.

2.5 INTRA-WELL NON-PARAMETRIC TREND ANALYSIS

In addition to the compliance assessment provided above, trend analysis can provide an indication of the long-term trends in data and provide a means of predicting future concerns or changes as they relate to a particular action. Accordingly, a trend analysis was conducted for all wells except B-3D, R-2D, and S6-D. These wells did not have sufficient background data to permit analysis. The selected statistical method for the trend analysis was Sen’s non-parametric estimator of slope. According to Gilbert (1987), Sen’s test evaluates the slope of monitoring data from a particular sample location and is not greatly affected by data errors or outliers and it can be computed where data are missing. This is a two-sided (tailed) confidence interval and was applied at the 98% level of confidence ($\alpha = 0.01$ per tail). Further information regarding Sen’s slope test can be obtained from Gilbert (1987), the Unified Guidance, or other statistic books. The program CHEMSTAT™ was subsequently used to perform Sen’s trend test on the facility’s compliance monitoring wells. Tables 5 and 6 summarize the findings of the trend analysis for background/ambient and compliance (all other) monitoring wells, respectively.

Table 5: Non-Parametric Intra-Well Trend Analysis for Background/Ambient Wells

Constituent	SSGL	B-2	B-3	B-4	S-6	S-1C	S-2	S-10
pH	6.2 – 9.0	--	--	--	--	--	--	--
TDS (mg/l)	1700	D	D	--	--	--	--	--
Nitrate as N (mg/l)	38	--	D	--	--	--	--	--
Arsenic (mg/l)	0.11	--	--	--	--	*	--	*
Boron (mg/l)	1	D	--	--	--	*	--	*
Chloride (mg/l)	490	D	D	--	--	*	--	*
Iron (mg/l)	3.7	--	--	--	--	*	--	*
Manganese (mg/l)	2.05	--	--	--	--	*	--	*
Sodium (mg/l)	210	--	D	--	--	*	--	*
Sulfate (mg/l)	250	--	--	--	--	*	--	*

*Insufficient data to perform trend analysis. (--) No Trend. (U) Upward Trend. (D) Downward Trend.

Table 6: Non-Parametric Intra-Well Trend Analysis for All Other Wells

Constituent	SSGL	R-1	R-2	S-1	S-6	S-7E	S-7W	S-8	S-9
pH	6.2 – 9.0	--	U	--	--	--	--	--	--
TDS (mg/l)	1700	--	--	--	--	--	--	--	--
Nitrate as N (mg/l)	38	--	D	--	--	--	--	--	--
Arsenic (mg/l)	0.11	--	--	--	--	--	--	*	*
Boron (mg/l)	1	--	--	--	--	--	--	*	*
Chloride (mg/l)	490	U	--	--	--	--	D	*	*
Iron (mg/l)	3.7	--	--	--	--	--	--	*	*
Manganese (mg/l)	2.05	U	U	--	--	--	--	*	*
Sodium (mg/l)	210	--	--	--	--	--	--	*	*
Sulfate (mg/l)	250	--	--	--	--	--	--	*	*

*Insufficient data to perform trend analysis. (--) No Trend. (U) Upward Trend. (D) Downward Trend.



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Trend analysis of historical data suggest mostly stable (no trend) groundwater quality at most wells and for most constituents including background/ambient monitoring wells B-4, S-6, S-1C, S-2, and S-10 as well as compliance wells S-1, S-6, S-7E, S-8, and S-9. There were downward trends noted at background/ambient monitoring wells B-2 (TDS, boron, and chloride) and B-3 (TDS, nitrate, chloride, and sodium) as well as at compliance monitoring wells R-2 (nitrate) and S-7W (chloride). Upward trends were also noted for compliance well R-1 (chloride and manganese) and R-2 (pH and manganese). Geochemical evidence suggests that both R-1 and R-2 are most likely representative of background conditions, however some impacts from effluent could not be ruled out.



3.0 CONCLUSIONS/RECOMMENDATIONS

Groundwater elevation and contour data were evaluated and a determination made that wells B-2, B-3, B-3D, B-4, and S-10 are located hydrogeologically upgradient of effluent storage and land application operations. Conversely, the remaining wells were located down to cross gradient of effluent storage and land application operations. Further analysis of general mineral chemistry found that wells S-1C and S-2 were representative of background conditions, while wells R-1, R-2, and S-9 were more likely reflective of background/ambient conditions, despite being down to cross gradient of effluent land application, however some effluent influence could not be ruled out. In contrast, wells most likely influenced by effluent storage and land application operations were identified based on groundwater flow direction and water chemistry to be S-6, S-7E, S-7W, and S-8. These wells also correspond to areas that have historically had the highest hydraulic loading of effluent and thus the fact that they show evidence of mixing/recharge from this source is not surprising.

Subsequent statistical analysis of the background dataset was conducted in order to determine the upper threshold static of groundwater quality likely present pre-effluent land application. These statistics were then compared to water quality goals for potable and agricultural use and site-specific groundwater limitations (SSGLs) proposed. Further statistical analysis was conducted comparing all wells, except B-2, B-3, B-3D, B-4, and S-10, comparing the most recent eight observations at each location to the SSGLs. Of the wells assessed manganese at R-2 and iron at S-7W were identified at concentrations that exceeded the SSGL. However, the iron concentrations at S-7W were further reviewed and found to be outliers at the 99% level of significance, roughly 1000x higher than historical observations and consistent with a concentration unit reporting error. No other statistically significant exceedance was noted for S-7W. The manganese exceedance at R-2 was however found to be representative of the range of conditions present at this location. It is important to note that chemical data suggest that water quality at R-2 is most likely representative of a background source, although some effluent influence could not be excluded.

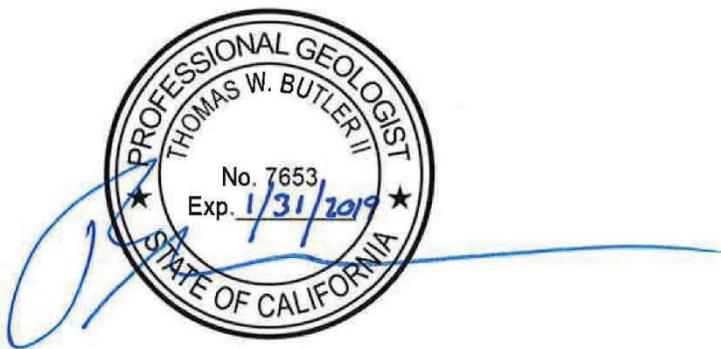
Given the relative dilute nature of effluent compared to background groundwater quality, these findings are not surprising. The most likely parameter to show up in groundwater at a concentration above a water quality goal remains nitrate, with effluent concentrations averaging around 21 mg/l. However, land application and associated plant up-take of nitrogen and soil denitrification will most likely keep nitrogen levels lower than the average concentration and well below the upper threshold background statistic of 38 mg/l. Continued monitoring is however recommended to assess further temporal trends in groundwater quality at the site to help assure on-going compliance.



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4.0 PROFESSIONAL SEALS AND CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.



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